BAKASH Sophie

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	14 from 27	3 from 12	9 from 10	2 from 4	0 from 1	0 from 0
A02 and 3	35 from 53	7 from 14	9 from 13	7 from 8	5 from 11	7 from 7
Total	49 from 80	10 from 26	18 from 23	9 from 12	5 from 12	7 from 7

Your Pinpoint Topics

Topic 1: Simple Fibonacci Sequences. Mathswatch Clip: 141

Topic 2: Understanding Number. Mathswatch Clip: NA

Topic 3: Speed. Mathswatch Clip: 142

Topic 4: Tree Diagrams. Mathswatch Clip: 151

Topic 5: Simple Vectors. Mathswatch Clip: 174

1) Simple Fibonacci Sequences (Non-Calc): Easier

1. To find the next term in a Fibonacci sequence, you find the sum of the 2 previous terms.

   1 1 2 3 5 8

   a) Find the next term in this sequence $5 + 8$

   _____13_____

   (1 mark)

   b) Find the 9th term of this sequence $8 + 13 = 21,\ 21 + 13 = 34$

   _____34_____

   (1 mark)

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2. Below are the first 5 terms of a Fibonacci sequence.

   4 5 9 14 23

   a) Find the next term in this sequence $14 + 23 = 37$ _____37_____

   (1 mark)

   b) Find the 8th term of this sequence $37 + 23 = 60,\ 60 + 27 = 97$

   _____97_____

   (1 mark)

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3. Below are the first 5 terms of a Fibonacci sequence.

   2 4 6 10 16

   a) Find the next term in this sequence $10 + 16 = 26$

   _____26_____

   (1 mark)

   b) Will 68 be in this sequence?

   $26 + 16 = 42,\ 42 + 26 = 68$ _____Yes_____

   (1 mark)

---

4. The sequence below is a Fibonacci sequence

   2 3 __5__ 8 13

   a) Find the missing number from the sequence

   $8 - 3 = 5$ _____5_____

   (1 mark)

   b) Find the next term in this sequence $13 + 8 = 21$

   _____21_____

   (1 mark)

1) Simple Fibonacci Sequences (Non-Calc): Medium

5. Here is a Fibonacci-type sequence

2 _5_ _7_ 12 19

Find the 2 missing terms

$19 - 12 = 7,\ 12 - 7 = 5$

_____5___ and ____7___

(2 marks)

---

6. Here are the fourth and fifth terms of a Fibonacci-type sequence

_3_ _7_ _10_ 17 27

Show that the first term is 3

$27 - 17 = 10,$

$17 - 10 = 7,$

$10 - 7 = 3$

(1 mark)

---

7. The first 3 terms of a Fibonacci sequence are

$1 \qquad x \qquad x + 1$

a) Write an expression for the 4th term

$x + (x + 1) = 2x + 1$

_____$2x + 1$___

(1 mark)

b) If the 5th term is 11, find the value of x

5^{th} term: $(2x + 1) + (x + 1) = 3x + 2 = 11$

$3x = 9$

_____$x = 3$____

(2 marks)

1) Simple Fibonacci Sequences (Non-Calc): Harder

8. The first three terms of a Fibonacci sequence are

$$x \quad y \quad x+y$$

a) Show that the 5th term of this sequence is $2x+3y$

4^{th} term: $y+(x+y)=x+2y$

5^{th} term: $(x+y)+(x+2y)=2x+3y$ **(2 marks)**

Given that the 3rd term is 5 and the 5th term is 14

b) Find the value of x and the value of y

$x+y=5$ (A) $\quad 2x+3y=14$ (B)

$2\times$(A): $2x+2y=10$ (C) $\quad x =$ 1

(B)- (C): $y=4$, sub into (A): $x+4=5$, $x=1$ $\quad y =$ 4

(3 marks)

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9. Here are the first and third terms of a Fibonacci sequence

$$p \quad q-p \quad q \quad 2q-p \quad 3q-p$$

a) Write an expression, in terms of p and q, for the second term

$q-p$

(1 mark)

b) Write an expression, in terms of p and q, for the fifth term

4^{th} term: $(q-p)+q=2q-p$

5^{th} term: $(2q-p)+q=3q-p$ $\quad 3q-p$

(1 mark)

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10. The first and third terms of a Fibonacci sequence are

$$a \quad b+1-a \quad b+1 \quad 2b+2-a \quad 3b+3-a$$

a) Write an expression, in terms of a and b, for the fifth term

2^{nd} term: $(b+1)-a=b+1-a$

4^{th} term: $(b+1)+(b+1-a)=2b+2-a$

5^{th} term: $(2b+2-a)+(b+1)=3b+3-a$ $\quad 3b+3-a$

(2 marks)

Given that the second term is 9 and the fifth term is 35

b) Find the value of a and the value of b

$b+1-a=9 \quad \Rightarrow b-a=8$ (A)

$3b+3-a=35 \Rightarrow 3b-a=32$ (B)

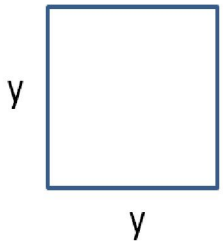
(B) – (A): $2b=24 \Rightarrow b=12$ $\quad a =$ 4

Sub into (A): $12-a=8 \Rightarrow a=4$ $\quad b =$ 12

(3 marks)

2) Understanding Number (Non-Calc): Easier

1. Jim is looking at the area and lengths of squares.



Jim considers a square with area $9m^2$.

Jim works out the length of the square as follows:

$$y^2 = 9$$

$$y = \sqrt{9}$$

$$y = 3cm$$

Jim considers another square with a **different** area.

Please tick below:

	This method will **always** give an answer which is a whole number
/	This method will **sometimes** give an answer which is a whole number
	This method will **never** give an answer which is a whole number

Show working to support your answer

Any area which is a square number will give a whole number using this method

e.g. $y^2 = 16$ gives $y = \sqrt{16} = 4$ cm

Any area that is a non-square number won't give a whole number

e.g. $y^2 = 10$ gives $y = \sqrt{10} = 3.162\ldots$ cm

(3 marks)

2) Understanding Number (Non-Calc): Medium

2.a) Anne puts a number in her calculator and squares her number. The number gets a lot bigger.

Anne says "if you square a number it will **always** get bigger".

Please tick below:

	Anne is correct
/	Anne is **not** correct

Show working to support your answer

If you square a number that is between 0 and 1 it will become smaller

e.g. $0.5^2 = 0.25$

(3 marks)

b) Pete says "if you square a number it will **always** be positive".

Please tick below:

	Pete is correct
/	Pete is **not** correct

Show working to support your answer

If you square **zero** the answer is zero, a non-positive number.

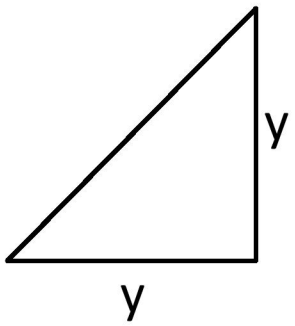
$$0^2 = 0 \times 0 = 0$$

(3 marks)

2) Understanding Number (Non-Calc): Harder

3.a) Amir cuts a square in half along the diagonal to produce a right angled triangle.

It has a length, y, which is a whole number.



Amir works out the **area** of the triangle.

Please tick below:

	The area **must** be a whole number.
/	The area will **sometimes** be a whole number.

Show working to support your answer

If y = 3 then the area is $(3 \times 3) \div 2 = 9 \div 2 = 4.5$ a decimal

If y = 4 then the area is $(4 \times 4) \div 2 = 16 \div 2 = 8$ a whole number

(3 marks)

b) Amir is about the work out the **hypotenuse** of the triangle.

Amir says "The hypotenuse of the triangle will **always** be a whole number".

Show that Amir is wrong.

Pythagoras' Theorem: $a^2 + b^2 = c^2$

If $a = 2$ and $b = 3$ then

$$c^2 = 2^2 + 3^2 = 4 + 9 = 13$$

$$c = \sqrt{13} = 3.605 \ldots$$

So the hypotenuse is not a whole number in this case

(3 marks)

3) Speed: Easier

1) Pete drove 50 miles in 4 hours
Work out his average speed in miles per hour.

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{50}{4} = \frac{25}{2} = 12.5 \text{ mph}$$

12.5 miles/hour

(2 Marks)

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2) Dave cycled 8km in 30 minutes.
Work out Dave's average speed in km/h.

30 mins = 0.5 hours

$$\text{speed} = \frac{8}{0.5} = 16 \text{ km/h}$$

16 Km/h

(3 Marks)

---

3) Jess travels 400km at an average speed of 300 km/h.
How long was she travelling for? Give your answer in minutes.

$$s = \frac{d}{t} \quad \text{so} \quad t = \frac{d}{s} = \frac{400}{300} = \frac{4}{3} = 1\tfrac{1}{3} \text{ h}$$

1 h = 60 mins so $\frac{1}{3}$ h = 20 mins

so total time = 60 + 20 = 80 mins

80 minutes

(3 Marks)

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4) Jeff set off for work at 3pm. He arrived at his destination at 5pm.
If Jeff travelled at a constant speed of 24 Km/h, how far did he travel?

t = 2 hours

$$s = \frac{d}{t} \quad \text{so} \quad d = s \times t = 24 \times 2 = 48 \text{ km}$$

48 Km

(2 Marks)

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3) Speed: Medium

Pete needs to catch a ferry.

Pete leaves his home and drives

10 miles towards the motorway

180 miles on the motorway

15 miles from the motorway to the ferry port

Pete

Takes 20 minutes to get to the motorway

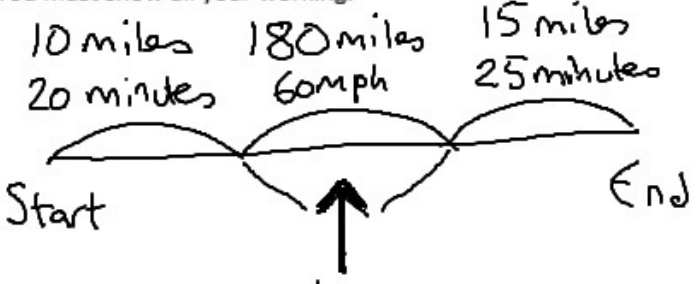
Drives at an average speed of 60mph whilst on the motorway

Takes 25 minutes to get from the motorway to the ferry port.

Pete has to arrive at the ferry port no later than midday.

What is the latest time Pete can leave his house?

You must show all your working.



$T = D/S$

$T = 180/60 = 3$ hours

Total time

3 hours

25 minutes

20 minutes +

3hrs 45 mins

Midday = 12:00pm

3hrs 45 mins

Answer = 8:15am

3) Speed: Harder

Abigail is on a bus going into the city.

The bus picks her up and drives

4 miles towards a motorway

45 miles on the motorway

6 miles from the motorway to the city bus depot

The bus

Takes 10 minutes to get to the main road

Drives at an average speed of 60mph whilst on the motorway

Takes 15 minutes to get from the motorway to the bus depot

Abigail gets on the bus at 10:19am. What time will she get off the bus?

You must show all your working.

4miles 10mins | 45mins 60mph | 6miles 15mins

Start → End

$T = D/S$

$T = 45/60 = \frac{3}{4}$

$= 45$mins

Total time taken

45
15
10
70 mins
or 1hr 10mins

10:19 + 1hr 10mins

11:29am

4) Tree Diagrams: Easier

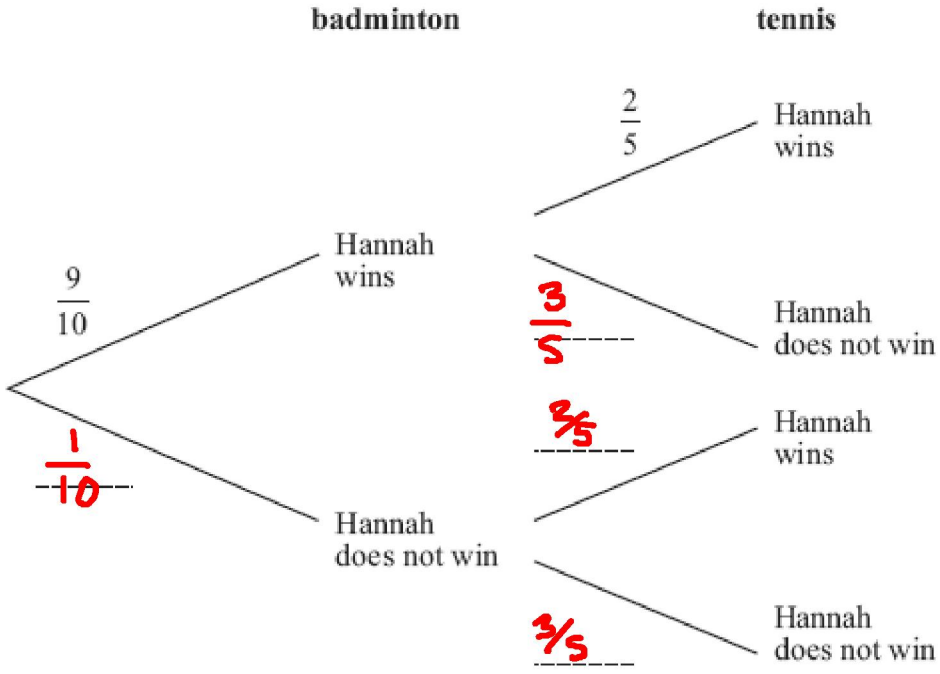
1. Hannah is going to play one badminton match and one tennis match.

The probability that she will win the badminton match is $\frac{9}{10}$

The probability that she will win the tennis match is $\frac{2}{5}$

(a) Complete the probability tree diagram.

(2)



(b) Work out the probability that Hannah will win **both** matches.

(2)

$P(W,W) = \frac{9}{10} \times \frac{2}{5} = \frac{18}{50}$

$\frac{18}{50}$

.....

(4 marks)

4) Tree Diagrams: Medium

6. Here are seven tiles.

Jim takes at random a tile.
He does **not** replace the tile.

Jim then takes at random a second tile.

(a) Calculate the probability that both the tiles Jim takes have the number 1 on them.

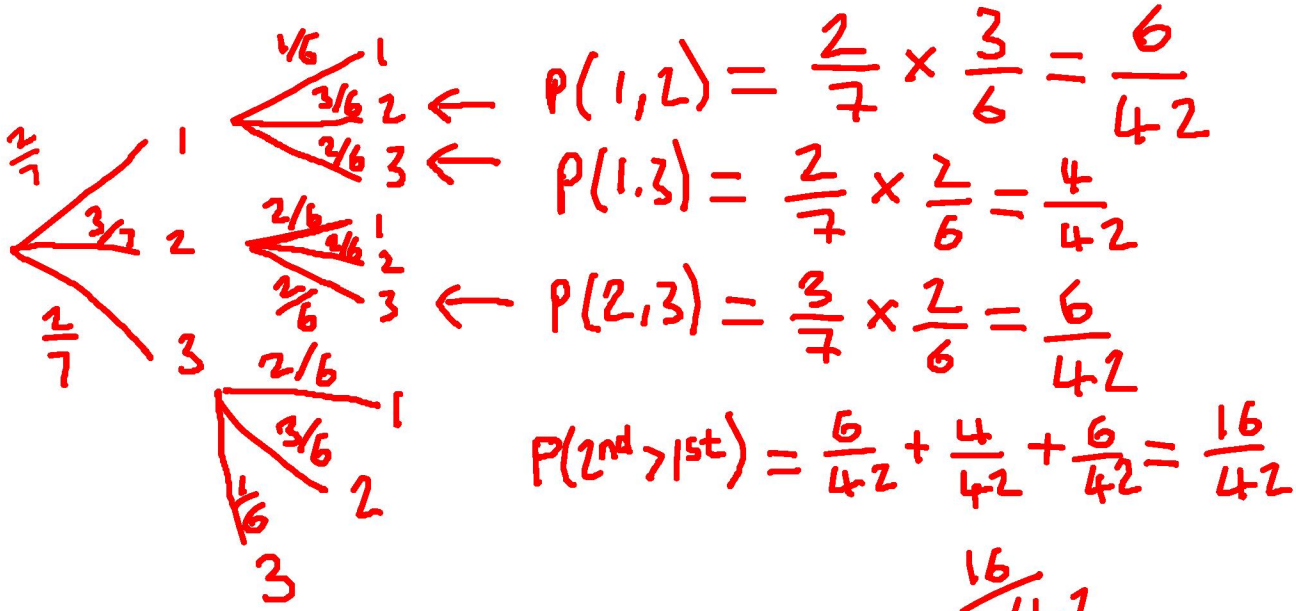
$\frac{2}{7} \times \frac{1}{6} = \frac{2}{42}$

$\frac{2}{42}$

.....

(2)

(b) Calculate the probability that the number on the second tile Jim takes is greater than the number on the first tile he takes.



$\frac{16}{42}$

.....

(3)

(5 marks)

4) Tree Diagrams: Harder

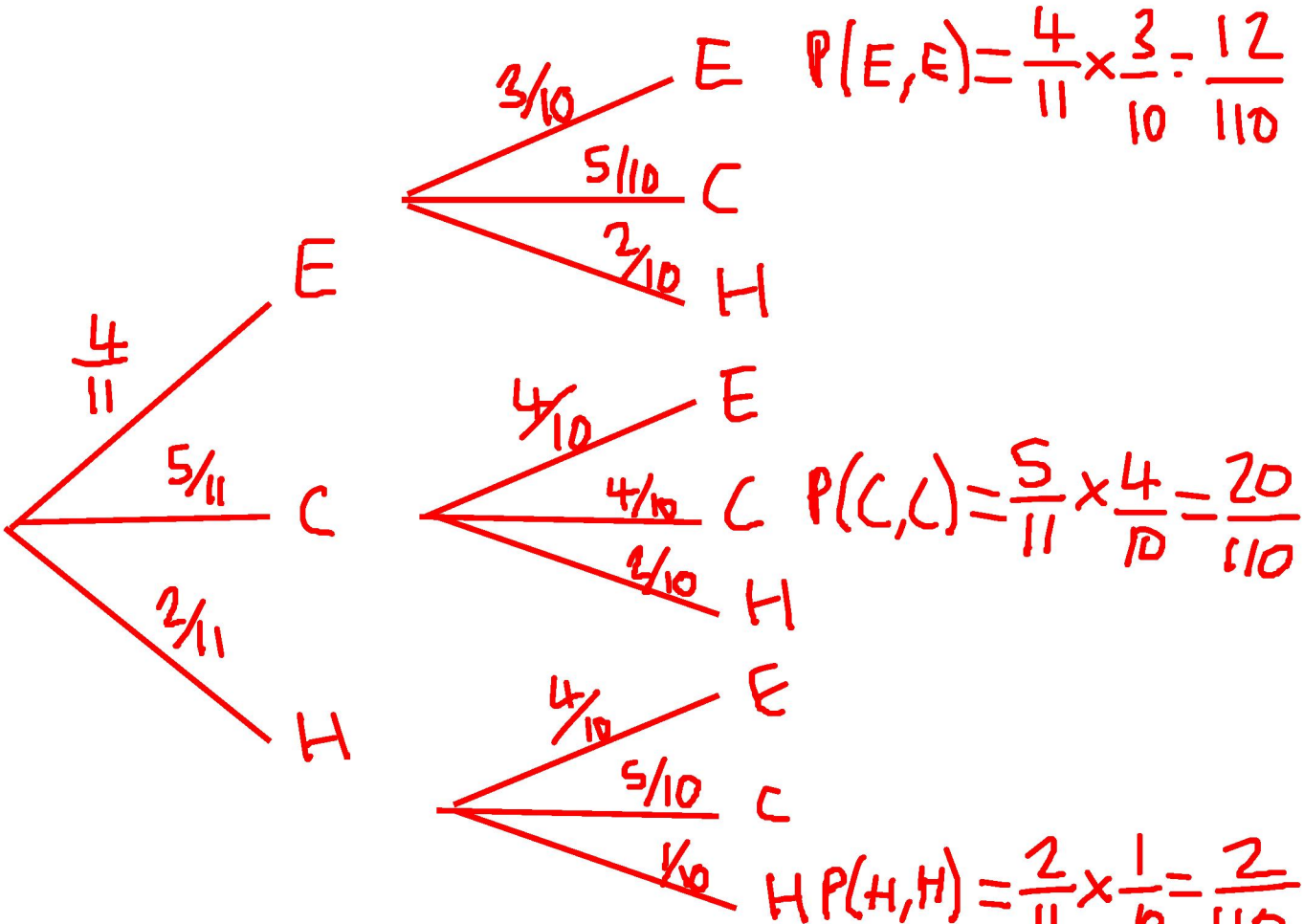
7. There are three different types of sandwiches on a shelf.

There are

4 egg sandwiches,
5 cheese sandwiches
and 2 ham sandwiches.

Erin takes at random 2 of these sandwiches.

Work out the probability that she takes 2 different types of sandwiches.



$P(\text{same}) = \frac{12}{110} + \frac{20}{110} + \frac{2}{110} = \frac{34}{110}$

$P(\text{diff}) = 1 - P(\text{same})$

$P(\text{diff}) = 1 - \frac{34}{110} = \frac{76}{110}$

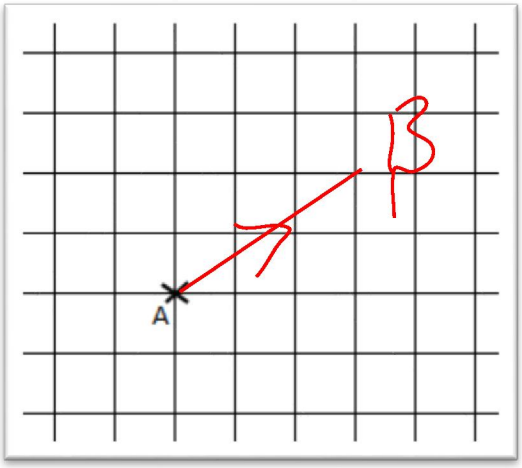
$\frac{76}{110}$

.....

(5 marks)

5) Simple Vectors (Non-Calc): Easier

3)

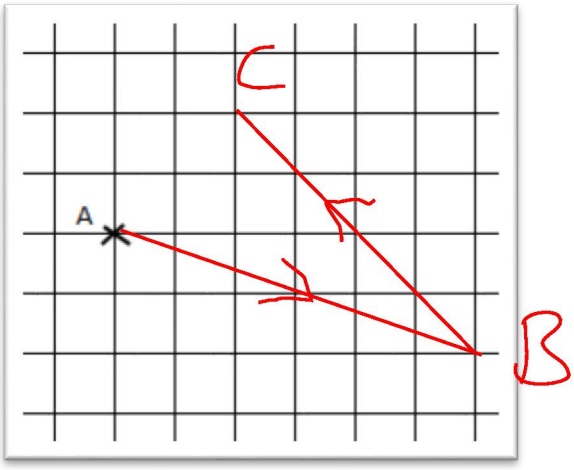


On the grid, draw the Vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ from Point A.

Label the new point B.

(1 Mark)

4)



a) On the grid, draw the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ from Point A

Label the new point B.

(1 Mark)

bi) On the grid draw the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ from Point B

Label the new point C

ii) State the vector $\overrightarrow{AC}$ $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$ (2 Marks)

5) Simple Vectors (Non-Calc): Medium

5) Vector $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 11 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

_____

(2 Marks)

6) Vector $\overrightarrow{AB} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

_____

(2 Marks)

7) Vector $\overrightarrow{AB} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 10 \end{pmatrix}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} -4 \\ -2 \end{pmatrix} + \begin{pmatrix} -2 \\ 10 \end{pmatrix} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}$

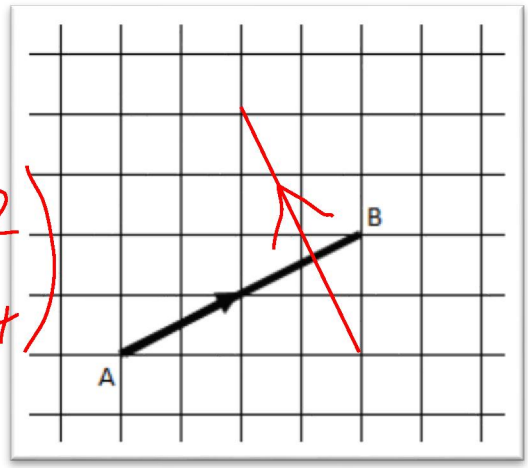
State Vector $\overrightarrow{CA}$

$\overrightarrow{CA} = -\overrightarrow{AC} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

(2 Marks)

5) Simple Vectors (Non-Calc): Harder

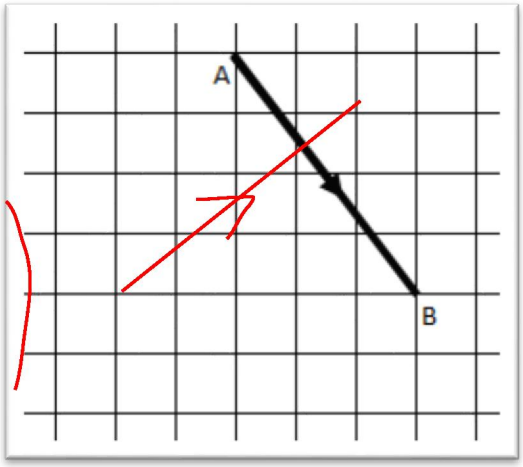
8)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

9)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

BROOKES Max

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Your Pinpoint Topics

Topic 1: Parallelogram Angle Reasoning. Mathswatch Clip: NA

Topic 2: Simple Vectors. Mathswatch Clip: 174

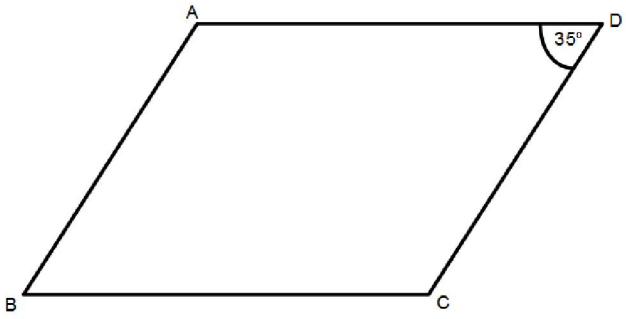
Topic 3: Algebraic Equivalence. Mathswatch Clip: NA

Topic 4: Recognising graphs. Mathswatch Clip:

Topic 5: Direct and Inverse Proportion. Mathswatch Clip: 199

1) Parallelogram Angle Reasoning: Easier

1) ABCD is a parallelogram



a) Work out the size of angle BCD

$180^o - 35^o = 145^o$

145^o

.....

b) Work out the size angle of ABC

35^o

.....

(2 Marks)

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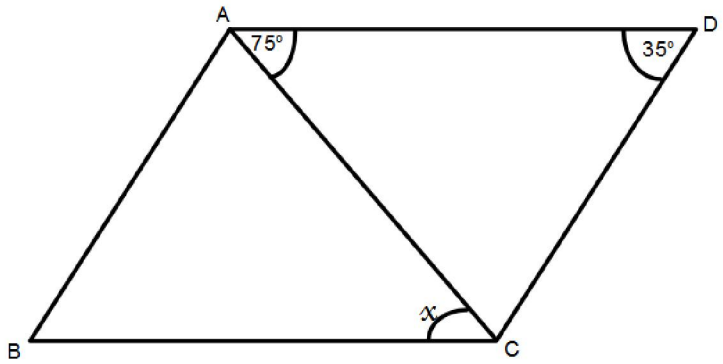
2) ABCD is a parallelogram



a) Work out the size of angle x giving reasons for your answer

75^o

.....

Reason:

Alternate angles are equal

(2 Marks)

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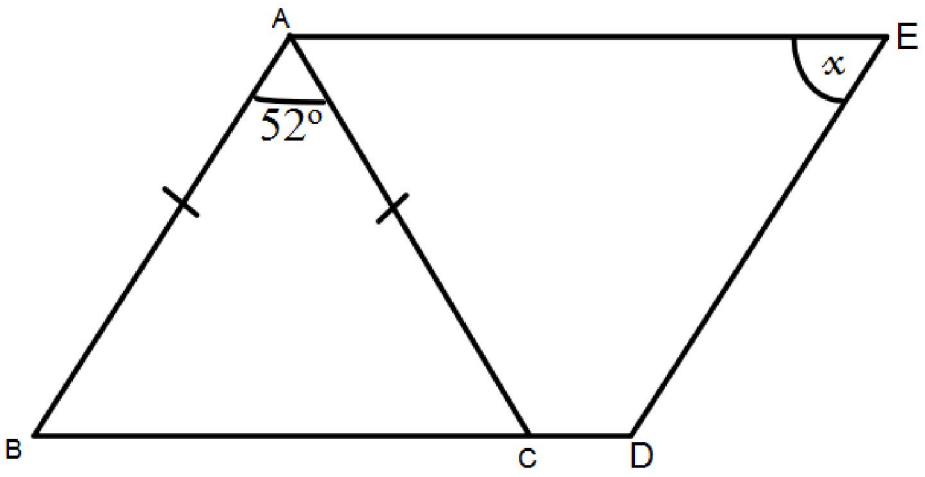
1) Parallelogram Angle Reasoning: Medium

3) ABDE is a parallelogram.

ABC is an isosceles triangle. AB=AC



Show that angle x is 64°. Give reasons at each stage

Angle ABC=ACB

180°- 52° =128°

128°÷2=64°

Base angles of an isosceles triangle are equal and angles in a triangle add up to 180°

Angle EDB=180°-64°=116°

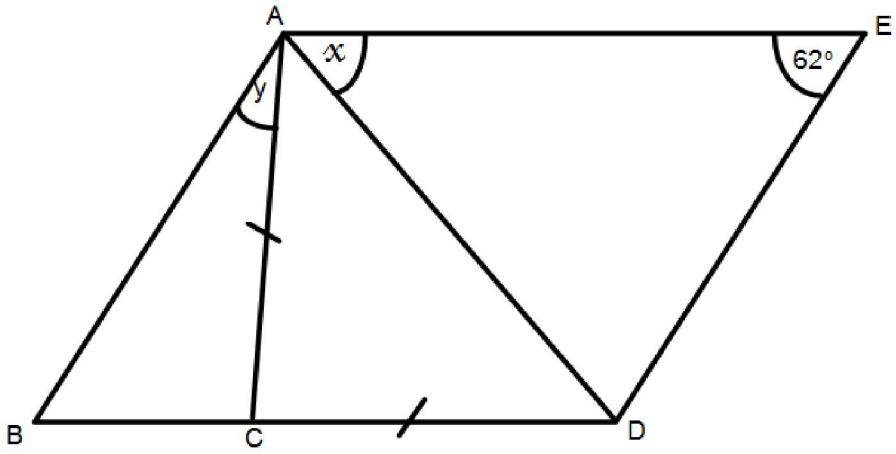
Angle x = 64° cointerior angles add to 180°.

.

(3 Marks)

1) Parallelogram Angle Reasoning: Harder

4) ABDE is a parallelogram.
AB=CD



Show that $2x + y = 118^o$

Angle ADC is x (alternate angles are equal)

Angle CAD is x (base angles of an isosceles triangle are equal)

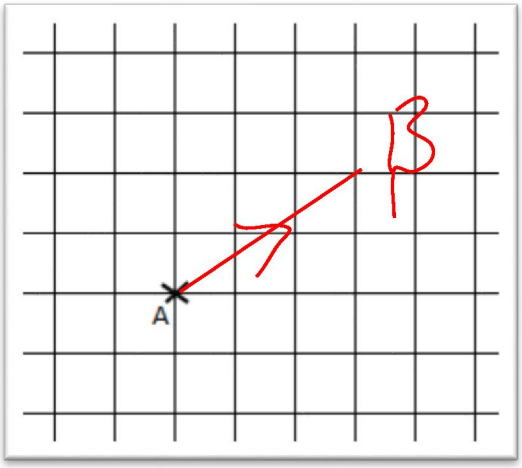
Angle BAE is 118^o (cointerior angles are equal)

Therefore $2x + y = 118^o$

(3 marks)

2) Simple Vectors: Easier

3)

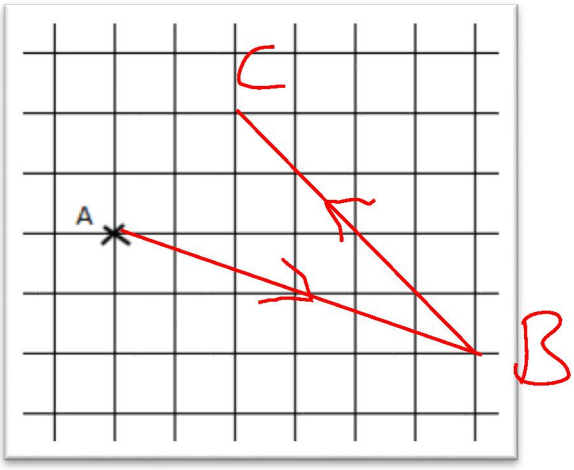


On the grid, draw the Vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ from Point A.

Label the new point B.

(1 Mark)

4)



a) On the grid, draw the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ from Point A

Label the new point B.

(1 Mark)

bi) On the grid draw the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ from Point B

Label the new point C

ii) State the vector $\overrightarrow{AC}$ $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$ (2 Marks)

2) Simple Vectors: Medium

5) Vector $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 11 \end{pmatrix}$

_____

(2 Marks)

6) Vector $\overrightarrow{AB} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$

_____

(2 Marks)

7) Vector $\overrightarrow{AB} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 10 \end{pmatrix}$

State Vector $\overrightarrow{CA}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

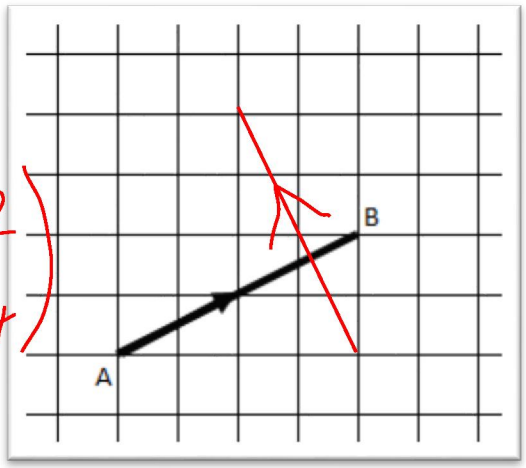
$\begin{pmatrix} -4 \\ -2 \end{pmatrix} + \begin{pmatrix} -2 \\ 10 \end{pmatrix} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}$

$\overrightarrow{CA} = -\overrightarrow{AC} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

(2 Marks)

2) Simple Vectors: Harder

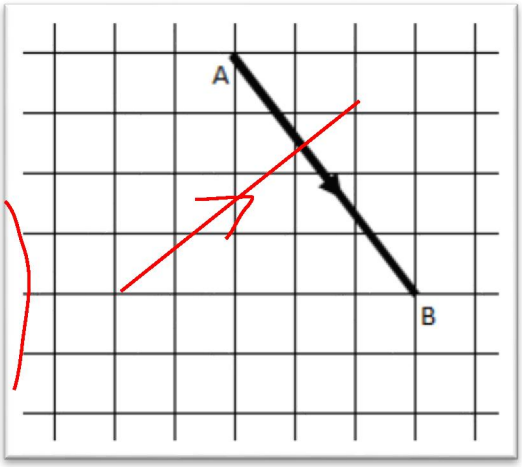
8)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

9)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

3) Algebraic Equivalence: Easier

1) Simplify $\frac{3x^2}{x}$

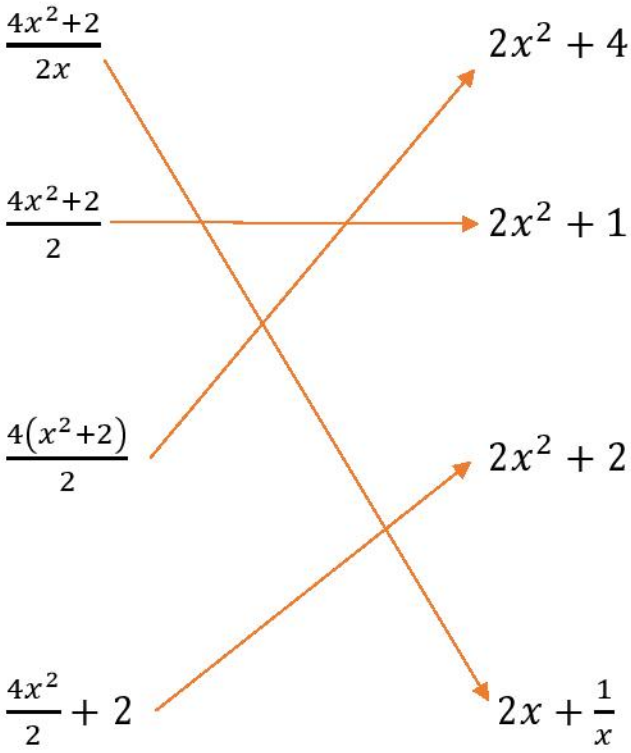
$3x$

_____

(1 Mark)

---

2) Match each of the four expressions on the left hand side with 1 equivalent expression on the right hand side



3) Algebraic Equivalence: Medium

3) Circle the expression that is equivalent to $\frac{3x^2+2}{x}$ where x is not equal to 0

A $3x^3+2$ B $3x+\frac{2}{x}$ C $2x^2+\frac{2}{x}$ D $3x+2$

$$\frac{3x^2+2}{x}$$

$$=\frac{3x^2}{x}+\frac{2}{x}$$

$$=3x+\frac{2}{x}$$

(1 Mark)

---

4) **Two** of these four expressions are equivalent. Circle the two expressions

A $\frac{x}{x+5}$ B $1+\frac{x}{5}$ C $\frac{5+x}{5}$ D $\frac{x^2}{x^2+5}$

(1 mark)

3) Algebraic Equivalence: Harder

5) Fiona tries to simplify this expression

$$\frac{3x}{3+x}$$

She writes

$$\frac{3x}{3}+\frac{3x}{x}$$

$$x+3$$

Explain why Fiona can not rewrite the expression like this

Dividing $3x$ by $3+x$ is not the same as dividing it by 3 and adding it to $\frac{3x}{x}$

Numerical Example

If $x = 1$

$$\frac{3x}{3+x}=\frac{3}{4}$$

$$\frac{3x}{3}+\frac{3x}{x}=\frac{3}{3}+\frac{3}{1}=4$$

As you can see, these two expressions are not equal

(1 mark)

---

6) Show that $\frac{2x+5}{1+\frac{2}{x}}$ is equivalent to $\frac{2x^2+5x}{x+2}$

$$\frac{2x+5}{1+\frac{2}{x}}$$

$$=\frac{x(2x+5)}{x(1+\frac{2}{x})}$$

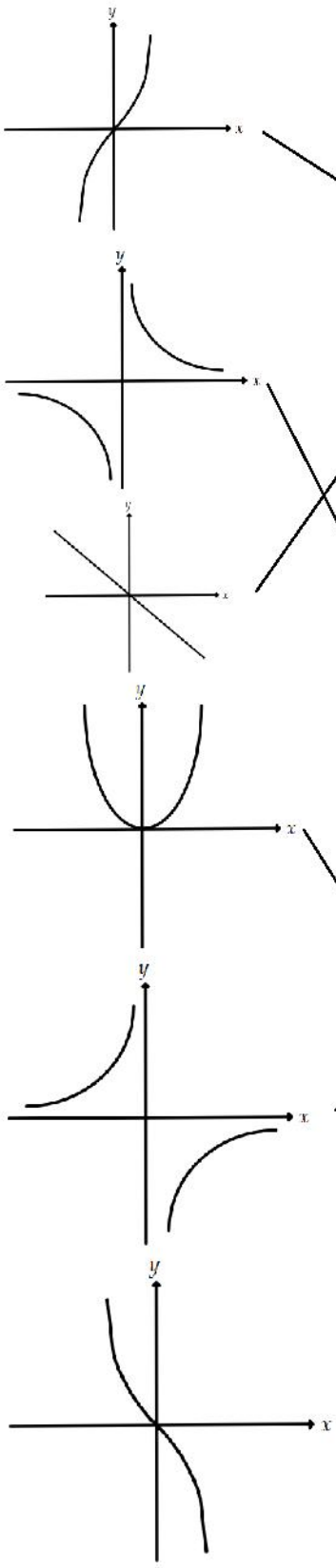
$$=\frac{2x^2+5x}{x+2}$$

(1 mark)

---

4) Recognising graphs: Easier

1) Match each of the graphs with its equation, the first one is done for you



$y = -x$

$y = x^3$

$y = -x^3$

$y = -\frac{1}{x}$

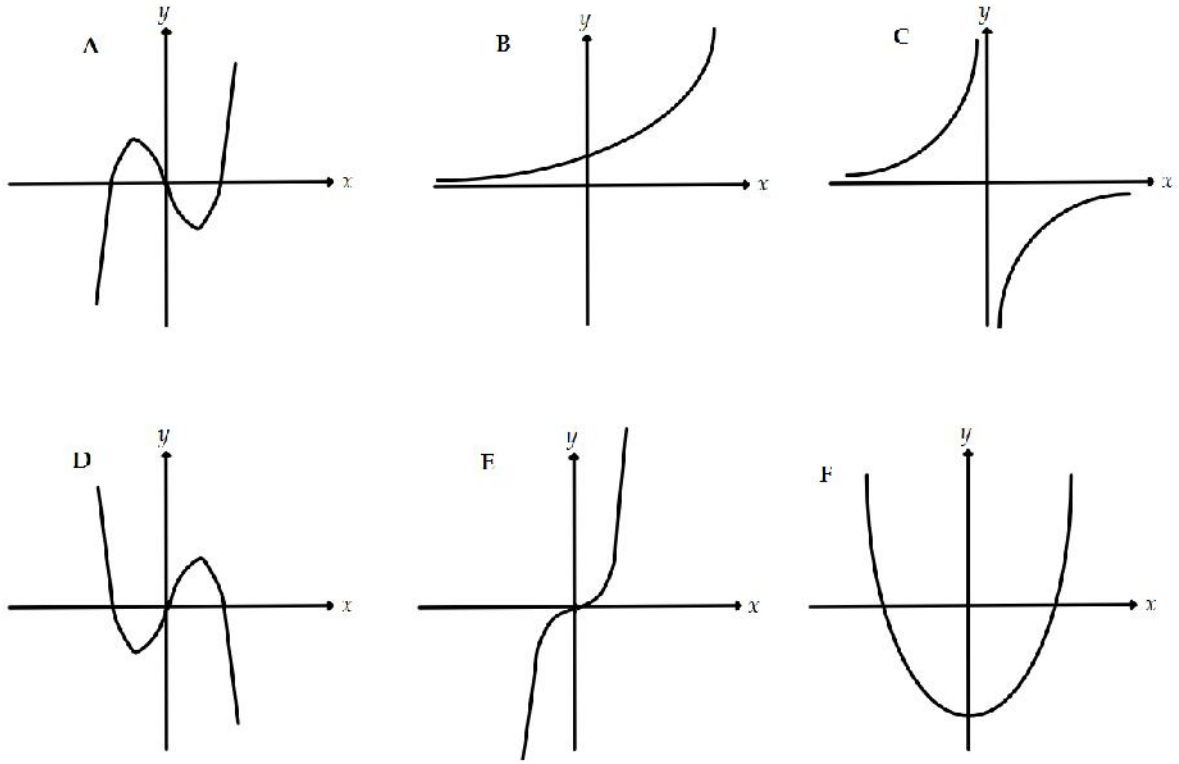
$y = \frac{1}{x}$

$y = x^2$

(3 marks)

4) Recognising graphs: Medium

2) Harry has sketched some graphs



a) Write down the letter of the graph that could have the equation $y = 3^x$

B

_____

(1 Mark)

b) Write down the letter of the graph that could have the equation $y = -\frac{5}{x}$

C

_____

(1 Mark)

c) Write down the letter of the graph that could have the equation $y = 2x - x^3$

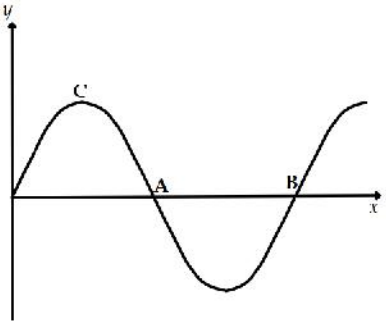
D

_____

(1 Mark)

4) Recognising graphs: Harder

3) A sketch of part of $y = \sin(x)$ is drawn below



a) Write down the coordinates of A

$(180°, 0)$

_____

(1 Mark)

b) Write down the coordinates of B

$(360°, 0)$

_____

(1 Mark)

c) Write down the coordinates of C

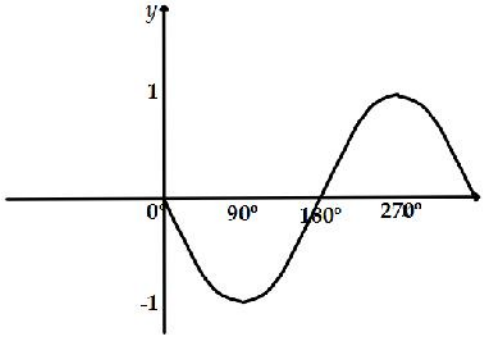
$(90°, 1)$

_____

(1 Mark)

---

4) Lanre was asked to sketch $y = \cos(x)\ for\ 0° \leq x \leq 360°$. This is what Lanre sketched



Write down one mistake Lanre has made

$y = \cos(x)$ does not go through (0,0) it starts at (0,1) and decreases to (90°,0)

(1 Mark)

5) Direct and Inverse Proportion: Easier

1. The weight of a piece of wire is directly proportional to its length.

A piece of wire is 25 cm long and has a weight of 6 grams.
Another piece of the same wire is 30 cm long.

Calculate the weight of the 30 cm piece of wire.

$w = kl$
$6 = 25k$
$k = 0.24$

$w = 0.24l$
$w = 0.24 \times 30$
$w = 7.2$

7.2 ..... grams

(Total 2 marks)

2. A ball falls vertically after being dropped.
The ball falls a distance d metres in a time of t seconds.
d is directly proportional to the square of t. $d = kt^2$

The ball falls 20 metres in a time of 2 seconds.

(a) Find a formula for d in terms of t.

$20 = k \times 2^2$
$20 = 4k$
$k = 5$

$d =$ $5t^2$

(3)

(b) Calculate the distance the ball falls in 3 seconds.

$d = 5 \times 3^2$
$d = 5 \times 9 = 45$

45 ..... m

(1)

(c) Calculate the time the ball takes to fall 605 m.

$d = 5t^2$
$605 = 5t^2$
$t^2 = 121$
$t = \pm 11$

(ignore -11 as time can't be $-ve$)

11 ..... seconds

(3)

(Total 7 marks)

5) Direct and Inverse Proportion: Medium

16. P is inversely proportional to V.

$P = \frac{k}{V}$

When $V = 8$, $P = 5$

(a) Find a formula for P in terms of V.

$5 = \frac{k}{8}$

$k = 5 \times 8$

$k = 40$

$P = \frac{40}{V}$

(3)

(b) Calculate the value of P when $V = 2$

$P = \frac{40}{2}$

$P = 20$

20

(1)

(Total 4 marks)

17. The force, F, between two magnets is inversely proportional to the square of the distance, x, between them.

$F = \frac{k}{x^2}$

When $x = 3$, $F = 4$.

(a) Calculate F when $x = 2$.

$4 = \frac{k}{9}$

$k = 36$

$F = \frac{36}{x^2}$

$F = \frac{36}{2^2}$

$F = \frac{36}{4} = 9$

$F = 9$

(4)

(b) Calculate x when $F = 64$.

$F = \frac{36}{x^2}$

$64 = \frac{36}{x^2}$

$64x^2 = 36$

$x^2 = \frac{36}{64}$

$x = \pm\frac{6}{8}$

$x = \frac{3}{4}$

(2)

(Total 6 marks)

5) Direct and Inverse Proportion: Harder

1) A is inversely proportional to the square root of B. Jim says if B is very large A will be negative. Is he right?

Solution: $A \propto \frac{1}{\sqrt{B}}$

$$A = \frac{k}{\sqrt{B}}$$

Jim is wrong. If B is very large $\sqrt{B}$ will be positive, therefore A will also be positive.

(As B becomes very large, A becomes very small)

(4 Marks)

---

2) If Sally drives to work 25% faster than she did yesterday. What would be her percentage decrease in the time taken to get to work?

Solution: $Time = \frac{Distance}{Speed}$

$$Time = \frac{D}{1.25}$$

$$Time = \frac{1}{1.25}$$

$$Time = \frac{4}{5}$$

$$\frac{4}{5} = 80\%$$

She will get there 20% faster.

(4Marks)

BURNS Megan

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	21 from 27	7 from 12	9 from 10	4 from 4	1 from 1	0 from 0
A02 and 3	40 from 53	10 from 14	9 from 13	8 from 8	6 from 11	7 from 7
Total	61 from 80	17 from 26	18 from 23	12 from 12	7 from 12	7 from 7

Your Pinpoint Topics

Topic 1: Simple Fibonacci Sequences. Mathswatch Clip: 141

Topic 2: Simple Vectors. Mathswatch Clip: 174

Topic 3: Recognising graphs. Mathswatch Clip:

Topic 4: Fractional and Negative Indices. MW: 188

Topic 5: Non-Calc Trigonometry. Mathswatch Clip: 173

1) Simple Fibonacci Sequences: Easier

1. To find the next term in a Fibonacci sequence, you find the sum of the 2 previous terms.

   1 1 2 3 5 8

   a) Find the next term in this sequence $5 + 8$

   13

   (1 mark)

   b) Find the 9th term of this sequence $8 + 13 = 21,\ 21 + 13 = 34$

   34

   (1 mark)

---

2. Below are the first 5 terms of a Fibonacci sequence.

   4 5 9 14 23

   a) Find the next term in this sequence $14 + 23 = 37$ 37

   (1 mark)

   b) Find the 8th term of this sequence $37 + 23 = 60,\ 60 + 27 = 97$

   97

   (1 mark)

---

3. Below are the first 5 terms of a Fibonacci sequence.

   2 4 6 10 16

   a) Find the next term in this sequence $10 + 16 = 26$

   26

   (1 mark)

   b) Will 68 be in this sequence?

   $26 + 16 = 42,\ 42 + 26 = 68$ Yes

   (1 mark)

---

4. The sequence below is a Fibonacci sequence

   2 3 5 8 13

   a) Find the missing number from the sequence

   $8 - 3 = 5$ 5

   (1 mark)

   b) Find the next term in this sequence $13 + 8 = 21$

   21

   (1 mark)

1) Simple Fibonacci Sequences: Medium

5. Here is a Fibonacci-type sequence

2 _5_ _7_ 12 19

Find the 2 missing terms

$19 - 12 = 7,\ 12 - 7 = 5$

_____5___ and ____7___

(2 marks)

---

6. Here are the fourth and fifth terms of a Fibonacci-type sequence

_3_ _7_ _10_ 17 27

Show that the first term is 3

$27 - 17 = 10,$

$17 - 10 = 7,$

$10 - 7 = 3$

(1 mark)

---

7. The first 3 terms of a Fibonacci sequence are

$1 \qquad x \qquad x + 1$

a) Write an expression for the 4th term

$x + (x + 1) = 2x + 1$

_____$2x + 1$___

(1 mark)

b) If the 5th term is 11, find the value of x

5^{th} term: $(2x + 1) + (x + 1) = 3x + 2 = 11$

$3x = 9$

_____$x = 3$____

(2 marks)

1) Simple Fibonacci Sequences: Harder

8. The first three terms of a Fibonacci sequence are

$$x \quad y \quad x+y$$

a) Show that the 5th term of this sequence is $2x+3y$

4^{th} term: $y+(x+y)=x+2y$

5^{th} term: $(x+y)+(x+2y)=2x+3y$ **(2 marks)**

Given that the 3rd term is 5 and the 5th term is 14

b) Find the value of x and the value of y

$x+y=5$ (A) $\quad 2x+3y=14$ (B)

$2\times$(A): $2x+2y=10$ (C) $\quad x =$ 1

(B)- (C): $y=4$, sub into (A): $x+4=5$, $x=1$ $\quad y =$ 4

(3 marks)

---

9. Here are the first and third terms of a Fibonacci sequence

$$p \quad q-p \quad q \quad 2q-p \quad 3q-p$$

a) Write an expression, in terms of p and q, for the second term

$q-p$

(1 mark)

b) Write an expression, in terms of p and q, for the fifth term

4^{th} term: $(q-p)+q=2q-p$

5^{th} term: $(2q-p)+q=3q-p$ $\quad 3q-p$

(1 mark)

---

10. The first and third terms of a Fibonacci sequence are

$$a \quad b+1-a \quad b+1 \quad 2b+2-a \quad 3b+3-a$$

a) Write an expression, in terms of a and b, for the fifth term

2^{nd} term: $(b+1)-a=b+1-a$

4^{th} term: $(b+1)+(b+1-a)=2b+2-a$

5^{th} term: $(2b+2-a)+(b+1)=3b+3-a$ $\quad 3b+3-a$

(2 marks)

Given that the second term is 9 and the fifth term is 35

b) Find the value of a and the value of b

$b+1-a=9 \quad \Rightarrow b-a=8$ (A)

$3b+3-a=35 \Rightarrow 3b-a=32$ (B)

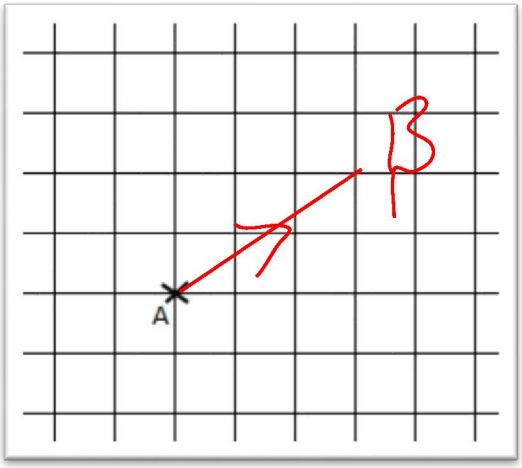
(B) – (A): $2b=24 \Rightarrow b=12$ $\quad a =$ 4

Sub into (A): $12-a=8 \Rightarrow a=4$ $\quad b =$ 12

(3 marks)

2) Simple Vectors: Easier

3)

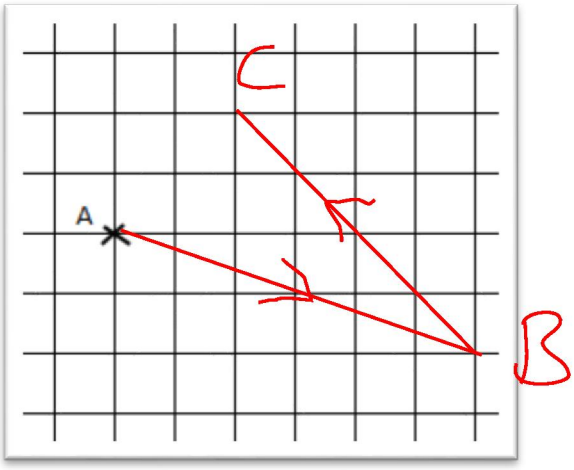


On the grid, draw the Vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ from Point A.

Label the new point B.

(1 Mark)

4)



a) On the grid, draw the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ from Point A

Label the new point B.

(1 Mark)

bi) On the grid draw the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ from Point B

Label the new point C

ii) State the vector $\overrightarrow{AC}$ $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$ (2 Marks)

2) Simple Vectors: Medium

5) Vector $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 11 \end{pmatrix}$

_____

(2 Marks)

6) Vector $\overrightarrow{AB} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$

_____

(2 Marks)

7) Vector $\overrightarrow{AB} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 10 \end{pmatrix}$

State Vector $\overrightarrow{CA}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

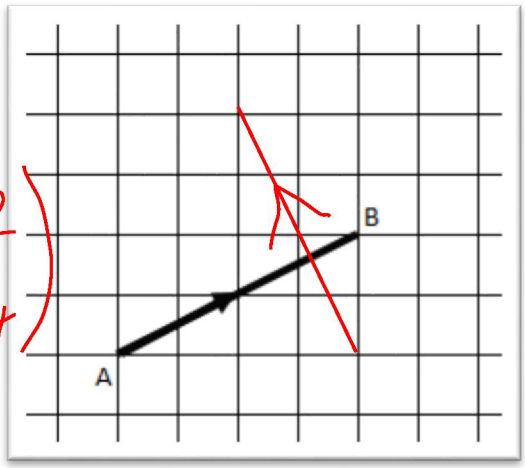
$\begin{pmatrix} -4 \\ -2 \end{pmatrix} + \begin{pmatrix} -2 \\ 10 \end{pmatrix} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}$

$\overrightarrow{CA} = -\overrightarrow{AC} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

(2 Marks)

2) Simple Vectors: Harder

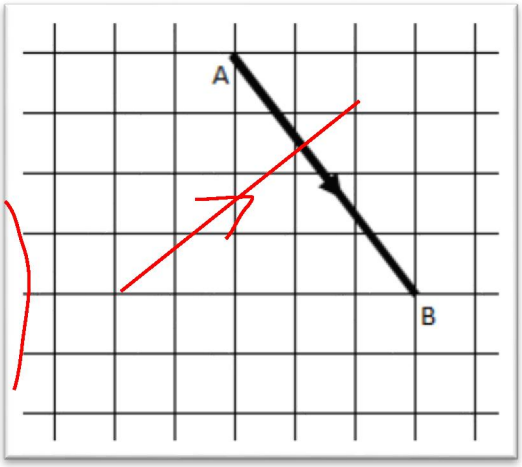
8)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

9)

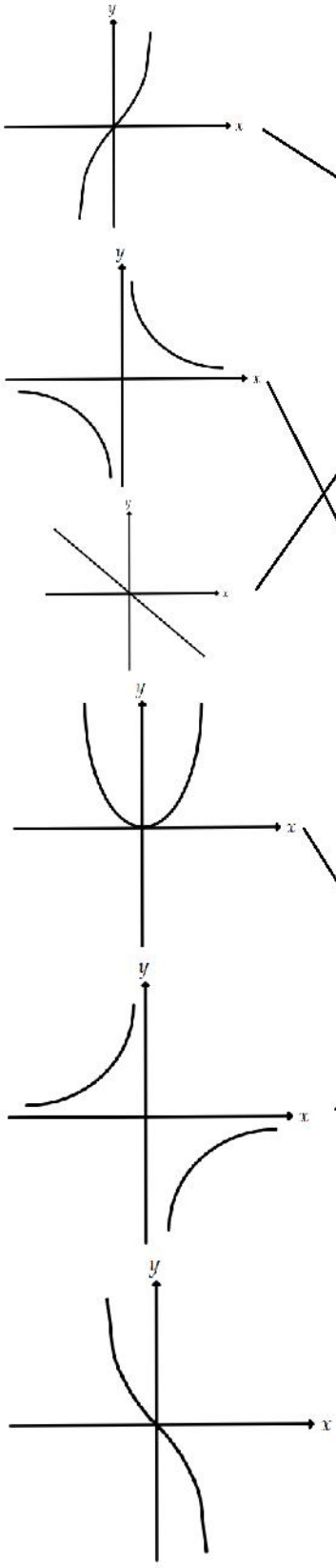


Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

3) Recognising graphs: Easier

1) Match each of the graphs with its equation, the first one is done for you



$y = -x$

$y = x^3$

$y = -x^3$

$y = -\frac{1}{x}$

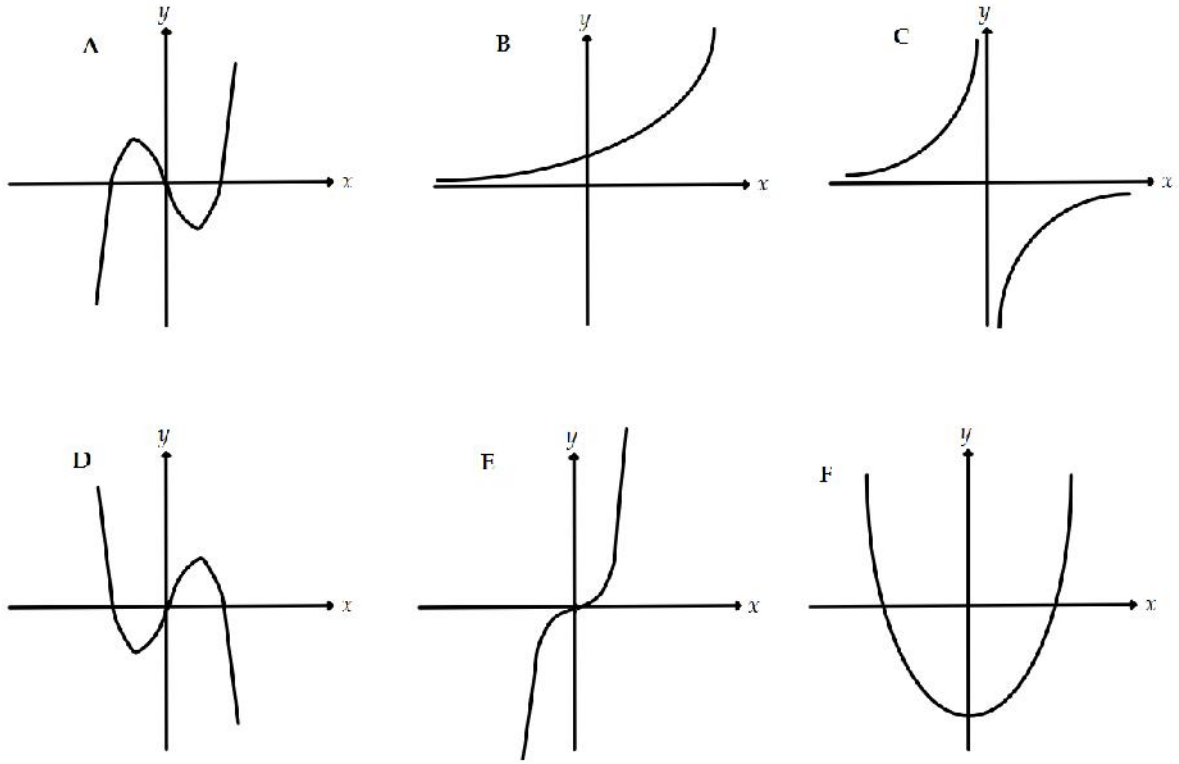
$y = \frac{1}{x}$

$y = x^2$

(3 marks)

3) Recognising graphs: Medium

2) Harry has sketched some graphs



a) Write down the letter of the graph that could have the equation $y = 3^x$

B

_____

(1 Mark)

b) Write down the letter of the graph that could have the equation $y = -\frac{5}{x}$

C

_____

(1 Mark)

c) Write down the letter of the graph that could have the equation $y = 2x - x^3$

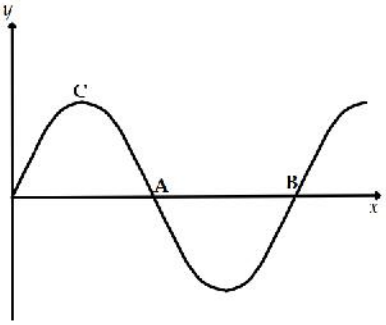
D

_____

(1 Mark)

3) Recognising graphs: Harder

3) A sketch of part of $y = \sin(x)$ is drawn below



a) Write down the coordinates of A

$(180°, 0)$

(1 Mark)

b) Write down the coordinates of B

$(360°, 0)$

(1 Mark)

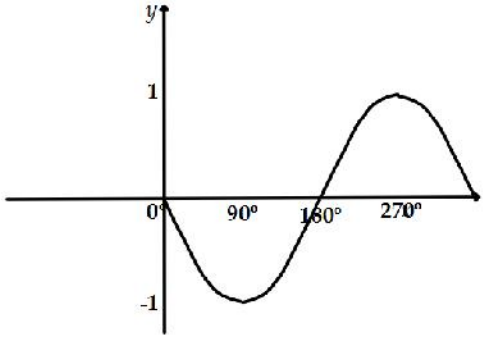
c) Write down the coordinates of C

$(90°, 1)$

(1 Mark)

---

4) Lanre was asked to sketch $y = \cos(x)\ for\ 0° \leq x \leq 360°$. This is what Lanre sketched



Write down one mistake Lanre has made

$y = \cos(x)$ does not go through (0,0) it starts at (0,1) and decreases to (90°,0)

(1 Mark)

4) Fractional and Negative Indices: Easier

1) Evaluate

a) 6^0 $= 1$ _____

(1 Mark)

a) $25^{\frac{1}{2}}$ $= \sqrt{25} = 5$ _____

(1 Mark)

c) 3^{-1} $= \frac{1}{3}$ _____

(1 Mark)

---

2) Sarah says that $9^{\frac{1}{2}}$ is 4.5. She is wrong. Explain her mistake.

Solution: $9^{\frac{1}{2}} = \sqrt{9} = 3$

_____

(1 Mark)

---

3) Evaluate

a) $27^{\frac{1}{3}}$ $\sqrt[3]{27} = 3$

_____

(1 Mark)

b) $27^{\frac{2}{3}}$ $\sqrt[3]{27}^2 = 9$ _____

(1 Mark)

c) $27^{\frac{-2}{3}}$ $\frac{1}{\sqrt[3]{27^2}} = \frac{1}{9}$ _____

(1 Mark)

4) Fractional and Negative Indices: Medium

4) Evaluate

a) $\left(\frac{25}{81}\right)^{\frac{-1}{2}}$ $\left(\frac{1}{25/81}\right)^{\frac{1}{2}} = \left(\frac{81}{25}\right)^{\frac{1}{2}} = \sqrt{\frac{81}{25}} = \frac{9}{5}$

(1 Mark)

b) $32^{\frac{-3}{5}}$ $\left(\frac{1}{32}\right)^{\frac{3}{5}} = \left(\sqrt[5]{\frac{1}{32}}^{3}\right) = \frac{1}{2^3} = \frac{1}{8}$

(1 Mark)

c) $144^{\frac{-1}{2}} \times 3^{-2}$

$\frac{1}{\sqrt{144}} \times \frac{1}{3^2} = \frac{1}{12} \times \frac{1}{9} = \frac{1}{108}$

(2 Marks)

---

5) Put these numbers in ascending order, show your working.

125^0 $125^{\frac{-1}{3}}$ $\left(\frac{1}{125}\right)^{\frac{-1}{3}}$ $125^{\frac{-2}{3}}$

1 $\frac{1}{\sqrt[3]{125}} = \frac{1}{5}$ $\left(\frac{1}{1/125}\right)^{\frac{1}{3}} = \sqrt[3]{125} = 5$ $\left(\frac{1}{125}\right)^{\frac{2}{3}} = \frac{1}{\sqrt[3]{125^2}} = \frac{1}{5^2} = \frac{1}{25}$

Correct order $\frac{1}{25}$, $\frac{1}{5}$, 1, 5.

(3 Marks)

4) Fractional and Negative Indices: Harder

6) If $2^{2x} = \frac{1}{16}$. Work out the value of x.

$2^{2x} = \frac{1}{4^2}$

$2^{2x} = 4^{-2}$

$2^{2x} = 2^{2(-2)}$

$x = -2$

(2 Marks)

---

7) One of these has a different value to the other two. Decide which one and justify your answer.

$4^{\frac{3}{4}}$ $8^{\frac{1}{4}}$ $2^{\frac{3}{2}}$

$2^{2\left(\frac{3}{4}\right)} = 2^{\frac{6}{4}} = 2^{\frac{3}{2}}$ $2^{3\left(\frac{1}{4}\right)} = 2^{\frac{3}{4}}$

The values that are the same are $4^{\frac{3}{4}}$ and $2^{\frac{3}{2}}$

(3 Marks)

---

8) If $32^{3x} = \frac{1}{8}$. Find the value of x

$2^{5(3x)} = \frac{1}{8}$

$2^{15x} = \frac{1}{2^3}$

$2^{15x} = 2^{-3}$

$15x = -3$

$x = \frac{-3}{15}$

$x = -\frac{1}{5}$

(3 Marks)

5) Non-Calc Trigonometry: Easier

Solutions for Question 1:

a) $\cos 30° = \frac{\sqrt{3}}{2}$

b) $\tan 60° = \sqrt{3}$

c) $\sin 45° = \frac{\sqrt{2}}{2}$

Solutions for Question 2:

a) $\tan 45° = 1$

b) $\cos 45° = \frac{\sqrt{2}}{2}$

c) $\sin 60° = \frac{\sqrt{3}}{2}$

5) Non-Calc Trigonometry: Medium

Solution for Question 3:

$\cos 60° = \frac{A}{H}$

$\cos 60° = \frac{6}{x}$

If $\cos 60° = 0.5$

$0.5 = \frac{6}{x}$

$x = 12cm$

Solution for Question 4:

$\tan 30° = \frac{O}{A}$

$\tan 30° = \frac{y}{9}$

If $\tan 30° = \frac{\sqrt{3}}{3}$

$\frac{\sqrt{3}}{3} = \frac{y}{9}$

$y = \frac{9\sqrt{3}}{3} cm$

$y = 3\sqrt{3}\, cm$

5) Non-Calc Trigonometry: Harder

Solution for Question 5:

$\sin 30° = \frac{6.1}{x}$

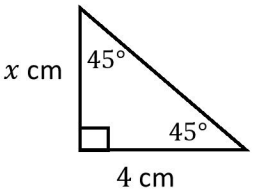
$x = \frac{6.1}{\sin 30°}$

$x = \frac{6.1}{0.5}$

$x = 12.2\ cm$

Solution for Question 6:

Cut triangle in half



Let x equal the height of the triangle

$\tan 45° = \frac{x}{4}$

$x = 4\ x\ \tan 45$

$x = 4cm$m

Area of triangle: $\frac{1}{2} \times 8 \times 4$ ...

Area of triangle = 16cm^2

FARTHING Rachel

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	15 from 27	8 from 12	2 from 10	4 from 4	1 from 1	0 from 0
A02 and 3	26 from 53	9 from 14	6 from 13	5 from 8	3 from 11	3 from 7
Total	41 from 80	17 from 26	8 from 23	9 from 12	4 from 12	3 from 7

Your Pinpoint Topics

Topic 1: Solving simple equations with fractions. MW: 135

Topic 2: Simple Fibonacci Sequences. Mathswatch Clip: 141

Topic 3: Simple Vectors. Mathswatch Clip: 174

Topic 4: Algebraic Equivalence. Mathswatch Clip: NA

Topic 5: Recognising graphs. Mathswatch Clip:

1) Solving simple equations with fractions (Non-Calc): Easier

1) Solve $\frac{x}{2} = 10$

$x = 20$

(multiplying both sides by 2)

_____

(1 Mark)

---

2) Solve $\frac{x}{5} = 6$

(multiplying both sides by 5) $x = 30$

_____

(1 Mark)

---

3) Solve $\frac{3x}{4} = 6$

Multiplying by 4 $3x = 24$

Dividing by 3 $x = 8$

$x = 8$

_____

(2 Marks)

---

4) Solve $\frac{2}{3}x = 4$

Multiplying by 3 $2x = 12$

Dividing by 2 $x = 6$

$x = 6$

_____

(2 Marks)

1) Solving simple equations with fractions (Non-Calc): Medium

5) Solve $\frac{x}{2} + 1 = 9$

Subtracting 1 $\frac{x}{2} = 8$

Multiplying by 2 $x = 16$

$x = 16$

(2 Marks)

---

6) Solve $\frac{x}{3} - 11 = 9$

Adding 11 $\frac{x}{3} = 20$

Multiplying by 3 $x = 60$

$x = 60$

(2 Marks)

---

7) Solve $\frac{3x}{2} - 5 = 9$

Adding 5 $\frac{3x}{2} = 14$

Multiplying by 2 $3x = 28$

Dividing by 3

$x = \frac{28}{3}$

$x = \frac{28}{3}$

(3 Marks)

---

1) Solving simple equations with fractions (Non-Calc): Harder

8) Aurora is solving this equation

$$\frac{2x}{3} + 3 = 12$$

Here is her working

$\frac{2x}{3} = 9$ line 1

$2x = 3$ line 2

$x = \frac{3}{2}$ line 3

Explain one mistake Aurora has made

From line 1 to line 2 she has multiplied the right hand side of the equation by 3 but divided the left hand side by 3, she should have multiplied both sides by 3 giving $2x = 27$, then her answer would have been $x = \frac{27}{2}$

(1 Mark)

2) Simple Fibonacci Sequences: Easier

1. To find the next term in a Fibonacci sequence, you find the sum of the 2 previous terms.

   1 1 2 3 5 8

   a) Find the next term in this sequence $5 + 8$

   13

   (1 mark)

   b) Find the 9th term of this sequence $8 + 13 = 21,\ 21 + 13 = 34$

   34

   (1 mark)

---

2. Below are the first 5 terms of a Fibonacci sequence.

   4 5 9 14 23

   a) Find the next term in this sequence $14 + 23 = 37$ 37

   (1 mark)

   b) Find the 8th term of this sequence $37 + 23 = 60,\ 60 + 27 = 97$

   97

   (1 mark)

---

3. Below are the first 5 terms of a Fibonacci sequence.

   2 4 6 10 16

   a) Find the next term in this sequence $10 + 16 = 26$

   26

   (1 mark)

   b) Will 68 be in this sequence?

   $26 + 16 = 42,\ 42 + 26 = 68$ Yes

   (1 mark)

---

4. The sequence below is a Fibonacci sequence

   2 3 5 8 13

   a) Find the missing number from the sequence

   $8 - 3 = 5$ 5

   (1 mark)

   b) Find the next term in this sequence $13 + 8 = 21$

   21

   (1 mark)

2) Simple Fibonacci Sequences: Medium

5. Here is a Fibonacci-type sequence

2 _5_ _7_ 12 19

Find the 2 missing terms

$19 - 12 = 7,\ 12 - 7 = 5$

_____5___ and ____7___

(2 marks)

---

6. Here are the fourth and fifth terms of a Fibonacci-type sequence

_3_ _7_ _10_ 17 27

Show that the first term is 3

$27 - 17 = 10,$

$17 - 10 = 7,$

$10 - 7 = 3$

(1 mark)

---

7. The first 3 terms of a Fibonacci sequence are

$1 \qquad x \qquad x + 1$

a) Write an expression for the 4th term

$x + (x + 1) = 2x + 1$

_____$2x + 1$___

(1 mark)

b) If the 5th term is 11, find the value of x

5^{th} term: $(2x + 1) + (x + 1) = 3x + 2 = 11$

$3x = 9$

_____$x = 3$____

(2 marks)

2) Simple Fibonacci Sequences: Harder

8. The first three terms of a Fibonacci sequence are

$$x \quad y \quad x+y$$

a) Show that the 5th term of this sequence is $2x+3y$

4^{th} term: $y+(x+y)=x+2y$

5^{th} term: $(x+y)+(x+2y)=2x+3y$ **(2 marks)**

Given that the 3rd term is 5 and the 5th term is 14

b) Find the value of x and the value of y

$x+y=5$ (A) $\quad 2x+3y=14$ (B)

$2\times$(A): $2x+2y=10$ (C) $\quad x =$ 1

(B)- (C): $y=4$, sub into (A): $x+4=5$, $x=1$ $\quad y =$ 4

(3 marks)

---

9. Here are the first and third terms of a Fibonacci sequence

$$p \quad q-p \quad q \quad 2q-p \quad 3q-p$$

a) Write an expression, in terms of p and q, for the second term

$q-p$

(1 mark)

b) Write an expression, in terms of p and q, for the fifth term

4^{th} term: $(q-p)+q=2q-p$

5^{th} term: $(2q-p)+q=3q-p$ $\quad 3q-p$

(1 mark)

---

10. The first and third terms of a Fibonacci sequence are

$$a \quad b+1-a \quad b+1 \quad 2b+2-a \quad 3b+3-a$$

a) Write an expression, in terms of a and b, for the fifth term

2^{nd} term: $(b+1)-a=b+1-a$

4^{th} term: $(b+1)+(b+1-a)=2b+2-a$

5^{th} term: $(2b+2-a)+(b+1)=3b+3-a$ $\quad 3b+3-a$

(2 marks)

Given that the second term is 9 and the fifth term is 35

b) Find the value of a and the value of b

$b+1-a=9 \Rightarrow b-a=8$ (A)

$3b+3-a=35 \Rightarrow 3b-a=32$ (B)

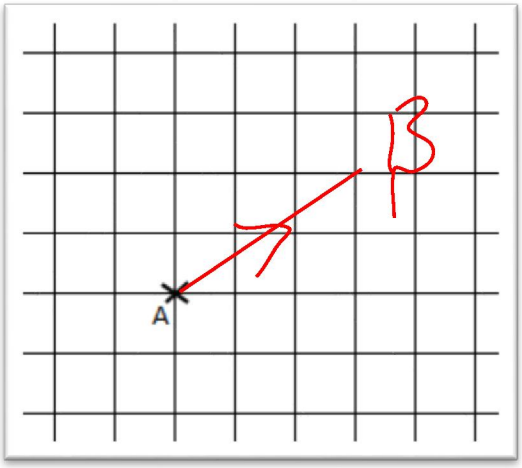
(B) – (A): $2b=24 \Rightarrow b=12$ $\quad a =$ 4

Sub into (A): $12-a=8 \Rightarrow a=4$ $\quad b =$ 12

(3 marks)

3) Simple Vectors: Easier

3)

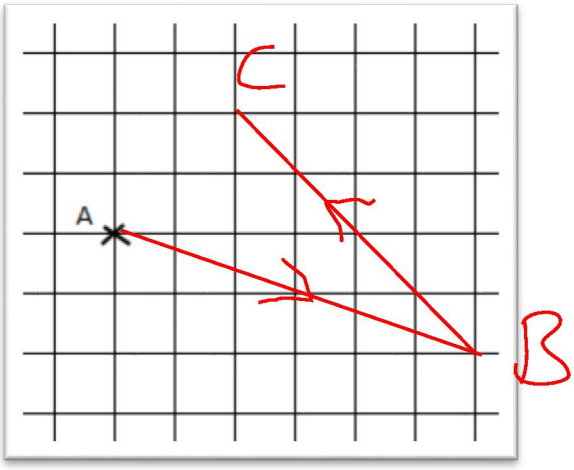


On the grid, draw the Vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ from Point A.

Label the new point B.

(1 Mark)

4)



a) On the grid, draw the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ from Point A

Label the new point B.

(1 Mark)

bi) On the grid draw the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ from Point B

Label the new point C

ii) State the vector $\overrightarrow{AC}$ $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$ (2 Marks)

3) Simple Vectors: Medium

5) Vector $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 11 \end{pmatrix}$

_____

(2 Marks)

6) Vector $\overrightarrow{AB} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$

_____

(2 Marks)

7) Vector $\overrightarrow{AB} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 10 \end{pmatrix}$

State Vector $\overrightarrow{CA}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

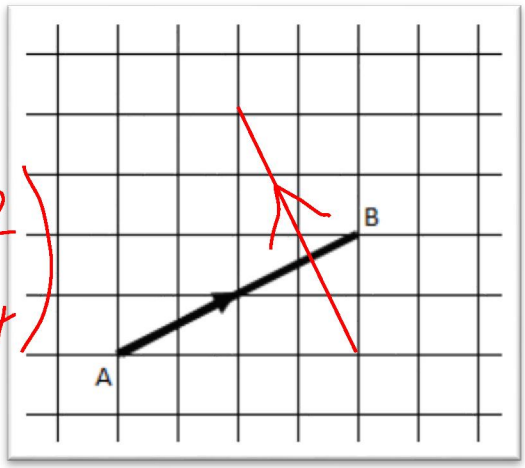
$\begin{pmatrix} -4 \\ -2 \end{pmatrix} + \begin{pmatrix} -2 \\ 10 \end{pmatrix} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}$

$\overrightarrow{CA} = -\overrightarrow{AC} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

(2 Marks)

3) Simple Vectors: Harder

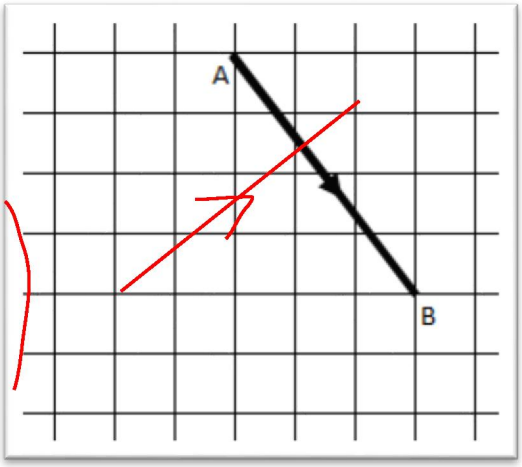
8)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

9)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

4) Algebraic Equivalence: Easier

1) Simplify $\frac{3x^2}{x}$

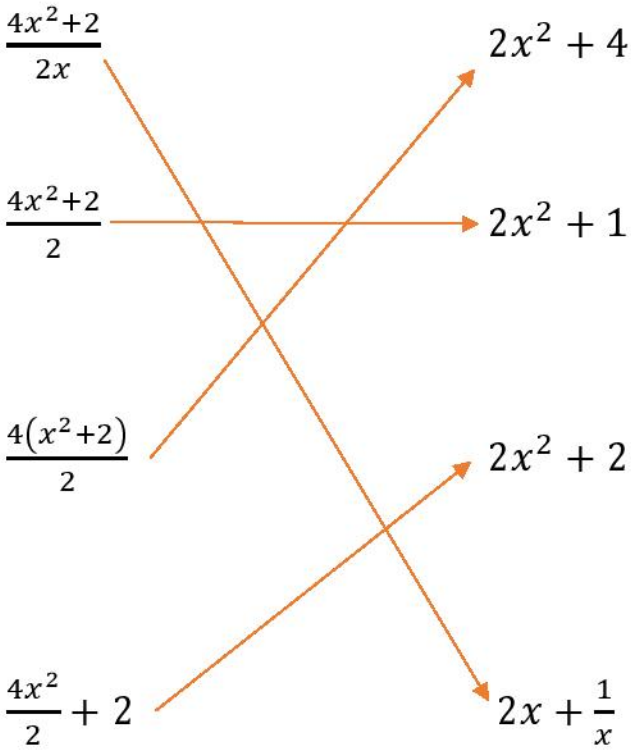
$3x$

_____

(1 Mark)

---

2) Match each of the four expressions on the left hand side with 1 equivalent expression on the right hand side



4) Algebraic Equivalence: Medium

3) Circle the expression that is equivalent to $\frac{3x^2+2}{x}$ where x is not equal to 0

A $3x^3+2$ B $3x+\frac{2}{x}$ C $2x^2+\frac{2}{x}$ D $3x+2$

$$\frac{3x^2+2}{x}$$

$$=\frac{3x^2}{x}+\frac{2}{x}$$

$$=3x+\frac{2}{x}$$

(1 Mark)

---

4) **Two** of these four expressions are equivalent. Circle the two expressions

A $\frac{x}{x+5}$ B $1+\frac{x}{5}$ C $\frac{5+x}{5}$ D $\frac{x^2}{x^2+5}$

(1 mark)

4) Algebraic Equivalence: Harder

5) Fiona tries to simplify this expression

$$\frac{3x}{3+x}$$

She writes

$$\frac{3x}{3}+\frac{3x}{x}$$

$$x+3$$

Explain why Fiona can not rewrite the expression like this

Dividing $3x$ by $3+x$ is not the same as dividing it by 3 and adding it to $\frac{3x}{x}$

Numerical Example

If $x=1$

$$\frac{3x}{3+x}=\frac{3}{4}$$

$$\frac{3x}{3}+\frac{3x}{x}=\frac{3}{3}+\frac{3}{1}=4$$

As you can see, these two expressions are not equal

(1 mark)

---

6) Show that $\frac{2x+5}{1+\frac{2}{x}}$ is equivalent to $\frac{2x^2+5x}{x+2}$

$$\frac{2x+5}{1+\frac{2}{x}}$$

$$=\frac{x(2x+5)}{x(1+\frac{2}{x})}$$

$$=\frac{2x^2+5x}{x+2}$$

(1 mark)

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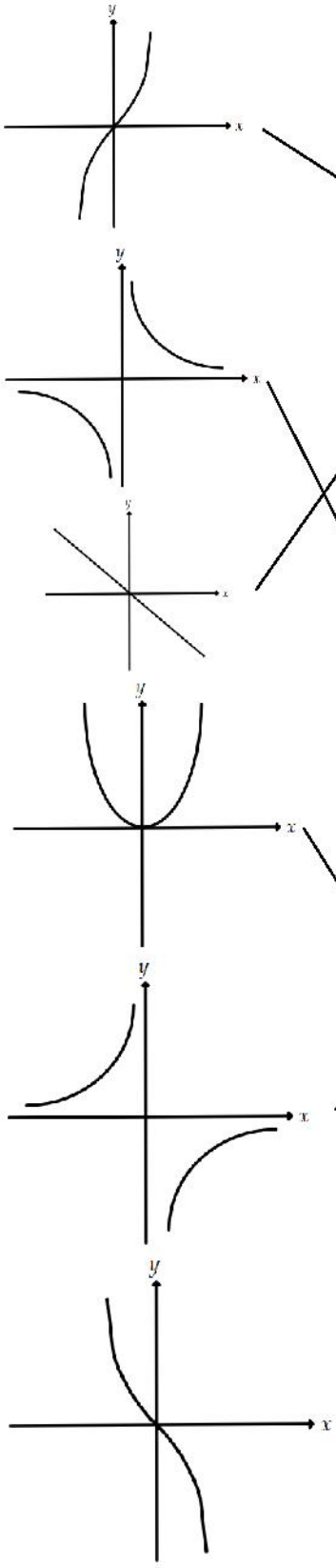
5) Recognising graphs: Easier

1) Match each of the graphs with its equation, the first one is done for you



$y = -x$

$y = x^3$

$y = -x^3$

$y = -\frac{1}{x}$

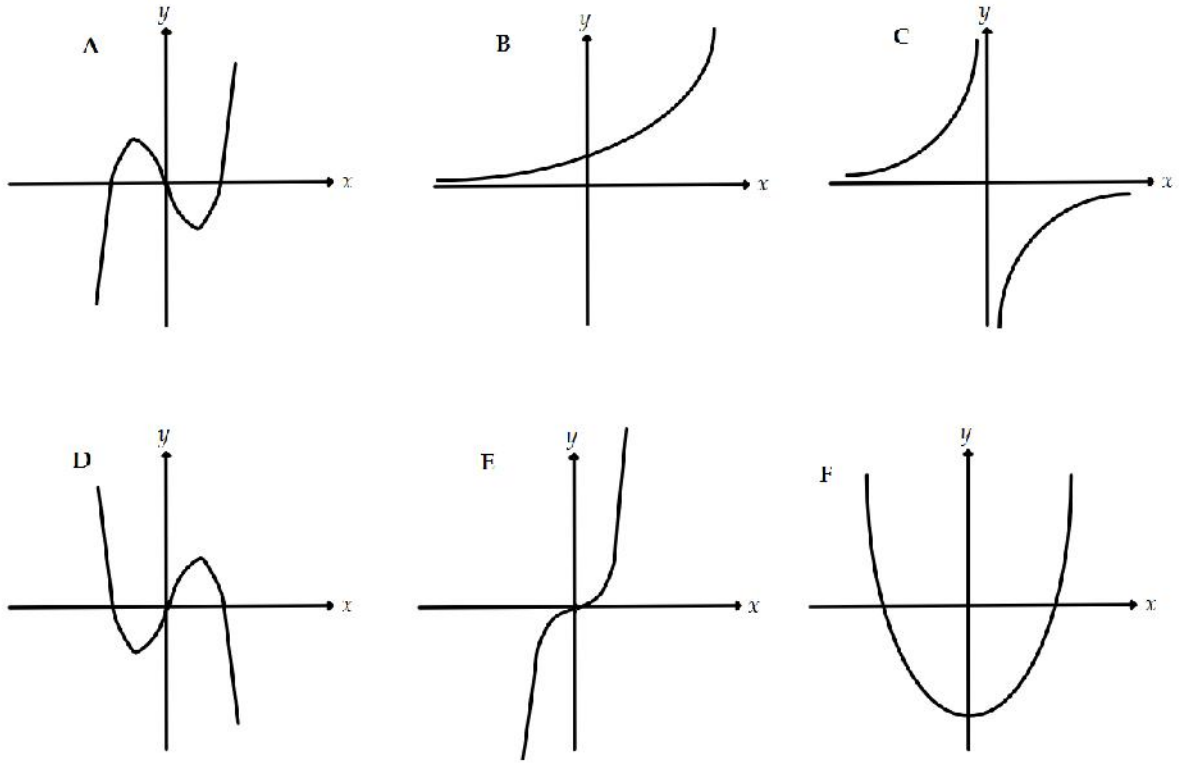
$y = \frac{1}{x}$

$y = x^2$

(3 marks)

5) Recognising graphs: Medium

2) Harry has sketched some graphs



a) Write down the letter of the graph that could have the equation $y = 3^x$

B

_____

(1 Mark)

b) Write down the letter of the graph that could have the equation $y = -\frac{5}{x}$

C

_____

(1 Mark)

c) Write down the letter of the graph that could have the equation $y = 2x - x^3$

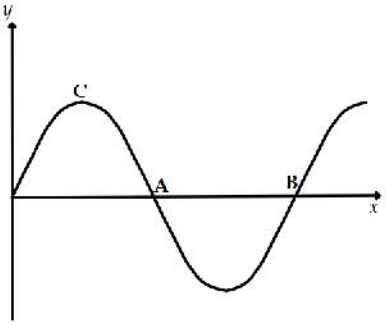
D

_____

(1 Mark)

5) Recognising graphs: Harder

3) A sketch of part of $y = \sin(x)$ is drawn below



a) Write down the coordinates of A

$(180°, 0)$

(1 Mark)

b) Write down the coordinates of B

$(360°, 0)$

(1 Mark)

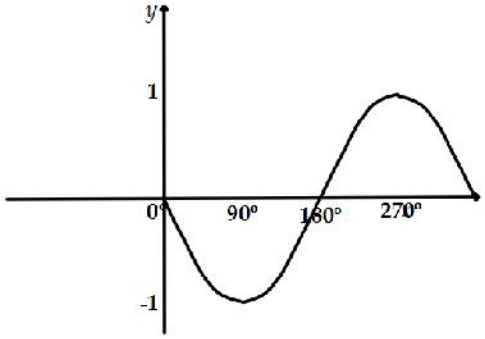
c) Write down the coordinates of C

$(90°, 1)$

(1 Mark)

---

4) Lanre was asked to sketch $y = \cos(x)\ for\ 0° \leq x \leq 360°$. This is what Lanre sketched



Write down one mistake Lanre has made

$y = \cos(x)$ does not go through (0,0) it starts at (0,1) and decreases to (90°,0)

(1 Mark)

GREAVES Will

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
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A02 and 3	35 from 53	8 from 14	8 from 13	5 from 8	7 from 11	7 from 7
Total	46 from 80	14 from 26	12 from 23	6 from 12	7 from 12	7 from 7

Your Pinpoint Topics

Topic 1: Solving simple equations with fractions. MW: 135

Topic 2: Tree Diagrams. Mathswatch Clip: 151

Topic 3: Drawing Quadratic Graphs. Mathswatch Clip: 98

Topic 4: Fractional and Negative Indices. MW: 188

Topic 5: Non-Calc Trigonometry. Mathswatch Clip: 173

1) Solving simple equations with fractions: Easier

1) Solve $\frac{x}{2} = 10$

$x = 20$

(multiplying both sides by 2)

_____

(1 Mark)

---

2) Solve $\frac{x}{5} = 6$

(multiplying both sides by 5) $x = 30$

_____

(1 Mark)

---

3) Solve $\frac{3x}{4} = 6$

Multiplying by 4 $3x = 24$

Dividing by 3 $x = 8$

$x = 8$

_____

(2 Marks)

---

4) Solve $\frac{2}{3}x = 4$

Multiplying by 3 $2x = 12$

Dividing by 2 $x = 6$

$x = 6$

_____

(2 Marks)

1) Solving simple equations with fractions: Medium

5) Solve $\frac{x}{2} + 1 = 9$

Subtracting 1 $\frac{x}{2} = 8$

Multiplying by 2 $x = 16$

$x = 16$

(2 Marks)

---

6) Solve $\frac{x}{3} - 11 = 9$

Adding 11 $\frac{x}{3} = 20$

Multiplying by 3 $x = 60$

$x = 60$

(2 Marks)

---

7) Solve $\frac{3x}{2} - 5 = 9$

Adding 5 $\frac{3x}{2} = 14$

Multiplying by 2 $3x = 28$

Dividing by 3

$x = \frac{28}{3}$

$x = \frac{28}{3}$

(3 Marks)

---

1) Solving simple equations with fractions: Harder

8) Aurora is solving this equation

$$\frac{2x}{3} + 3 = 12$$

Here is her working

$\frac{2x}{3} = 9$ line 1

$2x = 3$ line 2

$x = \frac{3}{2}$ line 3

Explain one mistake Aurora has made

From line 1 to line 2 she has multiplied the right hand side of the equation by 3 but divided the left hand side by 3, she should have multiplied both sides by 3 giving $2x = 27$, then her answer would have been $x = \frac{27}{2}$

(1 Mark)

2) Tree Diagrams: Easier

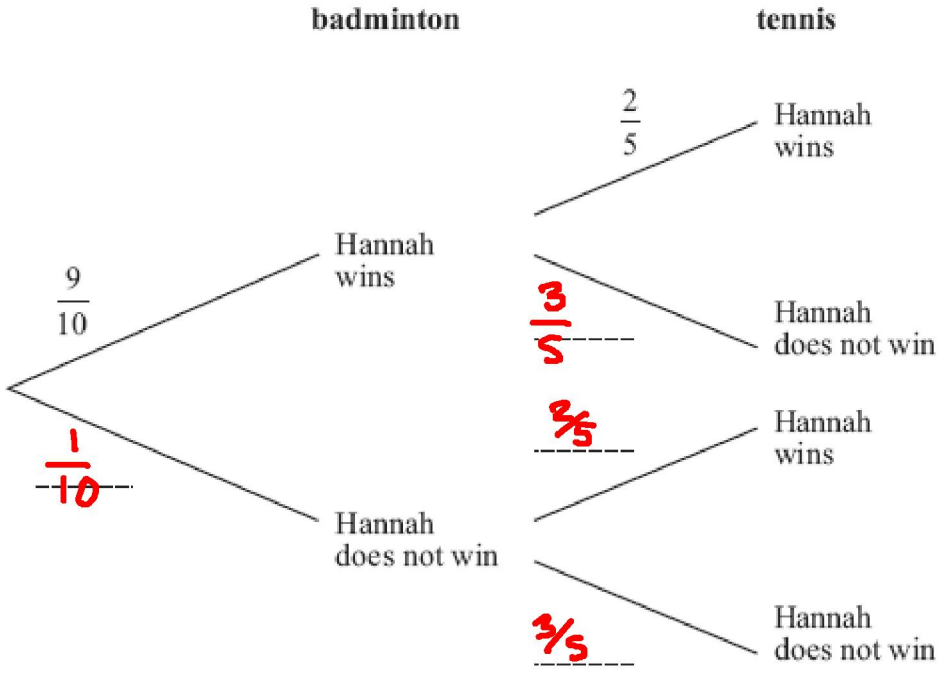
1. Hannah is going to play one badminton match and one tennis match.

The probability that she will win the badminton match is $\frac{9}{10}$

The probability that she will win the tennis match is $\frac{2}{5}$

(a) Complete the probability tree diagram.

(2)



(b) Work out the probability that Hannah will win **both** matches.

(2)

$P(W,W) = \frac{9}{10} \times \frac{2}{5} = \frac{18}{50}$

$\frac{18}{50}$

.....

(4 marks)

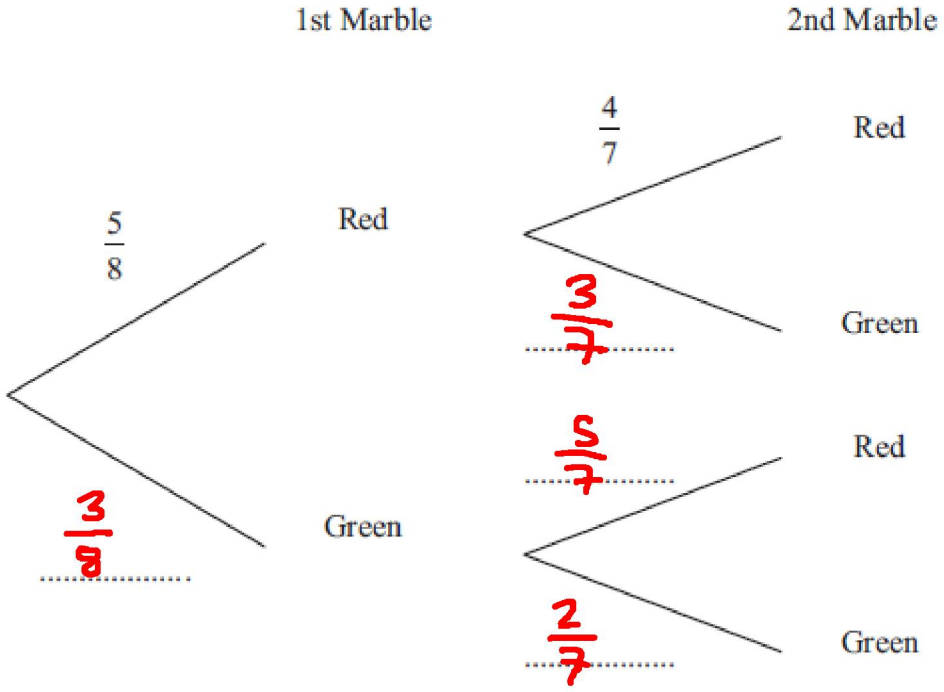
2) Tree Diagrams: Medium

2. There are only red marbles and green marbles in a bag.
There are 5 red marbles and 3 green marbles.

Dwayne takes at random a marble from the bag.
He does not put the marble back in the bag.

Dwayne takes at random a second marble from the bag.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Dwayne takes marbles of different colours.

$P(R,G) = \frac{5}{8} \times \frac{3}{7} = \frac{15}{56}$

$P(G,R) = \frac{3}{8} \times \frac{5}{7} = \frac{15}{56}$

$P(\text{diff colours}) = \frac{15}{56} + \frac{15}{56} = \frac{30}{56}$

$\frac{30}{56}$

(3)

(5 marks)

2) Tree Diagrams: Harder

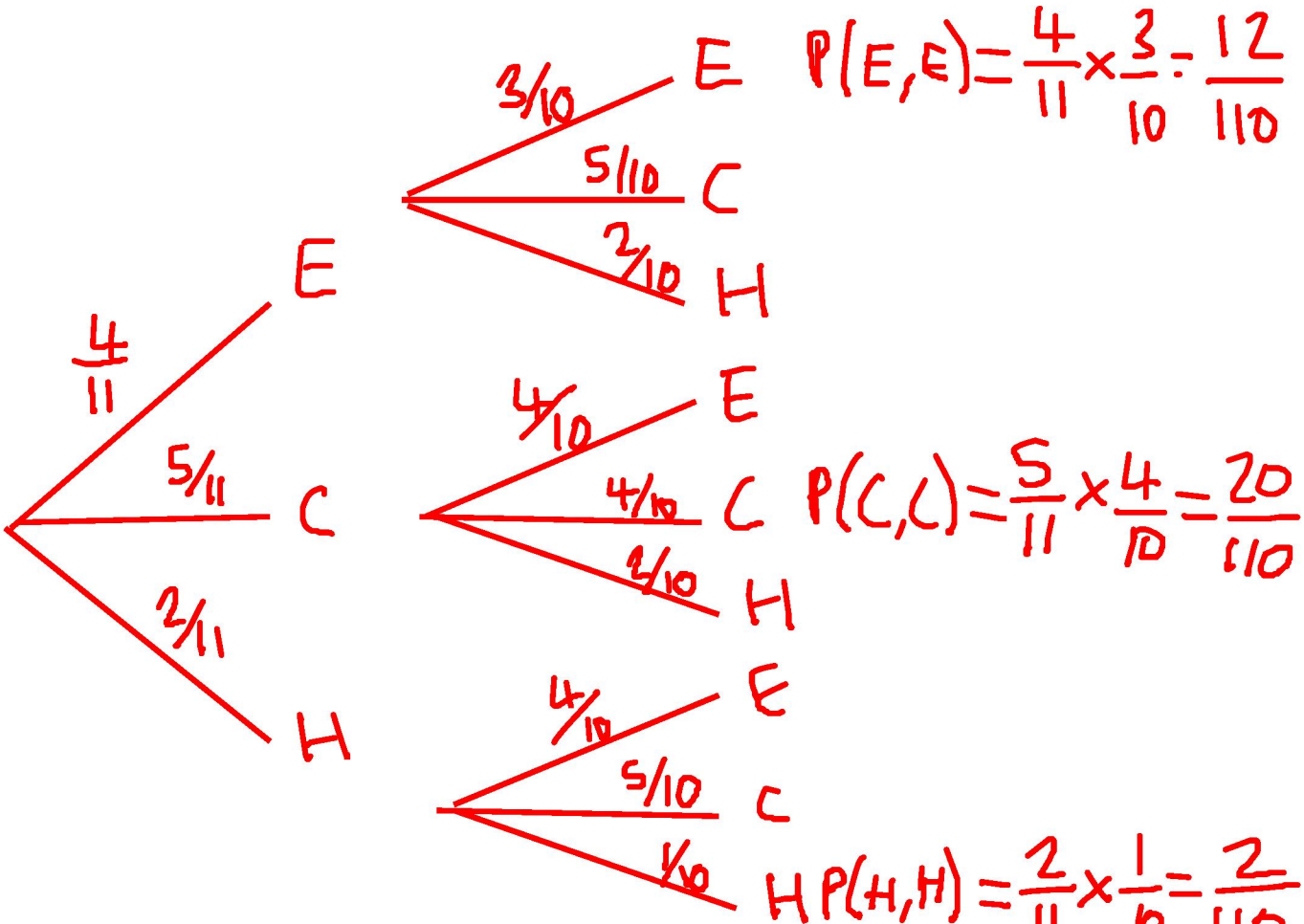
7. There are three different types of sandwiches on a shelf.

There are

4 egg sandwiches,
5 cheese sandwiches
and 2 ham sandwiches.

Erin takes at random 2 of these sandwiches.

Work out the probability that she takes 2 different types of sandwiches.



$P(\text{same}) = \frac{12}{110} + \frac{20}{110} + \frac{2}{110} = \frac{34}{110}$

$P(\text{diff}) = 1 - P(\text{same})$

$P(\text{diff}) = 1 - \frac{34}{110} = \frac{76}{110}$

$\frac{76}{110}$

(5 marks)

3) Drawing Quadratic Graphs: Easier

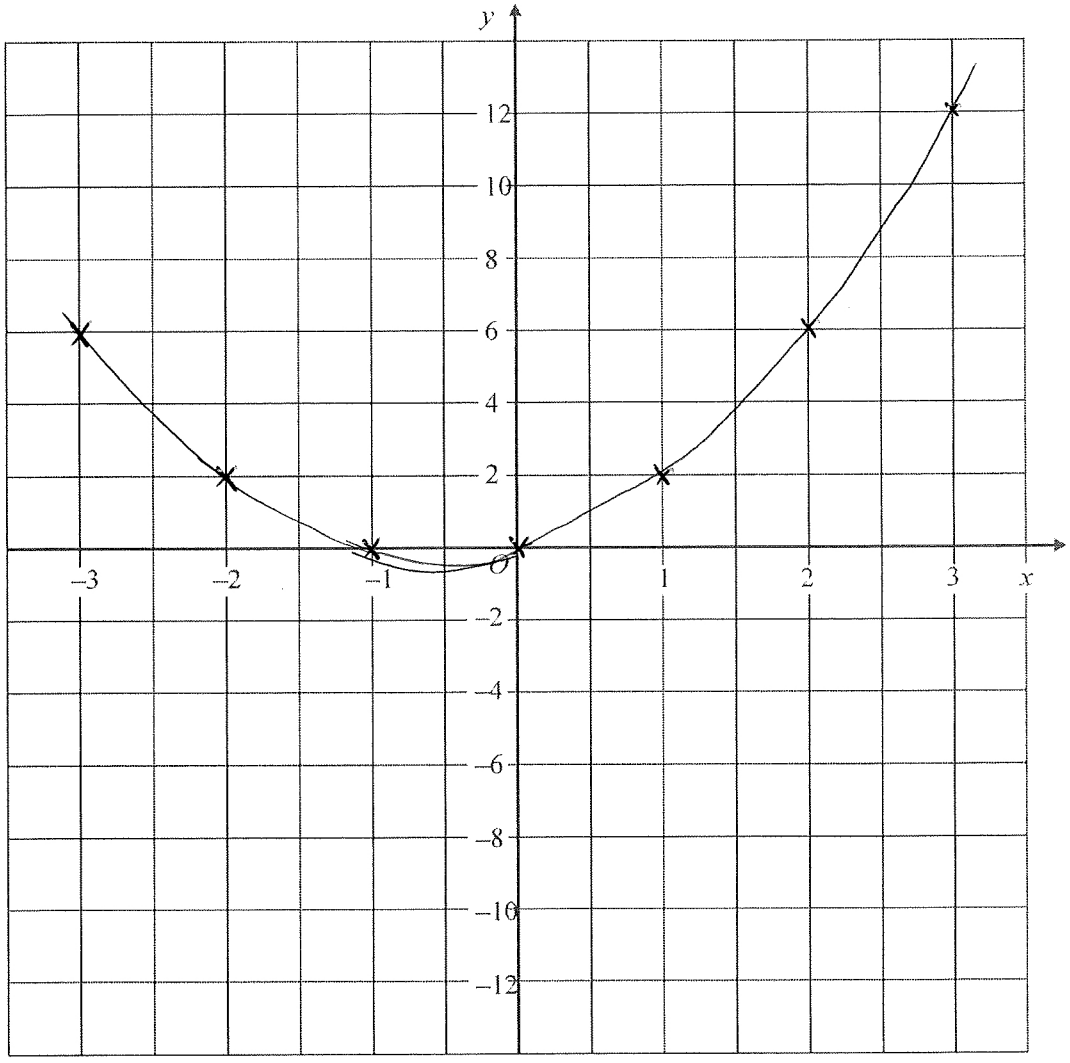
1. (a) Complete the table of values for $y = x^2 + x$.

x	–3	–2	–1	0	1	2	3
y	6	2	0	0	2	6	12

1+1 9+3

(2)

(b) On the grid, draw the graph of $y = x^2 + x$.



(2)

(Total 4 marks)

3) Drawing Quadratic Graphs: Medium

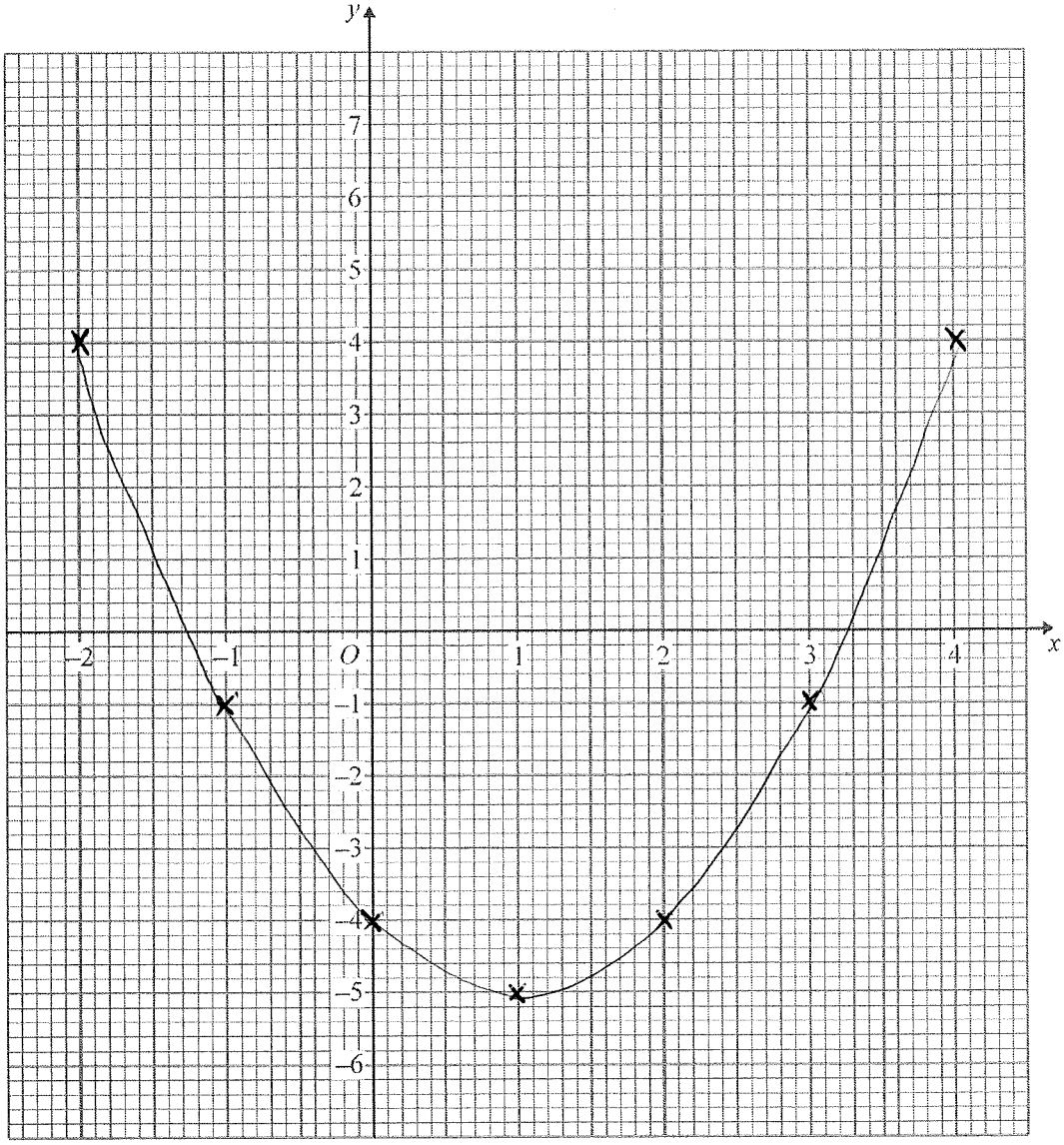
2. (a) Complete the table for $y = x^2 - 2x - 4$

x	−2	−1	0	1	2	3	4
y	4	−1	−4	−5	−4	−1	4

1+2-4 4-4-4 16-8-4

(2)

(b) On the grid, draw the graph of $y = x^2 - 2x - 4$



(2)

(Total 4 marks)

3) Drawing Quadratic Graphs: Harder

(Total 5 marks)

7. (a) Complete the table of values for $y = x^2 - 3x - 1$

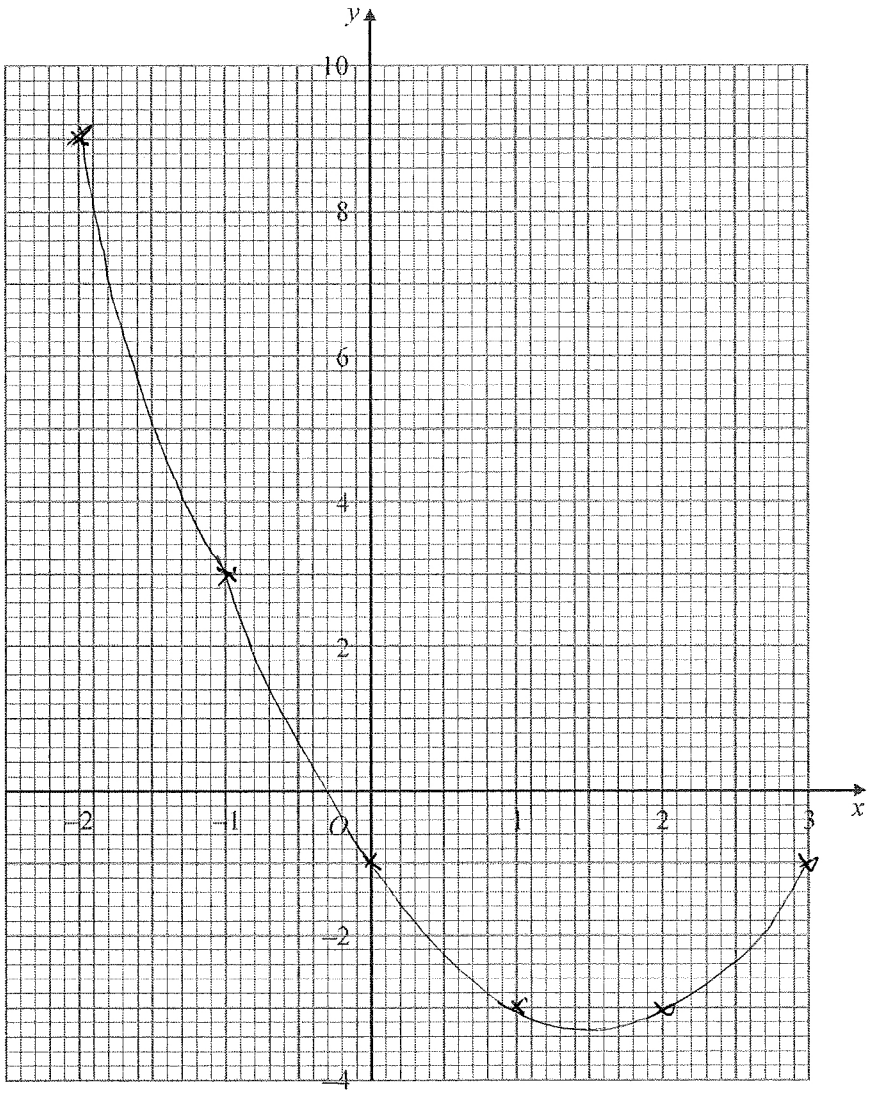
x	−2	−1	0	1	2	3
y	9	3	−1	−3	−3	−1

4+6−1 4−6−1 9−9−1

(2)

(b) On the grid, draw the graph of $y = x^2 - 3x - 1$

(2)



(Total 4 marks)

4) Fractional and Negative Indices: Easier

1) Evaluate

a) 6^0 $= 1$ _____

(1 Mark)

a) $25^{\frac{1}{2}}$ $= \sqrt{25} = 5$ _____

(1 Mark)

c) 3^{-1} $= \frac{1}{3}$ _____

(1 Mark)

---

2) Sarah says that $9^{\frac{1}{2}}$ is 4.5. She is wrong. Explain her mistake.

Solution: $9^{\frac{1}{2}} = \sqrt{9} = 3$

_____

(1 Mark)

---

3) Evaluate

a) $27^{\frac{1}{3}}$ $\sqrt[3]{27} = 3$

_____

(1 Mark)

b) $27^{\frac{2}{3}}$ $\sqrt[3]{27}^2 = 9$ _____

(1 Mark)

c) $27^{\frac{-2}{3}}$ $\frac{1}{\sqrt[3]{27^2}} = \frac{1}{9}$ _____

(1 Mark)

4) Fractional and Negative Indices: Medium

4) Evaluate

a) $\left(\frac{25}{81}\right)^{\frac{-1}{2}}$ $\left(\frac{1}{25/81}\right)^{\frac{1}{2}} = \left(\frac{81}{25}\right)^{\frac{1}{2}} = \sqrt{\frac{81}{25}} = \frac{9}{5}$

(1 Mark)

b) $32^{\frac{-3}{5}}$ $\left(\frac{1}{32}\right)^{\frac{3}{5}} = \left(\sqrt[5]{\frac{1}{32}}^{3}\right) = \frac{1}{2^3} = \frac{1}{8}$

(1 Mark)

c) $144^{\frac{-1}{2}} \times 3^{-2}$

$\frac{1}{\sqrt{144}} \times \frac{1}{3^2} = \frac{1}{12} \times \frac{1}{9} = \frac{1}{108}$

(2 Marks)

---

5) Put these numbers in ascending order, show your working.

125^0 $125^{\frac{-1}{3}}$ $\left(\frac{1}{125}\right)^{\frac{-1}{3}}$ $125^{\frac{-2}{3}}$

1 $\frac{1}{\sqrt[3]{125}} = \frac{1}{5}$ $\left(\frac{1}{1/125}\right)^{\frac{1}{3}} = \sqrt[3]{125} = 5$ $\left(\frac{1}{125}\right)^{\frac{2}{3}} = \frac{1}{\sqrt[3]{125^2}} = \frac{1}{5^2} = \frac{1}{25}$

Correct order $\frac{1}{25}$, $\frac{1}{5}$, 1, 5.

(3 Marks)

4) Fractional and Negative Indices: Harder

6) If $2^{2x} = \frac{1}{16}$. Work out the value of x.

$2^{2x} = \frac{1}{4^2}$

$2^{2x} = 4^{-2}$

$2^{2x} = 2^{2(-2)}$

$x = -2$

(2 Marks)

---

7) One of these has a different value to the other two. Decide which one and justify your answer.

$4^{\frac{3}{4}}$ $8^{\frac{1}{4}}$ $2^{\frac{3}{2}}$

$2^{2\left(\frac{3}{4}\right)} = 2^{\frac{6}{4}} = 2^{\frac{3}{2}}$ $2^{3\left(\frac{1}{4}\right)} = 2^{\frac{3}{4}}$

The values that are the same are $4^{\frac{3}{4}}$ and $2^{\frac{3}{2}}$

(3 Marks)

---

8) If $32^{3x} = \frac{1}{8}$. Find the value of x

$2^{5(3x)} = \frac{1}{8}$

$2^{15x} = \frac{1}{2^3}$

$2^{15x} = 2^{-3}$

$15x = -3$

$x = \frac{-3}{15}$

$x = -\frac{1}{5}$

(3 Marks)

5) Non-Calc Trigonometry: Easier

Solutions for Question 1:

a) $\cos 30° = \frac{\sqrt{3}}{2}$

b) $\tan 60° = \sqrt{3}$

c) $\sin 45° = \frac{\sqrt{2}}{2}$

Solutions for Question 2:

a) $\tan 45° = 1$

b) $\cos 45° = \frac{\sqrt{2}}{2}$

c) $\sin 60° = \frac{\sqrt{3}}{2}$

5) Non-Calc Trigonometry: Medium

Solution for Question 3:

$\cos 60° = \frac{A}{H}$

$\cos 60° = \frac{6}{x}$

If $\cos 60° = 0.5$

$0.5 = \frac{6}{x}$

$x = 12cm$

Solution for Question 4:

$\tan 30° = \frac{O}{A}$

$\tan 30° = \frac{y}{9}$

If $\tan 30° = \frac{\sqrt{3}}{3}$

$\frac{\sqrt{3}}{3} = \frac{y}{9}$

$y = \frac{9\sqrt{3}}{3} cm$

$y = 3\sqrt{3}\, cm$

5) Non-Calc Trigonometry: Harder

Solution for Question 5:

$$\sin 30° = \frac{6.1}{x}$$

$$x = \frac{6.1}{\sin 30°}$$

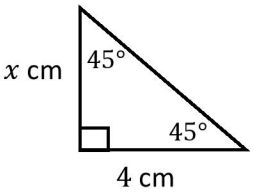
$$x = \frac{6.1}{0.5}$$

$$x = 12.2\ cm$$

Solution for Question 6:

Cut triangle in half

Let x equal the height of the triangle



$$\tan 45° = \frac{x}{4}$$

$$x = 4\ x\ \tan 45$$

$$x = 4cm\text{m}$$

Area of triangle: $\frac{1}{2} \times 8 \times 4$ ...

Area of triangle = 16cm^2

GREGG Samuel

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	22 from 27	10 from 12	7 from 10	4 from 4	1 from 1	0 from 0
A02 and 3	46 from 53	10 from 14	13 from 13	8 from 8	9 from 11	6 from 7
Total	68 from 80	20 from 26	20 from 23	12 from 12	10 from 12	6 from 7

Your Pinpoint Topics

Topic 1: Understanding Number. Mathswatch Clip: NA

Topic 2: Simple Vectors. Mathswatch Clip: 174

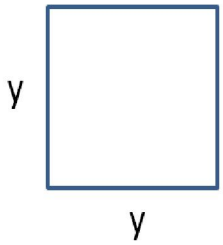
Topic 3: Direct and Inverse Proportion. Mathswatch Clip: 199

Topic 4: Drawing Quadratic Graphs. Mathswatch Clip: 98

Topic 5: Surds. Mathswatch Clip: 207

1) Understanding Number: Easier

1. Jim is looking at the area and lengths of squares.



Jim considers a square with area $9m^2$.

Jim works out the length of the square as follows:

$$y^2 = 9$$

$$y = \sqrt{9}$$

$$y = 3cm$$

Jim considers another square with a **different** area.

Please tick below:

	This method will **always** give an answer which is a whole number
/	This method will **sometimes** give an answer which is a whole number
	This method will **never** give an answer which is a whole number

Show working to support your answer

Any area which is a square number will give a whole number using this method

e.g. $y^2 = 16$ gives $y = \sqrt{16} = 4$ cm

Any area that is a non-square number won't give a whole number

e.g. $y^2 = 10$ gives $y = \sqrt{10} = 3.162\ldots$ cm

(3 marks)

1) Understanding Number: Medium

2.a) Anne puts a number in her calculator and squares her number. The number gets a lot bigger.

Anne says "if you square a number it will **always** get bigger".

Please tick below:

	Anne is correct
/	Anne is **not** correct

Show working to support your answer

If you square a number that is between 0 and 1 it will become smaller

e.g. $0.5^2 = 0.25$

(3 marks)

b) Pete says "if you square a number it will **always** be positive".

Please tick below:

	Pete is correct
/	Pete is **not** correct

Show working to support your answer

If you square **zero** the answer is zero, a non-positive number.

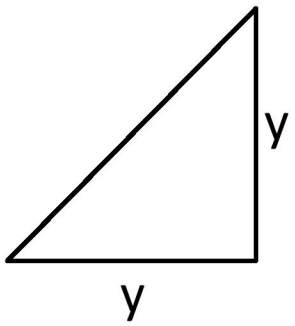
$$0^2 = 0 \times 0 = 0$$

(3 marks)

1) Understanding Number: Harder

3.a) Amir cuts a square in half along the diagonal to produce a right angled triangle.

It has a length, y, which is a whole number.



Amir works out the **area** of the triangle.

Please tick below:

	The area **must** be a whole number.
/	The area will **sometimes** be a whole number.

Show working to support your answer

If y = 3 then the area is $(3 \times 3) \div 2 = 9 \div 2 = 4.5$ a decimal

If y = 4 then the area is $(4 \times 4) \div 2 = 16 \div 2 = 8$ a whole number

(3 marks)

b) Amir is about the work out the **hypotenuse** of the triangle.

Amir says "The hypotenuse of the triangle will **always** be a whole number".

Show that Amir is wrong.

Pythagoras' Theorem: $a^2 + b^2 = c^2$

If $a = 2$ and $b = 3$ then

$$c^2 = 2^2 + 3^2 = 4 + 9 = 13$$

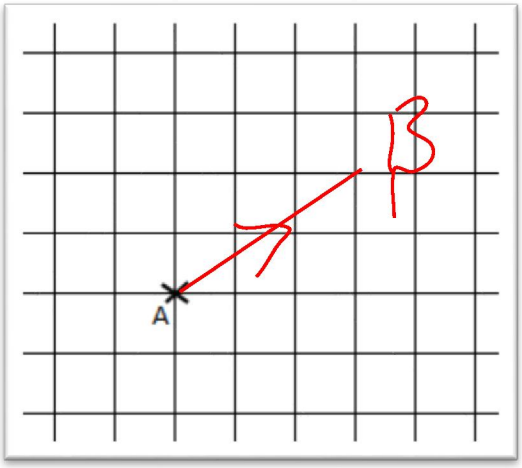
$$c = \sqrt{13} = 3.605 \ldots$$

So the hypotenuse is not a whole number in this case

(3 marks)

2) Simple Vectors: Easier

3)

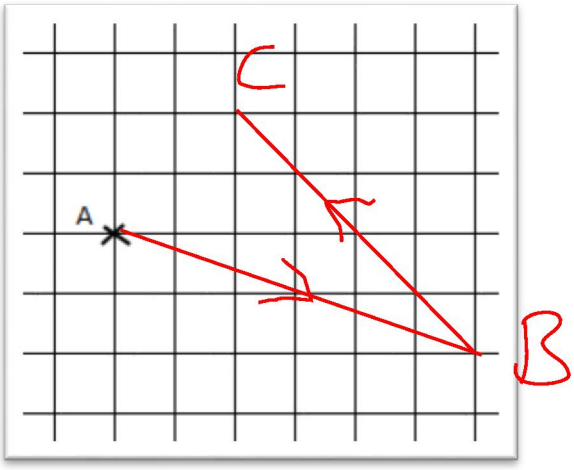


On the grid, draw the Vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ from Point A.

Label the new point B.

(1 Mark)

4)



a) On the grid, draw the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ from Point A

Label the new point B.

(1 Mark)

bi) On the grid draw the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ from Point B

Label the new point C

ii) State the vector $\overrightarrow{AC}$ $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$ (2 Marks)

2) Simple Vectors: Medium

5) Vector $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 11 \end{pmatrix}$

_____

(2 Marks)

6) Vector $\overrightarrow{AB} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$

_____

(2 Marks)

7) Vector $\overrightarrow{AB} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 10 \end{pmatrix}$

State Vector $\overrightarrow{CA}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

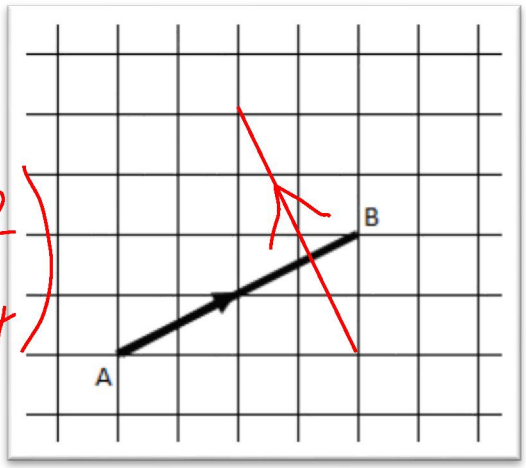
$\begin{pmatrix} -4 \\ -2 \end{pmatrix} + \begin{pmatrix} -2 \\ 10 \end{pmatrix} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}$

$\overrightarrow{CA} = -\overrightarrow{AC} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

(2 Marks)

2) Simple Vectors: Harder

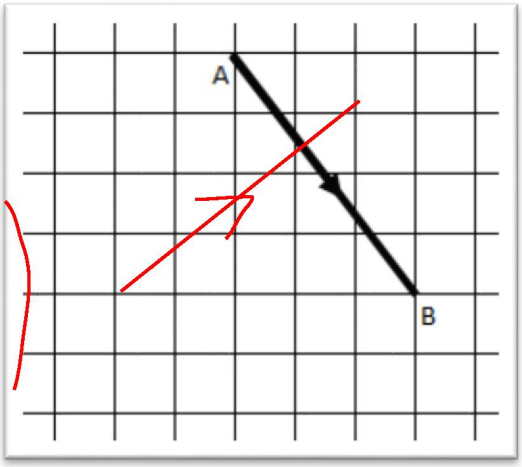
8)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

9)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

3) Direct and Inverse Proportion: Easier

1. The weight of a piece of wire is directly proportional to its length.

A piece of wire is 25 cm long and has a weight of 6 grams.
Another piece of the same wire is 30 cm long.

Calculate the weight of the 30 cm piece of wire.

$w = kl$

$6 = 25k$

$k = 0.24$

$w = 0.24l$

$w = 0.24 \times 30$

$w = 7.2$

7.2 ..... grams

(Total 2 marks)

2. A ball falls vertically after being dropped.
The ball falls a distance d metres in a time of t seconds.
d is directly proportional to the square of t.

$d = kt^2$

The ball falls 20 metres in a time of 2 seconds.

(a) Find a formula for d in terms of t.

$20 = k \times 2^2$

$20 = 4k$

$k = 5$

$d =$ $5t^2$ .....

(3)

(b) Calculate the distance the ball falls in 3 seconds.

$d = 5 \times 3^2$

$d = 5 \times 9 = 45$

45 ..... m

(1)

(c) Calculate the time the ball takes to fall 605 m.

$d = 5t^2$

$605 = 5t^2$

$t^2 = 121$

$t = \pm 11$

(ignore -11 as time can't be $-ve$)

11 ..... seconds

(3)

(Total 7 marks)

3) Direct and Inverse Proportion: Medium

16. P is inversely proportional to V.

$P = \frac{k}{V}$

When $V = 8$, $P = 5$

(a) Find a formula for P in terms of V.

$5 = \frac{k}{8}$

$k = 5 \times 8$

$k = 40$

$P = \frac{40}{V}$

(3)

(b) Calculate the value of P when $V = 2$

$P = \frac{40}{2}$

$P = 20$

20

(1)

(Total 4 marks)

17. The force, F, between two magnets is inversely proportional to the square of the distance, x, between them.

$F = \frac{k}{x^2}$

When $x = 3$, $F = 4$.

(a) Calculate F when $x = 2$.

$4 = \frac{k}{9}$

$k = 36$

$F = \frac{36}{x^2}$

$F = \frac{36}{2^2}$

$F = \frac{36}{4} = 9$

$F = 9$

(4)

(b) Calculate x when $F = 64$.

$F = \frac{36}{x^2}$

$64 = \frac{36}{x^2}$

$64x^2 = 36$

$x^2 = \frac{36}{64}$

$x = \pm\frac{6}{8}$

$x = \frac{3}{4}$

(2)

(Total 6 marks)

3) Direct and Inverse Proportion: Harder

1) A is inversely proportional to the square root of B. Jim says if B is very large A will be negative. Is he right?

Solution: $A \propto \frac{1}{\sqrt{B}}$

$$A = \frac{k}{\sqrt{B}}$$

Jim is wrong. If B is very large $\sqrt{B}$ will be positive, therefore A will also be positive.

(As B becomes very large, A becomes very small)

(4 Marks)

---

2) If Sally drives to work 25% faster than she did yesterday. What would be her percentage decrease in the time taken to get to work?

Solution: $Time = \frac{Distance}{Speed}$

$$Time = \frac{D}{1.25}$$

$$Time = \frac{1}{1.25}$$

$$Time = \frac{4}{5}$$

$$\frac{4}{5} = 80\%$$

She will get there 20% faster.

(4Marks)

---

4) Drawing Quadratic Graphs: Easier

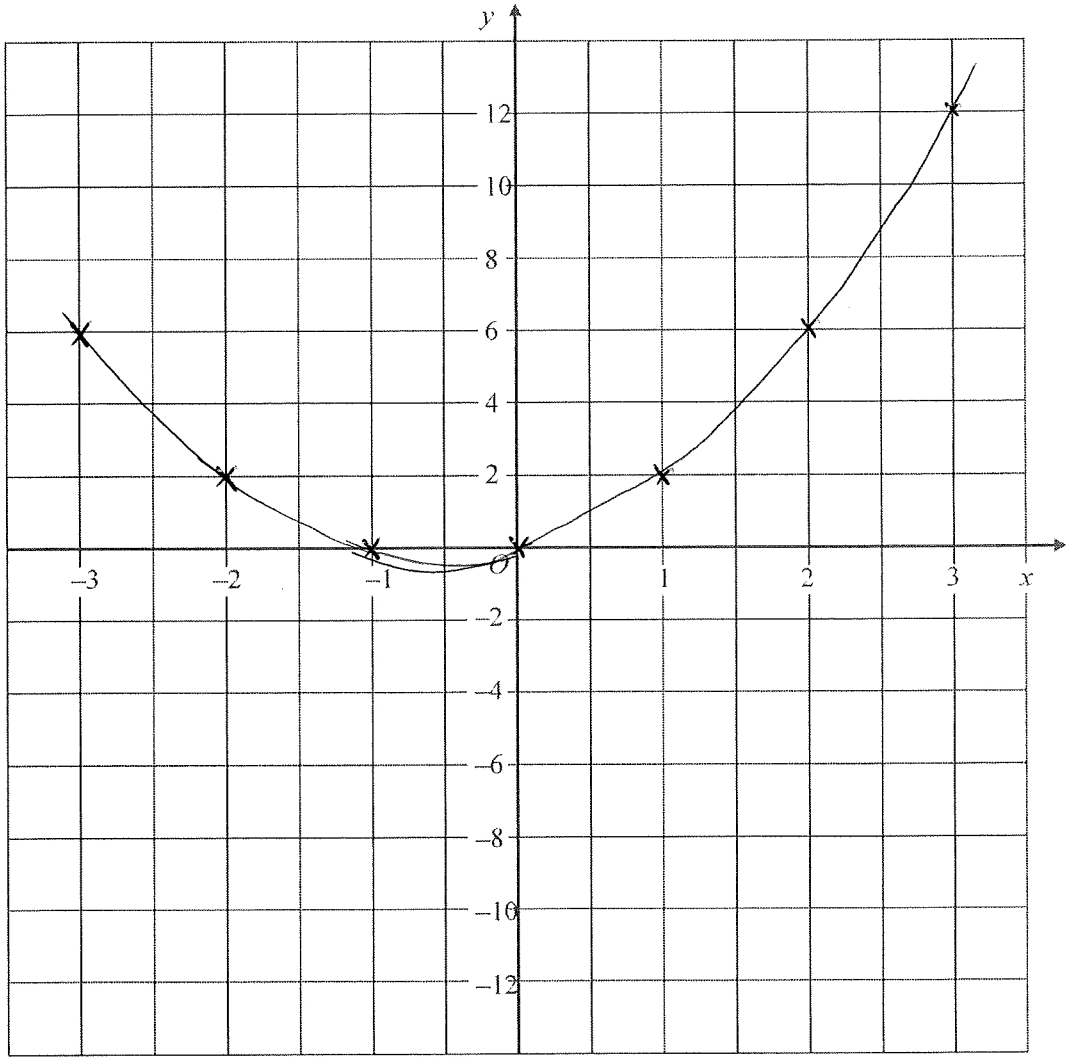
1. (a) Complete the table of values for $y = x^2 + x$.

x	–3	–2	–1	0	1	2	3
y	6	2	0	0	2	6	12

1+1 9+3

(2)

(b) On the grid, draw the graph of $y = x^2 + x$.



(2)

(Total 4 marks)

4) Drawing Quadratic Graphs: Medium

6. (a) Complete the table for $y = x^2 - 3x + 1$

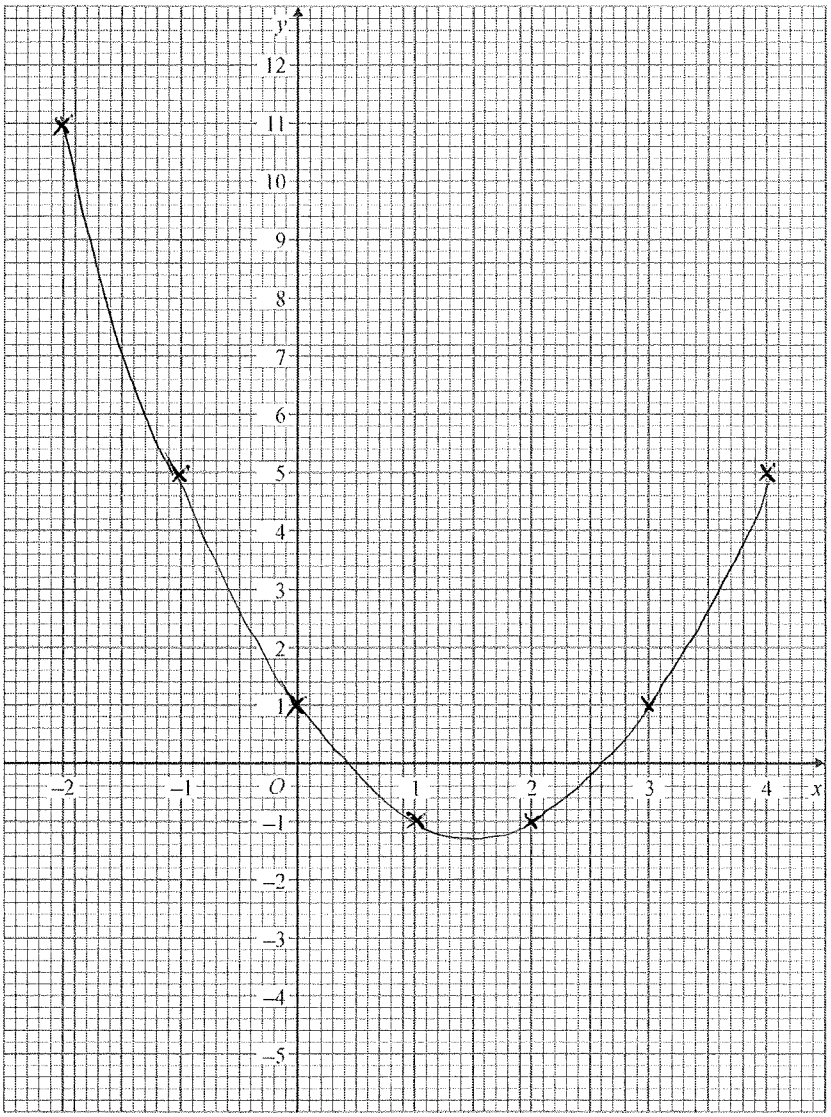
x	−2	−1	0	1	2	3	4
y	11	5	1	−1	−1	1	5

1 + 3 + 1 4 − 6 + 1

(2)

(b) On the grid below, draw the graph of $y = x^2 - 3x + 1$

(2)



(c) Use your graph to find an estimate for the minimum value of y.

$y =$ −1.3

(1)

4) Drawing Quadratic Graphs: Harder

(Total 5 marks)

7. (a) Complete the table of values for $y = x^2 - 3x - 1$

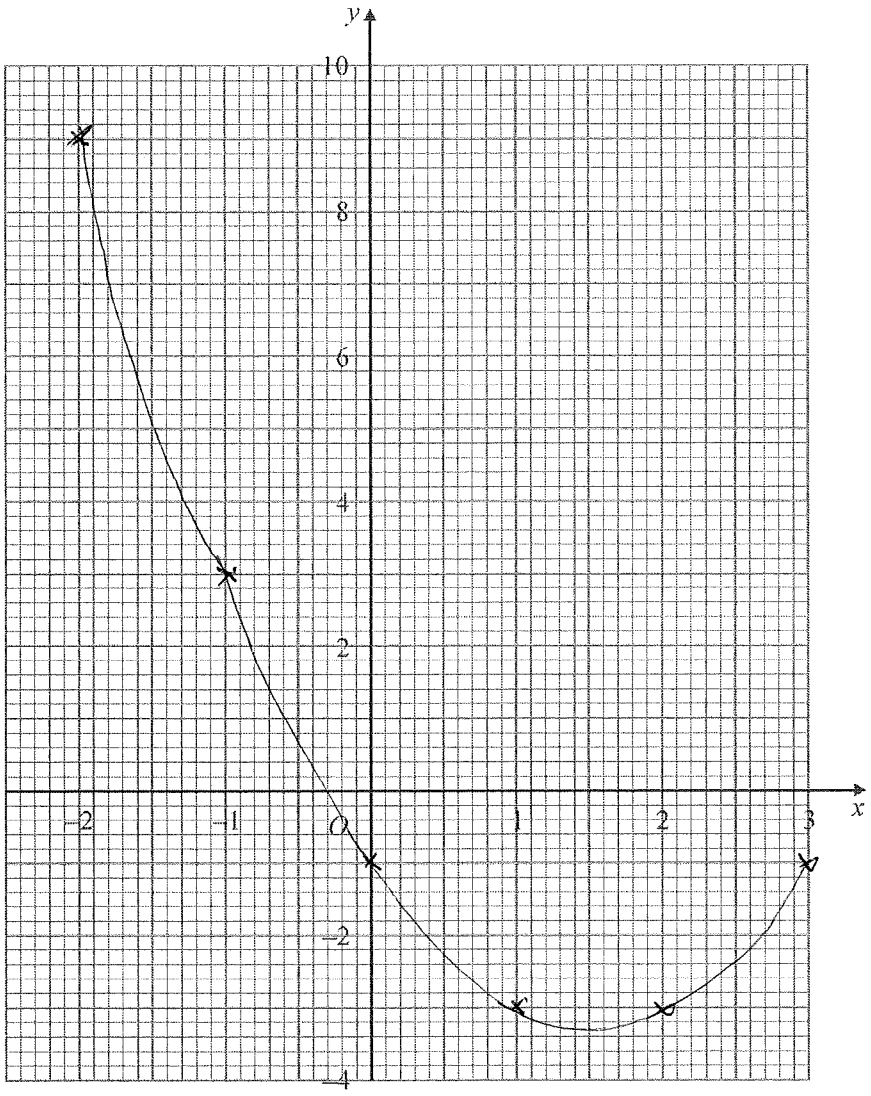
x	−2	−1	0	1	2	3
y	9	3	−1	−3	−3	−1

4+6−1 4−6−1 9−9−1

(2)

(b) On the grid, draw the graph of $y = x^2 - 3x - 1$

(2)



(Total 4 marks)

5) Surds: Easier

1. a) Simplify $\sqrt{75}$

$\sqrt{75} = \sqrt{25 \times 3}$

$= 5\sqrt{3}$

..... **(1)**

b) Express $\sqrt{75} - \sqrt{48}$ in the form $a\sqrt{3}$ where a is an integer.

$5\sqrt{3} - \sqrt{16 \times 3}$

$= 5\sqrt{3} - 4\sqrt{3}$

$\sqrt{3}$

a = 1

..... **(2)**

2. Express $\frac{15}{\sqrt{5}}$ in the form $a\sqrt{b}$ where a and b are positive integers.

$\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{15\sqrt{5}}{5}$

$= 3\sqrt{5}$

..... **(2)**

3. Expand and simplify $(2 + \sqrt{3})(4 + \sqrt{3})$ giving your answer in the $a + b\sqrt{3}$ where a and b are integers.

$(2 + \sqrt{3})(4 + \sqrt{3})$

$= 8 + 2\sqrt{3} + 4\sqrt{3} + 3$

$= 11 + 6\sqrt{3}$

..... **(3)**

5) Surds: Medium

6. Work out

$$\frac{(3+\sqrt{5})(3-\sqrt{5})}{\sqrt{8}}$$

Give your answer in the form $a\sqrt{2}$ where a is an integer.

$$\frac{(3+\sqrt{5})(3-\sqrt{5})}{\sqrt{8}}$$

$$\frac{9-3\sqrt{5}+3\sqrt{5}-5}{2\sqrt{2}}$$

$$\frac{4}{2\sqrt{2}}$$

$$\frac{2}{\sqrt{2}}$$

$$\frac{2\sqrt{2}}{2}$$

$$\sqrt{2}$$

…… **(3)**

7. Find the area of a square given that its perimeter is $\sqrt{80}cm$.

Length of one side = $\frac{\sqrt{80}}{4}$

$= \frac{4\sqrt{5}}{4}$

$= \sqrt{5}$

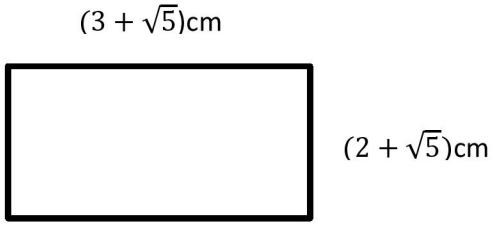
Area = $\sqrt{5}$ x $\sqrt{5}$

= 5cm^2

…… **(3)**

5) Surds: Harder

8. Find the area of the rectangle below, give your answer in simplest form.



$(3+\sqrt{5})(2+\sqrt{5})$

$= 6 + 3\sqrt{5} + 2\sqrt{5} + 5$

$= (5\sqrt{5} + 11)\text{cm}^2$

GRIFFIN Joshua

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	21 from 27	9 from 12	7 from 10	4 from 4	1 from 1	0 from 0
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Total	57 from 80	19 from 26	16 from 23	9 from 12	6 from 12	7 from 7

Your Pinpoint Topics

Topic 1: Parallelogram Angle Reasoning. Mathswatch Clip: NA

Topic 2: Understanding Number. Mathswatch Clip: NA

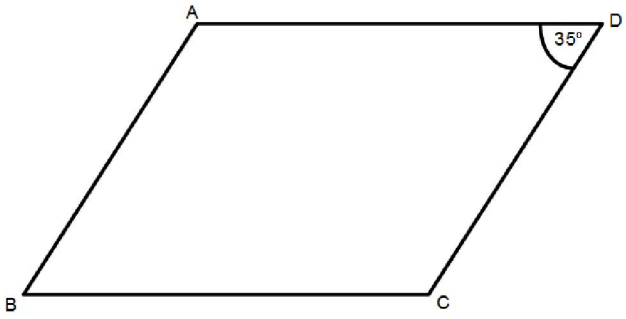
Topic 3: Simple Vectors. Mathswatch Clip: 174

Topic 4: Recognising graphs. Mathswatch Clip:

Topic 5: Drawing Quadratic Graphs. Mathswatch Clip: 98

1) Parallelogram Angle Reasoning: Easier

1) ABCD is a parallelogram



a) Work out the size of angle BCD

$180^o - 35^o = 145^o$

145^o

.....

b) Work out the size angle of ABC

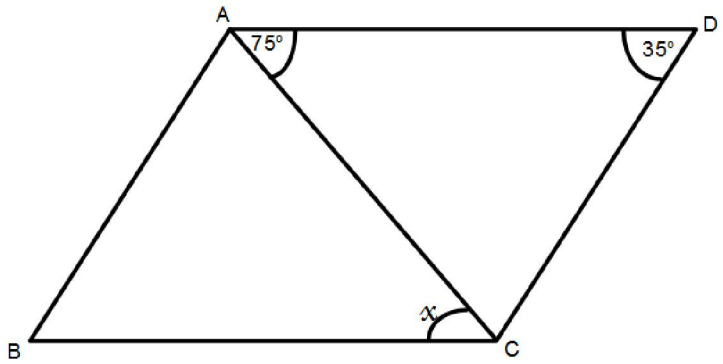
35^o

.....

(2 Marks)

---

2) ABCD is a parallelogram



a) Work out the size of angle x giving reasons for your answer

75^o

.....

Reason:

Alternate angles are equal

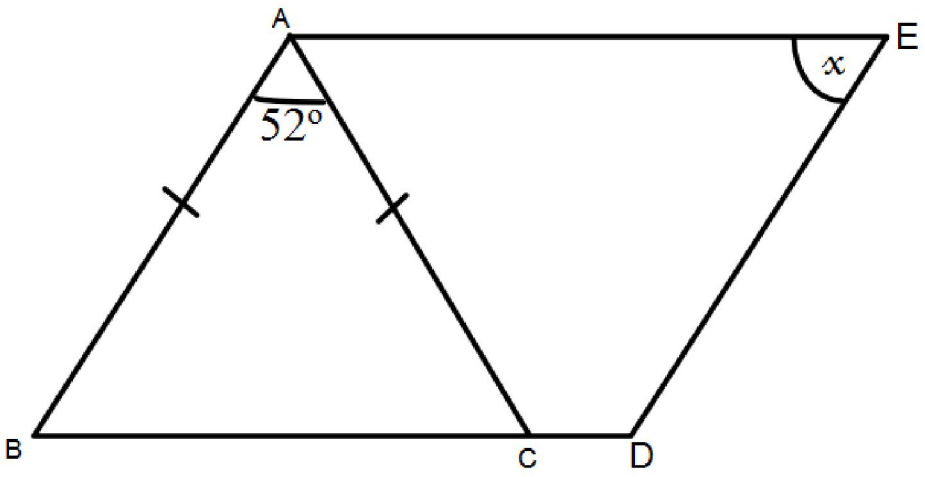
(2 Marks)

---

1) Parallelogram Angle Reasoning: Medium

3) ABDE is a parallelogram.

ABC is an isosceles triangle. AB=AC



Show that angle x is 64°. Give reasons at each stage

Angle ABC=ACB

180°- 52° =128°

128°÷2=64°

Base angles of an isosceles triangle are equal and angles in a triangle add up to 180°

Angle EDB=180°-64°=116°

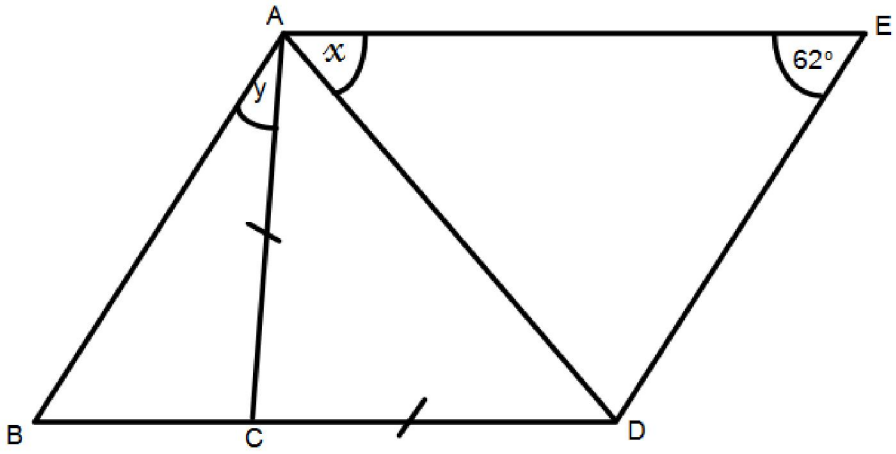
Angle x = 64° cointerior angles add to 180°.

.

(3 Marks)

1) Parallelogram Angle Reasoning: Harder

4) ABDE is a parallelogram.
AB=CD



Show that $2x + y = 118^o$

Angle ADC is x (alternate angles are equal)

Angle CAD is x (base angles of an isosceles triangle are equal)

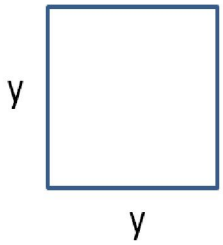
Angle BAE is 118^o (cointerior angles are equal)

Therefore $2x + y = 118^o$

(3 marks)

2) Understanding Number: Easier

1. Jim is looking at the area and lengths of squares.



Jim considers a square with area $9m^2$.

Jim works out the length of the square as follows:

$$y^2 = 9$$

$$y = \sqrt{9}$$

$$y = 3cm$$

Jim considers another square with a **different** area.

Please tick below:

	This method will **always** give an answer which is a whole number
/	This method will **sometimes** give an answer which is a whole number
	This method will **never** give an answer which is a whole number

Show working to support your answer

Any area which is a square number will give a whole number using this method

e.g. $y^2 = 16$ gives $y = \sqrt{16} = 4$ cm

Any area that is a non-square number won't give a whole number

e.g. $y^2 = 10$ gives $y = \sqrt{10} = 3.162\ldots$ cm

(3 marks)

2) Understanding Number: Medium

2.a) Anne puts a number in her calculator and squares her number. The number gets a lot bigger.

Anne says "if you square a number it will **always** get bigger".

Please tick below:

☐	Anne is correct
/	Anne is **not** correct

Show working to support your answer

If you square a number that is between 0 and 1 it will become smaller

e.g. $0.5^2 = 0.25$

(3 marks)

b) Pete says "if you square a number it will **always** be positive".

Please tick below:

☐	Pete is correct
/	Pete is **not** correct

Show working to support your answer

If you square **zero** the answer is zero, a non-positive number.

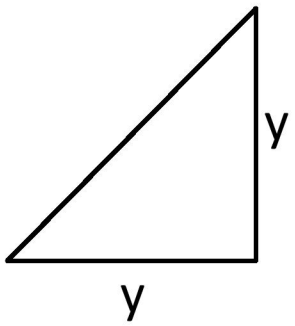
$$0^2 = 0 \times 0 = 0$$

(3 marks)

2) Understanding Number: Harder

3.a) Amir cuts a square in half along the diagonal to produce a right angled triangle.

It has a length, y, which is a whole number.



Amir works out the **area** of the triangle.

Please tick below:

	The area **must** be a whole number.
/	The area will **sometimes** be a whole number.

Show working to support your answer

If y = 3 then the area is $(3 \times 3) \div 2 = 9 \div 2 = 4.5$ a decimal

If y = 4 then the area is $(4 \times 4) \div 2 = 16 \div 2 = 8$ a whole number

(3 marks)

b) Amir is about the work out the **hypotenuse** of the triangle.

Amir says "The hypotenuse of the triangle will **always** be a whole number".

Show that Amir is wrong.

Pythagoras' Theorem: $a^2 + b^2 = c^2$

If $a = 2$ and $b = 3$ then

$$c^2 = 2^2 + 3^2 = 4 + 9 = 13$$

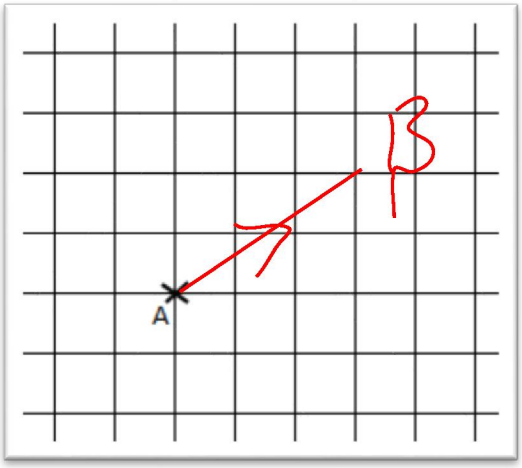
$$c = \sqrt{13} = 3.605 \ldots$$

So the hypotenuse is not a whole number in this case

(3 marks)

3) Simple Vectors: Easier

3)

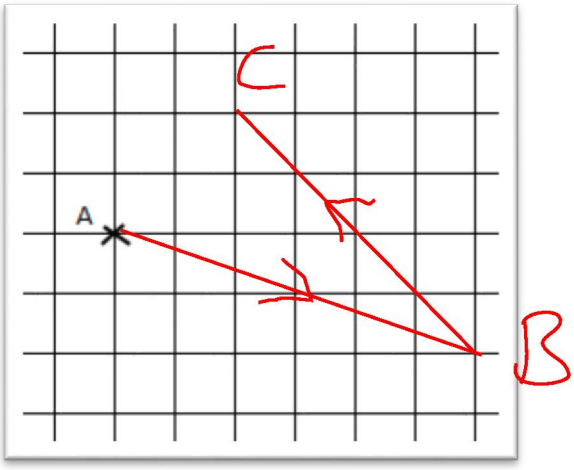


On the grid, draw the Vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ from Point A.

Label the new point B.

(1 Mark)

4)



a) On the grid, draw the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ from Point A

Label the new point B.

(1 Mark)

bi) On the grid draw the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ from Point B

Label the new point C

ii) State the vector $\overrightarrow{AC}$ $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$ (2 Marks)

3) Simple Vectors: Medium

5) Vector $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 11 \end{pmatrix}$

_____

(2 Marks)

6) Vector $\overrightarrow{AB} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$

_____

(2 Marks)

7) Vector $\overrightarrow{AB} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 10 \end{pmatrix}$

State Vector $\overrightarrow{CA}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

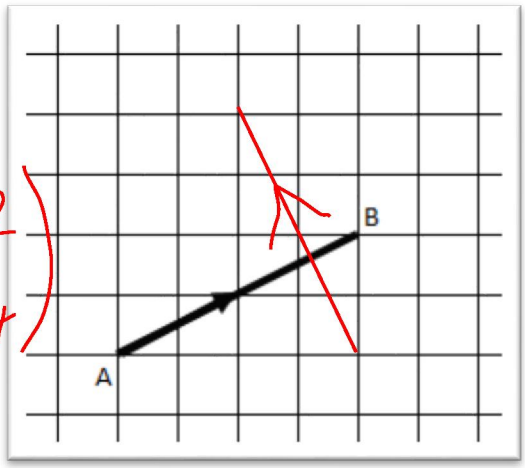
$\begin{pmatrix} -4 \\ -2 \end{pmatrix} + \begin{pmatrix} -2 \\ 10 \end{pmatrix} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}$

$\overrightarrow{CA} = -\overrightarrow{AC} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

(2 Marks)

3) Simple Vectors: Harder

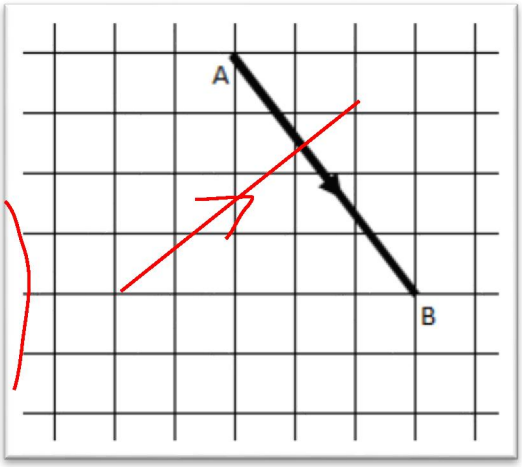
8)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

9)

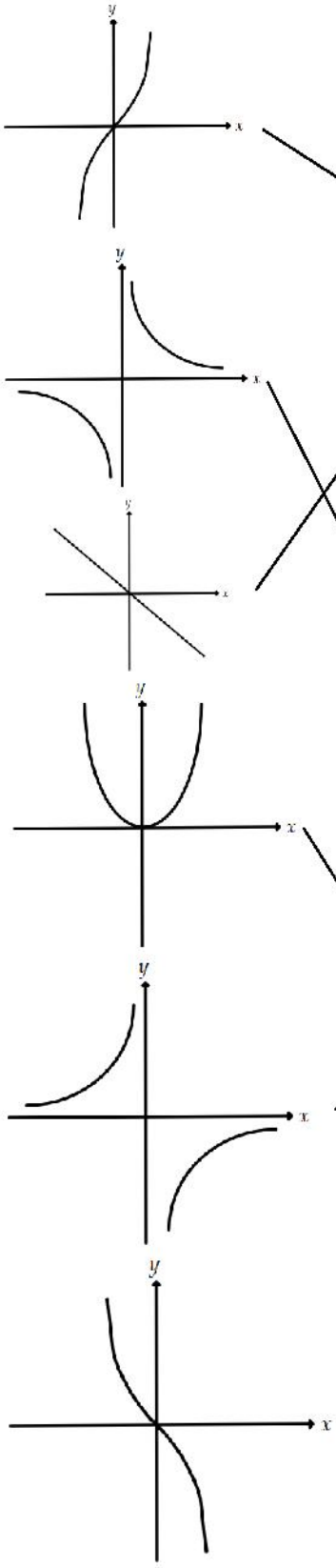


Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

4) Recognising graphs: Easier

1) Match each of the graphs with its equation, the first one is done for you



$y = -x$

$y = x^3$

$y = -x^3$

$y = -\frac{1}{x}$

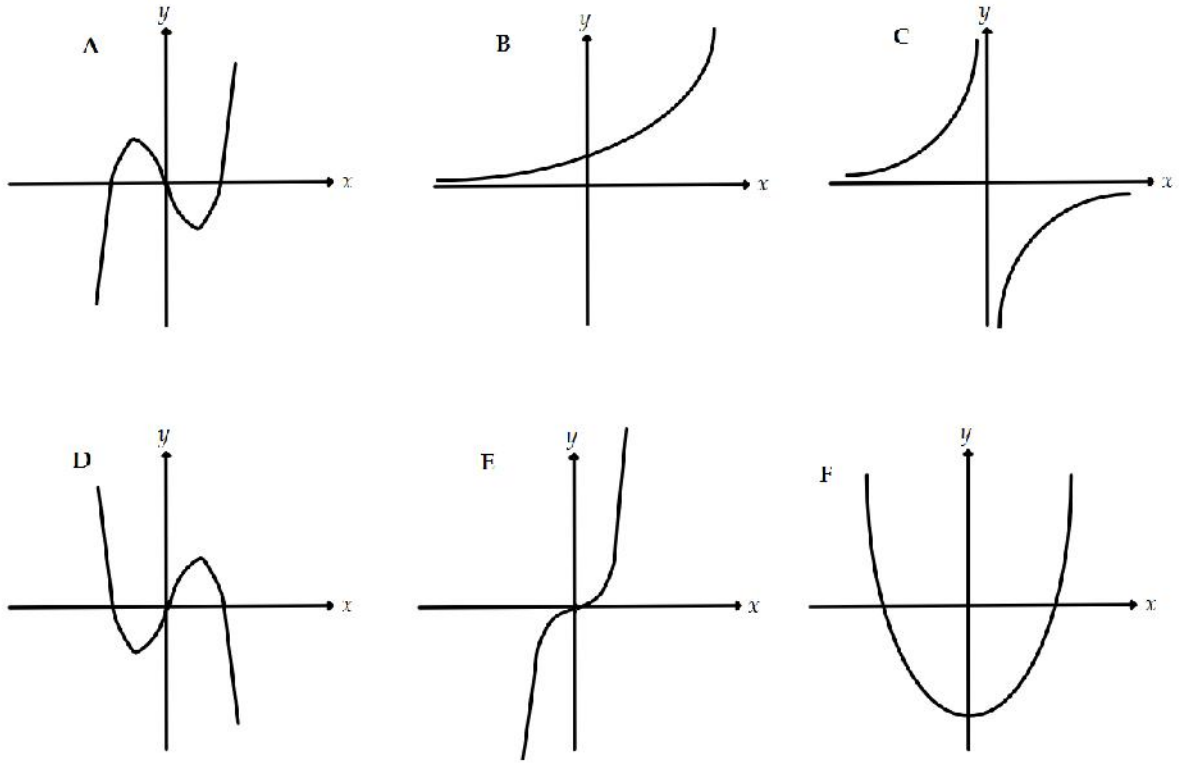
$y = \frac{1}{x}$

$y = x^2$

(3 marks)

4) Recognising graphs: Medium

2) Harry has sketched some graphs



a) Write down the letter of the graph that could have the equation $y = 3^x$

B

_____

(1 Mark)

b) Write down the letter of the graph that could have the equation $y = -\frac{5}{x}$

C

_____

(1 Mark)

c) Write down the letter of the graph that could have the equation $y = 2x - x^3$

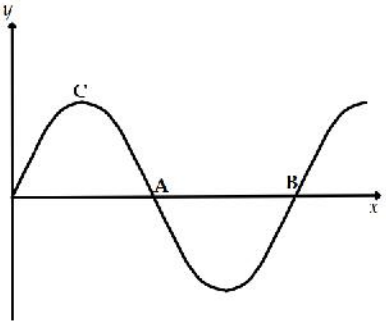
D

_____

(1 Mark)

4) Recognising graphs: Harder

3) A sketch of part of $y = \sin(x)$ is drawn below



a) Write down the coordinates of A

$(180°, 0)$

_____

(1 Mark)

b) Write down the coordinates of B

$(360°, 0)$

_____

(1 Mark)

c) Write down the coordinates of C

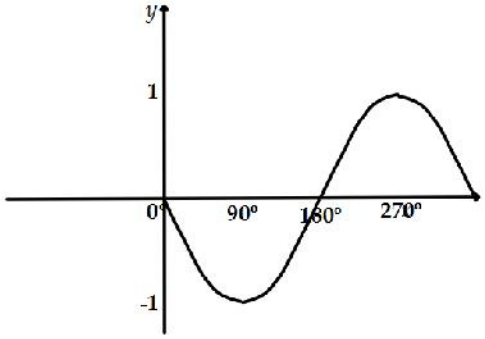
$(90°, 1)$

_____

(1 Mark)

---

4) Lanre was asked to sketch $y = \cos(x)\ for\ 0° \leq x \leq 360°$. This is what Lanre sketched



Write down one mistake Lanre has made

$y = \cos(x)$ does not go through (0,0) it starts at (0,1) and decreases to (90°,0)

(1 Mark)

5) Drawing Quadratic Graphs: Easier

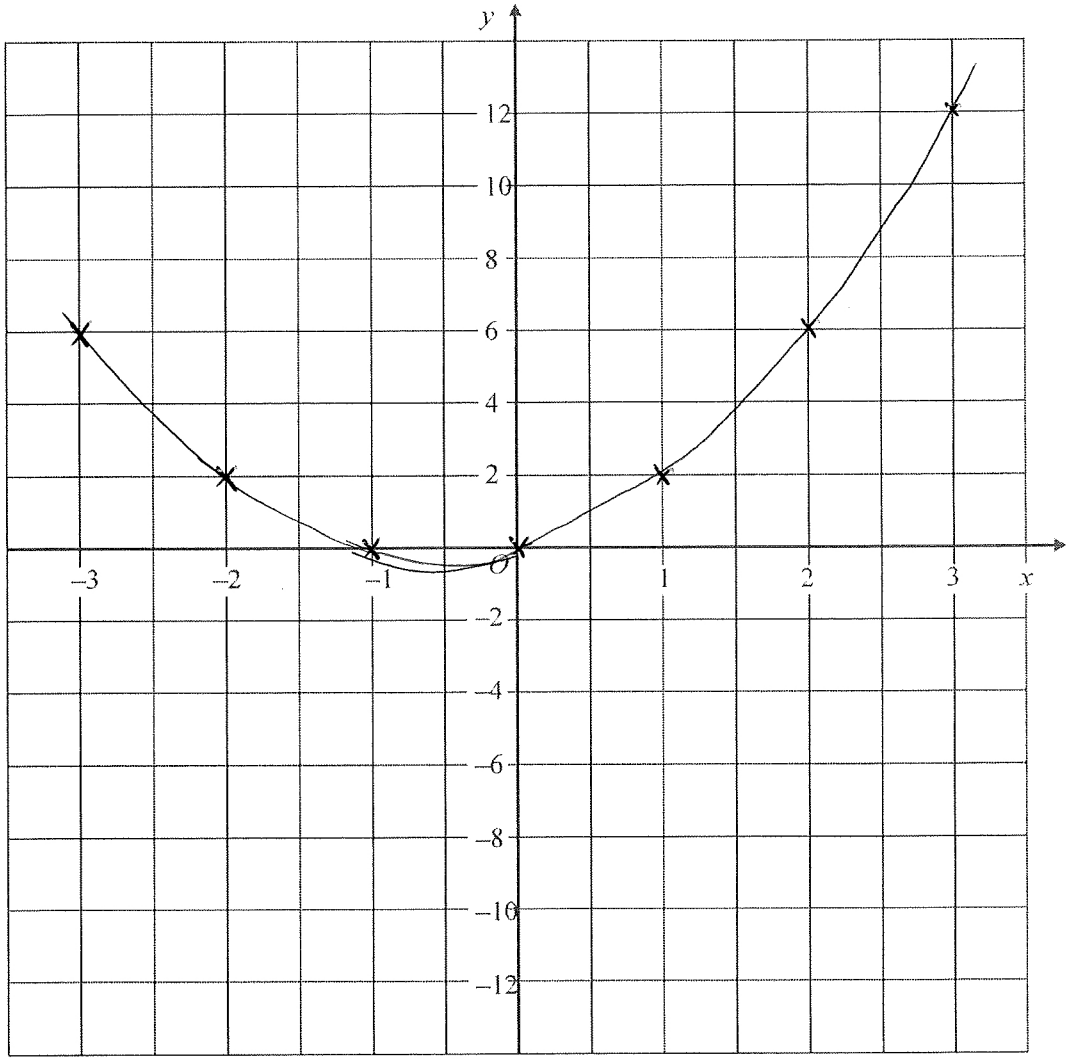
1. (a) Complete the table of values for $y = x^2 + x$.

x	–3	–2	–1	0	1	2	3
y	6	2	0	0	2	6	12

1+1 9+3

(2)

(b) On the grid, draw the graph of $y = x^2 + x$.



(2)

(Total 4 marks)

5) Drawing Quadratic Graphs: Medium

6. (a) Complete the table for $y = x^2 - 3x + 1$

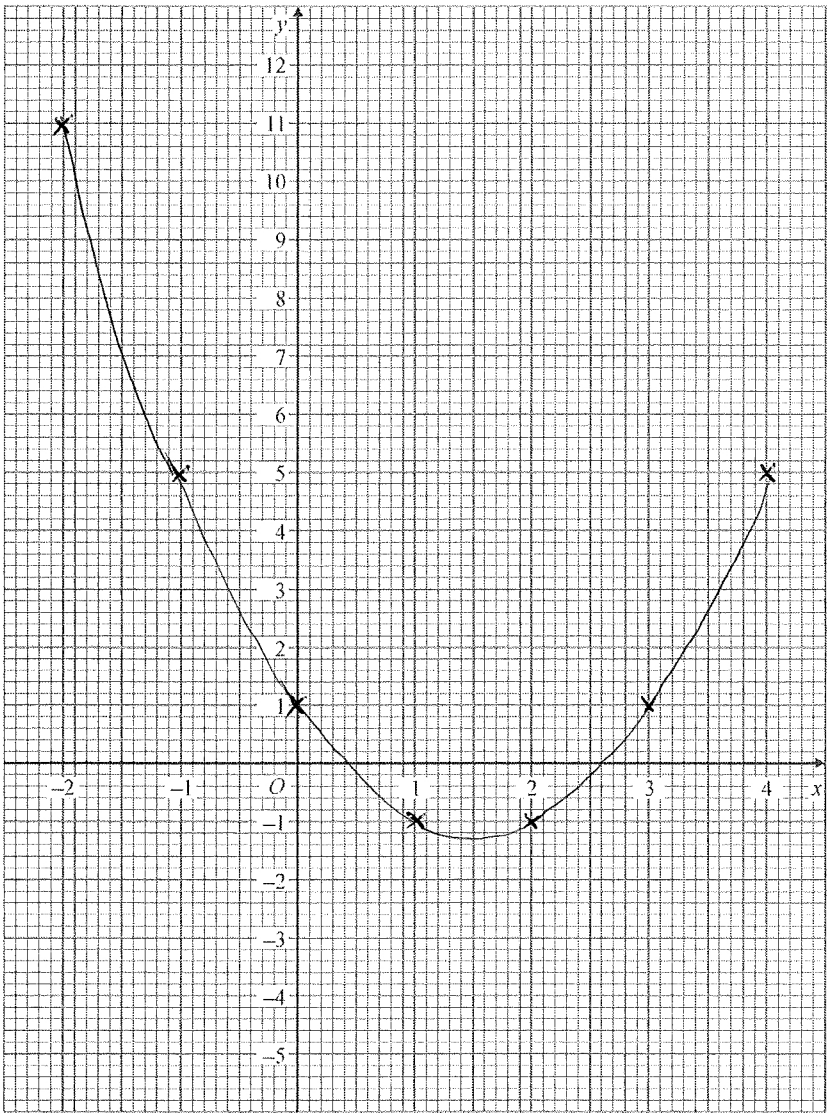
x	−2	−1	0	1	2	3	4
y	11	5	1	−1	−1	1	5

1 + 3 + 1 4 − 6 + 1

(2)

(b) On the grid below, draw the graph of $y = x^2 - 3x + 1$

(2)



(c) Use your graph to find an estimate for the minimum value of y.

$y =$ −1.3

(1)

5) Drawing Quadratic Graphs: Harder

(Total 5 marks)

7. (a) Complete the table of values for $y = x^2 - 3x - 1$

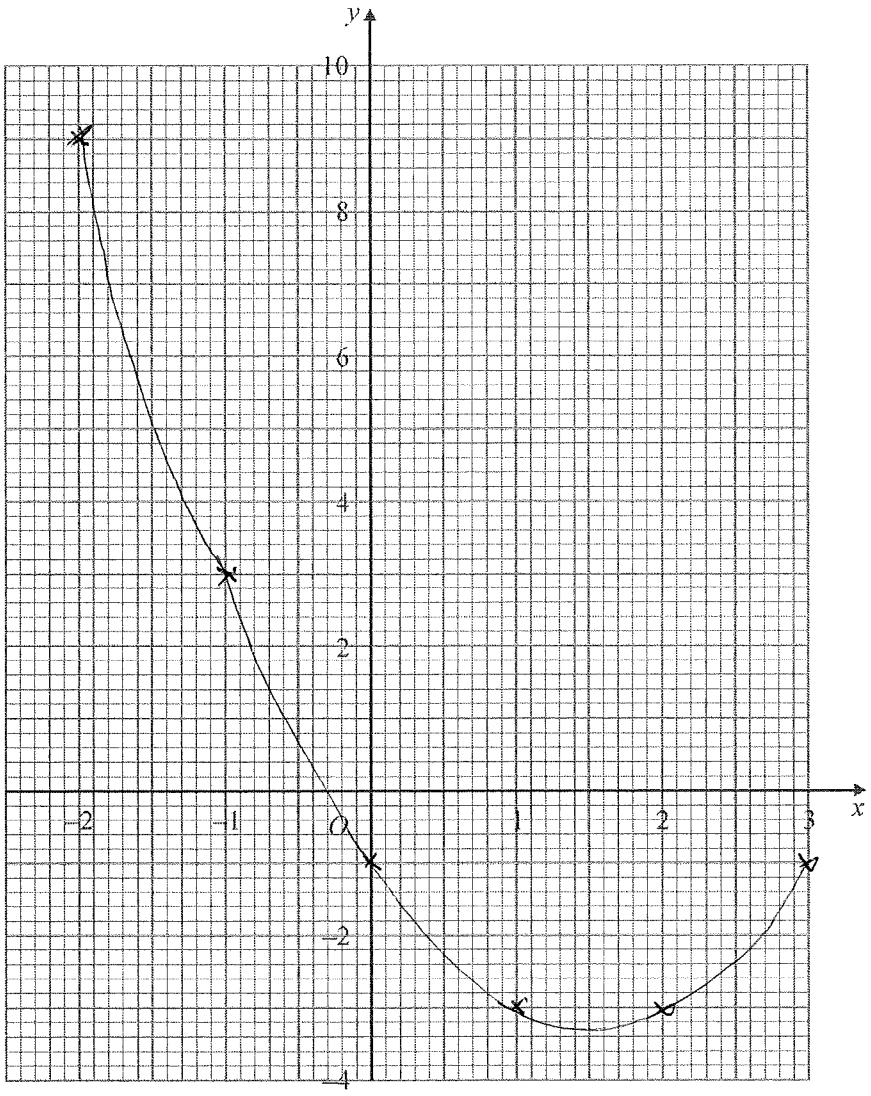
x	−2	−1	0	1	2	3
y	9	3	−1	−3	−3	−1

4+6−1 4−6−1 9−9−1

(2)

(b) On the grid, draw the graph of $y = x^2 - 3x - 1$

(2)



(Total 4 marks)

GROCH Anna

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	15 from 27	4 from 12	6 from 10	4 from 4	1 from 1	0 from 0
A02 and 3	30 from 53	10 from 14	9 from 13	1 from 8	7 from 11	3 from 7
Total	45 from 80	14 from 26	15 from 23	5 from 12	8 from 12	3 from 7

Your Pinpoint Topics

Topic 1: Solving simple equations with fractions. MW: 135

Topic 2: Estimation and Reasoning. Mathswatch Clip: 91

Topic 3: Algebraic Equivalence. Mathswatch Clip: NA

Topic 4: Direct and Inverse Proportion. Mathswatch Clip: 199

Topic 5: Fractional and Negative Indices. MW: 188

1) Solving simple equations with fractions: Easier

1) Solve $\frac{x}{2} = 10$

$x = 20$

(multiplying both sides by 2)

_____

(1 Mark)

---

2) Solve $\frac{x}{5} = 6$

(multiplying both sides by 5) $x = 30$

_____

(1 Mark)

---

3) Solve $\frac{3x}{4} = 6$

Multiplying by 4 $3x = 24$

Dividing by 3 $x = 8$

$x = 8$

_____

(2 Marks)

---

4) Solve $\frac{2}{3}x = 4$

Multiplying by 3 $2x = 12$

Dividing by 2 $x = 6$

$x = 6$

_____

(2 Marks)

---

1) Solving simple equations with fractions: Medium

5) Solve $\frac{x}{2} + 1 = 9$

Subtracting 1 $\frac{x}{2} = 8$

Multiplying by 2 $x = 16$

$x = 16$

(2 Marks)

---

6) Solve $\frac{x}{3} - 11 = 9$

Adding 11 $\frac{x}{3} = 20$

Multiplying by 3 $x = 60$

$x = 60$

(2 Marks)

---

7) Solve $\frac{3x}{2} - 5 = 9$

Adding 5 $\frac{3x}{2} = 14$

Multiplying by 2 $3x = 28$

Dividing by 3

$x = \frac{28}{3}$

$x = \frac{28}{3}$

(3 Marks)

---

1) Solving simple equations with fractions: Harder

8) Aurora is solving this equation

$$\frac{2x}{3} + 3 = 12$$

Here is her working

$\frac{2x}{3} = 9$ line 1

$2x = 3$ line 2

$x = \frac{3}{2}$ line 3

Explain one mistake Aurora has made

From line 1 to line 2 she has multiplied the right hand side of the equation by 3 but divided the left hand side by 3, she should have multiplied both sides by 3 giving $2x = 27$, then her answer would have been $x = \frac{27}{2}$

(1 Mark)

2) Estimation and Reasoning: Easier

1) Find an estimate for $\dfrac{423 \times 69.5}{0.52}$

$$\frac{400 \times 70}{0.5}$$

$$= \frac{28000}{0.5}$$

$= 56000$

(2 Marks)

---

2) a) Estimate the value of $\sqrt{2.9 + 9.6 + 1.98}$

$$\sqrt{3 + 10 + 2}$$

$$= \sqrt{15}$$

3.9

b) Explain if your answer to a) is an overestimate or underestimate

All numbers have been rounded up so it is an overestimate

(3 Marks)

---

3) A water bottling plant has 967 machines, each machine filters on average 2912 litres per day. The water is then put into ½ litre bottles. Estimate how many bottles the plant fills in one day

$$\frac{1000 \times 3000}{0.5}$$

$$\frac{3000000}{0.5}$$

6000000

(2 marks)

2) Estimation and Reasoning: Medium

4) A litre of petrol costs £1.07, Sally's car can travel 9.8Km on one litre of petrol. Sally wants to travel from Manchester to Stoke. The distance from Manchester to Stoke is 71.4km. Estimate the cost of Sally's journey from Manchester to Stoke. Show your working.

$$\frac{70}{10} \times 1$$

£7_____

(2 Marks)

5) Jeremy organised a charity celebrity football match. Each ticket for the football match cost £20.05. Jeremy sold 507 tickets. Jeremy had to pay costs of £2980 He gave all money left to the charity.

a) Work out an estimate for the amount of money Jeremy gave to the charity.

$$20 \times 500 = 10000$$

$$10000 - 3000 = £7000$$

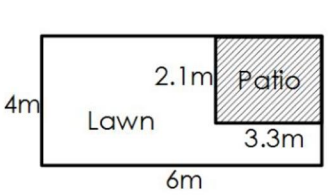
£7000_____

b) Is your answer to (a) an underestimate or an overestimate?
Give a reason for your answer.

An underestimate as the amount of money he made has been rounded down and the cost is rounded up so the difference will be smaller than the actual difference

(4 Marks)

6) Elizabeth wants to lay new turf on her lawn. Below is a diagram to show the measurements of the lawn. Each roll of turf covers $3m^2$.



a) Work out an estimate for how many rolls she will need. You must show all working for how you reached your estimate.

Area of Lawn = $(4 \times 6) - (2 \times 3) = 18m^2$

$$\frac{18}{3} = 6\ rolls$$

b) By considering your estimate and no further calculations explain if Elizabeth will have enough rolls to cover the lawn, assuming no turf is wasted

The area of the lawn is actually bigger than estimated as the area of the patio is smaller than estimated as both numbers are rounded down. Since we subtracted a smaller number than the actual number, our estimate is an overestimate so Elizabeth will have enough rolls to cover the lawn.

(3 Marks)

2) Estimation and Reasoning: Harder

7) a) The population of Italy is 59715625. It has an area of 301230Km^2. Population density can be worked out using the formula below. Work out an estimate for the population density of Italy.

$$Population\ Density = \frac{Population}{Area}$$

$$Population\ Density = \frac{60000000}{300000} = 200 population/km^2$$

$200 population/km^2$

b) Explain whether Italy is more densely populated than your estimate or less densely populated.

It is actually less densely populated as the estimate is an overestimate. The population has been rounded up and the area has been rounded down so when we divide an overestimate by an underestimate it becomes even bigger.

(3 Marks)

---

8) The mass of the Earth is $5.98 \times 10^{24} kg$. Jupiter's mass is 318 times larger than Earth's. Estimate the mass of Jupiter. Give your estimate in standard form. You must show how you reached your estimate.

$$6 \times 10^{24} \times 3 \times 10^{2}$$

$$= 18 \times 10^{26}$$

$$= 1.8 \times 10^{27} \text{Kg}$$

$= 1.8 \times 10^{27}$Kg

(3 Marks)

3) Algebraic Equivalence: Easier

1) Simplify $\frac{3x^2}{x}$

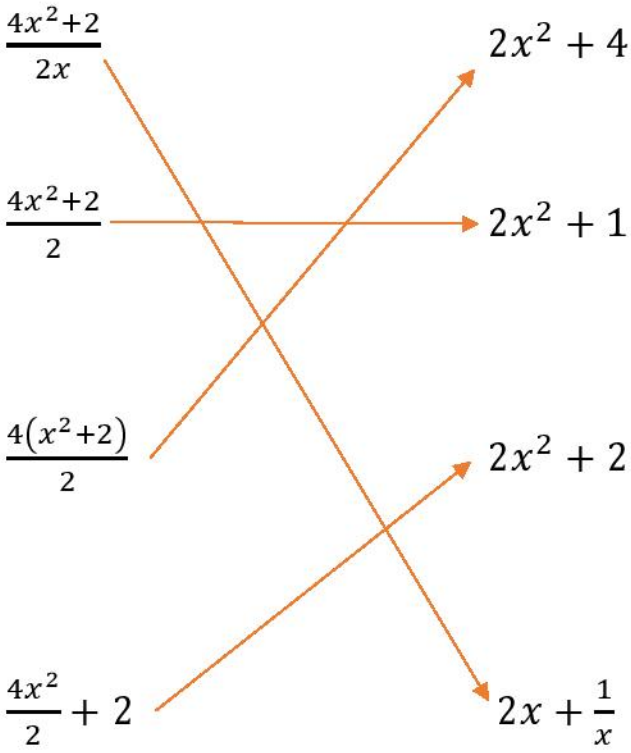
$3x$

_____

(1 Mark)

---

2) Match each of the four expressions on the left hand side with 1 equivalent expression on the right hand side



3) Algebraic Equivalence: Medium

3) Circle the expression that is equivalent to $\frac{3x^2+2}{x}$ where x is not equal to 0

A $3x^3+2$ B $3x+\frac{2}{x}$ C $2x^2+\frac{2}{x}$ D $3x+2$

$$\frac{3x^2+2}{x}$$

$$=\frac{3x^2}{x}+\frac{2}{x}$$

$$=3x+\frac{2}{x}$$

(1 Mark)

---

4) **Two** of these four expressions are equivalent. Circle the two expressions

A $\frac{x}{x+5}$ B $1+\frac{x}{5}$ C $\frac{5+x}{5}$ D $\frac{x^2}{x^2+5}$

(1 mark)

3) Algebraic Equivalence: Harder

5) Fiona tries to simplify this expression

$$\frac{3x}{3+x}$$

She writes

$$\frac{3x}{3}+\frac{3x}{x}$$

$$x+3$$

Explain why Fiona can not rewrite the expression like this

Dividing $3x$ by $3+x$ is not the same as dividing it by 3 and adding it to $\frac{3x}{x}$

Numerical Example

If $x=1$

$$\frac{3x}{3+x}=\frac{3}{4}$$

$$\frac{3x}{3}+\frac{3x}{x}=\frac{3}{3}+\frac{3}{1}=4$$

As you can see, these two expressions are not equal

(1 mark)

---

6) Show that $\frac{2x+5}{1+\frac{2}{x}}$ is equivalent to $\frac{2x^2+5x}{x+2}$

$$\frac{2x+5}{1+\frac{2}{x}}$$

$$=\frac{x(2x+5)}{x(1+\frac{2}{x})}$$

$$=\frac{2x^2+5x}{x+2}$$

(1 mark)

---

4) Direct and Inverse Proportion: Easier

1. The weight of a piece of wire is directly proportional to its length.

A piece of wire is 25 cm long and has a weight of 6 grams.
Another piece of the same wire is 30 cm long.

Calculate the weight of the 30 cm piece of wire.

$w = kl$

$6 = 25k$

$k = 0.24$

$w = 0.24l$

$w = 0.24 \times 30$

$w = 7.2$

7.2 ..... grams

(Total 2 marks)

2. A ball falls vertically after being dropped.
The ball falls a distance d metres in a time of t seconds.
d is directly proportional to the square of t. $d = kt^2$

The ball falls 20 metres in a time of 2 seconds.

(a) Find a formula for d in terms of t.

$20 = k \times 2^2$

$20 = 4k$

$k = 5$

$d =$ $5t^2$ .....

(3)

(b) Calculate the distance the ball falls in 3 seconds.

$d = 5 \times 3^2$

$d = 5 \times 9 = 45$

45 ..... m

(1)

(c) Calculate the time the ball takes to fall 605 m.

$d = 5t^2$

$605 = 5t^2$

$t^2 = 121$

$t = \pm 11$

(ignore -11 as time can't be -ve)

11 ..... seconds

(3)

(Total 7 marks)

4) Direct and Inverse Proportion: Medium

3. The time, T seconds, it takes a water heater to boil some water is directly proportional to the mass of water, m kg, in the water heater.

When $m = 250$, $T = 600$

$T = km$

(a) Find T when $m = 400$

$600 = 250k$

$k = \frac{600}{250} = 2.4$

$T = 2.4m$

$T = 2.4 \times 400$

$T = 960$

$T =$ 960

(3)

The time, T seconds, it takes a water heater to boil a constant mass of water is inversely proportional to the power, P watts, of the water heater.

When $P = 1400$, $T = 360$

$T = \frac{k}{P}$

(b) Find the value of T when $P = 900$

$360 = \frac{k}{1400}$

$k = 360 \times 1400$

$k = 504{,}000$

$\therefore T = \frac{504000}{P}$

$T = \frac{504000}{900} = 560$

$T =$ 560

(3)

(Total 6 marks)

4. D is proportional to S^2.

$D = 900$ when $S = 20$

Calculate the value of D when $S = 25$

$D = kS^2$

$900 = k \times 20^2$

$900 = 400k$

$k = \frac{900}{400} = 2.25$

$D = 2.25S^2$

$D = 2.25 \times 25^2$

$D =$ 1406.25

(Total 4 marks)

4) Direct and Inverse Proportion: Harder

1) A is inversely proportional to the square root of B. Jim says if B is very large A will be negative. Is he right?

Solution: $A \propto \frac{1}{\sqrt{B}}$

$$A = \frac{k}{\sqrt{B}}$$

Jim is wrong. If B is very large $\sqrt{B}$ will be positive, therefore A will also be positive.

(As B becomes very large, A becomes very small)

(4 Marks)

---

2) If Sally drives to work 25% faster than she did yesterday. What would be her percentage decrease in the time taken to get to work?

Solution: $Time = \frac{Distance}{Speed}$

$$Time = \frac{D}{1.25}$$

$$Time = \frac{1}{1.25}$$

$$Time = \frac{4}{5}$$

$$\frac{4}{5} = 80\%$$

She will get there 20% faster.

(4Marks)

---

5) Fractional and Negative Indices: Easier

1) Evaluate

a) 6^0 $= 1$ _____

(1 Mark)

a) $25^{\frac{1}{2}}$ $= \sqrt{25} = 5$ _____

(1 Mark)

c) 3^{-1} $= \frac{1}{3}$ _____

(1 Mark)

---

2) Sarah says that $9^{\frac{1}{2}}$ is 4.5. She is wrong. Explain her mistake.

Solution: $9^{\frac{1}{2}} = \sqrt{9} = 3$

_____

(1 Mark)

---

3) Evaluate

a) $27^{\frac{1}{3}}$ $\sqrt[3]{27} = 3$

_____

(1 Mark)

b) $27^{\frac{2}{3}}$ $\sqrt[3]{27}^2 = 9$ _____

(1 Mark)

c) $27^{\frac{-2}{3}}$ $\frac{1}{\sqrt[3]{27^2}} = \frac{1}{9}$ _____

(1 Mark)

5) Fractional and Negative Indices: Medium

4) Evaluate

a) $\left(\frac{25}{81}\right)^{\frac{-1}{2}}$ $\left(\frac{1}{25/81}\right)^{\frac{1}{2}} = \left(\frac{81}{25}\right)^{\frac{1}{2}} = \sqrt{\frac{81}{25}} = \frac{9}{5}$

_____

(1 Mark)

b) $32^{\frac{-3}{5}}$ $\left(\frac{1}{32}\right)^{\frac{3}{5}} = \left(\sqrt[5]{\frac{1}{32}}^{3}\right) = \frac{1}{2^3} = \frac{1}{8}$

_____

(1 Mark)

c) $144^{\frac{-1}{2}} \times 3^{-2}$

$\frac{1}{\sqrt{144}} \times \frac{1}{3^2} = \frac{1}{12} \times \frac{1}{9} = \frac{1}{108}$

_____

(2 Marks)

---

5) Put these numbers in ascending order, show your working.

125^0 $125^{\frac{-1}{3}}$ $\left(\frac{1}{125}\right)^{\frac{-1}{3}}$ $125^{\frac{-2}{3}}$

1 $\frac{1}{\sqrt[3]{125}} = \frac{1}{5}$ $\left(\frac{1}{1/125}\right)^{\frac{1}{3}} = \sqrt[3]{125} = 5$ $\left(\frac{1}{125}\right)^{\frac{2}{3}} = \frac{1}{\sqrt[3]{125^2}} = \frac{1}{5^2} = \frac{1}{25}$

Correct order $\frac{1}{25}$, $\frac{1}{5}$, 1, 5.

_____

(3 Marks)

5) Fractional and Negative Indices: Harder

6) If $2^{2x} = \frac{1}{16}$. Work out the value of x.

$2^{2x} = \frac{1}{4^2}$

$2^{2x} = 4^{-2}$

$2^{2x} = 2^{2(-2)}$

$x = -2$

(2 Marks)

---

7) One of these has a different value to the other two. Decide which one and justify your answer.

$4^{\frac{3}{4}}$ $8^{\frac{1}{4}}$ $2^{\frac{3}{2}}$

$2^{2\left(\frac{3}{4}\right)} = 2^{\frac{6}{4}} = 2^{\frac{3}{2}}$ $2^{3\left(\frac{1}{4}\right)} = 2^{\frac{3}{4}}$

The values that are the same are $4^{\frac{3}{4}}$ and $2^{\frac{3}{2}}$

(3 Marks)

---

8) If $32^{3x} = \frac{1}{8}$. Find the value of x

$2^{5(3x)} = \frac{1}{8}$

$2^{15x} = \frac{1}{2^3}$

$2^{15x} = 2^{-3}$

$15x = -3$

$x = \frac{-3}{15}$

$x = -\frac{1}{5}$

(3 Marks)

HATCHELL Charlie

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	7 from 27	0 from 12	5 from 10	2 from 4	0 from 1	0 from 0
A02 and 3	16 from 53	4 from 14	3 from 13	0 from 8	4 from 11	5 from 7
Total	23 from 80	4 from 26	8 from 23	2 from 12	4 from 12	5 from 7

Your Pinpoint Topics

Topic 1: Speed. Mathswatch Clip: 142

Topic 2: Estimation and Reasoning. Mathswatch Clip: 91

Topic 3: Algebraic Equivalence. Mathswatch Clip: NA

Topic 4: Recognising graphs. Mathswatch Clip:

Topic 5: Drawing Quadratic Graphs. Mathswatch Clip: 98

1) Speed: Easier

1) Pete drove 50 miles in 4 hours
Work out his average speed in miles per hour.

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{50}{4} = \frac{25}{2} = 12.5 \text{ mph}$$

12.5 miles/hour

(2 Marks)

---

2) Dave cycled 8km in 30 minutes.
Work out Dave's average speed in km/h.

30 mins = 0.5 hours

$$\text{speed} = \frac{8}{0.5} = 16 \text{ km/h}$$

16 Km/h

(3 Marks)

---

3) Jess travels 400km at an average speed of 300 km/h.
How long was she travelling for? Give your answer in minutes.

$$s = \frac{d}{t} \quad \text{so} \quad t = \frac{d}{s} = \frac{400}{300} = \frac{4}{3} = 1\tfrac{1}{3} \text{ h}$$

1 h = 60 mins so $\frac{1}{3}$ h = 20 mins

so total time = 60 + 20 = 80 mins

80 minutes

(3 Marks)

---

4) Jeff set off for work at 3pm. He arrived at his destination at 5pm.
If Jeff travelled at a constant speed of 24 Km/h, how far did he travel?

t = 2 hours

$$s = \frac{d}{t} \quad \text{so} \quad d = s \times t = 24 \times 2 = 48 \text{ km}$$

48 Km

(2 Marks)

---

1) Speed: Medium

Pete needs to catch a ferry.

Pete leaves his home and drives

10 miles towards the motorway

180 miles on the motorway

15 miles from the motorway to the ferry port

Pete

Takes 20 minutes to get to the motorway

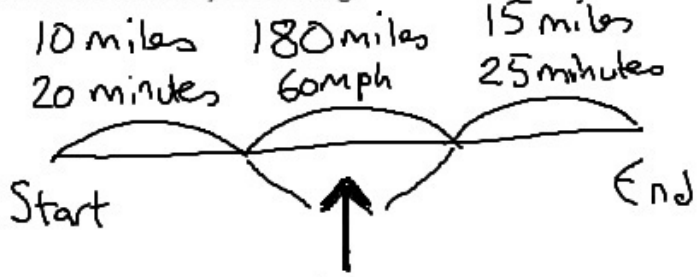
Drives at an average speed of 60mph whilst on the motorway

Takes 25 minutes to get from the motorway to the ferry port.

Pete has to arrive at the ferry port no later than midday.

What is the latest time Pete can leave his house?

You must show all your working.



T = D/S

T = 180/60 = 3 hours

Total time

3 hours

25 minutes

20 minutes +

3hrs 45 mins

Midday = 12:00pm

3hrs 45 mins

Answer = 8:15am

1) Speed: Harder

Abigail is on a bus going into the city.

The bus picks her up and drives

4 miles towards a motorway

45 miles on the motorway

6 miles from the motorway to the city bus depot

The bus

Takes 10 minutes to get to the main road

Drives at an average speed of 60mph whilst on the motorway

Takes 15 minutes to get from the motorway to the bus depot

Abigail gets on the bus at 10:19am. What time will she get off the bus?

You must show all your working.

4miles 10mins | 45mins 60mph | 6miles 15mins

Start → End

$T = D/S$

$T = 45/60 = \frac{3}{4}$

$= 45$mins

Total time taken

45
15
10
70 mins
or 1hr 10mins

10:19 + 1hr 10mins

11:29am

2) Estimation and Reasoning: Easier

1) Find an estimate for $\frac{423 \times 69.5}{0.52}$

$$\frac{400 \times 70}{0.5}$$

$$= \frac{28000}{0.5}$$

$= 56000$

(2 Marks)

---

2) a) Estimate the value of $\sqrt{2.9 + 9.6 + 1.98}$

$$\sqrt{3 + 10 + 2}$$

$$= \sqrt{15}$$

3.9

b) Explain if your answer to a) is an overestimate or underestimate

All numbers have been rounded up so it is an overestimate

(3 Marks)

---

3) A water bottling plant has 967 machines, each machine filters on average 2912 litres per day. The water is then put into ½ litre bottles. Estimate how many bottles the plant fills in one day

$$\frac{1000 \times 3000}{0.5}$$

$$\frac{3000000}{0.5}$$

6000000

(2 marks)

2) Estimation and Reasoning: Medium

4) A litre of petrol costs £1.07, Sally's car can travel 9.8Km on one litre of petrol. Sally wants to travel from Manchester to Stoke. The distance from Manchester to Stoke is 71.4km. Estimate the cost of Sally's journey from Manchester to Stoke. Show your working.

$$\frac{70}{10} \times 1$$

£7_____

(2 Marks)

---

5) Jeremy organised a charity celebrity football match. Each ticket for the football match cost £20.05. Jeremy sold 507 tickets. Jeremy had to pay costs of £2980 He gave all money left to the charity.

a) Work out an estimate for the amount of money Jeremy gave to the charity.

$$20 \times 500 = 10000$$

$$10000 - 3000 = £7000$$

£7000_____

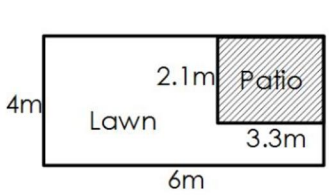
b) Is your answer to (a) an underestimate or an overestimate?
Give a reason for your answer.

An underestimate as the amount of money he made has been rounded down and the cost is rounded up so the difference will be smaller than the actual difference

(4 Marks)

---

6) Elizabeth wants to lay new turf on her lawn. Below is a diagram to show the measurements of the lawn. Each roll of turf covers $3m^2$.



a) Work out an estimate for how many rolls she will need. You must show all working for how you reached your estimate.

Area of Lawn = $(4 \times 6) - (2 \times 3) = 18m^2$

$$\frac{18}{3} = 6\ rolls$$

b) By considering your estimate and no further calculations explain if Elizabeth will have enough rolls to cover the lawn, assuming no turf is wasted

The area of the lawn is actually bigger than estimated as the area of the patio is smaller than estimated as both numbers are rounded down. Since we subtracted a smaller number than the actual number, our estimate is an overestimate so Elizabeth will have enough rolls to cover the lawn.

(3 Marks)

2) Estimation and Reasoning: Harder

7) a) The population of Italy is 59715625. It has an area of 301230Km^2. Population density can be worked out using the formula below. Work out an estimate for the population density of Italy.

$$Population\ Density = \frac{Population}{Area}$$

$$Population\ Density = \frac{60000000}{300000} = 200 population/km^2$$

$200 population/km^2$

b) Explain whether Italy is more densely populated than your estimate or less densely populated.

It is actually less densely populated as the estimate is an overestimate. The population has been rounded up and the area has been rounded down so when we divide an overestimate by an underestimate it becomes even bigger.

(3 Marks)

8) The mass of the Earth is $5.98 \times 10^{24} kg$. Jupiter's mass is 318 times larger than Earth's. Estimate the mass of Jupiter. Give your estimate in standard form. You must show how you reached your estimate.

$$6 \times 10^{24} \times 3 \times 10^{2}$$

$$= 18 \times 10^{26}$$

$$= 1.8 \times 10^{27}\text{Kg}$$

$= 1.8 \times 10^{27}$Kg

(3 Marks)

3) Algebraic Equivalence: Easier

1) Simplify $\frac{3x^2}{x}$

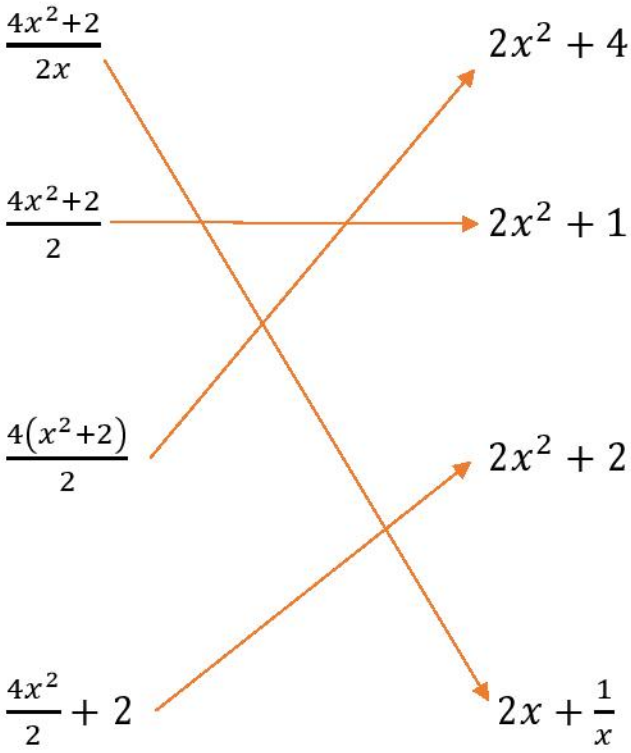
$3x$

_____

(1 Mark)

---

2) Match each of the four expressions on the left hand side with 1 equivalent expression on the right hand side



3) Algebraic Equivalence: Medium

3) Circle the expression that is equivalent to $\frac{3x^2+2}{x}$ where x is not equal to 0

A $3x^3+2$ B $3x+\frac{2}{x}$ C $2x^2+\frac{2}{x}$ D $3x+2$

$$\frac{3x^2+2}{x}$$

$$=\frac{3x^2}{x}+\frac{2}{x}$$

$$=3x+\frac{2}{x}$$

(1 Mark)

---

4) **Two** of these four expressions are equivalent. Circle the two expressions

A $\frac{x}{x+5}$ B $1+\frac{x}{5}$ C $\frac{5+x}{5}$ D $\frac{x^2}{x^2+5}$

(1 mark)

3) Algebraic Equivalence: Harder

5) Fiona tries to simplify this expression

$$\frac{3x}{3+x}$$

She writes

$$\frac{3x}{3}+\frac{3x}{x}$$

$$x+3$$

Explain why Fiona can not rewrite the expression like this

Dividing $3x$ by $3+x$ is not the same as dividing it by 3 and adding it to $\frac{3x}{x}$

Numerical Example

If $x = 1$

$$\frac{3x}{3+x}=\frac{3}{4}$$

$$\frac{3x}{3}+\frac{3x}{x}=\frac{3}{3}+\frac{3}{1}=4$$

As you can see, these two expressions are not equal

(1 mark)

---

6) Show that $\frac{2x+5}{1+\frac{2}{x}}$ is equivalent to $\frac{2x^2+5x}{x+2}$

$$\frac{2x+5}{1+\frac{2}{x}}$$

$$=\frac{x(2x+5)}{x(1+\frac{2}{x})}$$

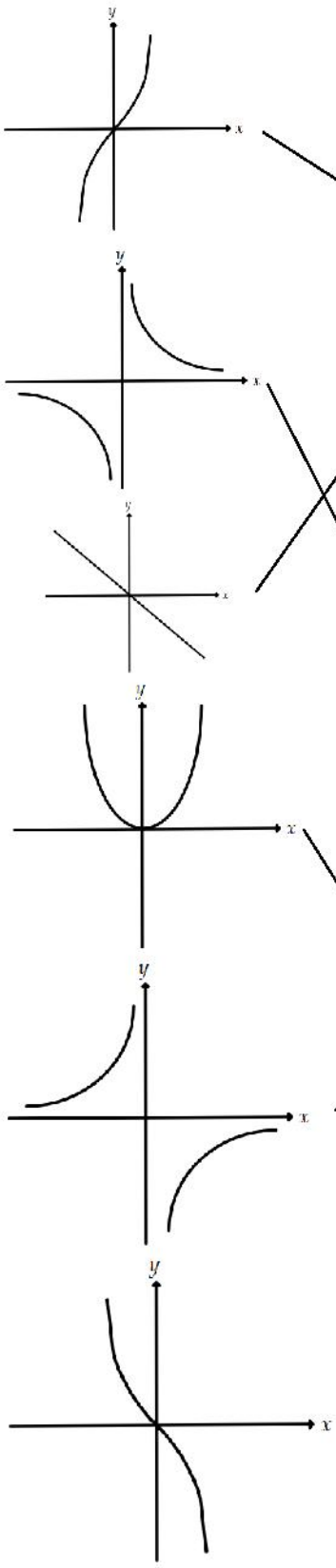
$$=\frac{2x^2+5x}{x+2}$$

(1 mark)

---

4) Recognising graphs: Easier

1) Match each of the graphs with its equation, the first one is done for you



$y = -x$

$y = x^3$

$y = -x^3$

$y = -\frac{1}{x}$

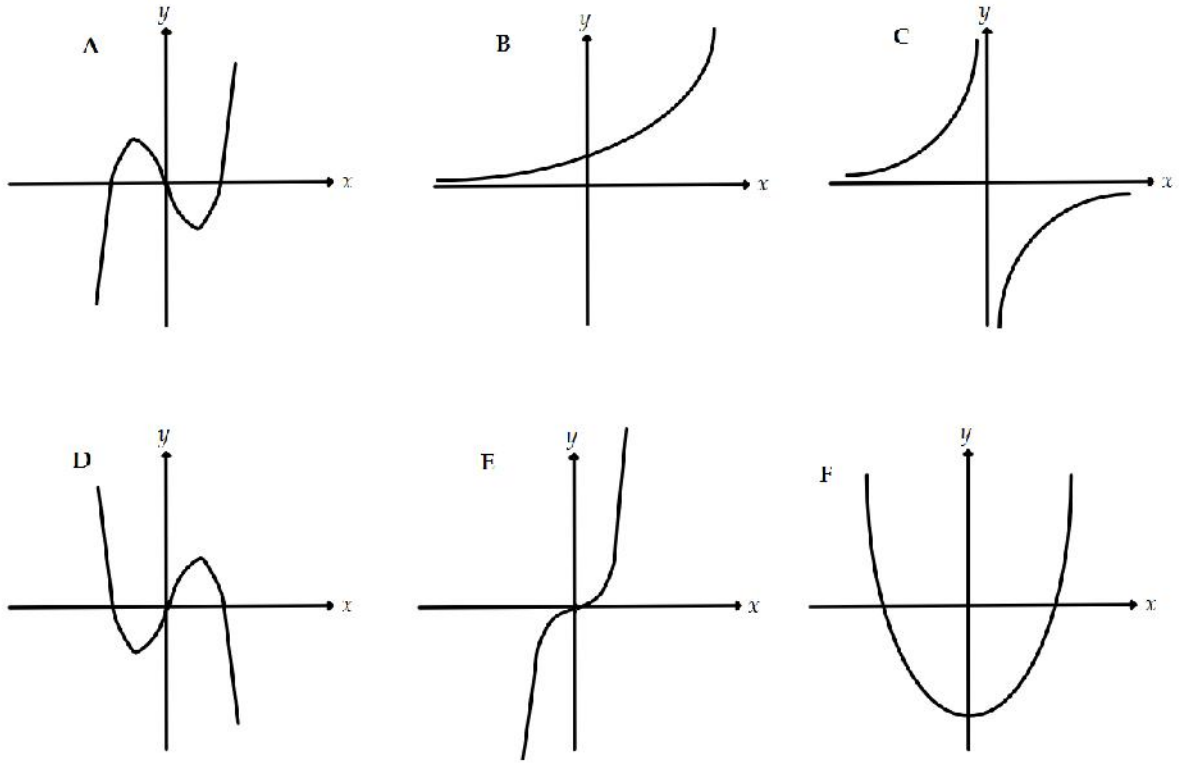
$y = \frac{1}{x}$

$y = x^2$

(3 marks)

4) Recognising graphs: Medium

2) Harry has sketched some graphs



a) Write down the letter of the graph that could have the equation $y = 3^x$

B

(1 Mark)

b) Write down the letter of the graph that could have the equation $y = -\frac{5}{x}$

C

(1 Mark)

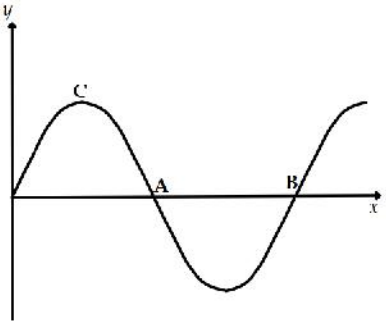
c) Write down the letter of the graph that could have the equation $y = 2x - x^3$

D

(1 Mark)

4) Recognising graphs: Harder

3) A sketch of part of $y = \sin(x)$ is drawn below



a) Write down the coordinates of A

$(180°, 0)$

(1 Mark)

b) Write down the coordinates of B

$(360°, 0)$

(1 Mark)

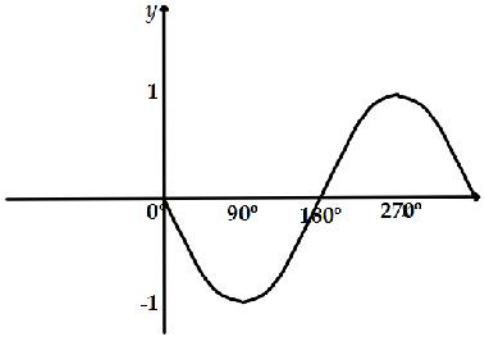
c) Write down the coordinates of C

$(90°, 1)$

(1 Mark)

---

4) Lanre was asked to sketch $y = \cos(x)\ for\ 0° \leq x \leq 360°$. This is what Lanre sketched



Write down one mistake Lanre has made

$y = \cos(x)$ does not go through (0,0) it starts at (0,1) and decreases to (90°,0)

(1 Mark)

5) Drawing Quadratic Graphs: Easier

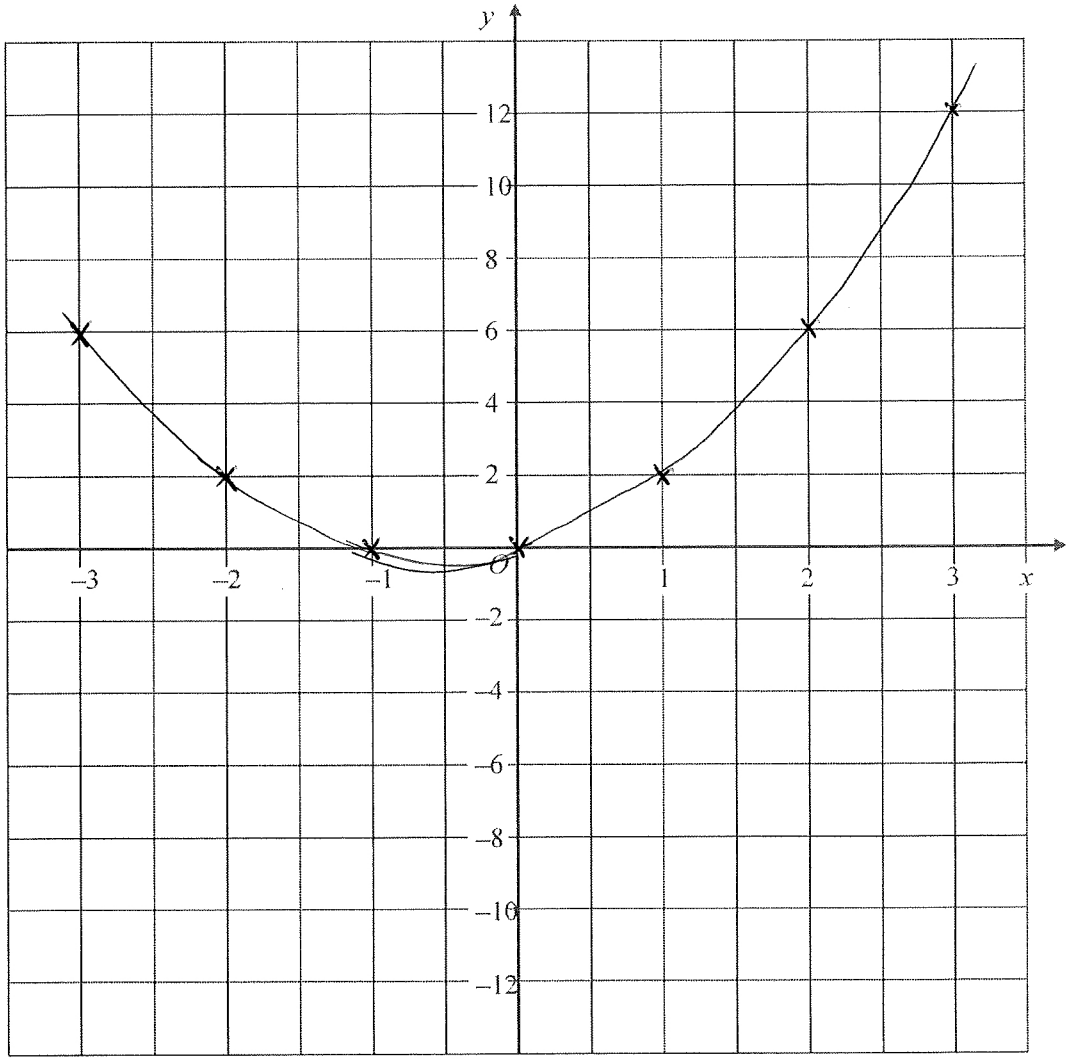
1. (a) Complete the table of values for $y = x^2 + x$.

x	–3	–2	–1	0	1	2	3
y	6	2	0	0	2	6	12

1+1 9+3

(2)

(b) On the grid, draw the graph of $y = x^2 + x$.



(2)

(Total 4 marks)

5) Drawing Quadratic Graphs: Medium

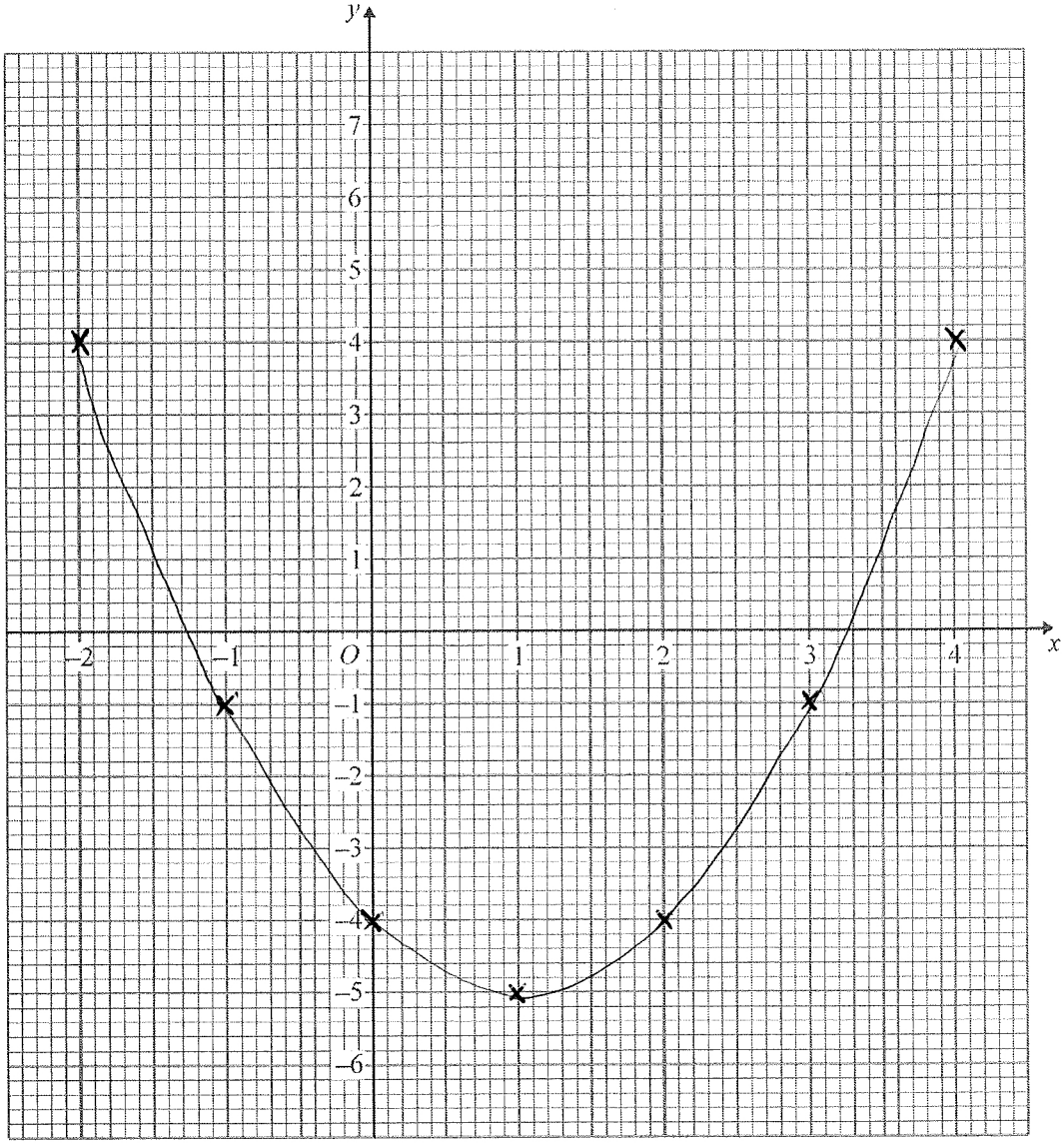
2. (a) Complete the table for $y = x^2 - 2x - 4$

x	–2	–1	0	1	2	3	4
y	4	–1	–4	–5	–4	–1	4

1+2-4 4-4-4 16-8-4

(2)

(b) On the grid, draw the graph of $y = x^2 - 2x - 4$



(2)

(Total 4 marks)

5) Drawing Quadratic Graphs: Harder

(Total 5 marks)

7. (a) Complete the table of values for $y = x^2 - 3x - 1$

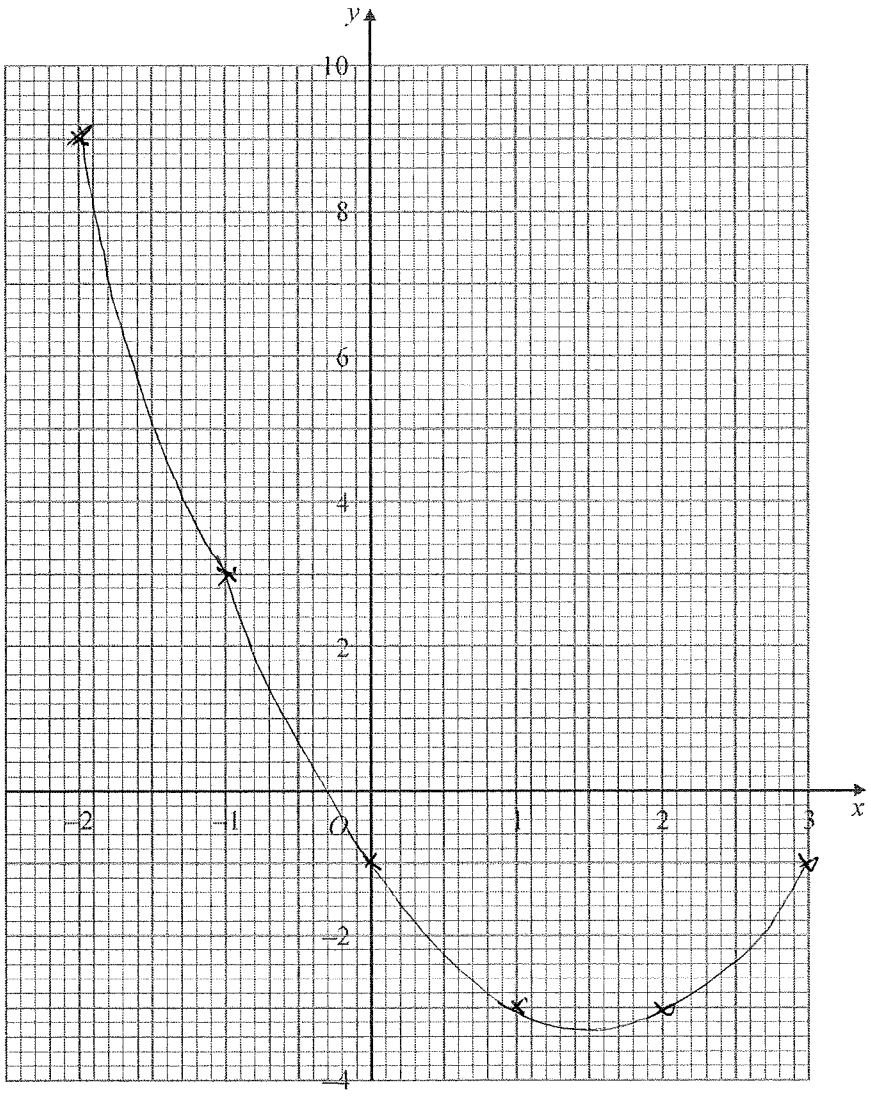
x	−2	−1	0	1	2	3
y	9	3	−1	−3	−3	−1

4+6−1 4−6−1 9−9−1

(2)

(b) On the grid, draw the graph of $y = x^2 - 3x - 1$

(2)



(Total 4 marks)

HAYES Benjamin

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
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A02 and 3	38 from 53	10 from 14	10 from 13	5 from 8	7 from 11	6 from 7
Total	60 from 80	20 from 26	17 from 23	9 from 12	8 from 12	6 from 7

Your Pinpoint Topics

Topic 1: Solving simple equations with fractions. MW: 135

Topic 2: Simple Fibonacci Sequences. Mathswatch Clip: 141

Topic 3: Understanding Number. Mathswatch Clip: NA

Topic 4: Algebraic Equivalence. Mathswatch Clip: NA

Topic 5: Direct and Inverse Proportion. Mathswatch Clip: 199

1) Solving simple equations with fractions: Easier

1) Solve $\frac{x}{2} = 10$

$x = 20$

(multiplying both sides by 2)

_____

(1 Mark)

---

2) Solve $\frac{x}{5} = 6$

(multiplying both sides by 5)

$x = 30$

_____

(1 Mark)

---

3) Solve $\frac{3x}{4} = 6$

Multiplying by 4 $3x = 24$

Dividing by 3 $x = 8$

$x = 8$

_____

(2 Marks)

---

4) Solve $\frac{2}{3}x = 4$

Multiplying by 3 $2x = 12$

Dividing by 2 $x = 6$

$x = 6$

_____

(2 Marks)

---

1) Solving simple equations with fractions: Medium

5) Solve $\frac{x}{2} + 1 = 9$

Subtracting 1 $\frac{x}{2} = 8$

Multiplying by 2 $x = 16$

$x = 16$

(2 Marks)

---

6) Solve $\frac{x}{3} - 11 = 9$

Adding 11 $\frac{x}{3} = 20$

Multiplying by 3 $x = 60$

$x = 60$

(2 Marks)

---

7) Solve $\frac{3x}{2} - 5 = 9$

Adding 5 $\frac{3x}{2} = 14$

Multiplying by 2 $3x = 28$

Dividing by 3

$x = \frac{28}{3}$

$x = \frac{28}{3}$

(3 Marks)

---

1) Solving simple equations with fractions: Harder

8) Aurora is solving this equation

$$\frac{2x}{3} + 3 = 12$$

Here is her working

$\frac{2x}{3} = 9$ line 1

$2x = 3$ line 2

$x = \frac{3}{2}$ line 3

Explain one mistake Aurora has made

From line 1 to line 2 she has multiplied the right hand side of the equation by 3 but divided the left hand side by 3, she should have multiplied both sides by 3 giving $2x = 27$, then her answer would have been $x = \frac{27}{2}$

(1 Mark)

2) Simple Fibonacci Sequences: Easier

1. To find the next term in a Fibonacci sequence, you find the sum of the 2 previous terms.

   1 1 2 3 5 8

   a) Find the next term in this sequence $5 + 8$

   13

   (1 mark)

   b) Find the 9th term of this sequence $8 + 13 = 21,\ 21 + 13 = 34$

   34

   (1 mark)

---

2. Below are the first 5 terms of a Fibonacci sequence.

   4 5 9 14 23

   a) Find the next term in this sequence $14 + 23 = 37$ 37

   (1 mark)

   b) Find the 8th term of this sequence $37 + 23 = 60,\ 60 + 27 = 97$

   97

   (1 mark)

---

3. Below are the first 5 terms of a Fibonacci sequence.

   2 4 6 10 16

   a) Find the next term in this sequence $10 + 16 = 26$

   26

   (1 mark)

   b) Will 68 be in this sequence?

   $26 + 16 = 42,\ 42 + 26 = 68$ Yes

   (1 mark)

---

4. The sequence below is a Fibonacci sequence

   2 3 5 8 13

   a) Find the missing number from the sequence

   $8 - 3 = 5$ 5

   (1 mark)

   b) Find the next term in this sequence $13 + 8 = 21$

   21

   (1 mark)

2) Simple Fibonacci Sequences: Medium

5. Here is a Fibonacci-type sequence

2 _5_ _7_ 12 19

Find the 2 missing terms

$19 - 12 = 7,\ 12 - 7 = 5$

_____5___ and ____7___

(2 marks)

---

6. Here are the fourth and fifth terms of a Fibonacci-type sequence

_3_ _7_ _10_ 17 27

Show that the first term is 3

$27 - 17 = 10,$

$17 - 10 = 7,$

$10 - 7 = 3$

(1 mark)

---

7. The first 3 terms of a Fibonacci sequence are

$1 \qquad x \qquad x + 1$

a) Write an expression for the 4th term

$x + (x + 1) = 2x + 1$

_____$2x + 1$___

(1 mark)

b) If the 5th term is 11, find the value of x

5^{th} term: $(2x + 1) + (x + 1) = 3x + 2 = 11$

$3x = 9$

_____$x = 3$____

(2 marks)

2) Simple Fibonacci Sequences: Harder

8. The first three terms of a Fibonacci sequence are

$$x \quad y \quad x+y$$

a) Show that the 5th term of this sequence is $2x+3y$

4^{th} term: $y+(x+y)=x+2y$

5^{th} term: $(x+y)+(x+2y)=2x+3y$ **(2 marks)**

Given that the 3rd term is 5 and the 5th term is 14

b) Find the value of x and the value of y

$x+y=5$ (A) $\quad 2x+3y=14$ (B)

$2\times$(A): $2x+2y=10$ (C) $\quad x =$ 1

(B)- (C): $y=4$, sub into (A): $x+4=5$, $x=1$ $\quad y =$ 4

(3 marks)

---

9. Here are the first and third terms of a Fibonacci sequence

$$p \quad q-p \quad q \quad 2q-p \quad 3q-p$$

a) Write an expression, in terms of p and q, for the second term

$q-p$

(1 mark)

b) Write an expression, in terms of p and q, for the fifth term

4^{th} term: $(q-p)+q=2q-p$

5^{th} term: $(2q-p)+q=3q-p$ $\quad 3q-p$

(1 mark)

---

10. The first and third terms of a Fibonacci sequence are

$$a \quad b+1-a \quad b+1 \quad 2b+2-a \quad 3b+3-a$$

a) Write an expression, in terms of a and b, for the fifth term

2^{nd} term: $(b+1)-a=b+1-a$

4^{th} term: $(b+1)+(b+1-a)=2b+2-a$

5^{th} term: $(2b+2-a)+(b+1)=3b+3-a$ $\quad 3b+3-a$

(2 marks)

Given that the second term is 9 and the fifth term is 35

b) Find the value of a and the value of b

$b+1-a=9 \quad \Rightarrow b-a=8$ (A)

$3b+3-a=35 \Rightarrow 3b-a=32$ (B)

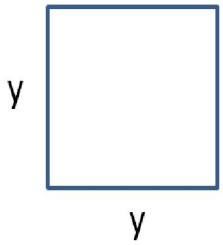
(B) – (A): $2b=24 \Rightarrow b=12$ $\quad a =$ 4

Sub into (A): $12-a=8 \Rightarrow a=4$ $\quad b =$ 12

(3 marks)

3) Understanding Number: Easier

1. Jim is looking at the area and lengths of squares.



Jim considers a square with area $9m^2$.

Jim works out the length of the square as follows:

$$y^2 = 9$$

$$y = \sqrt{9}$$

$$y = 3cm$$

Jim considers another square with a **different** area.

Please tick below:

	This method will **always** give an answer which is a whole number
/	This method will **sometimes** give an answer which is a whole number
	This method will **never** give an answer which is a whole number

Show working to support your answer

Any area which is a square number will give a whole number using this method

e.g. $y^2 = 16$ gives $y = \sqrt{16} = 4$ cm

Any area that is a non-square number won't give a whole number

e.g. $y^2 = 10$ gives $y = \sqrt{10} = 3.162\ldots$ cm

(3 marks)

3) Understanding Number: Medium

2.a) Anne puts a number in her calculator and squares her number. The number gets a lot bigger.

Anne says "if you square a number it will **always** get bigger".

Please tick below:

☐	Anne is correct
/	Anne is **not** correct

Show working to support your answer

If you square a number that is between 0 and 1 it will become smaller

e.g. $0.5^2 = 0.25$

(3 marks)

b) Pete says "if you square a number it will **always** be positive".

Please tick below:

☐	Pete is correct
/	Pete is **not** correct

Show working to support your answer

If you square **zero** the answer is zero, a non-positive number.

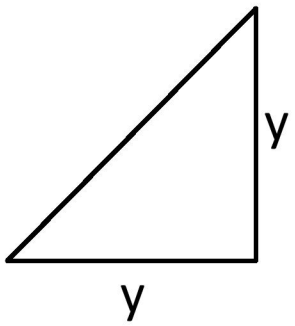
$$0^2 = 0 \times 0 = 0$$

(3 marks)

3) Understanding Number: Harder

3.a) Amir cuts a square in half along the diagonal to produce a right angled triangle.

It has a length, y, which is a whole number.



Amir works out the **area** of the triangle.

Please tick below:

	The area **must** be a whole number.
/	The area will **sometimes** be a whole number.

Show working to support your answer

If y = 3 then the area is $(3 \times 3) \div 2 = 9 \div 2 = 4.5$ a decimal

If y = 4 then the area is $(4 \times 4) \div 2 = 16 \div 2 = 8$ a whole number

(3 marks)

b) Amir is about the work out the **hypotenuse** of the triangle.

Amir says "The hypotenuse of the triangle will **always** be a whole number".

Show that Amir is wrong.

Pythagoras' Theorem: $a^2 + b^2 = c^2$

If $a = 2$ and $b = 3$ then

$$c^2 = 2^2 + 3^2 = 4 + 9 = 13$$

$$c = \sqrt{13} = 3.605 \ldots$$

So the hypotenuse is not a whole number in this case

(3 marks)

4) Algebraic Equivalence: Easier

1) Simplify $\frac{3x^2}{x}$

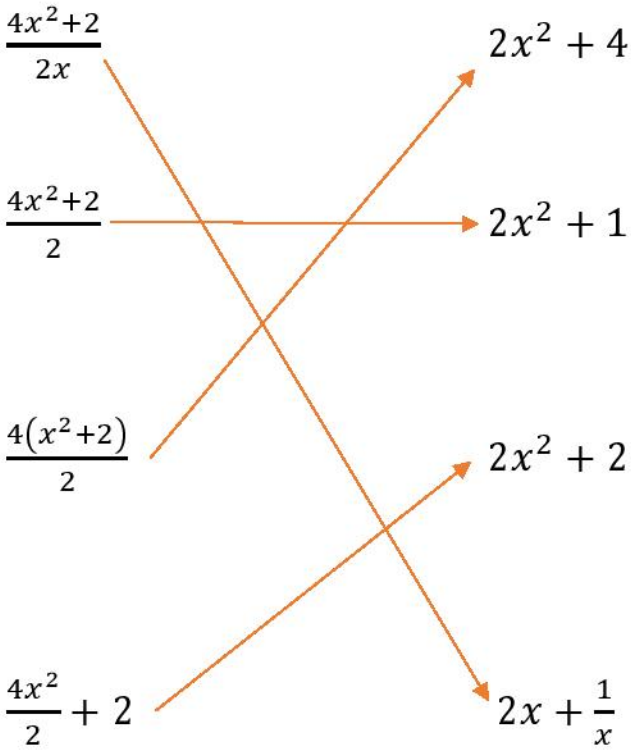
$3x$

_____

(1 Mark)

---

2) Match each of the four expressions on the left hand side with 1 equivalent expression on the right hand side



4) Algebraic Equivalence: Medium

3) Circle the expression that is equivalent to $\frac{3x^2+2}{x}$ where x is not equal to 0

A $3x^3+2$ B $3x+\frac{2}{x}$ C $2x^2+\frac{2}{x}$ D $3x+2$

$$\frac{3x^2+2}{x}$$

$$=\frac{3x^2}{x}+\frac{2}{x}$$

$$=3x+\frac{2}{x}$$

(1 Mark)

---

4) **Two** of these four expressions are equivalent. Circle the two expressions

A $\frac{x}{x+5}$ B $1+\frac{x}{5}$ C $\frac{5+x}{5}$ D $\frac{x^2}{x^2+5}$

(1 mark)

4) Algebraic Equivalence: Harder

5) Fiona tries to simplify this expression

$$\frac{3x}{3+x}$$

She writes

$$\frac{3x}{3}+\frac{3x}{x}$$

$$x+3$$

Explain why Fiona can not rewrite the expression like this

Dividing $3x$ by $3+x$ is not the same as dividing it by 3 and adding it to $\frac{3x}{x}$

Numerical Example

If $x=1$

$$\frac{3x}{3+x}=\frac{3}{4}$$

$$\frac{3x}{3}+\frac{3x}{x}=\frac{3}{3}+\frac{3}{1}=4$$

As you can see, these two expressions are not equal

(1 mark)

---

6) Show that $\frac{2x+5}{1+\frac{2}{x}}$ is equivalent to $\frac{2x^2+5x}{x+2}$

$$\frac{2x+5}{1+\frac{2}{x}}$$

$$=\frac{x(2x+5)}{x(1+\frac{2}{x})}$$

$$=\frac{2x^2+5x}{x+2}$$

(1 mark)

---

5) Direct and Inverse Proportion: Easier

1. The weight of a piece of wire is directly proportional to its length.

A piece of wire is 25 cm long and has a weight of 6 grams.
Another piece of the same wire is 30 cm long.

Calculate the weight of the 30 cm piece of wire.

$w = kl$
$6 = 25k$
$k = 0.24$

$w = 0.24l$
$w = 0.24 \times 30$
$w = 7.2$

7.2 ..... grams

(Total 2 marks)

2. A ball falls vertically after being dropped.
The ball falls a distance d metres in a time of t seconds.
d is directly proportional to the square of t. $d = kt^2$

The ball falls 20 metres in a time of 2 seconds.

(a) Find a formula for d in terms of t.

$20 = k \times 2^2$
$20 = 4k$
$k = 5$

$d =$ $5t^2$

(3)

(b) Calculate the distance the ball falls in 3 seconds.

$d = 5 \times 3^2$
$d = 5 \times 9 = 45$

45 ..... m

(1)

(c) Calculate the time the ball takes to fall 605 m.

$d = 5t^2$
$605 = 5t^2$
$t^2 = 121$
$t = \pm 11$

(ignore -11 as time can't be $-ve$)

11 ..... seconds

(3)

(Total 7 marks)

5) Direct and Inverse Proportion: Medium

16. P is inversely proportional to V.

$P = \frac{k}{V}$

When $V = 8$, $P = 5$

(a) Find a formula for P in terms of V.

$5 = \frac{k}{8}$

$k = 5 \times 8$

$k = 40$

$P = \frac{40}{V}$

(3)

(b) Calculate the value of P when $V = 2$

$P = \frac{40}{2}$

$P = 20$

20

(1)

(Total 4 marks)

17. The force, F, between two magnets is inversely proportional to the square of the distance, x, between them.

$F = \frac{k}{x^2}$

When $x = 3$, $F = 4$.

(a) Calculate F when $x = 2$.

$4 = \frac{k}{9}$

$k = 36$

$F = \frac{36}{x^2}$

$F = \frac{36}{2^2}$

$F = \frac{36}{4} = 9$

$F = 9$

(4)

(b) Calculate x when $F = 64$.

$F = \frac{36}{x^2}$

$64 = \frac{36}{x^2}$

$64x^2 = 36$

$x^2 = \frac{36}{64}$

$x = \pm\frac{6}{8}$

$x = \frac{3}{4}$

(2)

(Total 6 marks)

5) Direct and Inverse Proportion: Harder

1) A is inversely proportional to the square root of B. Jim says if B is very large A will be negative. Is he right?

Solution: $A \propto \frac{1}{\sqrt{B}}$

$$A = \frac{k}{\sqrt{B}}$$

Jim is wrong. If B is very large $\sqrt{B}$ will be positive, therefore A will also be positive.

(As B becomes very large, A becomes very small)

(4 Marks)

---

2) If Sally drives to work 25% faster than she did yesterday. What would be her percentage decrease in the time taken to get to work?

Solution: $Time = \frac{Distance}{Speed}$

$$Time = \frac{D}{1.25}$$

$$Time = \frac{1}{1.25}$$

$$Time = \frac{4}{5}$$

$$\frac{4}{5} = 80\%$$

She will get there 20% faster.

(4Marks)

HOWELL Zulekha

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	15 from 27	8 from 12	4 from 10	3 from 4	0 from 1	0 from 0
A02 and 3	23 from 53	6 from 14	5 from 13	4 from 8	4 from 11	4 from 7
Total	38 from 80	14 from 26	9 from 23	7 from 12	4 from 12	4 from 7

Your Pinpoint Topics

Topic 1: Understanding Number. Mathswatch Clip: NA

Topic 2: Simple Vectors. Mathswatch Clip: 174

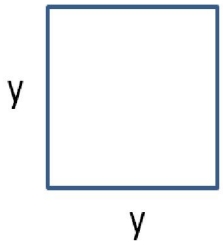
Topic 3: Algebraic Equivalence. Mathswatch Clip: NA

Topic 4: Recognising graphs. Mathswatch Clip:

Topic 5: Drawing Quadratic Graphs. Mathswatch Clip: 98

1) Understanding Number: Easier

1. Jim is looking at the area and lengths of squares.



Jim considers a square with area $9m^2$.

Jim works out the length of the square as follows:

$$y^2 = 9$$

$$y = \sqrt{9}$$

$$y = 3cm$$

Jim considers another square with a **different** area.

Please tick below:

☐	This method will **always** give an answer which is a whole number
/	This method will **sometimes** give an answer which is a whole number
☐	This method will **never** give an answer which is a whole number

Show working to support your answer

Any area which is a square number will give a whole number using this method

e.g. $y^2 = 16$ gives $y = \sqrt{16} = 4$ cm

Any area that is a non-square number won't give a whole number

e.g. $y^2 = 10$ gives $y = \sqrt{10} = 3.162\ldots$ cm

(3 marks)

1) Understanding Number: Medium

2.a) Anne puts a number in her calculator and squares her number. The number gets a lot bigger.

Anne says "if you square a number it will **always** get bigger".

Please tick below:

	Anne is correct
/	Anne is **not** correct

Show working to support your answer

If you square a number that is between 0 and 1 it will become smaller

e.g. $0.5^2 = 0.25$

(3 marks)

b) Pete says "if you square a number it will **always** be positive".

Please tick below:

	Pete is correct
/	Pete is **not** correct

Show working to support your answer

If you square **zero** the answer is zero, a non-positive number.

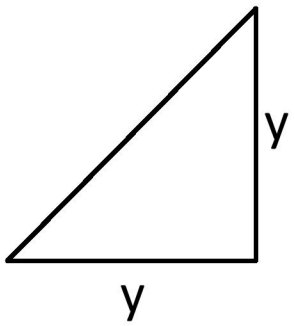
$$0^2 = 0 \times 0 = 0$$

(3 marks)

1) Understanding Number: Harder

3.a) Amir cuts a square in half along the diagonal to produce a right angled triangle.

It has a length, y, which is a whole number.



Amir works out the **area** of the triangle.

Please tick below:

	The area **must** be a whole number.
/	The area will **sometimes** be a whole number.

Show working to support your answer

If y = 3 then the area is $(3 \times 3) \div 2 = 9 \div 2 = 4.5$ a decimal

If y = 4 then the area is $(4 \times 4) \div 2 = 16 \div 2 = 8$ a whole number

(3 marks)

b) Amir is about the work out the **hypotenuse** of the triangle.

Amir says "The hypotenuse of the triangle will **always** be a whole number".

Show that Amir is wrong.

Pythagoras' Theorem: $a^2 + b^2 = c^2$

If $a = 2$ and $b = 3$ then

$$c^2 = 2^2 + 3^2 = 4 + 9 = 13$$

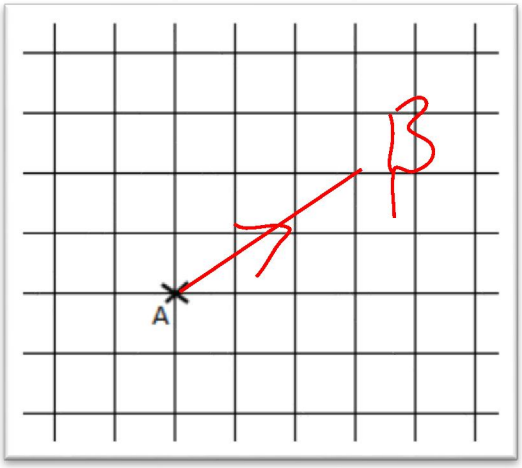
$$c = \sqrt{13} = 3.605 \ldots$$

So the hypotenuse is not a whole number in this case

(3 marks)

2) Simple Vectors: Easier

3)

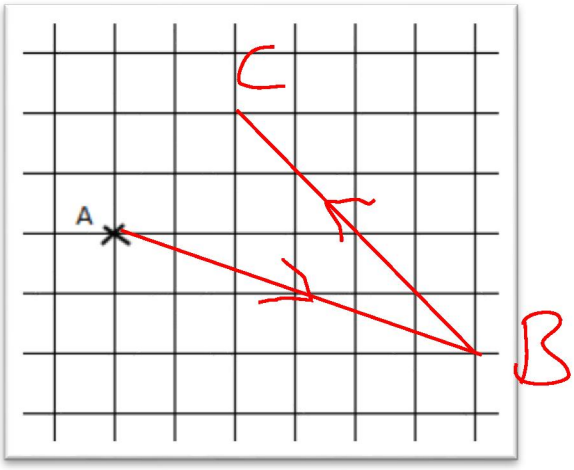


On the grid, draw the Vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ from Point A.

Label the new point B.

(1 Mark)

4)



a) On the grid, draw the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ from Point A

Label the new point B.

(1 Mark)

bi) On the grid draw the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ from Point B

Label the new point C

ii) State the vector $\overrightarrow{AC}$ $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$ (2 Marks)

2) Simple Vectors: Medium

5) Vector $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 11 \end{pmatrix}$

(2 Marks)

6) Vector $\overrightarrow{AB} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$

(2 Marks)

7) Vector $\overrightarrow{AB} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 10 \end{pmatrix}$

State Vector $\overrightarrow{CA}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

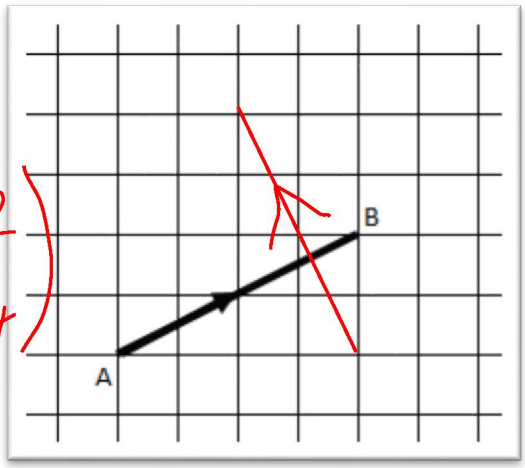
$\begin{pmatrix} -4 \\ -2 \end{pmatrix} + \begin{pmatrix} -2 \\ 10 \end{pmatrix} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}$

$\overrightarrow{CA} = -\overrightarrow{AC} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

(2 Marks)

2) Simple Vectors: Harder

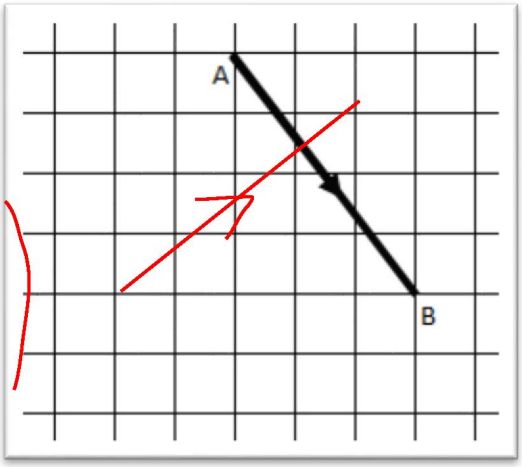
8)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

9)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

3) Algebraic Equivalence: Easier

1) Simplify $\frac{3x^2}{x}$

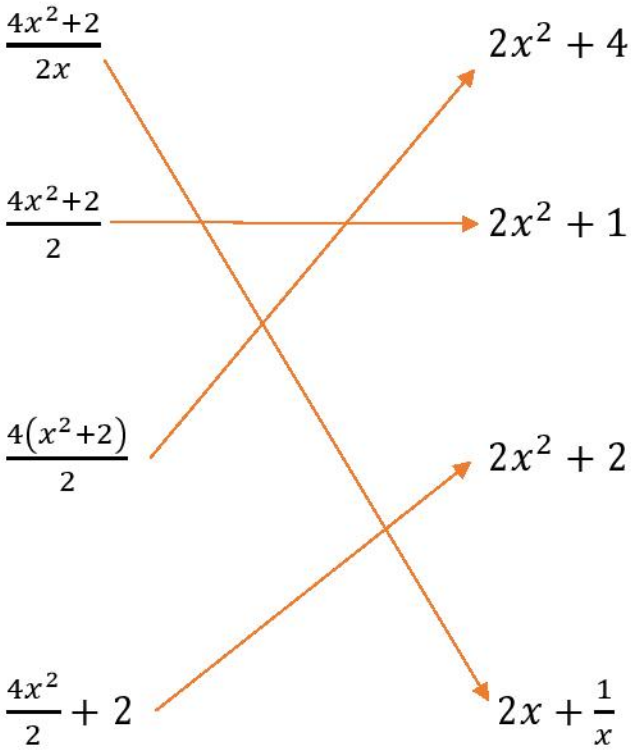
$3x$

_____

(1 Mark)

---

2) Match each of the four expressions on the left hand side with 1 equivalent expression on the right hand side



3) Algebraic Equivalence: Medium

3) Circle the expression that is equivalent to $\frac{3x^2+2}{x}$ where x is not equal to 0

A $3x^3+2$ B $3x+\frac{2}{x}$ C $2x^2+\frac{2}{x}$ D $3x+2$

$$\frac{3x^2+2}{x}$$

$$=\frac{3x^2}{x}+\frac{2}{x}$$

$$=3x+\frac{2}{x}$$

(1 Mark)

---

4) **Two** of these four expressions are equivalent. Circle the two expressions

A $\frac{x}{x+5}$ B $1+\frac{x}{5}$ C $\frac{5+x}{5}$ D $\frac{x^2}{x^2+5}$

(1 mark)

3) Algebraic Equivalence: Harder

5) Fiona tries to simplify this expression

$$\frac{3x}{3+x}$$

She writes

$$\frac{3x}{3}+\frac{3x}{x}$$

$$x+3$$

Explain why Fiona can not rewrite the expression like this

Dividing $3x$ by $3+x$ is not the same as dividing it by 3 and adding it to $\frac{3x}{x}$

Numerical Example

If $x=1$

$$\frac{3x}{3+x}=\frac{3}{4}$$

$$\frac{3x}{3}+\frac{3x}{x}=\frac{3}{3}+\frac{3}{1}=4$$

As you can see, these two expressions are not equal

(1 mark)

---

6) Show that $\frac{2x+5}{1+\frac{2}{x}}$ is equivalent to $\frac{2x^2+5x}{x+2}$

$$\frac{2x+5}{1+\frac{2}{x}}$$

$$=\frac{x(2x+5)}{x(1+\frac{2}{x})}$$

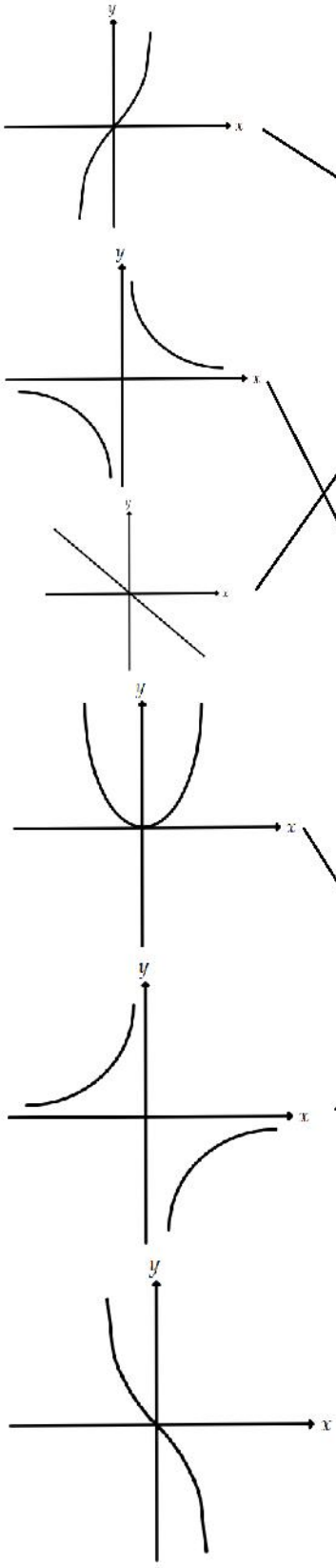
$$=\frac{2x^2+5x}{x+2}$$

(1 mark)

---

4) Recognising graphs: Easier

1) Match each of the graphs with its equation, the first one is done for you



$y = -x$

$y = x^3$

$y = -x^3$

$y = -\frac{1}{x}$

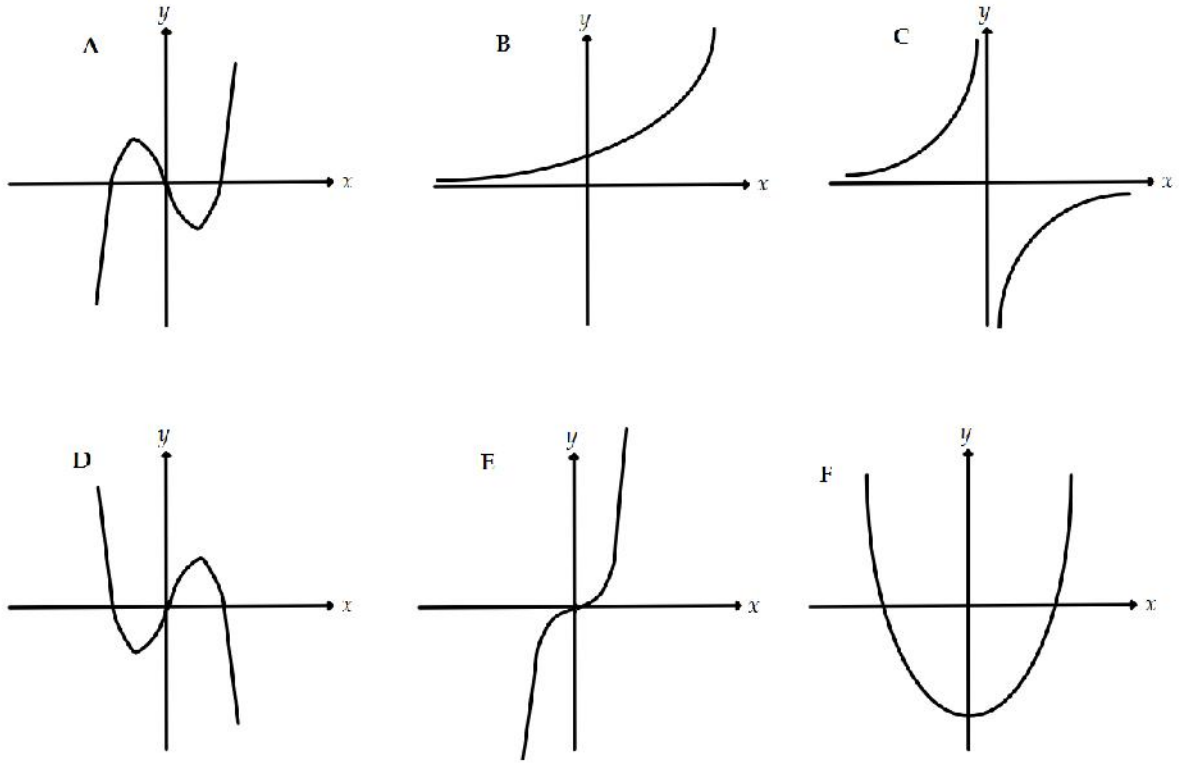
$y = \frac{1}{x}$

$y = x^2$

(3 marks)

4) Recognising graphs: Medium

2) Harry has sketched some graphs



a) Write down the letter of the graph that could have the equation $y = 3^x$

B

_____

(1 Mark)

b) Write down the letter of the graph that could have the equation $y = -\frac{5}{x}$

C

_____

(1 Mark)

c) Write down the letter of the graph that could have the equation $y = 2x - x^3$

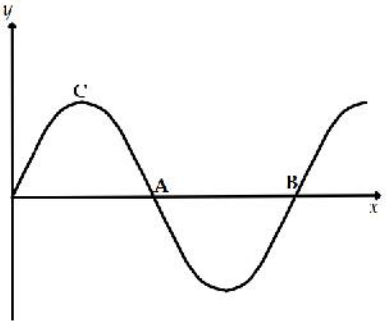
D

_____

(1 Mark)

4) Recognising graphs: Harder

3) A sketch of part of $y = \sin(x)$ is drawn below



a) Write down the coordinates of A

$(180°, 0)$

(1 Mark)

b) Write down the coordinates of B

$(360°, 0)$

(1 Mark)

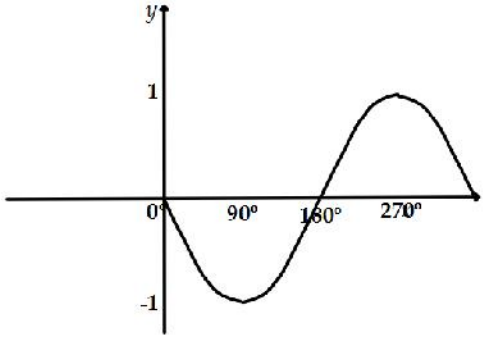
c) Write down the coordinates of C

$(90°, 1)$

(1 Mark)

---

4) Lanre was asked to sketch $y = \cos(x)\ for\ 0° \leq x \leq 360°$. This is what Lanre sketched



Write down one mistake Lanre has made

$y = \cos(x)$ does not go through (0,0) it starts at (0,1) and decreases to (90°,0)

(1 Mark)

5) Drawing Quadratic Graphs: Easier

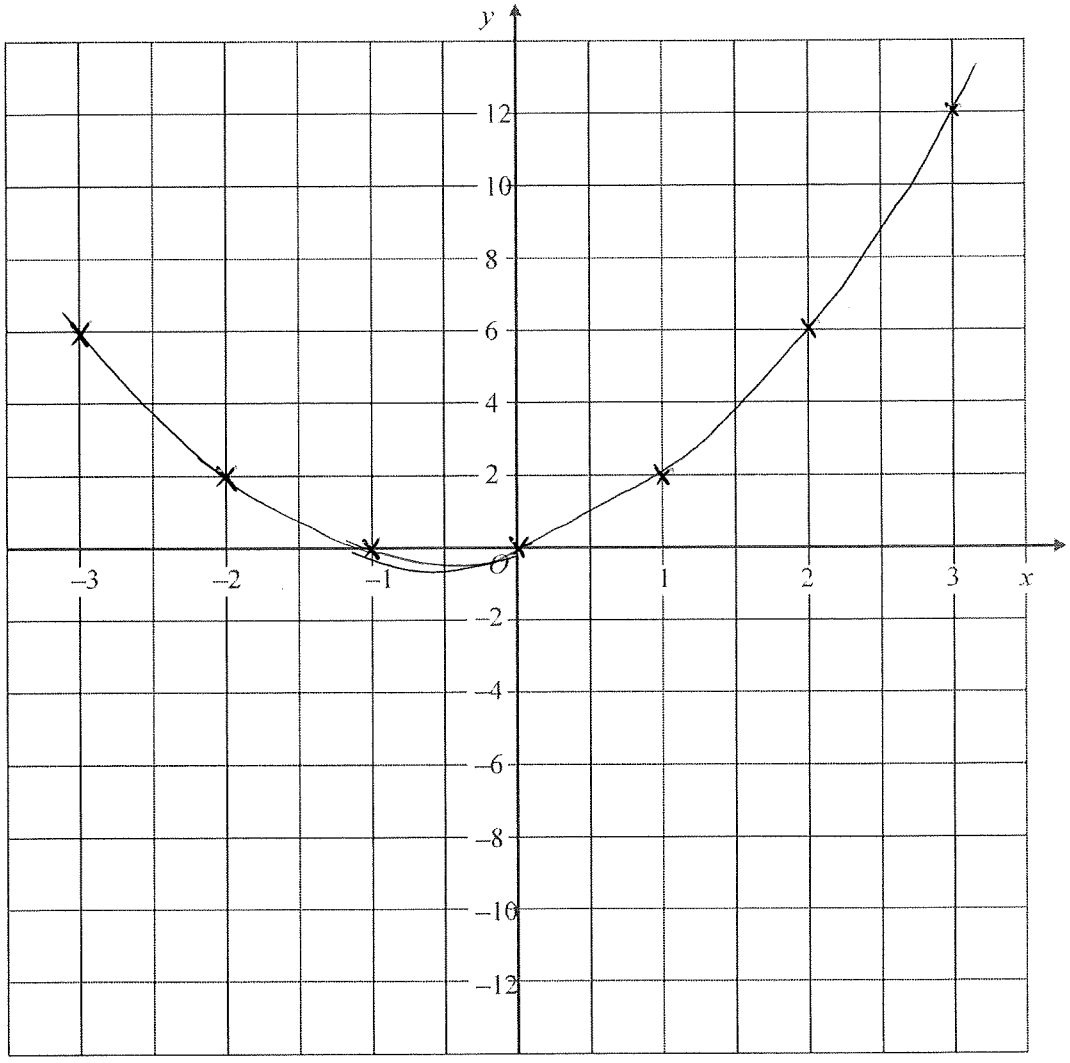
1. (a) Complete the table of values for $y = x^2 + x$.

x	–3	–2	–1	0	1	2	3
y	6	2	0	0	2	6	12

1+1 9+3

(2)

(b) On the grid, draw the graph of $y = x^2 + x$.



(2)

(Total 4 marks)

5) Drawing Quadratic Graphs: Medium

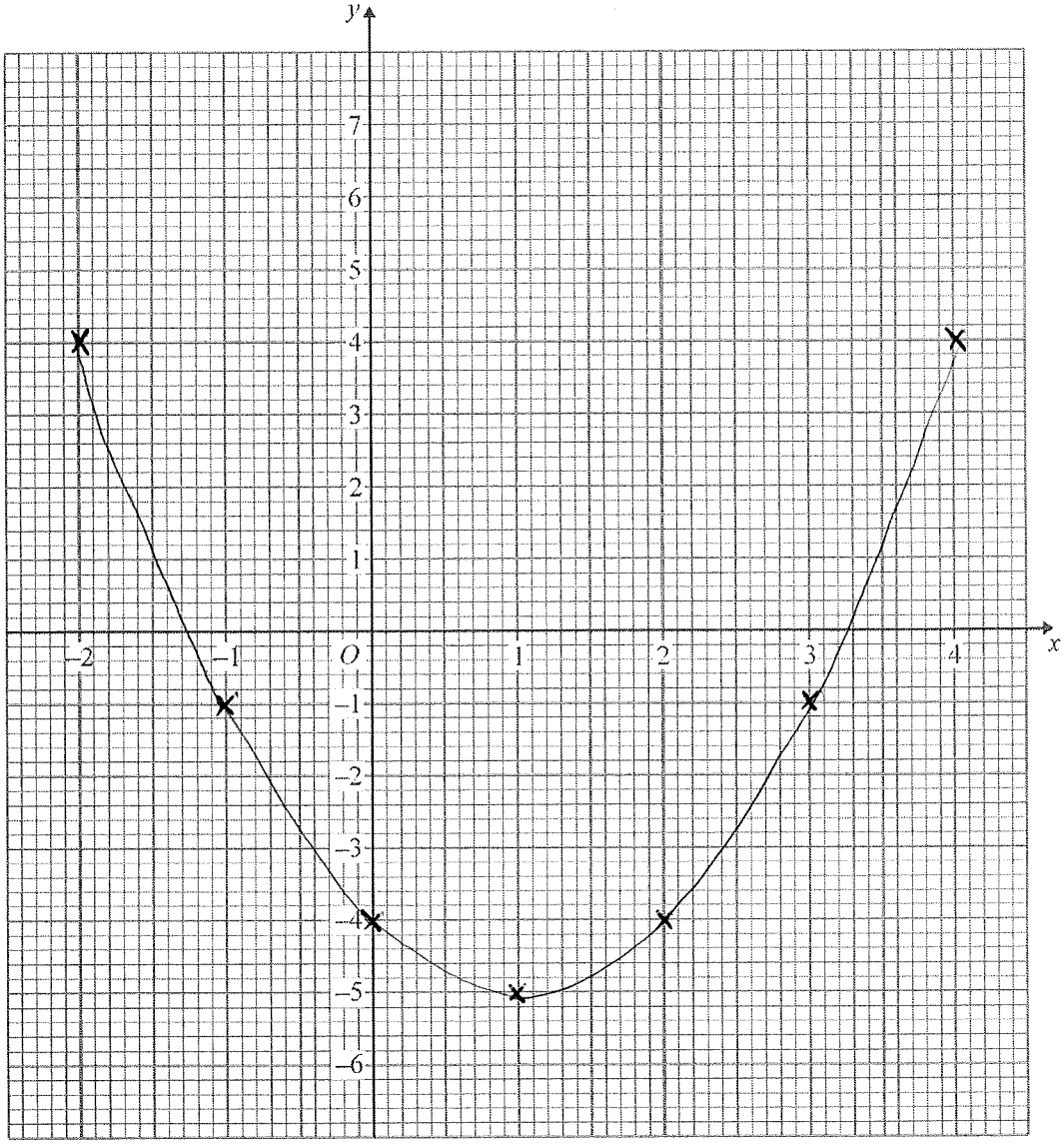
2. (a) Complete the table for $y = x^2 - 2x - 4$

x	−2	−1	0	1	2	3	4
y	4	−1	−4	−5	−4	−1	4

1+2-4 4-4-4 16-8-4

(2)

(b) On the grid, draw the graph of $y = x^2 - 2x - 4$



(2)

(Total 4 marks)

5) Drawing Quadratic Graphs: Harder

(Total 5 marks)

7. (a) Complete the table of values for $y = x^2 - 3x - 1$

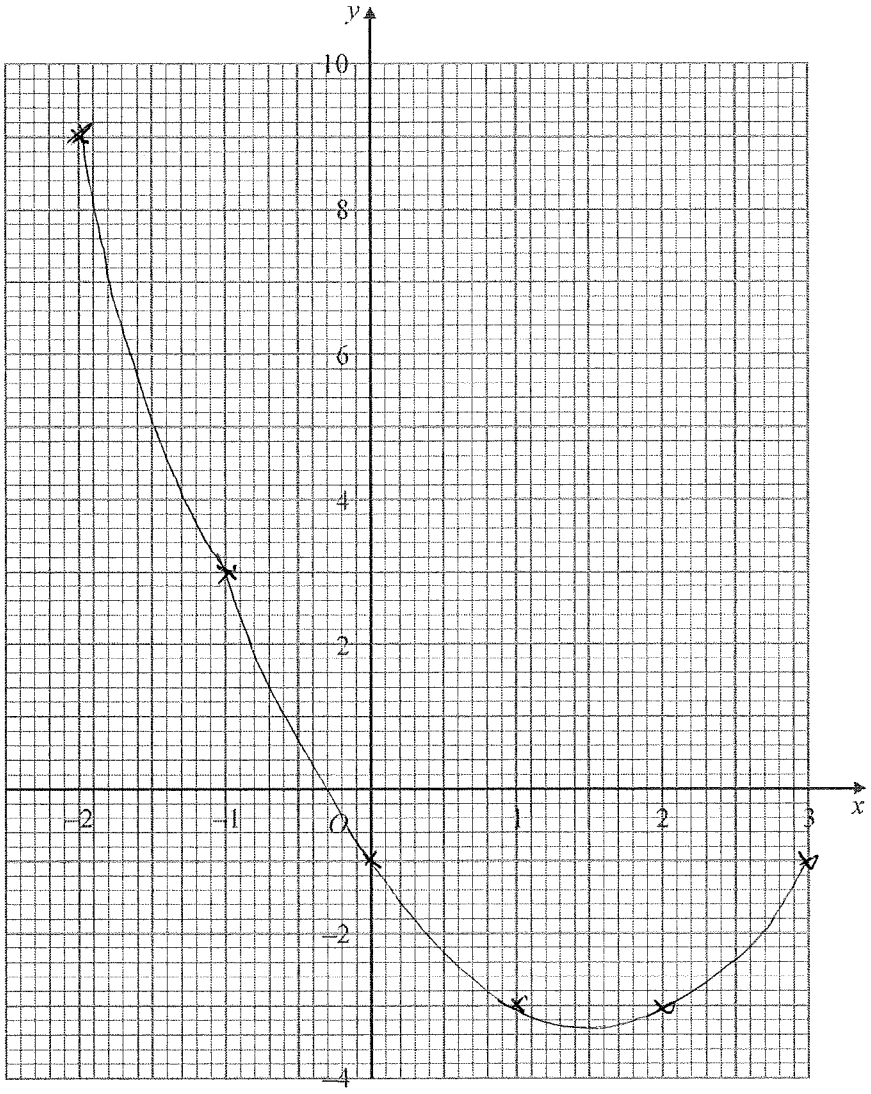
x	−2	−1	0	1	2	3
y	9	3	−1	−3	−3	−1

4+6−1 4−6−1 9−9−1

(2)

(b) On the grid, draw the graph of $y = x^2 - 3x - 1$

(2)



(Total 4 marks)

HUGHES Mia

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
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A02 and 3	44 from 53	14 from 14	10 from 13	5 from 8	11 from 11	4 from 7
Total	65 from 80	23 from 26	18 from 23	9 from 12	11 from 12	4 from 7

Your Pinpoint Topics

Topic 1: Simple Fibonacci Sequences. Mathswatch Clip: 141

Topic 2: Algebraic Equivalence. Mathswatch Clip: NA

Topic 3: Recognising graphs. Mathswatch Clip:

Topic 4: Direct and Inverse Proportion. Mathswatch Clip: 199

Topic 5: Surds. Mathswatch Clip: 207

1) Simple Fibonacci Sequences: Easier

1. To find the next term in a Fibonacci sequence, you find the sum of the 2 previous terms.

1 1 2 3 5 8

a) Find the next term in this sequence $5 + 8$

13

(1 mark)

b) Find the 9th term of this sequence $8 + 13 = 21,\ 21 + 13 = 34$

34

(1 mark)

---

2. Below are the first 5 terms of a Fibonacci sequence.

4 5 9 14 23

a) Find the next term in this sequence $14 + 23 = 37$ 37

(1 mark)

b) Find the 8th term of this sequence $37 + 23 = 60,\ 60 + 27 = 97$

97

(1 mark)

---

3. Below are the first 5 terms of a Fibonacci sequence.

2 4 6 10 16

a) Find the next term in this sequence $10 + 16 = 26$

26

(1 mark)

b) Will 68 be in this sequence?

$26 + 16 = 42,\ 42 + 26 = 68$ Yes

(1 mark)

---

4. The sequence below is a Fibonacci sequence

2 3 5 8 13

a) Find the missing number from the sequence

$8 - 3 = 5$ 5

(1 mark)

b) Find the next term in this sequence $13 + 8 = 21$

21

(1 mark)

1) Simple Fibonacci Sequences: Medium

5. Here is a Fibonacci-type sequence

2 _5_ _7_ 12 19

Find the 2 missing terms

$19 - 12 = 7,\ 12 - 7 = 5$

_____5___ and ____7___

(2 marks)

---

6. Here are the fourth and fifth terms of a Fibonacci-type sequence

_3_ _7_ _10_ 17 27

Show that the first term is 3

$27 - 17 = 10,$

$17 - 10 = 7,$

$10 - 7 = 3$

(1 mark)

---

7. The first 3 terms of a Fibonacci sequence are

$1 \qquad x \qquad x + 1$

a) Write an expression for the 4th term

$x + (x + 1) = 2x + 1$

_____$2x + 1$___

(1 mark)

b) If the 5th term is 11, find the value of x

5^{th} term: $(2x + 1) + (x + 1) = 3x + 2 = 11$

$3x = 9$

_____$x = 3$____

(2 marks)

1) Simple Fibonacci Sequences: Harder

8. The first three terms of a Fibonacci sequence are

$$x \quad y \quad x+y$$

a) Show that the 5th term of this sequence is $2x+3y$

4^{th} term: $y+(x+y)=x+2y$

5^{th} term: $(x+y)+(x+2y)=2x+3y$ **(2 marks)**

Given that the 3rd term is 5 and the 5th term is 14

b) Find the value of x and the value of y

$x+y=5$ (A) $\quad 2x+3y=14$ (B)

$2\times$(A): $2x+2y=10$ (C) $\quad x =$ 1

(B)- (C): $y=4$, sub into (A): $x+4=5$, $x=1$ $\quad y =$ 4

(3 marks)

---

9. Here are the first and third terms of a Fibonacci sequence

$$p \quad q-p \quad q \quad 2q-p \quad 3q-p$$

a) Write an expression, in terms of p and q, for the second term

$q-p$

(1 mark)

b) Write an expression, in terms of p and q, for the fifth term

4^{th} term: $(q-p)+q=2q-p$

5^{th} term: $(2q-p)+q=3q-p$ $\quad 3q-p$

(1 mark)

---

10. The first and third terms of a Fibonacci sequence are

$$a \quad b+1-a \quad b+1 \quad 2b+2-a \quad 3b+3-a$$

a) Write an expression, in terms of a and b, for the fifth term

2^{nd} term: $(b+1)-a=b+1-a$

4^{th} term: $(b+1)+(b+1-a)=2b+2-a$

5^{th} term: $(2b+2-a)+(b+1)=3b+3-a$ $\quad 3b+3-a$

(2 marks)

Given that the second term is 9 and the fifth term is 35

b) Find the value of a and the value of b

$b+1-a=9 \quad \Rightarrow b-a=8$ (A)

$3b+3-a=35 \Rightarrow 3b-a=32$ (B)

(B) – (A): $2b=24 \Rightarrow b=12$ $\quad a =$ 4

Sub into (A): $12-a=8 \Rightarrow a=4$ $\quad b =$ 12

(3 marks)

2) Algebraic Equivalence: Easier

1) Simplify $\frac{3x^2}{x}$

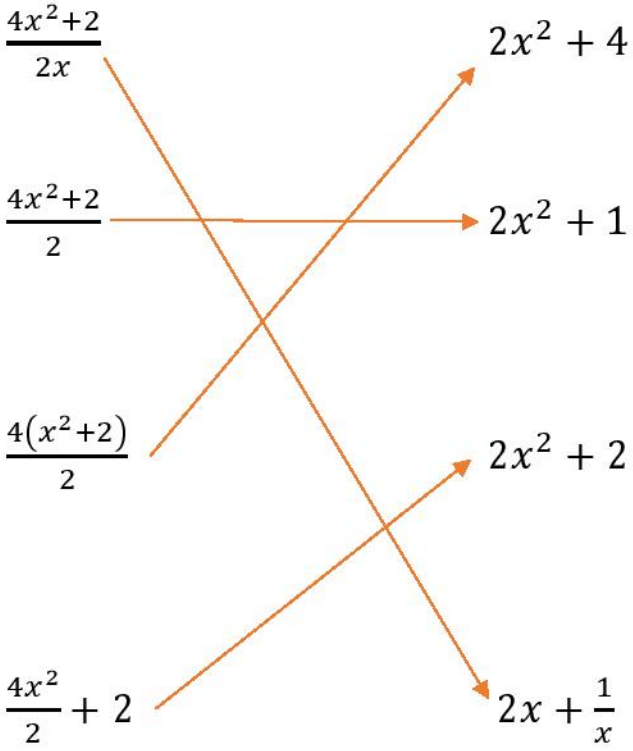
$3x$

_____

(1 Mark)

---

2) Match each of the four expressions on the left hand side with 1 equivalent expression on the right hand side



2) Algebraic Equivalence: Medium

3) Circle the expression that is equivalent to $\frac{3x^2+2}{x}$ where x is not equal to 0

A $3x^3+2$ B $3x+\frac{2}{x}$ C $2x^2+\frac{2}{x}$ D $3x+2$

$$\frac{3x^2+2}{x}$$

$$=\frac{3x^2}{x}+\frac{2}{x}$$

$$=3x+\frac{2}{x}$$

(1 Mark)

---

4) **Two** of these four expressions are equivalent. Circle the two expressions

A $\frac{x}{x+5}$ B $1+\frac{x}{5}$ C $\frac{5+x}{5}$ D $\frac{x^2}{x^2+5}$

(1 mark)

2) Algebraic Equivalence: Harder

5) Fiona tries to simplify this expression

$$\frac{3x}{3+x}$$

She writes

$$\frac{3x}{3}+\frac{3x}{x}$$

$$x+3$$

Explain why Fiona can not rewrite the expression like this

Dividing $3x$ by $3+x$ is not the same as dividing it by 3 and adding it to $\frac{3x}{x}$

Numerical Example

If $x=1$

$$\frac{3x}{3+x}=\frac{3}{4}$$

$$\frac{3x}{3}+\frac{3x}{x}=\frac{3}{3}+\frac{3}{1}=4$$

As you can see, these two expressions are not equal

(1 mark)

---

6) Show that $\frac{2x+5}{1+\frac{2}{x}}$ is equivalent to $\frac{2x^2+5x}{x+2}$

$$\frac{2x+5}{1+\frac{2}{x}}$$

$$=\frac{x(2x+5)}{x(1+\frac{2}{x})}$$

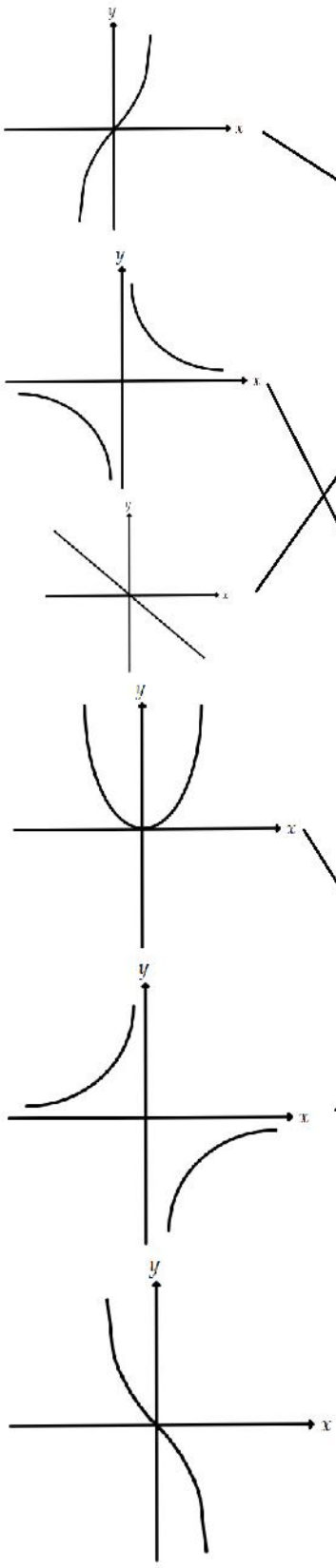
$$=\frac{2x^2+5x}{x+2}$$

(1 mark)

---

3) Recognising graphs: Easier

1) Match each of the graphs with its equation, the first one is done for you



$y = -x$

$y = x^3$

$y = -x^3$

$y = -\frac{1}{x}$

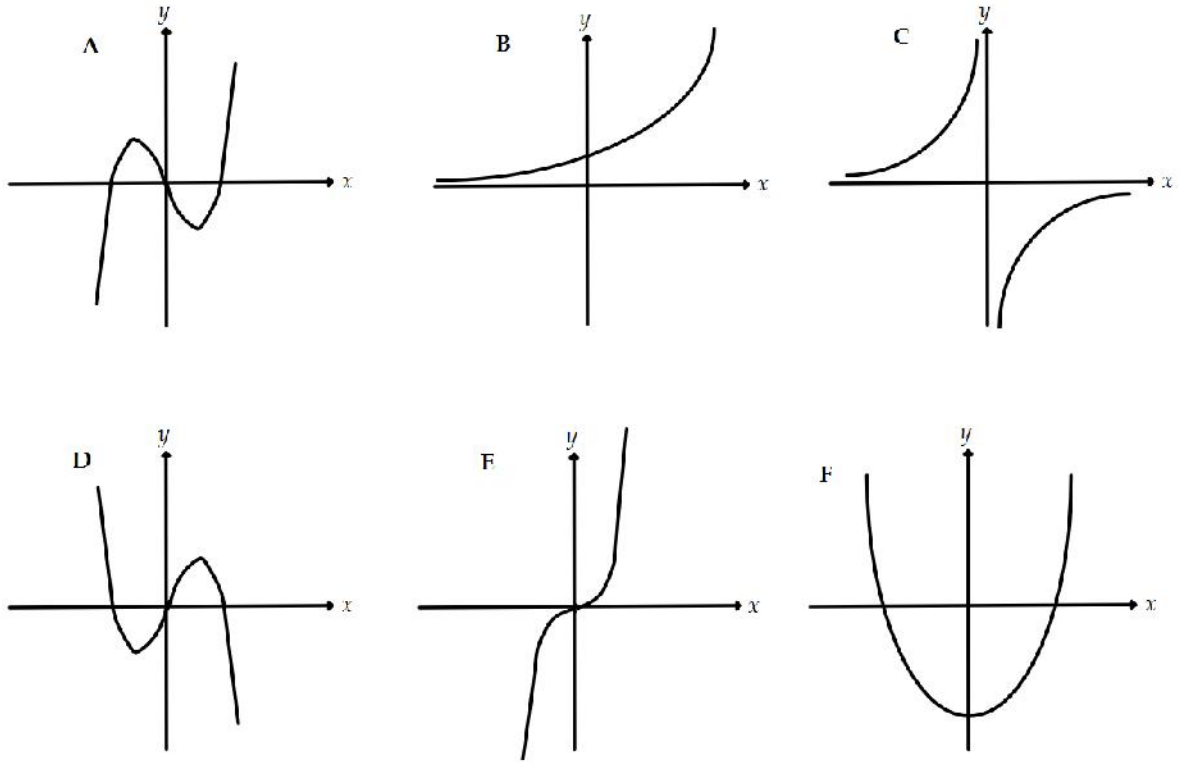
$y = \frac{1}{x}$

$y = x^2$

(3 marks)

3) Recognising graphs: Medium

2) Harry has sketched some graphs



a) Write down the letter of the graph that could have the equation $y = 3^x$

B

_____

(1 Mark)

b) Write down the letter of the graph that could have the equation $y = -\frac{5}{x}$

C

_____

(1 Mark)

c) Write down the letter of the graph that could have the equation $y = 2x - x^3$

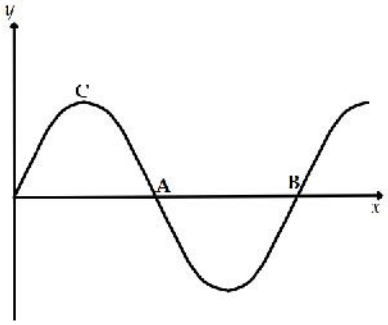
D

_____

(1 Mark)

3) Recognising graphs: Harder

3) A sketch of part of $y = \sin(x)$ is drawn below



a) Write down the coordinates of A

$(180°, 0)$

(1 Mark)

b) Write down the coordinates of B

$(360°, 0)$

(1 Mark)

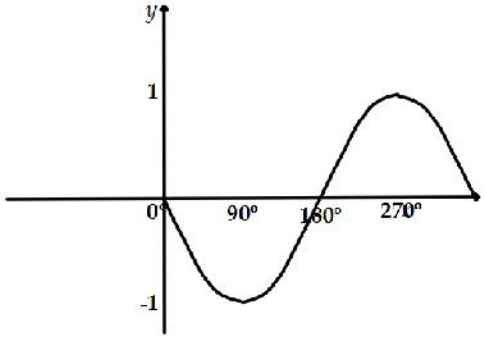
c) Write down the coordinates of C

$(90°, 1)$

(1 Mark)

---

4) Lanre was asked to sketch $y = \cos(x)\ for\ 0° \leq x \leq 360°$. This is what Lanre sketched



Write down one mistake Lanre has made

$y = \cos(x)$ does not go through (0,0) it starts at (0,1) and decreases to (90°,0)

(1 Mark)

4) Direct and Inverse Proportion: Easier

1. The weight of a piece of wire is directly proportional to its length.

A piece of wire is 25 cm long and has a weight of 6 grams.
Another piece of the same wire is 30 cm long.

Calculate the weight of the 30 cm piece of wire.

$W = kl$
$6 = 25k$
$k = 0.24$

$w = 0.24l$
$w = 0.24 \times 30$
$w = 7.2$

7.2 ..... grams

(Total 2 marks)

2. A ball falls vertically after being dropped.
The ball falls a distance d metres in a time of t seconds.
d is directly proportional to the square of t. $d = kt^2$

The ball falls 20 metres in a time of 2 seconds.

(a) Find a formula for d in terms of t.

$20 = k \times 2^2$
$20 = 4k$
$k = 5$

$d =$ $5t^2$ .....

(3)

(b) Calculate the distance the ball falls in 3 seconds.

$d = 5 \times 3^2$
$d = 5 \times 9 = 45$

45 ..... m

(1)

(c) Calculate the time the ball takes to fall 605 m.

$d = 5t^2$
$605 = 5t^2$
$t^2 = 121$
$t = \pm 11$
(ignore -11 as time can't be -ve)

11 ..... seconds

(3)

(Total 7 marks)

4) Direct and Inverse Proportion: Medium

16. P is inversely proportional to V.

$P = \frac{k}{V}$

When $V = 8$, $P = 5$

(a) Find a formula for P in terms of V.

$5 = \frac{k}{8}$

$k = 5 \times 8$

$k = 40$

$P = \frac{40}{V}$

(3)

(b) Calculate the value of P when $V = 2$

$P = \frac{40}{2}$

$P = 20$

20

(1)

(Total 4 marks)

17. The force, F, between two magnets is inversely proportional to the square of the distance, x, between them.

$F = \frac{k}{x^2}$

When $x = 3$, $F = 4$.

(a) Calculate F when $x = 2$.

$4 = \frac{k}{9}$

$k = 36$

$F = \frac{36}{x^2}$

$F = \frac{36}{2^2}$

$F = \frac{36}{4} = 9$

$F = 9$

(4)

(b) Calculate x when $F = 64$.

$F = \frac{36}{x^2}$

$64 = \frac{36}{x^2}$

$64x^2 = 36$

$x^2 = \frac{36}{64}$

$x = \pm\frac{6}{8}$

$x = \frac{3}{4}$

(2)

(Total 6 marks)

4) Direct and Inverse Proportion: Harder

1) A is inversely proportional to the square root of B. Jim says if B is very large A will be negative. Is he right?

Solution: $A \propto \frac{1}{\sqrt{B}}$

$$A = \frac{k}{\sqrt{B}}$$

Jim is wrong. If B is very large $\sqrt{B}$ will be positive, therefore A will also be positive.

(As B becomes very large, A becomes very small)

(4 Marks)

---

2) If Sally drives to work 25% faster than she did yesterday. What would be her percentage decrease in the time taken to get to work?

Solution: $Time = \frac{Distance}{Speed}$

$$Time = \frac{D}{1.25}$$

$$Time = \frac{1}{1.25}$$

$$Time = \frac{4}{5}$$

$$\frac{4}{5} = 80\%$$

She will get there 20% faster.

(4Marks)

---

5) Surds: Easier

1. a) Simplify $\sqrt{75}$

$\sqrt{75} = \sqrt{25 \times 3}$

$= 5\sqrt{3}$

..... **(1)**

b) Express $\sqrt{75} - \sqrt{48}$ in the form $a\sqrt{3}$ where a is an integer.

$5\sqrt{3} - \sqrt{16 \times 3}$

$= 5\sqrt{3} - 4\sqrt{3}$

$\sqrt{3}$

a = 1

..... **(2)**

2. Express $\frac{15}{\sqrt{5}}$ in the form $a\sqrt{b}$ where a and b are positive integers.

$\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{15\sqrt{5}}{5}$

$= 3\sqrt{5}$

..... **(2)**

3. Expand and simplify $(2 + \sqrt{3})(4 + \sqrt{3})$ giving your answer in the $a + b\sqrt{3}$ where a and b are integers.

$(2 + \sqrt{3})(4 + \sqrt{3})$

$= 8 + 2\sqrt{3} + 4\sqrt{3} + 3$

$= 11 + 6\sqrt{3}$

..... **(3)**

5) Surds: Medium

6. Work out

$$\frac{(3+\sqrt{5})(3-\sqrt{5})}{\sqrt{8}}$$

Give your answer in the form $a\sqrt{2}$ where a is an integer.

$$\frac{(3+\sqrt{5})(3-\sqrt{5})}{\sqrt{8}}$$

$$\frac{9-3\sqrt{5}+3\sqrt{5}-5}{2\sqrt{2}}$$

$$\frac{4}{2\sqrt{2}}$$

$$\frac{2}{\sqrt{2}}$$

$$\frac{2\sqrt{2}}{2}$$

$$\sqrt{2}$$

…… **(3)**

7. Find the area of a square given that its perimeter is $\sqrt{80}cm$.

Length of one side = $\frac{\sqrt{80}}{4}$

$= \frac{4\sqrt{5}}{4}$

$= \sqrt{5}$

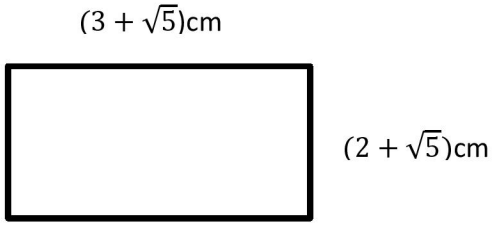
Area = $\sqrt{5}$ x $\sqrt{5}$

= 5cm^2

…… **(3)**

5) Surds: Harder

8. Find the area of the rectangle below, give your answer in simplest form.



$(3+\sqrt{5})(2+\sqrt{5})$

$= 6 + 3\sqrt{5} + 2\sqrt{5} + 5$

$= (5\sqrt{5} + 11)\text{cm}^2$

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	19 from 27	9 from 12	5 from 10	4 from 4	1 from 1	0 from 0
A02 and 3	25 from 53	7 from 14	4 from 13	3 from 8	4 from 11	7 from 7
Total	44 from 80	16 from 26	9 from 23	7 from 12	5 from 12	7 from 7

Your Pinpoint Topics

Topic 1: Simple Fibonacci Sequences. Mathswatch Clip: 141

Topic 2: Understanding Number. Mathswatch Clip: NA

Topic 3: Simple Vectors. Mathswatch Clip: 174

Topic 4: Algebraic Equivalence. Mathswatch Clip: NA

Topic 5: Recognising graphs. Mathswatch Clip:

1) Simple Fibonacci Sequences: Easier

1. To find the next term in a Fibonacci sequence, you find the sum of the 2 previous terms.

1 1 2 3 5 8

a) Find the next term in this sequence $5 + 8$

13

(1 mark)

b) Find the 9th term of this sequence $8 + 13 = 21,\ 21 + 13 = 34$

34

(1 mark)

---

2. Below are the first 5 terms of a Fibonacci sequence.

4 5 9 14 23

a) Find the next term in this sequence $14 + 23 = 37$ 37

(1 mark)

b) Find the 8th term of this sequence $37 + 23 = 60,\ 60 + 27 = 97$

97

(1 mark)

---

3. Below are the first 5 terms of a Fibonacci sequence.

2 4 6 10 16

a) Find the next term in this sequence $10 + 16 = 26$

26

(1 mark)

b) Will 68 be in this sequence?

$26 + 16 = 42,\ 42 + 26 = 68$ Yes

(1 mark)

---

4. The sequence below is a Fibonacci sequence

2 3 _5_ 8 13

a) Find the missing number from the sequence

$8 - 3 = 5$ 5

(1 mark)

b) Find the next term in this sequence $13 + 8 = 21$

21

(1 mark)

1) Simple Fibonacci Sequences: Medium

5. Here is a Fibonacci-type sequence

2 _5_ _7_ 12 19

Find the 2 missing terms

$19 - 12 = 7,\ 12 - 7 = 5$

_____5___ and ____7___

(2 marks)

---

6. Here are the fourth and fifth terms of a Fibonacci-type sequence

_3_ _7_ _10_ 17 27

Show that the first term is 3

$27 - 17 = 10,$

$17 - 10 = 7,$

$10 - 7 = 3$

(1 mark)

---

7. The first 3 terms of a Fibonacci sequence are

$1 \qquad x \qquad x + 1$

a) Write an expression for the 4th term

$x + (x + 1) = 2x + 1$

_____$2x + 1$___

(1 mark)

b) If the 5th term is 11, find the value of x

5^{th} term: $(2x + 1) + (x + 1) = 3x + 2 = 11$

$3x = 9$

_____$x = 3$____

(2 marks)

1) Simple Fibonacci Sequences: Harder

8. The first three terms of a Fibonacci sequence are

$$x \quad y \quad x+y$$

a) Show that the 5th term of this sequence is $2x+3y$

4^{th} term: $y+(x+y)=x+2y$

5^{th} term: $(x+y)+(x+2y)=2x+3y$ **(2 marks)**

Given that the 3rd term is 5 and the 5th term is 14

b) Find the value of x and the value of y

$x+y=5$ (A) $\quad 2x+3y=14$ (B)

$2\times$(A): $2x+2y=10$ (C) $\quad x =$ 1

(B)- (C): $y=4$, sub into (A): $x+4=5$, $x=1$ $\quad y =$ 4

(3 marks)

---

9. Here are the first and third terms of a Fibonacci sequence

$$p \quad q-p \quad q \quad 2q-p \quad 3q-p$$

a) Write an expression, in terms of p and q, for the second term

$q-p$

(1 mark)

b) Write an expression, in terms of p and q, for the fifth term

4^{th} term: $(q-p)+q=2q-p$

5^{th} term: $(2q-p)+q=3q-p$ $\quad 3q-p$

(1 mark)

---

10. The first and third terms of a Fibonacci sequence are

$$a \quad b+1-a \quad b+1 \quad 2b+2-a \quad 3b+3-a$$

a) Write an expression, in terms of a and b, for the fifth term

2^{nd} term: $(b+1)-a=b+1-a$

4^{th} term: $(b+1)+(b+1-a)=2b+2-a$

5^{th} term: $(2b+2-a)+(b+1)=3b+3-a$ $\quad 3b+3-a$

(2 marks)

Given that the second term is 9 and the fifth term is 35

b) Find the value of a and the value of b

$b+1-a=9 \Rightarrow b-a=8$ (A)

$3b+3-a=35 \Rightarrow 3b-a=32$ (B)

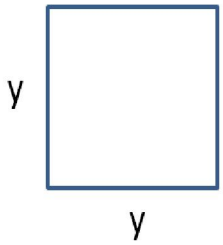
(B) – (A): $2b=24 \Rightarrow b=12$ $\quad a =$ 4

Sub into (A): $12-a=8 \Rightarrow a=4$ $\quad b =$ 12

(3 marks)

2) Understanding Number: Easier

1. Jim is looking at the area and lengths of squares.



Jim considers a square with area $9m^2$.

Jim works out the length of the square as follows:

$$y^2 = 9$$

$$y = \sqrt{9}$$

$$y = 3cm$$

Jim considers another square with a **different** area.

Please tick below:

☐	This method will **always** give an answer which is a whole number
/	This method will **sometimes** give an answer which is a whole number
☐	This method will **never** give an answer which is a whole number

Show working to support your answer

Any area which is a square number will give a whole number using this method

e.g. $y^2 = 16$ gives $y = \sqrt{16} = 4$ cm

Any area that is a non-square number won't give a whole number

e.g. $y^2 = 10$ gives $y = \sqrt{10} = 3.162\ldots$ cm

(3 marks)

2) Understanding Number: Medium

2.a) Anne puts a number in her calculator and squares her number. The number gets a lot bigger.

Anne says "if you square a number it will **always** get bigger".

Please tick below:

☐	Anne is correct
/	Anne is **not** correct

Show working to support your answer

If you square a number that is between 0 and 1 it will become smaller

e.g. $0.5^2 = 0.25$

(3 marks)

b) Pete says "if you square a number it will **always** be positive".

Please tick below:

☐	Pete is correct
/	Pete is **not** correct

Show working to support your answer

If you square **zero** the answer is zero, a non-positive number.

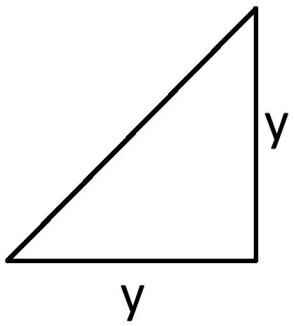
$$0^2 = 0 \times 0 = 0$$

(3 marks)

2) Understanding Number: Harder

3.a) Amir cuts a square in half along the diagonal to produce a right angled triangle.

It has a length, y, which is a whole number.



Amir works out the **area** of the triangle.

Please tick below:

	The area **must** be a whole number.
/	The area will **sometimes** be a whole number.

Show working to support your answer

If y = 3 then the area is $(3 \times 3) \div 2 = 9 \div 2 = 4.5$ a decimal

If y = 4 then the area is $(4 \times 4) \div 2 = 16 \div 2 = 8$ a whole number

(3 marks)

b) Amir is about the work out the **hypotenuse** of the triangle.

Amir says "The hypotenuse of the triangle will **always** be a whole number".

Show that Amir is wrong.

Pythagoras' Theorem: $a^2 + b^2 = c^2$

If $a = 2$ and $b = 3$ then

$$c^2 = 2^2 + 3^2 = 4 + 9 = 13$$

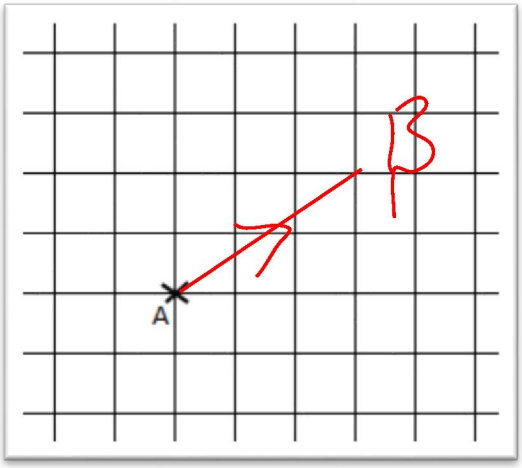
$$c = \sqrt{13} = 3.605 \ldots$$

So the hypotenuse is not a whole number in this case

(3 marks)

3) Simple Vectors: Easier

3)

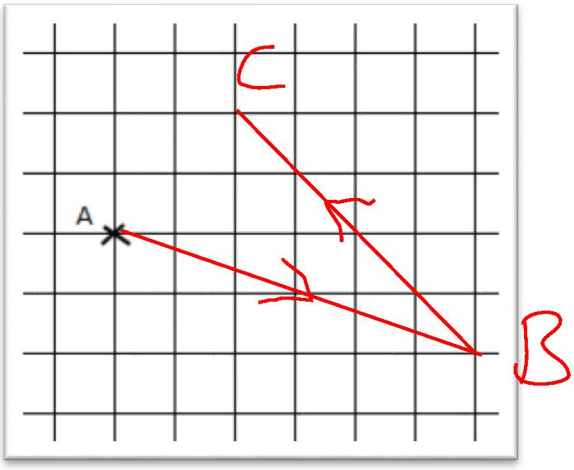


On the grid, draw the Vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ from Point A.

Label the new point B.

(1 Mark)

4)



a) On the grid, draw the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ from Point A

Label the new point B.

(1 Mark)

bi) On the grid draw the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ from Point B

Label the new point C

ii) State the vector $\overrightarrow{AC}$ $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$ (2 Marks)

3) Simple Vectors: Medium

5) Vector $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 11 \end{pmatrix}$

(2 Marks)

6) Vector $\overrightarrow{AB} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$

(2 Marks)

7) Vector $\overrightarrow{AB} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 10 \end{pmatrix}$

State Vector $\overrightarrow{CA}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

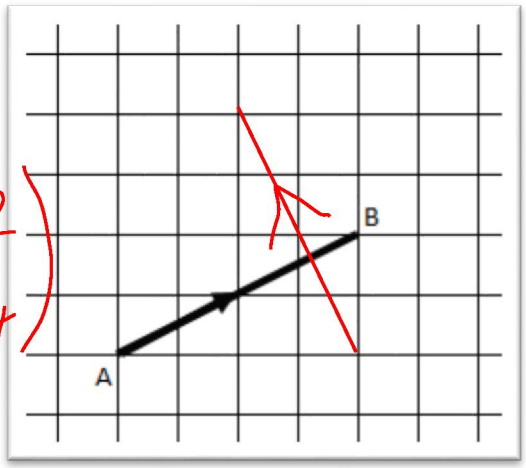
$\begin{pmatrix} -4 \\ -2 \end{pmatrix} + \begin{pmatrix} -2 \\ 10 \end{pmatrix} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}$

$\overrightarrow{CA} = -\overrightarrow{AC} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

(2 Marks)

3) Simple Vectors: Harder

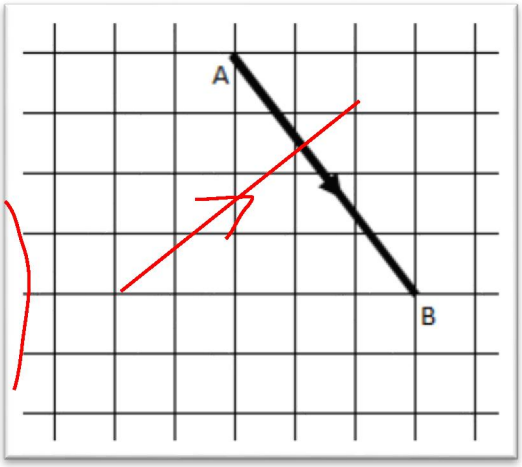
8)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

9)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

4) Algebraic Equivalence: Easier

1) Simplify $\frac{3x^2}{x}$

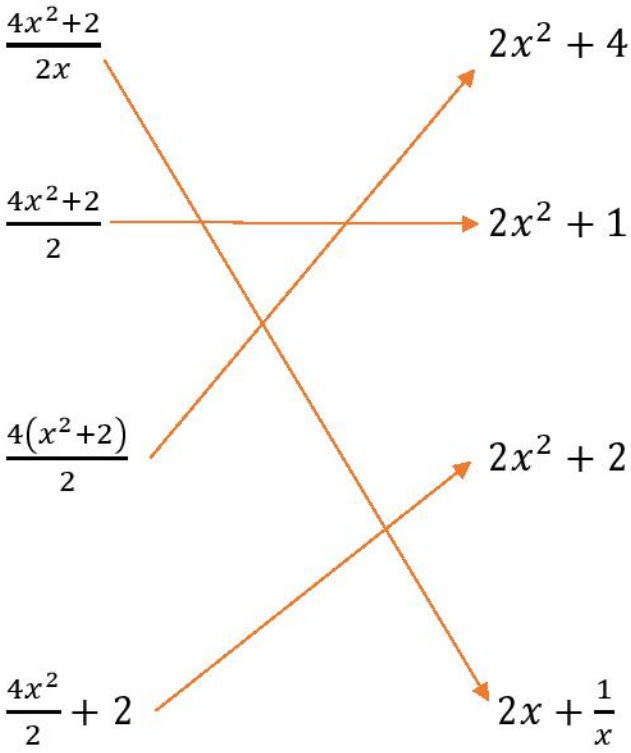
$3x$

_____

(1 Mark)

---

2) Match each of the four expressions on the left hand side with 1 equivalent expression on the right hand side



4) Algebraic Equivalence: Medium

3) Circle the expression that is equivalent to $\frac{3x^2+2}{x}$ where x is not equal to 0

A $3x^3+2$ B $3x+\frac{2}{x}$ C $2x^2+\frac{2}{x}$ D $3x+2$

$$\frac{3x^2+2}{x}$$

$$=\frac{3x^2}{x}+\frac{2}{x}$$

$$=3x+\frac{2}{x}$$

(1 Mark)

---

4) **Two** of these four expressions are equivalent. Circle the two expressions

A $\frac{x}{x+5}$ B $1+\frac{x}{5}$ C $\frac{5+x}{5}$ D $\frac{x^2}{x^2+5}$

(1 mark)

4) Algebraic Equivalence: Harder

5) Fiona tries to simplify this expression

$$\frac{3x}{3+x}$$

She writes

$$\frac{3x}{3}+\frac{3x}{x}$$

$$x+3$$

Explain why Fiona can not rewrite the expression like this

Dividing $3x$ by $3+x$ is not the same as dividing it by 3 and adding it to $\frac{3x}{x}$

Numerical Example

If $x=1$

$$\frac{3x}{3+x}=\frac{3}{4}$$

$$\frac{3x}{3}+\frac{3x}{x}=\frac{3}{3}+\frac{3}{1}=4$$

As you can see, these two expressions are not equal

(1 mark)

---

6) Show that $\frac{2x+5}{1+\frac{2}{x}}$ is equivalent to $\frac{2x^2+5x}{x+2}$

$$\frac{2x+5}{1+\frac{2}{x}}$$

$$=\frac{x(2x+5)}{x(1+\frac{2}{x})}$$

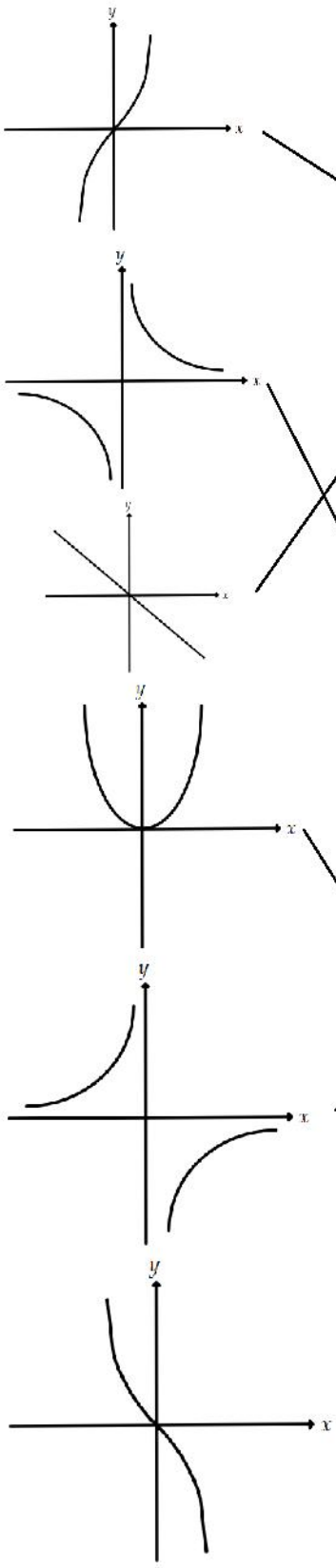
$$=\frac{2x^2+5x}{x+2}$$

(1 mark)

---

5) Recognising graphs: Easier

1) Match each of the graphs with its equation, the first one is done for you



$y = -x$

$y = x^3$

$y = -x^3$

$y = -\frac{1}{x}$

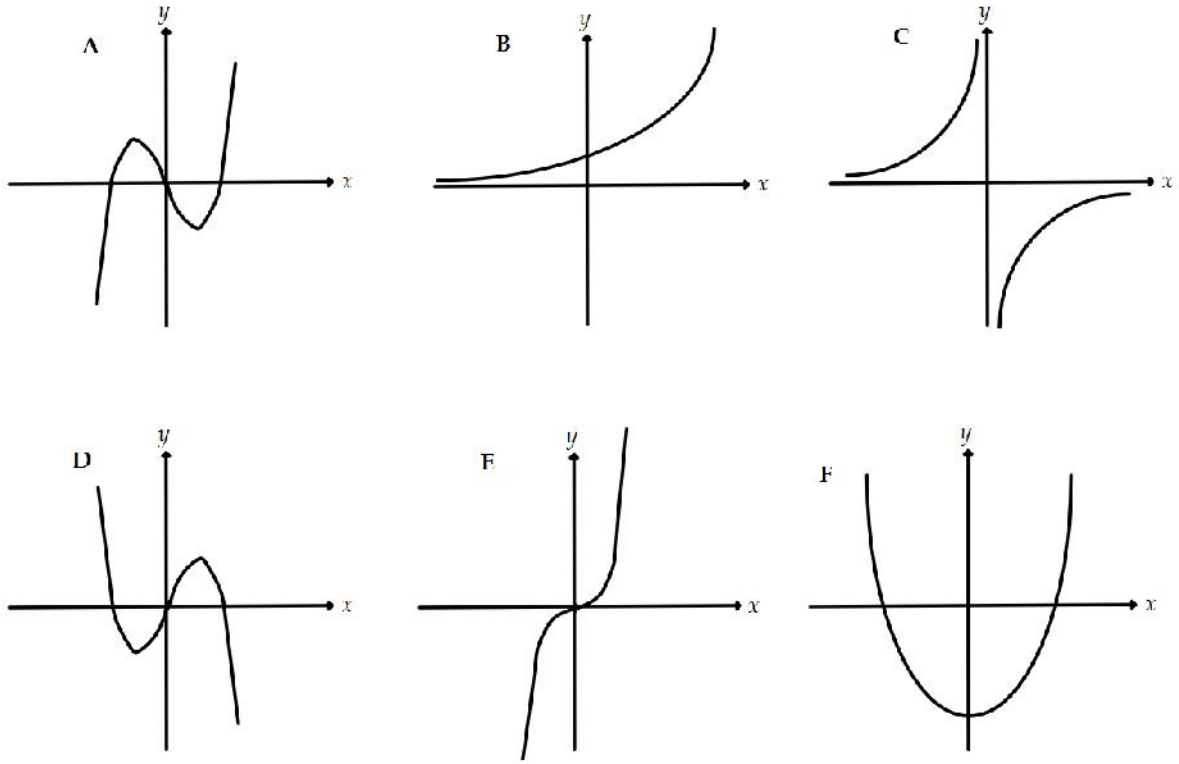
$y = \frac{1}{x}$

$y = x^2$

(3 marks)

5) Recognising graphs: Medium

2) Harry has sketched some graphs



a) Write down the letter of the graph that could have the equation $y = 3^x$

B

_____

(1 Mark)

b) Write down the letter of the graph that could have the equation $y = -\frac{5}{x}$

C

_____

(1 Mark)

c) Write down the letter of the graph that could have the equation $y = 2x - x^3$

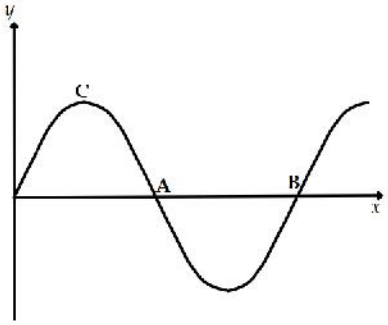
D

_____

(1 Mark)

5) Recognising graphs: Harder

3) A sketch of part of $y = \sin(x)$ is drawn below



a) Write down the coordinates of A

$(180°, 0)$

(1 Mark)

b) Write down the coordinates of B

$(360°, 0)$

(1 Mark)

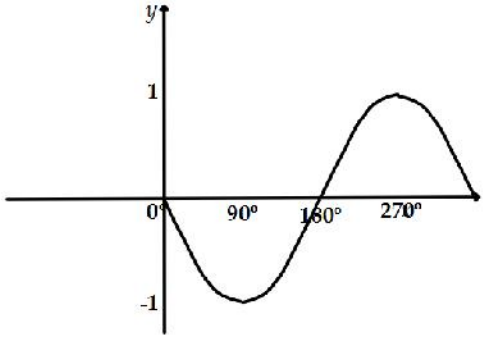
c) Write down the coordinates of C

$(90°, 1)$

(1 Mark)

---

4) Lanre was asked to sketch $y = \cos(x)\ for\ 0° \leq x \leq 360°$. This is what Lanre sketched



Write down one mistake Lanre has made

$y = \cos(x)$ does not go through (0,0) it starts at (0,1) and decreases to (90°,0)

(1 Mark)

JANSON Eleanor

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	20 from 27	10 from 12	6 from 10	4 from 4	0 from 1	0 from 0
A02 and 3	25 from 53	7 from 14	7 from 13	5 from 8	3 from 11	3 from 7
Total	45 from 80	17 from 26	13 from 23	9 from 12	3 from 12	3 from 7

Your Pinpoint Topics

Topic 1: Simple Vectors. Mathswatch Clip: 174

Topic 2: Recognising graphs. Mathswatch Clip:

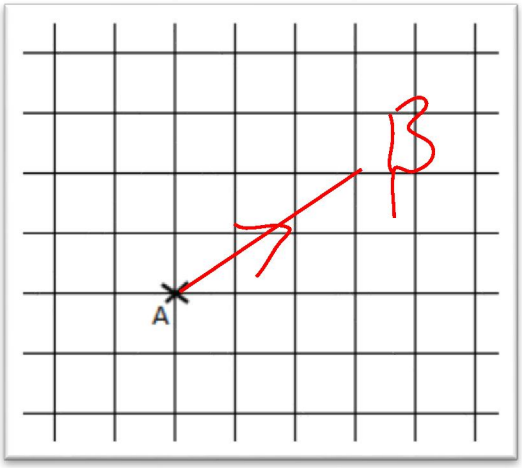
Topic 3: Direct and Inverse Proportion. Mathswatch Clip: 199

Topic 4: Drawing Quadratic Graphs. Mathswatch Clip: 98

Topic 5: Fractional and Negative Indices. MW: 188

1) Simple Vectors: Easier

3)

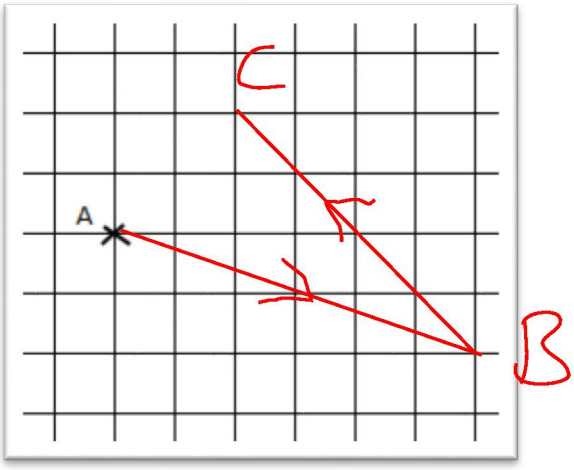


On the grid, draw the Vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ from Point A.

Label the new point B.

(1 Mark)

4)



a) On the grid, draw the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ from Point A

Label the new point B.

(1 Mark)

bi) On the grid draw the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ from Point B

Label the new point C

ii) State the vector $\overrightarrow{AC}$ $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$ (2 Marks)

1) Simple Vectors: Medium

5) Vector $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 11 \end{pmatrix}$

(2 Marks)

6) Vector $\overrightarrow{AB} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$

(2 Marks)

7) Vector $\overrightarrow{AB} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 10 \end{pmatrix}$

State Vector $\overrightarrow{CA}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

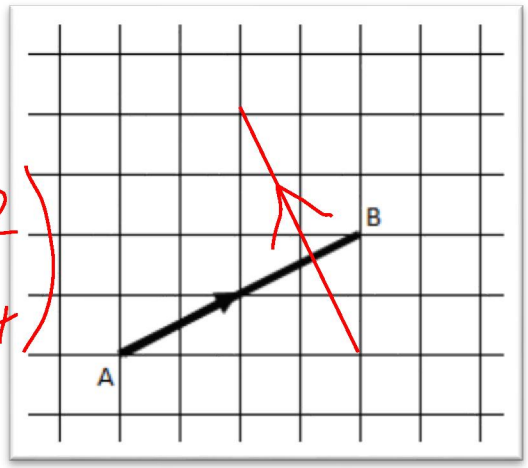
$\begin{pmatrix} -4 \\ -2 \end{pmatrix} + \begin{pmatrix} -2 \\ 10 \end{pmatrix} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}$

$\overrightarrow{CA} = -\overrightarrow{AC} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

(2 Marks)

1) Simple Vectors: Harder

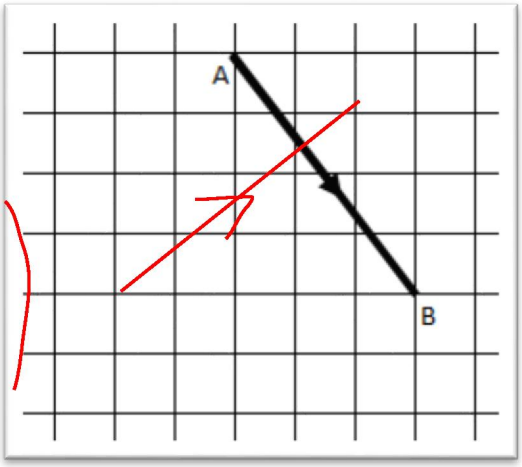
8)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

9)

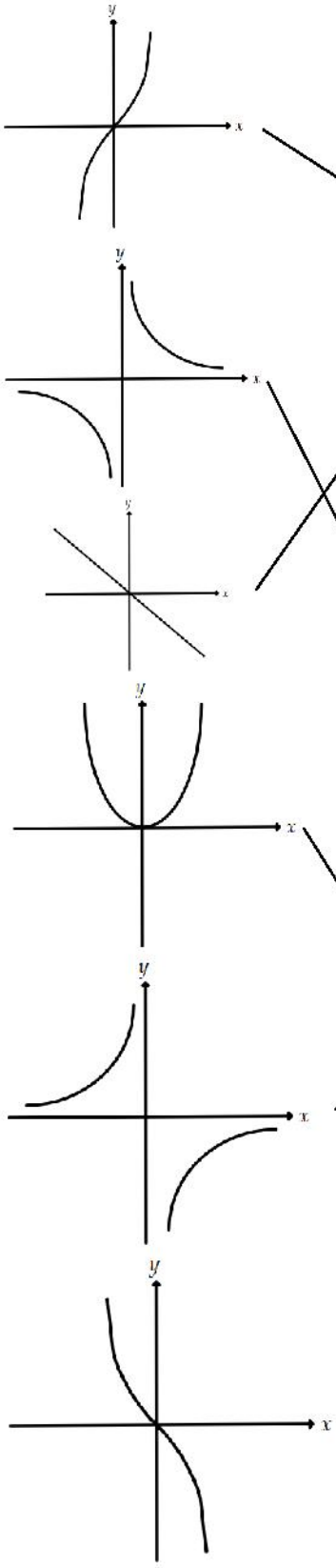


Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

2) Recognising graphs: Easier

1) Match each of the graphs with its equation, the first one is done for you



$y = -x$

$y = x^3$

$y = -x^3$

$y = -\frac{1}{x}$

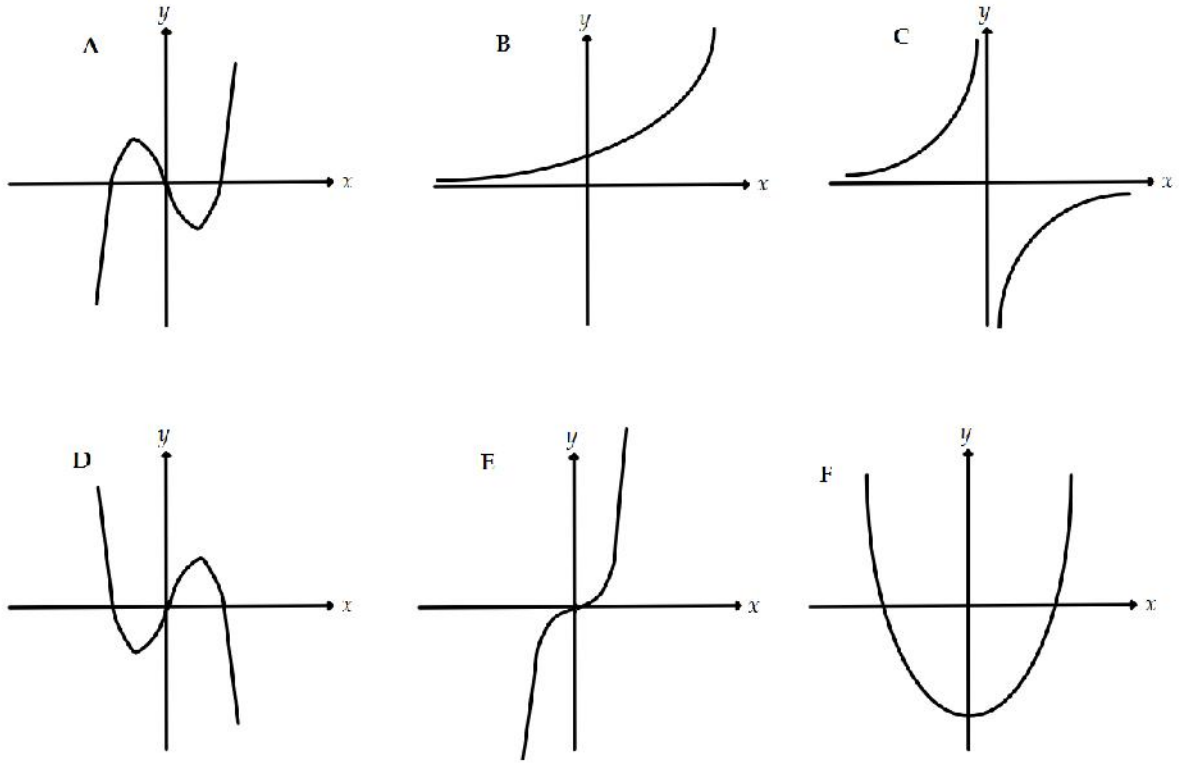
$y = \frac{1}{x}$

$y = x^2$

(3 marks)

2) Recognising graphs: Medium

2) Harry has sketched some graphs



a) Write down the letter of the graph that could have the equation $y = 3^x$

B

_____

(1 Mark)

b) Write down the letter of the graph that could have the equation $y = -\frac{5}{x}$

C

_____

(1 Mark)

c) Write down the letter of the graph that could have the equation $y = 2x - x^3$

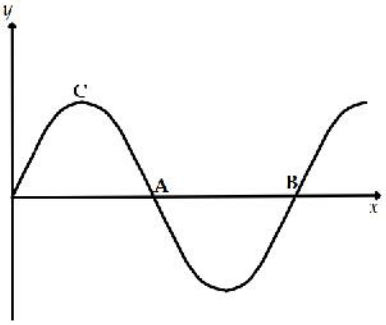
D

_____

(1 Mark)

2) Recognising graphs: Harder

3) A sketch of part of $y = \sin(x)$ is drawn below



a) Write down the coordinates of A

$(180°, 0)$

(1 Mark)

b) Write down the coordinates of B

$(360°, 0)$

(1 Mark)

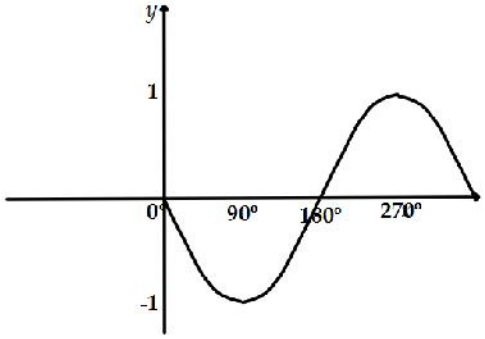
c) Write down the coordinates of C

$(90°, 1)$

(1 Mark)

---

4) Lanre was asked to sketch $y = \cos(x)\ for\ 0° \leq x \leq 360°$. This is what Lanre sketched



Write down one mistake Lanre has made

$y = \cos(x)$ does not go through (0,0) it starts at (0,1) and decreases to (90°,0)

(1 Mark)

3) Direct and Inverse Proportion: Easier

1. The weight of a piece of wire is directly proportional to its length.

A piece of wire is 25 cm long and has a weight of 6 grams.
Another piece of the same wire is 30 cm long.

Calculate the weight of the 30 cm piece of wire.

$w = kl$

$6 = 25k$

$k = 0.24$

$w = 0.24l$

$w = 0.24 \times 30$

$w = 7.2$

7.2 ..... grams

(Total 2 marks)

2. A ball falls vertically after being dropped.
The ball falls a distance d metres in a time of t seconds.
d is directly proportional to the square of t. $d = kt^2$

The ball falls 20 metres in a time of 2 seconds.

(a) Find a formula for d in terms of t.

$20 = k \times 2^2$

$20 = 4k$

$k = 5$

$d =$ $5t^2$

(3)

(b) Calculate the distance the ball falls in 3 seconds.

$d = 5 \times 3^2$

$d = 5 \times 9 = 45$

45 ..... m

(1)

(c) Calculate the time the ball takes to fall 605 m.

$d = 5t^2$

$605 = 5t^2$

$t^2 = 121$

$t = \pm 11$

(ignore -11 as time can't be -ve)

11 ..... seconds

(3)

(Total 7 marks)

3) Direct and Inverse Proportion: Medium

3. The time, T seconds, it takes a water heater to boil some water is directly proportional to the mass of water, m kg, in the water heater.

When $m = 250$, $T = 600$

(a) Find T when $m = 400$

$T = km$

$600 = 250k$

$k = \frac{600}{250} = 2.4$

$T = 2.4m$

$T = 2.4 \times 400$

$T = 960$

$T =$ 960

(3)

The time, T seconds, it takes a water heater to boil a constant mass of water is inversely proportional to the power, P watts, of the water heater.

When $P = 1400$, $T = 360$

$T = \frac{k}{P}$

(b) Find the value of T when $P = 900$

$360 = \frac{k}{1400}$

$k = 360 \times 1400$

$k = 504{,}000$

$\therefore T = \frac{504000}{P}$

$T = \frac{504000}{900} = 560$

$T =$ 560

(3)

(Total 6 marks)

4. D is proportional to S^2.

$D = 900$ when $S = 20$

Calculate the value of D when $S = 25$

$D = kS^2$

$900 = k \times 20^2$

$900 = 400k$

$k = \frac{900}{400} = 2.25$

$D = 2.25S^2$

$D = 2.25 \times 25^2$

$D =$ 1406.25

(Total 4 marks)

3) Direct and Inverse Proportion: Harder

1) A is inversely proportional to the square root of B. Jim says if B is very large A will be negative. Is he right?

Solution: $A \propto \frac{1}{\sqrt{B}}$

$$A = \frac{k}{\sqrt{B}}$$

Jim is wrong. If B is very large $\sqrt{B}$ will be positive, therefore A will also be positive.

(As B becomes very large, A becomes very small)

(4 Marks)

---

2) If Sally drives to work 25% faster than she did yesterday. What would be her percentage decrease in the time taken to get to work?

Solution: $Time = \frac{Distance}{Speed}$

$$Time = \frac{D}{1.25}$$

$$Time = \frac{1}{1.25}$$

$$Time = \frac{4}{5}$$

$$\frac{4}{5} = 80\%$$

She will get there 20% faster.

(4Marks)

---

4) Drawing Quadratic Graphs: Easier

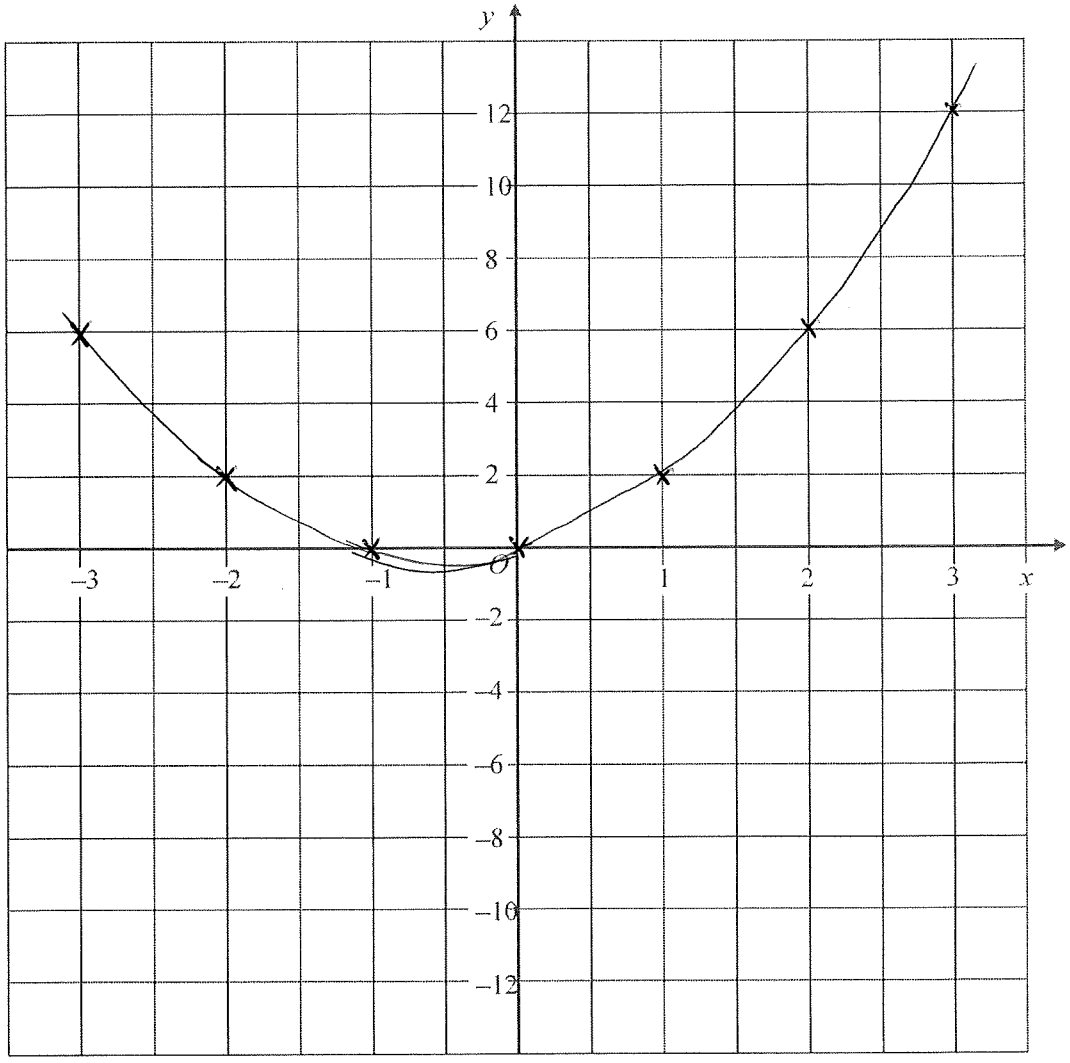
1. (a) Complete the table of values for $y = x^2 + x$.

x	–3	–2	–1	0	1	2	3
y	6	2	0	0	2	6	12

1+1 9+3

(2)

(b) On the grid, draw the graph of $y = x^2 + x$.



(2)

(Total 4 marks)

4) Drawing Quadratic Graphs: Medium

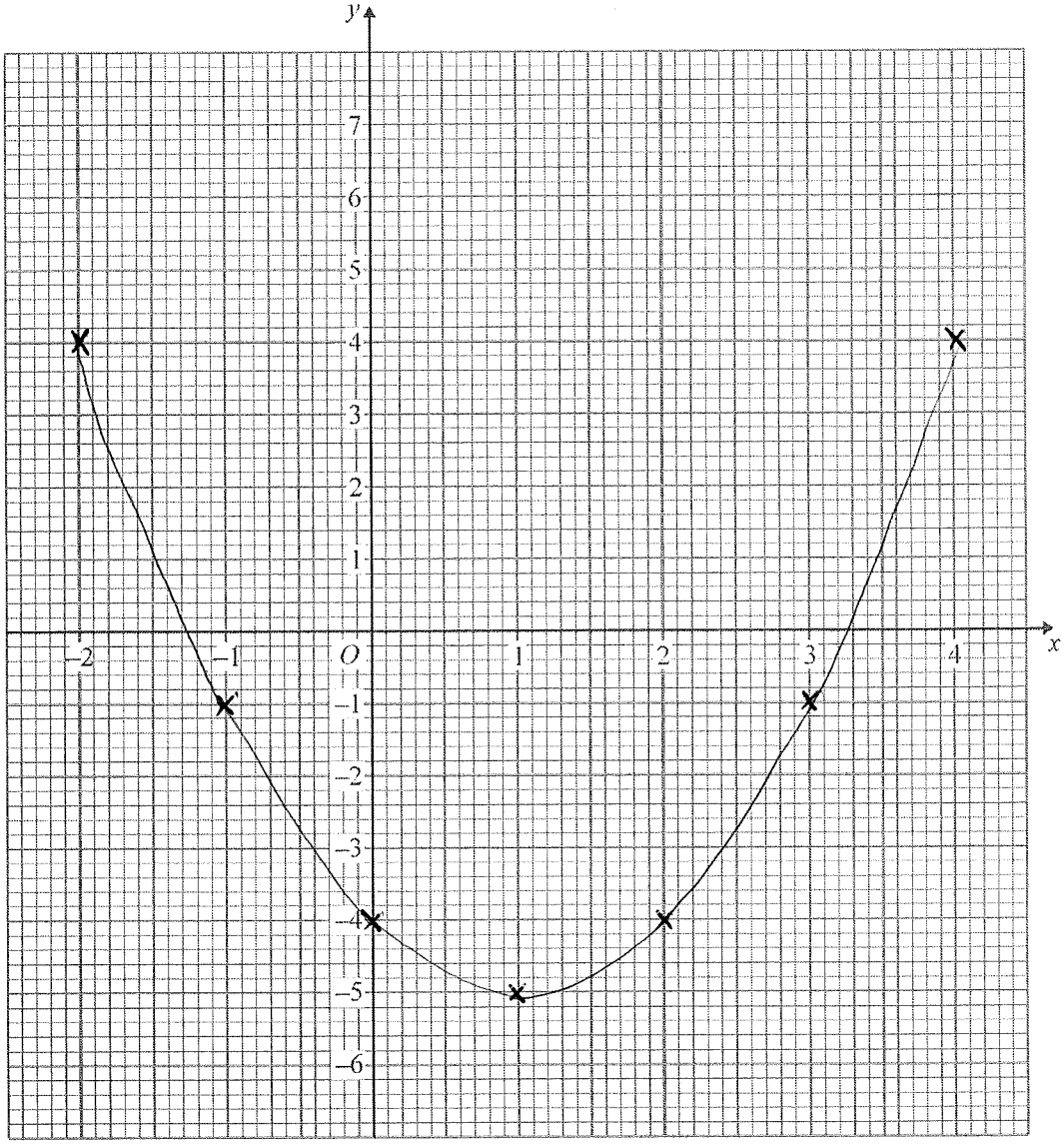
2. (a) Complete the table for $y = x^2 - 2x - 4$

x	–2	–1	0	1	2	3	4
y	4	–1	–4	–5	–4	–1	4

1+2-4 4-4-4 16-8-4

(2)

(b) On the grid, draw the graph of $y = x^2 - 2x - 4$



(2)

(Total 4 marks)

4) Drawing Quadratic Graphs: Harder

(Total 5 marks)

7. (a) Complete the table of values for $y = x^2 - 3x - 1$

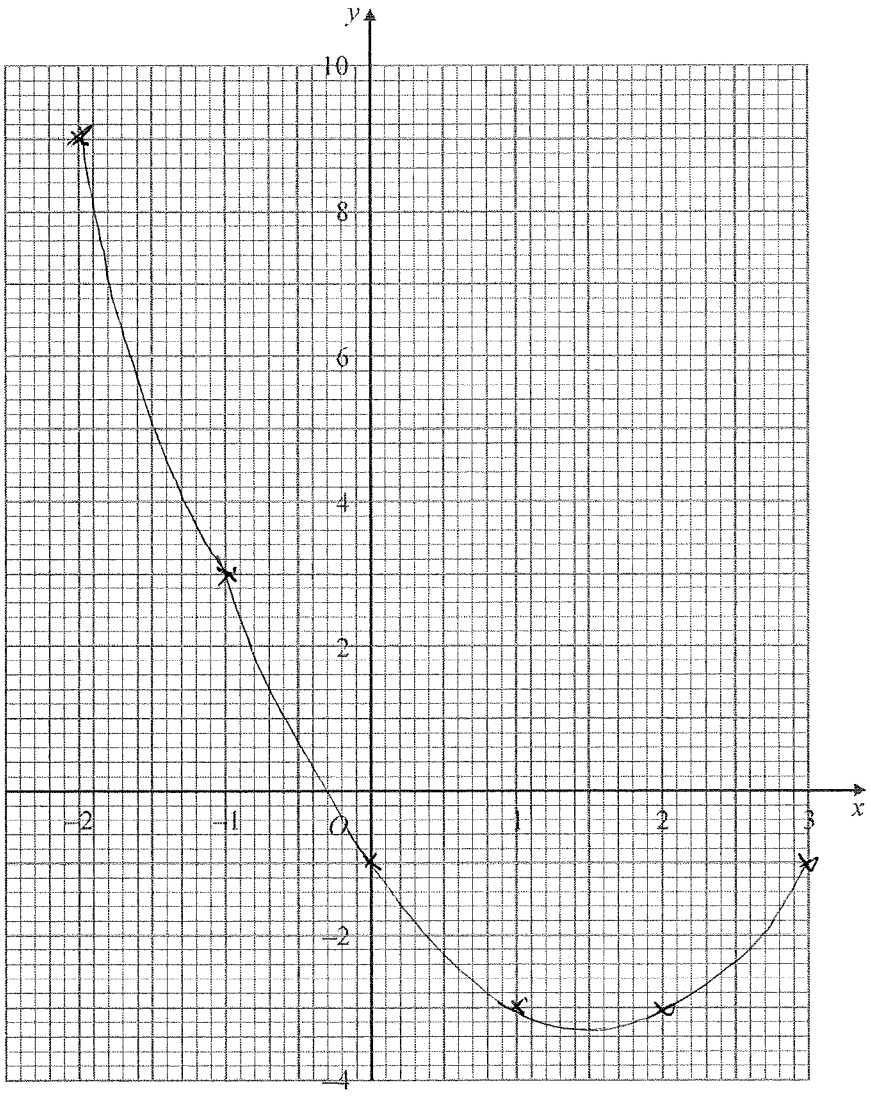
x	−2	−1	0	1	2	3
y	9	3	−1	−3	−3	−1

4+6−1 4−6−1 9−9−1

(2)

(b) On the grid, draw the graph of $y = x^2 - 3x - 1$

(2)



(Total 4 marks)

5) Fractional and Negative Indices: Easier

1) Evaluate

a) 6^0 $= 1$ _____

(1 Mark)

a) $25^{\frac{1}{2}}$ $= \sqrt{25} = 5$ _____

(1 Mark)

c) 3^{-1} $= \frac{1}{3}$ _____

(1 Mark)

---

2) Sarah says that $9^{\frac{1}{2}}$ is 4.5. She is wrong. Explain her mistake.

Solution: $9^{\frac{1}{2}} = \sqrt{9} = 3$

_____

(1 Mark)

---

3) Evaluate

a) $27^{\frac{1}{3}}$ $\sqrt[3]{27} = 3$

_____

(1 Mark)

b) $27^{\frac{2}{3}}$ $\sqrt[3]{27}^2 = 9$ _____

(1 Mark)

c) $27^{\frac{-2}{3}}$ $\frac{1}{\sqrt[3]{27^2}} = \frac{1}{9}$ _____

(1 Mark)

5) Fractional and Negative Indices: Medium

4) Evaluate

a) $\left(\frac{25}{81}\right)^{\frac{-1}{2}}$ $\left(\frac{1}{25/81}\right)^{\frac{1}{2}} = \left(\frac{81}{25}\right)^{\frac{1}{2}} = \sqrt{\frac{81}{25}} = \frac{9}{5}$

(1 Mark)

b) $32^{\frac{-3}{5}}$ $\left(\frac{1}{32}\right)^{\frac{3}{5}} = \left(\sqrt[5]{\frac{1}{32}}^{3}\right) = \frac{1}{2^3} = \frac{1}{8}$

(1 Mark)

c) $144^{\frac{-1}{2}} \times 3^{-2}$ $\frac{1}{\sqrt{144}} \times \frac{1}{3^2} = \frac{1}{12} \times \frac{1}{9} = \frac{1}{108}$

(2 Marks)

---

5) Put these numbers in ascending order, show your working.

125^0 $125^{\frac{-1}{3}}$ $\left(\frac{1}{125}\right)^{\frac{-1}{3}}$ $125^{\frac{-2}{3}}$

1 $\frac{1}{\sqrt[3]{125}} = \frac{1}{5}$ $\left(\frac{1}{1/125}\right)^{\frac{1}{3}} = \sqrt[3]{125} = 5$ $\left(\frac{1}{125}\right)^{\frac{2}{3}} = \frac{1}{\sqrt[3]{125^2}} = \frac{1}{5^2} = \frac{1}{25}$

Correct order $\frac{1}{25}$, $\frac{1}{5}$, 1, 5.

(3 Marks)

5) Fractional and Negative Indices: Harder

6) If $2^{2x} = \frac{1}{16}$. Work out the value of x.

$$2^{2x} = \frac{1}{4^2}$$
$$2^{2x} = 4^{-2}$$
$$2^{2x} = 2^{2(-2)}$$
$$x = -2$$

(2 Marks)

---

7) One of these has a different value to the other two. Decide which one and justify your answer.

$4^{\frac{3}{4}}$ $\quad$ $8^{\frac{1}{4}}$ $\quad$ $2^{\frac{3}{2}}$

$2^{2\left(\frac{3}{4}\right)} = 2^{\frac{6}{4}} = 2^{\frac{3}{2}}$ $\quad$ $2^{3\left(\frac{1}{4}\right)} = 2^{\frac{3}{4}}$

The values that are the same are $4^{\frac{3}{4}}$ and $2^{\frac{3}{2}}$

(3 Marks)

---

8) If $32^{3x} = \frac{1}{8}$. Find the value of x

$$2^{5(3x)} = \frac{1}{8}$$
$$2^{15x} = \frac{1}{2^3}$$
$$2^{15x} = 2^{-3}$$
$$15x = -3$$
$$x = \frac{-3}{15}$$
$$x = -\frac{1}{5}$$

(3 Marks)

KANE Emily

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Pinpoint Topics

Topic 1: Understanding Number. Mathswatch Clip: NA

Topic 2: Tree Diagrams. Mathswatch Clip: 151

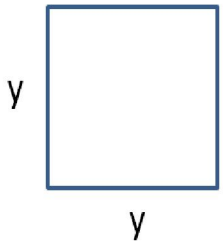
Topic 3: Algebraic Equivalence. Mathswatch Clip: NA

Topic 4: Surds. Mathswatch Clip: 207

Topic 5: Fractional and Negative Indices. MW: 188

1) Understanding Number: Easier

1. Jim is looking at the area and lengths of squares.



Jim considers a square with area $9m^2$.

Jim works out the length of the square as follows:

$$y^2 = 9$$

$$y = \sqrt{9}$$

$$y = 3cm$$

Jim considers another square with a **different** area.

Please tick below:

	This method will **always** give an answer which is a whole number
/	This method will **sometimes** give an answer which is a whole number
	This method will **never** give an answer which is a whole number

Show working to support your answer

Any area which is a square number will give a whole number using this method

e.g. $y^2 = 16$ gives $y = \sqrt{16} = 4$ cm

Any area that is a non-square number won't give a whole number

e.g. $y^2 = 10$ gives $y = \sqrt{10} = 3.162\ldots$ cm

(3 marks)

1) Understanding Number: Medium

2.a) Anne puts a number in her calculator and squares her number. The number gets a lot bigger.

Anne says "if you square a number it will **always** get bigger".

Please tick below:

	Anne is correct
/	Anne is **not** correct

Show working to support your answer

If you square a number that is between 0 and 1 it will become smaller

e.g. $0.5^2 = 0.25$

(3 marks)

b) Pete says "if you square a number it will **always** be positive".

Please tick below:

	Pete is correct
/	Pete is **not** correct

Show working to support your answer

If you square **zero** the answer is zero, a non-positive number.

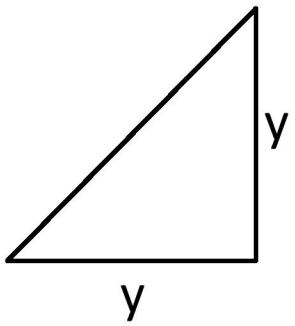
$$0^2 = 0 \times 0 = 0$$

(3 marks)

1) Understanding Number: Harder

3.a) Amir cuts a square in half along the diagonal to produce a right angled triangle.

It has a length, y, which is a whole number.



Amir works out the **area** of the triangle.

Please tick below:

	The area **must** be a whole number.
/	The area will **sometimes** be a whole number.

Show working to support your answer

If y = 3 then the area is $(3 \times 3) \div 2 = 9 \div 2 = 4.5$ a decimal

If y = 4 then the area is $(4 \times 4) \div 2 = 16 \div 2 = 8$ a whole number

(3 marks)

b) Amir is about the work out the **hypotenuse** of the triangle.

Amir says "The hypotenuse of the triangle will **always** be a whole number".

Show that Amir is wrong.

Pythagoras' Theorem: $a^2 + b^2 = c^2$

If $a = 2$ and $b = 3$ then

$$c^2 = 2^2 + 3^2 = 4 + 9 = 13$$

$$c = \sqrt{13} = 3.605 \ldots$$

So the hypotenuse is not a whole number in this case

(3 marks)

2) Tree Diagrams: Easier

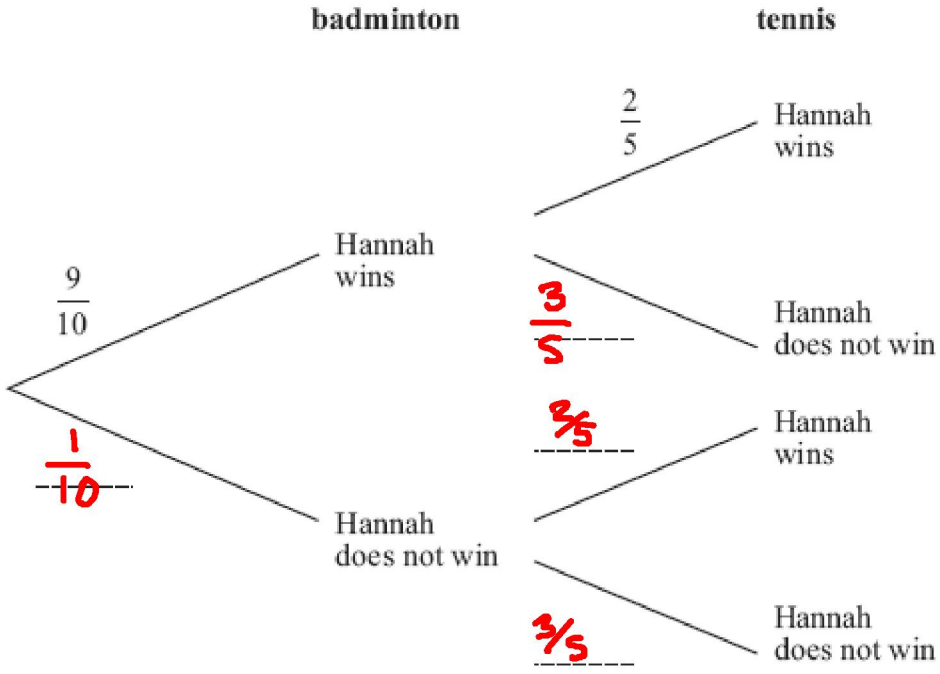
1. Hannah is going to play one badminton match and one tennis match.

The probability that she will win the badminton match is $\frac{9}{10}$

The probability that she will win the tennis match is $\frac{2}{5}$

(a) Complete the probability tree diagram.

(2)



(b) Work out the probability that Hannah will win **both** matches.

(2)

$P(W,W) = \frac{9}{10} \times \frac{2}{5} = \frac{18}{50}$

$\frac{18}{50}$

.....

(4 marks)

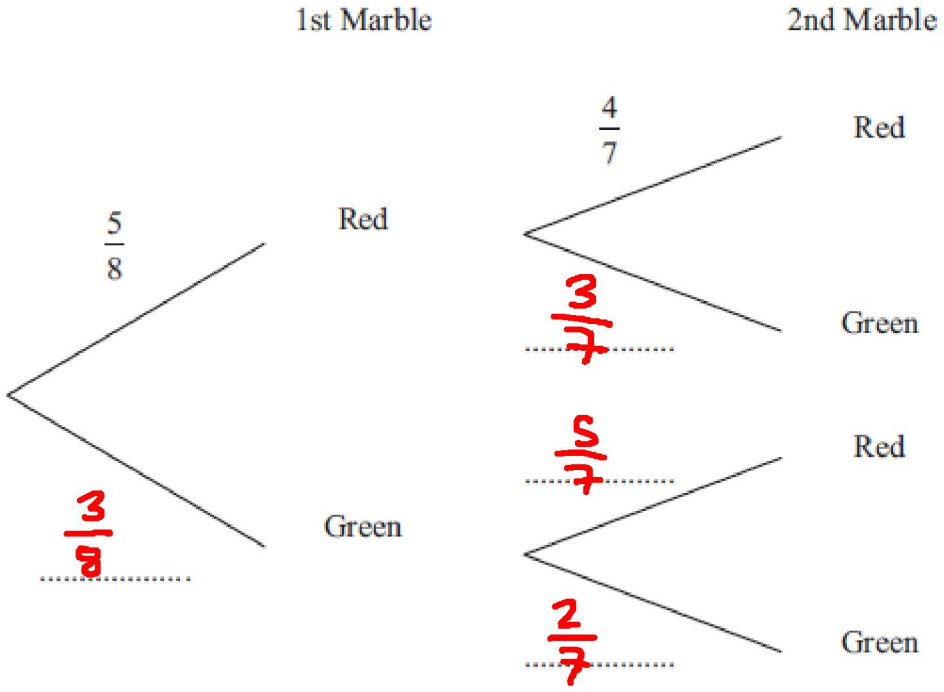
2) Tree Diagrams: Medium

2. There are only red marbles and green marbles in a bag.
There are 5 red marbles and 3 green marbles.

Dwayne takes at random a marble from the bag.
He does not put the marble back in the bag.

Dwayne takes at random a second marble from the bag.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Dwayne takes marbles of different colours.

$P(R,G) = \frac{5}{8} \times \frac{3}{7} = \frac{15}{56}$

$P(G,R) = \frac{3}{8} \times \frac{5}{7} = \frac{15}{56}$

$P(\text{diff colours}) = \frac{15}{56} + \frac{15}{56} = \frac{30}{56}$

$\frac{30}{56}$

(3)

(5 marks)

2) Tree Diagrams: Harder

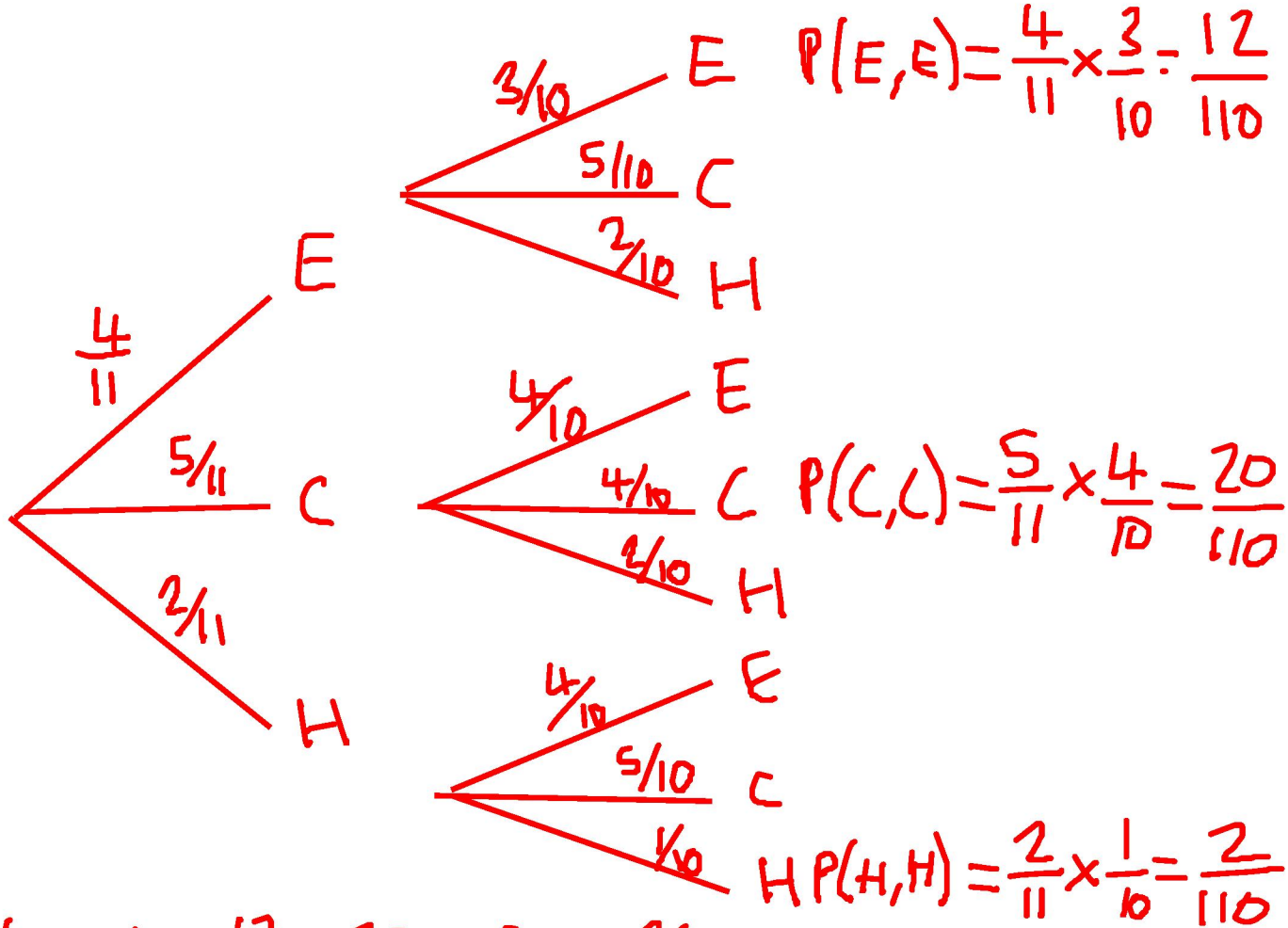
7. There are three different types of sandwiches on a shelf.

There are

4 egg sandwiches,
5 cheese sandwiches
and 2 ham sandwiches.

Erin takes at random 2 of these sandwiches.

Work out the probability that she takes 2 different types of sandwiches.



$P(\text{same}) = \frac{12}{110} + \frac{20}{110} + \frac{2}{110} = \frac{34}{110}$

$P(\text{diff}) = 1 - P(\text{same})$

$P(\text{diff}) = 1 - \frac{34}{110} = \frac{76}{110}$

$\frac{76}{110}$

.....

(5 marks)

3) Algebraic Equivalence: Easier

1) Simplify $\frac{3x^2}{x}$

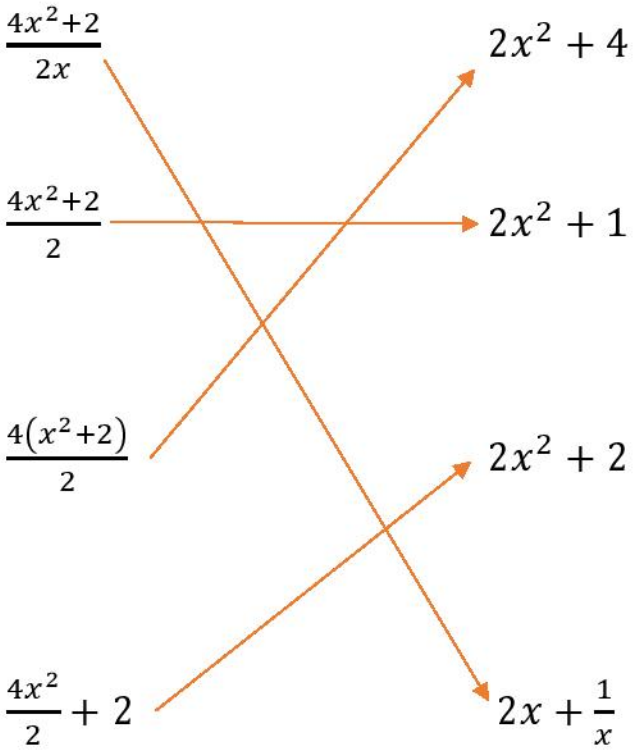
$3x$

_____

(1 Mark)

---

2) Match each of the four expressions on the left hand side with 1 equivalent expression on the right hand side



3) Algebraic Equivalence: Medium

3) Circle the expression that is equivalent to $\frac{3x^2+2}{x}$ where x is not equal to 0

A $3x^3+2$ B $3x+\frac{2}{x}$ C $2x^2+\frac{2}{x}$ D $3x+2$

$$\frac{3x^2+2}{x}$$

$$=\frac{3x^2}{x}+\frac{2}{x}$$

$$=3x+\frac{2}{x}$$

(1 Mark)

---

4) **Two** of these four expressions are equivalent. Circle the two expressions

A $\frac{x}{x+5}$ B $1+\frac{x}{5}$ C $\frac{5+x}{5}$ D $\frac{x^2}{x^2+5}$

(1 mark)

3) Algebraic Equivalence: Harder

5) Fiona tries to simplify this expression

$$\frac{3x}{3+x}$$

She writes

$$\frac{3x}{3}+\frac{3x}{x}$$

$$x+3$$

Explain why Fiona can not rewrite the expression like this

Dividing $3x$ by $3+x$ is not the same as dividing it by 3 and adding it to $\frac{3x}{x}$

Numerical Example

If $x=1$

$$\frac{3x}{3+x}=\frac{3}{4}$$

$$\frac{3x}{3}+\frac{3x}{x}=\frac{3}{3}+\frac{3}{1}=4$$

As you can see, these two expressions are not equal

(1 mark)

---

6) Show that $\frac{2x+5}{1+\frac{2}{x}}$ is equivalent to $\frac{2x^2+5x}{x+2}$

$$\frac{2x+5}{1+\frac{2}{x}}$$

$$=\frac{x(2x+5)}{x(1+\frac{2}{x})}$$

$$=\frac{2x^2+5x}{x+2}$$

(1 mark)

---

4) Surds: Easier

1. a) Simplify $\sqrt{75}$

$\sqrt{75} = \sqrt{25 \times 3}$

$= 5\sqrt{3}$

..... **(1)**

b) Express $\sqrt{75} - \sqrt{48}$ in the form $a\sqrt{3}$ where a is an integer.

$5\sqrt{3} - \sqrt{16 \times 3}$

$= 5\sqrt{3} - 4\sqrt{3}$

$\sqrt{3}$

a = 1

..... **(2)**

2. Express $\frac{15}{\sqrt{5}}$ in the form $a\sqrt{b}$ where a and b are positive integers.

$\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{15\sqrt{5}}{5}$

$= 3\sqrt{5}$

..... **(2)**

3. Expand and simplify $(2 + \sqrt{3})(4 + \sqrt{3})$ giving your answer in the $a + b\sqrt{3}$ where a and b are integers.

$(2 + \sqrt{3})(4 + \sqrt{3})$

$= 8 + 2\sqrt{3} + 4\sqrt{3} + 3$

$= 11 + 6\sqrt{3}$

..... **(3)**

4) Surds: Medium

4. Expand and simplify $(4-2\sqrt{3})^2$ giving your answer in the $a+b\sqrt{3}$ where a and b are integers.

$$(4-2\sqrt{3})(4-2\sqrt{3})$$
$$=16-8\sqrt{3}-8\sqrt{3}+12$$
$$=30-16\sqrt{3}$$

…… **(3)**

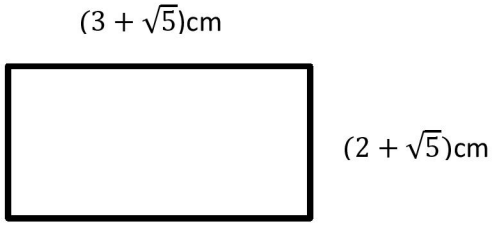
5. Expand and simplify $(\sqrt{5}-\sqrt{10})^2$ giving your answer in the $a+b\sqrt{2}$ where a and b are integers.

$$(\sqrt{5}-\sqrt{10})(\sqrt{5}-\sqrt{10})$$
$$=5-\sqrt{50}-\sqrt{50}+\sqrt{100}$$
$$=15-2\sqrt{50}$$
$$=15-2\sqrt{25\times 2}$$
$$=15-10\sqrt{2}$$

…… **(4)**

4) Surds: Harder

8. Find the area of the rectangle below, give your answer in simplest form.



$(3+\sqrt{5})(2+\sqrt{5})$

$= 6 + 3\sqrt{5} + 2\sqrt{5} + 5$

$= (5\sqrt{5} + 11)\text{cm}^2$

5) Fractional and Negative Indices: Easier

1) Evaluate

a) 6^0 $= 1$ _____

(1 Mark)

a) $25^{\frac{1}{2}}$ $= \sqrt{25} = 5$ _____

(1 Mark)

c) 3^{-1} $= \frac{1}{3}$ _____

(1 Mark)

---

2) Sarah says that $9^{\frac{1}{2}}$ is 4.5. She is wrong. Explain her mistake.

Solution: $9^{\frac{1}{2}} = \sqrt{9} = 3$

_____

(1 Mark)

---

3) Evaluate

a) $27^{\frac{1}{3}}$ $\sqrt[3]{27} = 3$

_____

(1 Mark)

b) $27^{\frac{2}{3}}$ $\sqrt[3]{27}^2 = 9$ _____

(1 Mark)

c) $27^{\frac{-2}{3}}$ $\frac{1}{\sqrt[3]{27^2}} = \frac{1}{9}$ _____

(1 Mark)

5) Fractional and Negative Indices: Medium

4) Evaluate

a) $\left(\frac{25}{81}\right)^{\frac{-1}{2}}$ $\left(\frac{1}{25/81}\right)^{\frac{1}{2}} = \left(\frac{81}{25}\right)^{\frac{1}{2}} = \sqrt{\frac{81}{25}} = \frac{9}{5}$

(1 Mark)

b) $32^{\frac{-3}{5}}$ $\left(\frac{1}{32}\right)^{\frac{3}{5}} = \left(\sqrt[5]{\frac{1}{32}}^{3}\right) = \frac{1}{2^3} = \frac{1}{8}$

(1 Mark)

c) $144^{\frac{-1}{2}} \times 3^{-2}$ $\frac{1}{\sqrt{144}} \times \frac{1}{3^2} = \frac{1}{12} \times \frac{1}{9} = \frac{1}{108}$

(2 Marks)

---

5) Put these numbers in ascending order, show your working.

125^0 $125^{\frac{-1}{3}}$ $\left(\frac{1}{125}\right)^{\frac{-1}{3}}$ $125^{\frac{-2}{3}}$

1 $\frac{1}{\sqrt[3]{125}} = \frac{1}{5}$ $\left(\frac{1}{1/125}\right)^{\frac{1}{3}} = \sqrt[3]{125} = 5$ $\left(\frac{1}{125}\right)^{\frac{2}{3}} = \frac{1}{\sqrt[3]{125^2}} = \frac{1}{5^2} = \frac{1}{25}$

Correct order $\frac{1}{25}$, $\frac{1}{5}$, 1, 5.

(3 Marks)

5) Fractional and Negative Indices: Harder

6) If $2^{2x} = \frac{1}{16}$. Work out the value of x.

$2^{2x} = \frac{1}{4^2}$

$2^{2x} = 4^{-2}$

$2^{2x} = 2^{2(-2)}$

$x = -2$

(2 Marks)

---

7) One of these has a different value to the other two. Decide which one and justify your answer.

$4^{\frac{3}{4}}$ $8^{\frac{1}{4}}$ $2^{\frac{3}{2}}$

$2^{2\left(\frac{3}{4}\right)} = 2^{\frac{6}{4}} = 2^{\frac{3}{2}}$ $2^{3\left(\frac{1}{4}\right)} = 2^{\frac{3}{4}}$

The values that are the same are $4^{\frac{3}{4}}$ and $2^{\frac{3}{2}}$

(3 Marks)

---

8) If $32^{3x} = \frac{1}{8}$. Find the value of x

$2^{5(3x)} = \frac{1}{8}$

$2^{15x} = \frac{1}{2^3}$

$2^{15x} = 2^{-3}$

$15x = -3$

$x = \frac{-3}{15}$

$x = -\frac{1}{5}$

(3 Marks)

LEE Yasmin

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	18 from 27	9 from 12	5 from 10	4 from 4	0 from 1	0 from 0
A02 and 3	32 from 53	7 from 14	9 from 13	3 from 8	6 from 11	7 from 7
Total	50 from 80	16 from 26	14 from 23	7 from 12	6 from 12	7 from 7

Your Pinpoint Topics

Topic 1: Solving simple equations with fractions. MW: 135

Topic 2: Speed. Mathswatch Clip: 142

Topic 3: Simple Vectors. Mathswatch Clip: 174

Topic 4: Algebraic Equivalence. Mathswatch Clip: NA

Topic 5: Drawing Quadratic Graphs. Mathswatch Clip: 98

1) Solving simple equations with fractions: Easier

1) Solve $\frac{x}{2} = 10$

$x = 20$

(multiplying both sides by 2)

_____

(1 Mark)

---

2) Solve $\frac{x}{5} = 6$

(multiplying both sides by 5) $x = 30$

_____

(1 Mark)

---

3) Solve $\frac{3x}{4} = 6$

Multiplying by 4 $3x = 24$

Dividing by 3 $x = 8$

$x = 8$

_____

(2 Marks)

---

4) Solve $\frac{2}{3}x = 4$

Multiplying by 3 $2x = 12$

Dividing by 2 $x = 6$

$x = 6$

_____

(2 Marks)

---

1) Solving simple equations with fractions: Medium

5) Solve $\frac{x}{2} + 1 = 9$

Subtracting 1 $\frac{x}{2} = 8$

Multiplying by 2 $x = 16$

$x = 16$

(2 Marks)

---

6) Solve $\frac{x}{3} - 11 = 9$

Adding 11 $\frac{x}{3} = 20$

Multiplying by 3 $x = 60$

$x = 60$

(2 Marks)

---

7) Solve $\frac{3x}{2} - 5 = 9$

Adding 5 $\frac{3x}{2} = 14$

Multiplying by 2 $3x = 28$

Dividing by 3

$x = \frac{28}{3}$

$x = \frac{28}{3}$

(3 Marks)

---

1) Solving simple equations with fractions: Harder

8) Aurora is solving this equation

$$\frac{2x}{3} + 3 = 12$$

Here is her working

$\frac{2x}{3} = 9$ line 1

$2x = 3$ line 2

$x = \frac{3}{2}$ line 3

Explain one mistake Aurora has made

From line 1 to line 2 she has multiplied the right hand side of the equation by 3 but divided the left hand side by 3, she should have multiplied both sides by 3 giving $2x = 27$, then her answer would have been $x = \frac{27}{2}$

(1 Mark)

2) Speed: Easier

1) Pete drove 50 miles in 4 hours
Work out his average speed in miles per hour.

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{50}{4} = \frac{25}{2} = 12.5 \text{ mph}$$

12.5 miles/hour

(2 Marks)

---

2) Dave cycled 8km in 30 minutes.
Work out Dave's average speed in km/h.

30 mins = 0.5 hours

$$\text{speed} = \frac{8}{0.5} = 16 \text{ km/h}$$

16 Km/h

(3 Marks)

---

3) Jess travels 400km at an average speed of 300 km/h.
How long was she travelling for? Give your answer in minutes.

$$s = \frac{d}{t} \quad \text{so} \quad t = \frac{d}{s} = \frac{400}{300} = \frac{4}{3} = 1\tfrac{1}{3} \text{ h}$$

1 h = 60 mins so $\frac{1}{3}$ h = 20 mins

so total time = 60 + 20 = 80 mins

80 minutes

(3 Marks)

---

4) Jeff set off for work at 3pm. He arrived at his destination at 5pm.
If Jeff travelled at a constant speed of 24 Km/h, how far did he travel?

t = 2 hours

$$s = \frac{d}{t} \quad \text{so} \quad d = s \times t = 24 \times 2 = 48 \text{ km}$$

48 Km

(2 Marks)

---

2) Speed: Medium

Pete needs to catch a ferry.

Pete leaves his home and drives

10 miles towards the motorway

180 miles on the motorway

15 miles from the motorway to the ferry port

Pete

Takes 20 minutes to get to the motorway

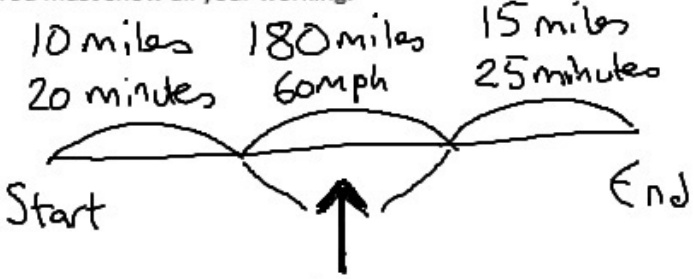
Drives at an average speed of 60mph whilst on the motorway

Takes 25 minutes to get from the motorway to the ferry port.

Pete has to arrive at the ferry port no later than midday.

What is the latest time Pete can leave his house?

You must show all your working.



$T = D/S$

$T = 180/60 = 3$ hours

Total time

3 hours

25 minutes

20 minutes +

3hrs 45 mins

Midday = 12:00pm

3hrs 45 mins

Answer = 8:15am

2) Speed: Harder

Abigail is on a bus going into the city.

The bus picks her up and drives

4 miles towards a motorway

45 miles on the motorway

6 miles from the motorway to the city bus depot

The bus

Takes 10 minutes to get to the main road

Drives at an average speed of 60mph whilst on the motorway

Takes 15 minutes to get from the motorway to the bus depot

Abigail gets on the bus at 10:19am. What time will she get off the bus?

You must show all your working.

4miles 10mins | 45mins 60mph | 6miles 15mins

Start → End

T = D/S

T = 45/60 = 3/4

= 45mins

Total time taken

45

15

10

70mins

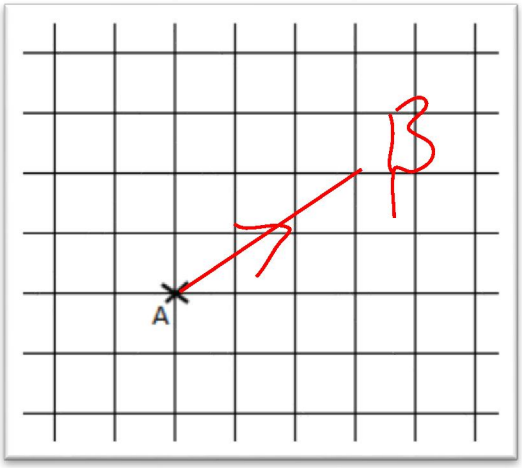
or 1hr 10mins

10:19 + 1hr 10mins

11:29am

3) Simple Vectors: Easier

3)

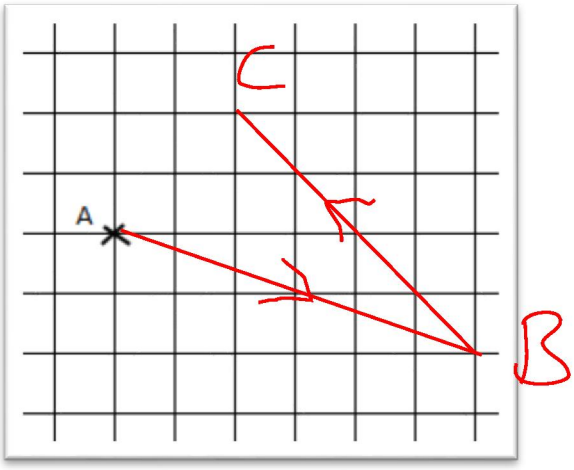


On the grid, draw the Vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ from Point A.

Label the new point B.

(1 Mark)

4)



a) On the grid, draw the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ from Point A

Label the new point B.

(1 Mark)

bi) On the grid draw the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ from Point B

Label the new point C

ii) State the vector $\overrightarrow{AC}$ $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$ (2 Marks)

3) Simple Vectors: Medium

5) Vector $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 11 \end{pmatrix}$

(2 Marks)

6) Vector $\overrightarrow{AB} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$

(2 Marks)

7) Vector $\overrightarrow{AB} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 10 \end{pmatrix}$

State Vector $\overrightarrow{CA}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

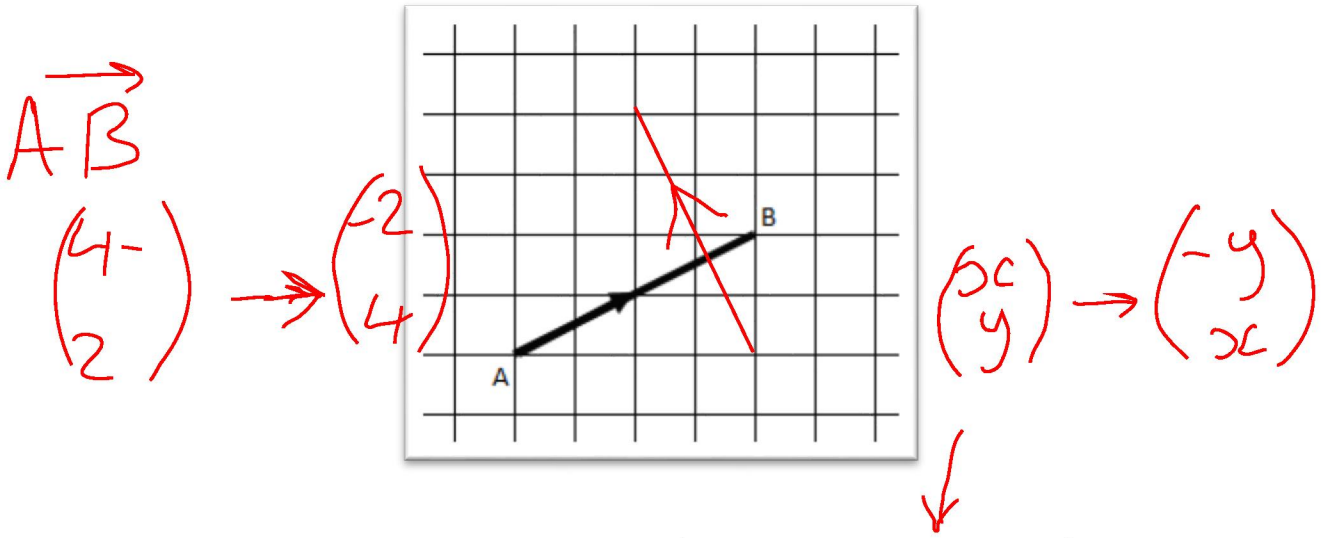
$\begin{pmatrix} -4 \\ -2 \end{pmatrix} + \begin{pmatrix} -2 \\ 10 \end{pmatrix} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}$

$\overrightarrow{CA} = -\overrightarrow{AC} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

(2 Marks)

3) Simple Vectors: Harder

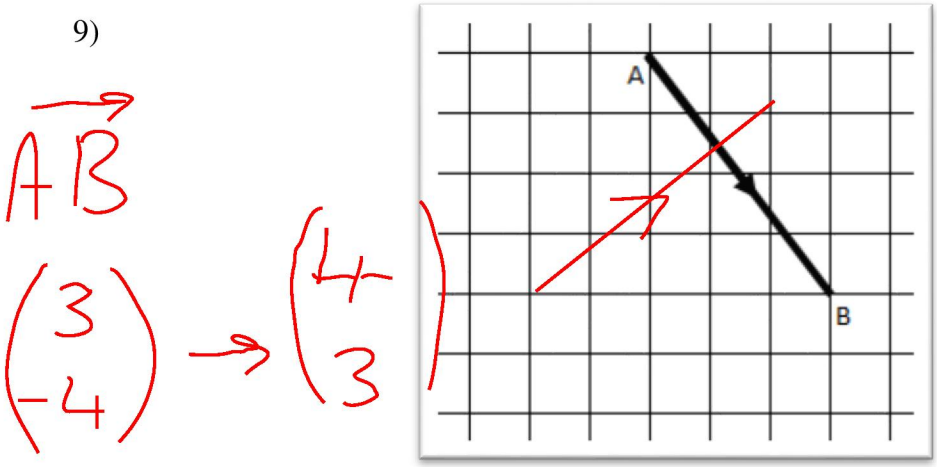
8)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

9)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

4) Algebraic Equivalence: Easier

1) Simplify $\frac{3x^2}{x}$

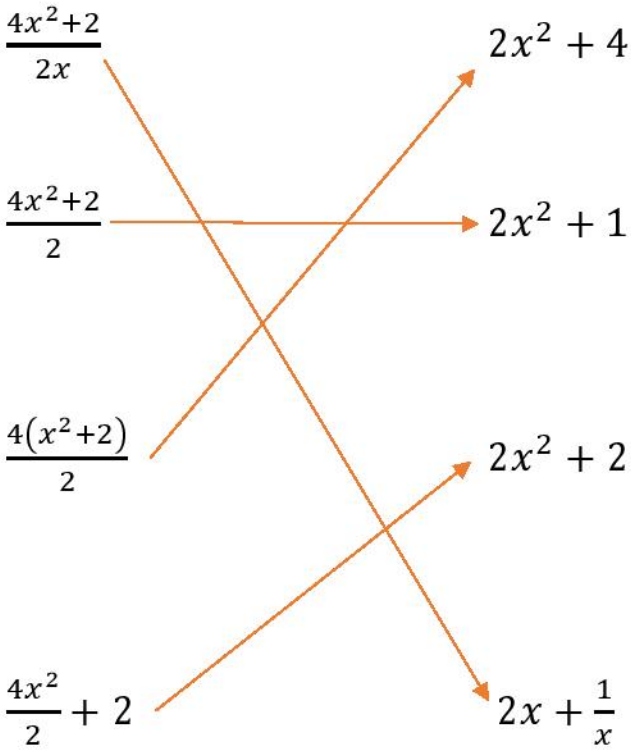
$3x$

_____

(1 Mark)

---

2) Match each of the four expressions on the left hand side with 1 equivalent expression on the right hand side



4) Algebraic Equivalence: Medium

3) Circle the expression that is equivalent to $\frac{3x^2+2}{x}$ where x is not equal to 0

A $3x^3+2$ B $3x+\frac{2}{x}$ C $2x^2+\frac{2}{x}$ D $3x+2$

$$\frac{3x^2+2}{x}$$

$$=\frac{3x^2}{x}+\frac{2}{x}$$

$$=3x+\frac{2}{x}$$

(1 Mark)

---

4) **Two** of these four expressions are equivalent. Circle the two expressions

A $\frac{x}{x+5}$ B $1+\frac{x}{5}$ C $\frac{5+x}{5}$ D $\frac{x^2}{x^2+5}$

(1 mark)

4) Algebraic Equivalence: Harder

5) Fiona tries to simplify this expression

$$\frac{3x}{3+x}$$

She writes

$$\frac{3x}{3}+\frac{3x}{x}$$

$$x+3$$

Explain why Fiona can not rewrite the expression like this

Dividing $3x$ by $3+x$ is not the same as dividing it by 3 and adding it to $\frac{3x}{x}$

Numerical Example

If $x=1$

$$\frac{3x}{3+x}=\frac{3}{4}$$

$$\frac{3x}{3}+\frac{3x}{x}=\frac{3}{3}+\frac{3}{1}=4$$

As you can see, these two expressions are not equal

(1 mark)

---

6) Show that $\frac{2x+5}{1+\frac{2}{x}}$ is equivalent to $\frac{2x^2+5x}{x+2}$

$$\frac{2x+5}{1+\frac{2}{x}}$$

$$=\frac{x(2x+5)}{x(1+\frac{2}{x})}$$

$$=\frac{2x^2+5x}{x+2}$$

(1 mark)

---

5) Drawing Quadratic Graphs: Easier

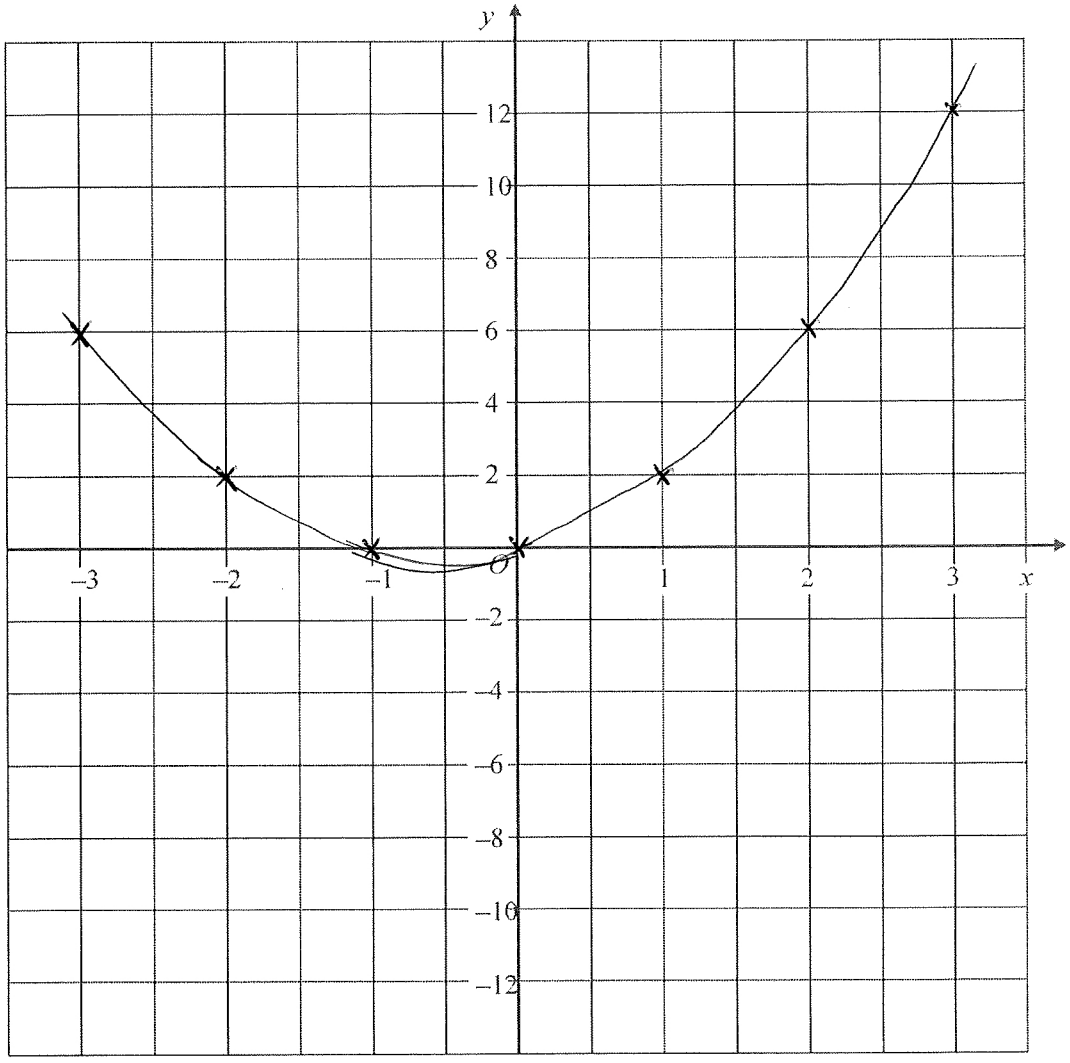
1. (a) Complete the table of values for $y = x^2 + x$.

x	–3	–2	–1	0	1	2	3
y	6	2	0	0	2	6	12

1+1 9+3

(2)

(b) On the grid, draw the graph of $y = x^2 + x$.



(2)

(Total 4 marks)

5) Drawing Quadratic Graphs: Medium

6. (a) Complete the table for $y = x^2 - 3x + 1$

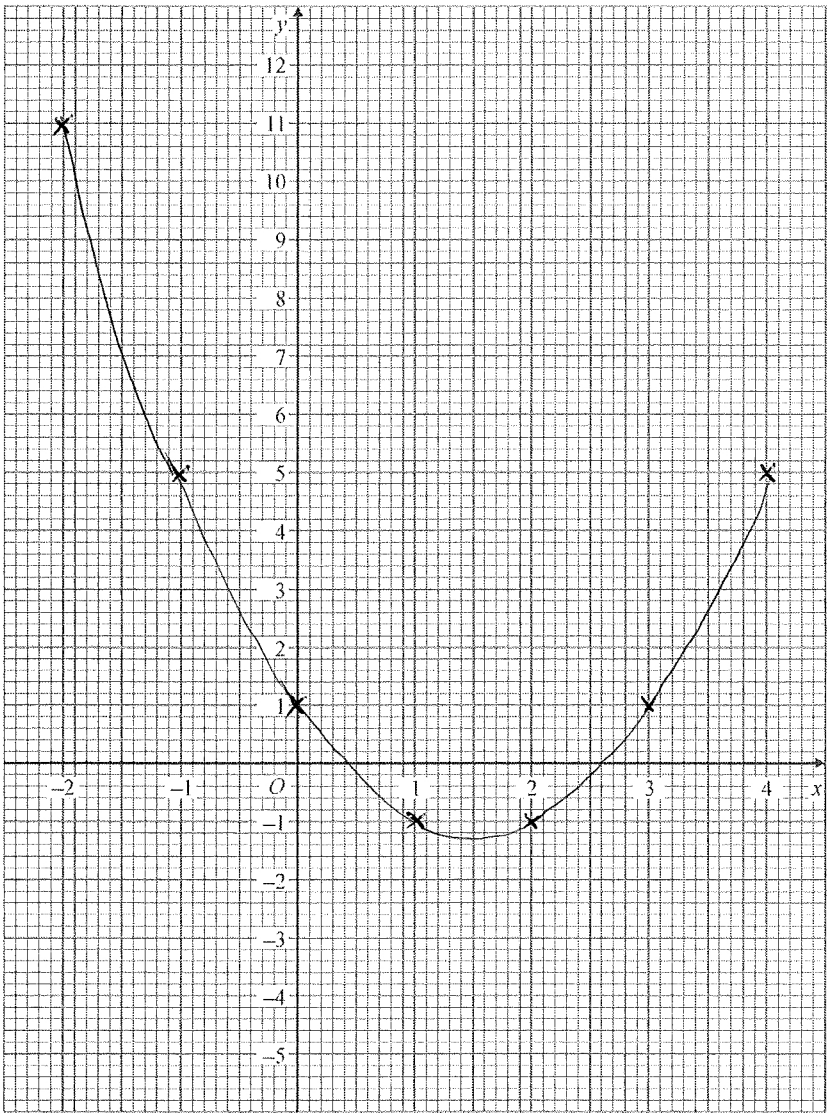
x	−2	−1	0	1	2	3	4
y	11	5	1	−1	−1	1	5

1 + 3 + 1 4 − 6 + 1

(2)

(b) On the grid below, draw the graph of $y = x^2 - 3x + 1$

(2)



(c) Use your graph to find an estimate for the minimum value of y.

$y =$ −1.3

(1)

5) Drawing Quadratic Graphs: Harder

(Total 5 marks)

7. (a) Complete the table of values for $y = x^2 - 3x - 1$

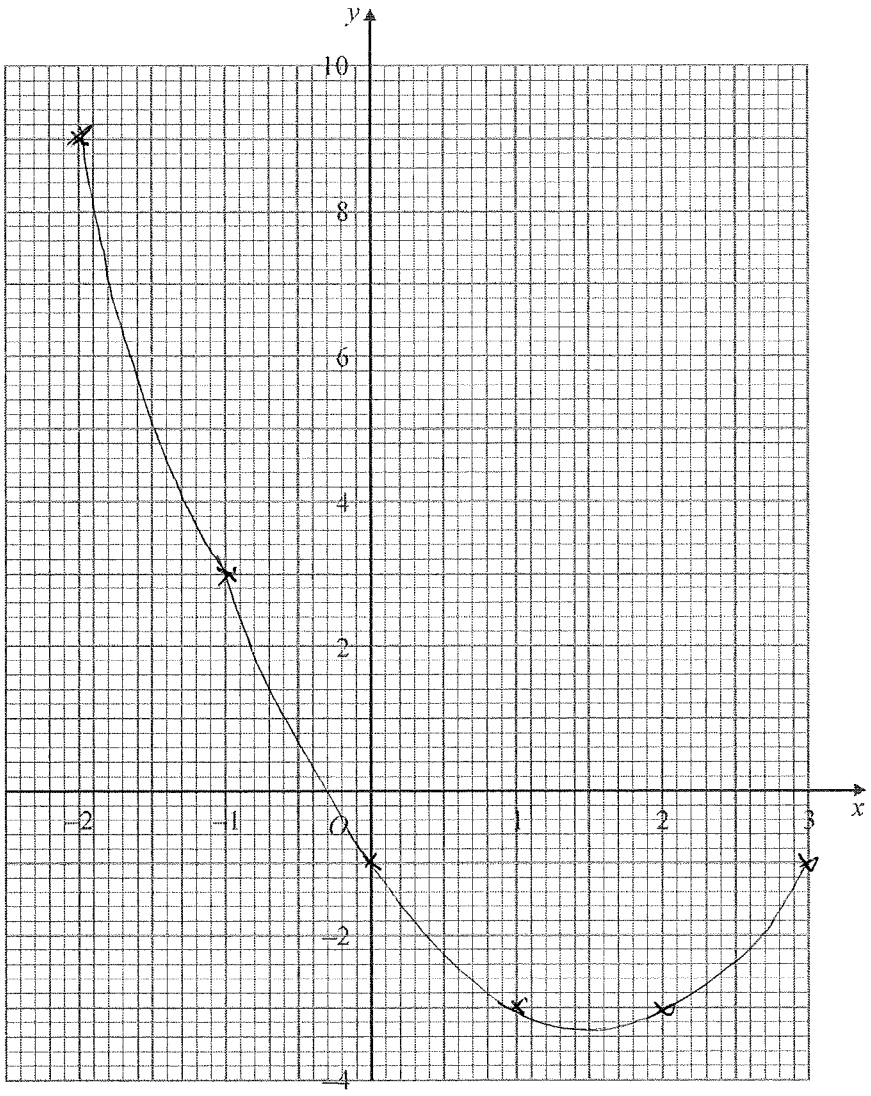
x	−2	−1	0	1	2	3
y	9	3	−1	−3	−3	−1

4+6−1 4−6−1 9−9−1

(2)

(b) On the grid, draw the graph of $y = x^2 - 3x - 1$

(2)



(Total 4 marks)

LEIGH-VALERO Nadia

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	22 from 27	11 from 12	8 from 10	2 from 4	1 from 1	0 from 0
A02 and 3	38 from 53	10 from 14	13 from 13	2 from 8	6 from 11	7 from 7
Total	60 from 80	21 from 26	21 from 23	4 from 12	7 from 12	7 from 7

Your Pinpoint Topics

Topic 1: Solving simple equations with fractions. MW: 135

Topic 2: Speed. Mathswatch Clip: 142

Topic 3: Tree Diagrams. Mathswatch Clip: 151

Topic 4: Simple Vectors. Mathswatch Clip: 174

Topic 5: Non-Calc Trigonometry. Mathswatch Clip: 173

1) Solving simple equations with fractions: Easier

1) Solve $\frac{x}{2} = 10$

$x = 20$

(multiplying both sides by 2)

_____

(1 Mark)

---

2) Solve $\frac{x}{5} = 6$

(multiplying both sides by 5) $x = 30$

_____

(1 Mark)

---

3) Solve $\frac{3x}{4} = 6$

Multiplying by 4 $3x = 24$

Dividing by 3 $x = 8$

$x = 8$

_____

(2 Marks)

---

4) Solve $\frac{2}{3}x = 4$

Multiplying by 3 $2x = 12$

Dividing by 2 $x = 6$

$x = 6$

_____

(2 Marks)

---

1) Solving simple equations with fractions: Medium

5) Solve $\frac{x}{2} + 1 = 9$

Subtracting 1 $\frac{x}{2} = 8$

Multiplying by 2 $x = 16$

$x = 16$

_____

(2 Marks)

---

6) Solve $\frac{x}{3} - 11 = 9$

Adding 11 $\frac{x}{3} = 20$

Multiplying by 3 $x = 60$

$x = 60$

_____

(2 Marks)

---

7) Solve $\frac{3x}{2} - 5 = 9$

Adding 5 $\frac{3x}{2} = 14$

Multiplying by 2 $3x = 28$

Dividing by 3

$x = \frac{28}{3}$

$x = \frac{28}{3}$

_____

(3 Marks)

---

1) Solving simple equations with fractions: Harder

8) Aurora is solving this equation

$$\frac{2x}{3} + 3 = 12$$

Here is her working

$\frac{2x}{3} = 9$ line 1

$2x = 3$ line 2

$x = \frac{3}{2}$ line 3

Explain one mistake Aurora has made

From line 1 to line 2 she has multiplied the right hand side of the equation by 3 but divided the left hand side by 3, she should have multiplied both sides by 3 giving $2x = 27$, then her answer would have been $x = \frac{27}{2}$

(1 Mark)

2) Speed: Easier

1) Pete drove 50 miles in 4 hours
Work out his average speed in miles per hour.

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{50}{4} = \frac{25}{2} = 12.5 \text{ mph}$$

12.5 miles/hour

(2 Marks)

---

2) Dave cycled 8km in 30 minutes.
Work out Dave's average speed in km/h.

30 mins = 0.5 hours

$$\text{speed} = \frac{8}{0.5} = 16 \text{ km/h}$$

16 Km/h

(3 Marks)

---

3) Jess travels 400km at an average speed of 300 km/h.
How long was she travelling for? Give your answer in minutes.

$$s = \frac{d}{t} \quad \text{so} \quad t = \frac{d}{s} = \frac{400}{300} = \frac{4}{3} = 1\tfrac{1}{3} \text{ h}$$

1 h = 60 mins so $\frac{1}{3}$ h = 20 mins

so total time = 60 + 20 = 80 mins

80 minutes

(3 Marks)

---

4) Jeff set off for work at 3pm. He arrived at his destination at 5pm.
If Jeff travelled at a constant speed of 24 Km/h, how far did he travel?

t = 2 hours

$$s = \frac{d}{t} \quad \text{so} \quad d = s \times t = 24 \times 2 = 48 \text{ km}$$

48 Km

(2 Marks)

---

2) Speed: Medium

Pete needs to catch a ferry.

Pete leaves his home and drives

10 miles towards the motorway

180 miles on the motorway

15 miles from the motorway to the ferry port

Pete

Takes 20 minutes to get to the motorway

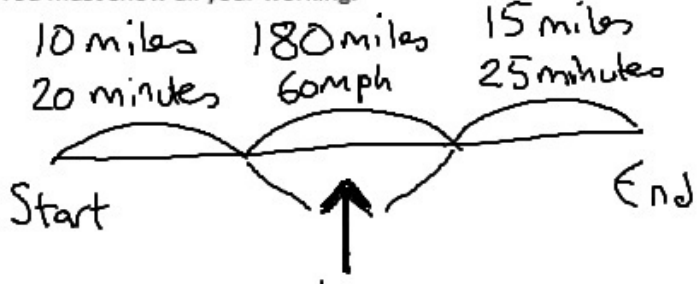
Drives at an average speed of 60mph whilst on the motorway

Takes 25 minutes to get from the motorway to the ferry port.

Pete has to arrive at the ferry port no later than midday.

What is the latest time Pete can leave his house?

You must show all your working.



$T = D/S$

$T = 180/60 = 3$ hours

Total time

3 hours

25 minutes

20 minutes +

3hrs 45 mins

Midday = 12:00pm

3hrs 45 mins

Answer = 8:15am

2) Speed: Harder

Abigail is on a bus going into the city.

The bus picks her up and drives

4 miles towards a motorway

45 miles on the motorway

6 miles from the motorway to the city bus depot

The bus

Takes 10 minutes to get to the main road

Drives at an average speed of 60mph whilst on the motorway

Takes 15 minutes to get from the motorway to the bus depot

Abigail gets on the bus at 10:19am. What time will she get off the bus?

You must show all your working.

$T = D/S$

$T = 45/60 = \frac{3}{4}$

$= 45$mins

Total time taken

45
15
10
70 mins
or 1hr 10mins

10:19 + 1hr 10mins

11:29am

3) Tree Diagrams: Easier

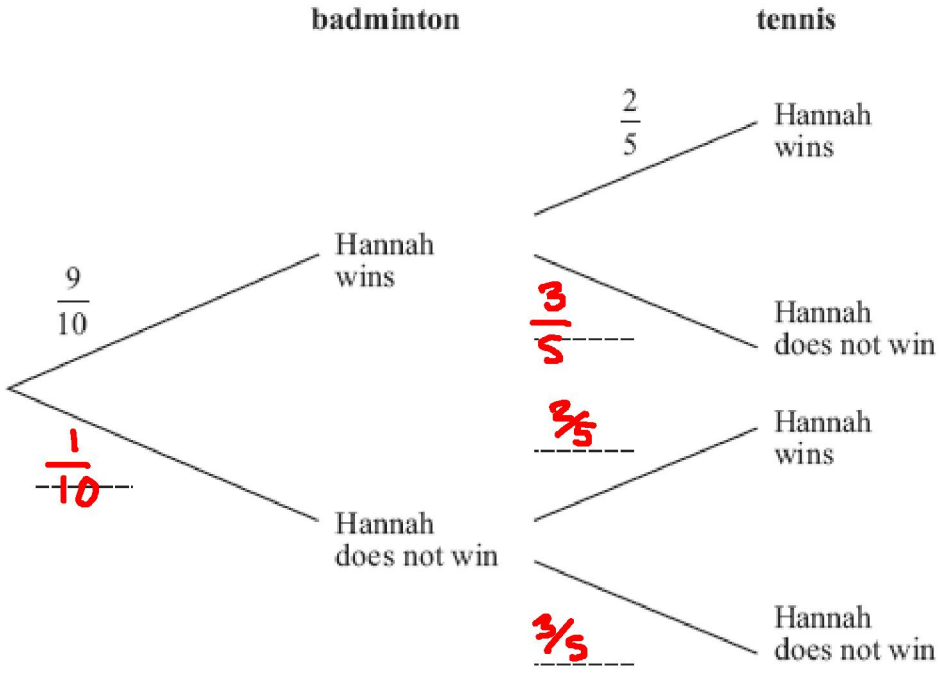
1. Hannah is going to play one badminton match and one tennis match.

The probability that she will win the badminton match is $\frac{9}{10}$

The probability that she will win the tennis match is $\frac{2}{5}$

(a) Complete the probability tree diagram.

(2)



(b) Work out the probability that Hannah will win **both** matches.

(2)

$P(W,W) = \frac{9}{10} \times \frac{2}{5} = \frac{18}{50}$

$\frac{18}{50}$

.....

(4 marks)

3) Tree Diagrams: Medium

6. Here are seven tiles.

Jim takes at random a tile.
He does **not** replace the tile.

Jim then takes at random a second tile.

(a) Calculate the probability that both the tiles Jim takes have the number 1 on them.

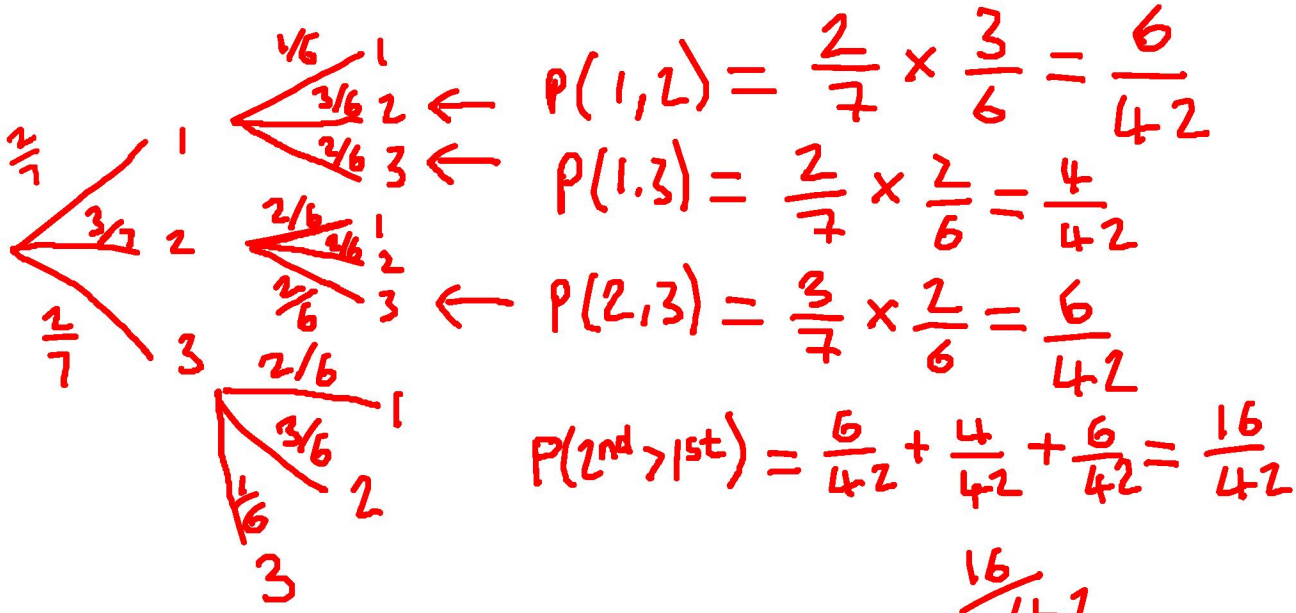
$\frac{2}{7} \times \frac{1}{6} = \frac{2}{42}$

$\frac{2}{42}$

.....

(2)

(b) Calculate the probability that the number on the second tile Jim takes is greater than the number on the first tile he takes.



$\frac{16}{42}$

.....

(3)

(5 marks)

3) Tree Diagrams: Harder

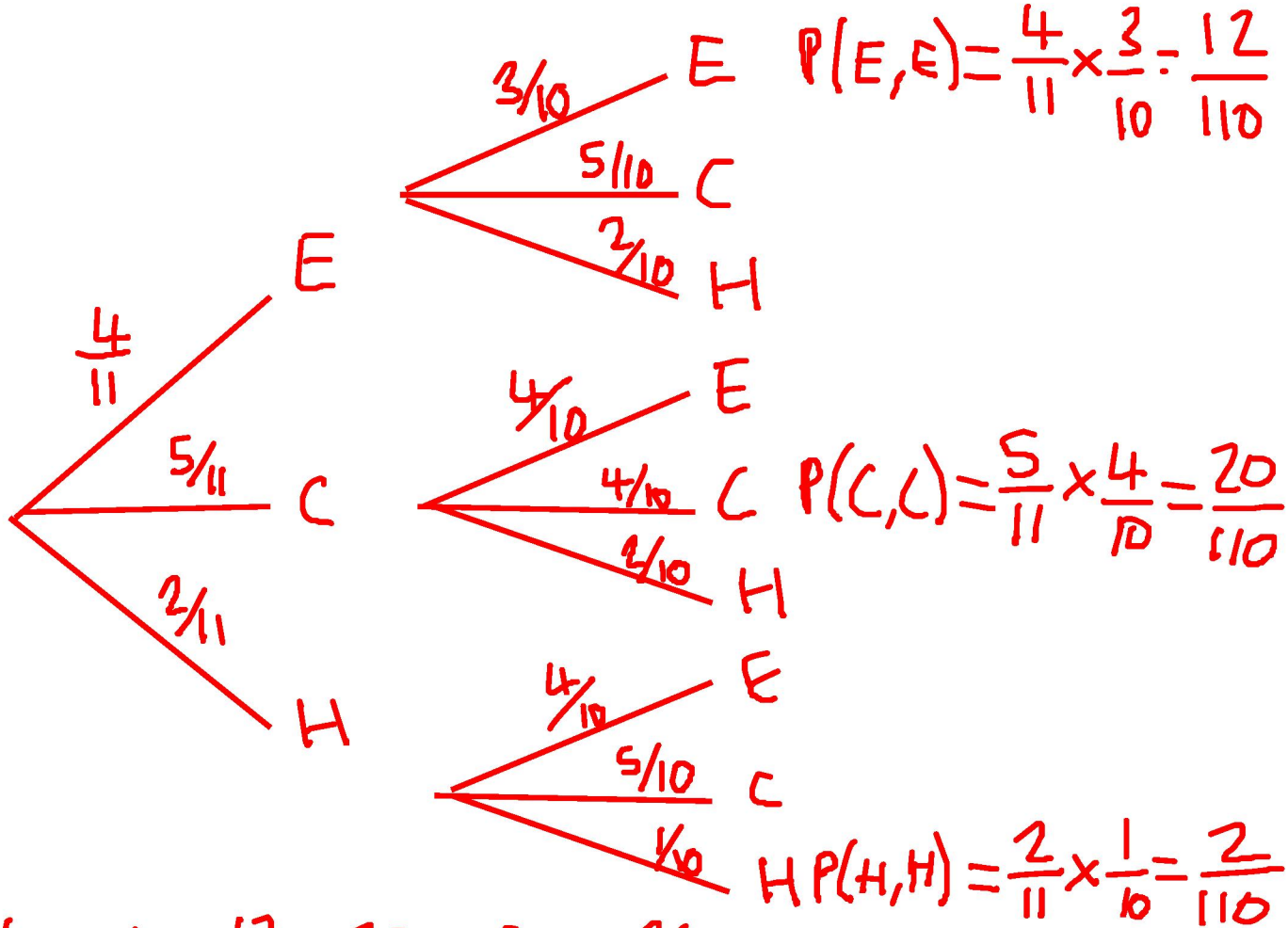
7. There are three different types of sandwiches on a shelf.

There are

4 egg sandwiches,
5 cheese sandwiches
and 2 ham sandwiches.

Erin takes at random 2 of these sandwiches.

Work out the probability that she takes 2 different types of sandwiches.



$P(\text{same}) = \frac{12}{110} + \frac{20}{110} + \frac{2}{110} = \frac{34}{110}$

$P(\text{diff}) = 1 - P(\text{same})$

$P(\text{diff}) = 1 - \frac{34}{110} = \frac{76}{110}$

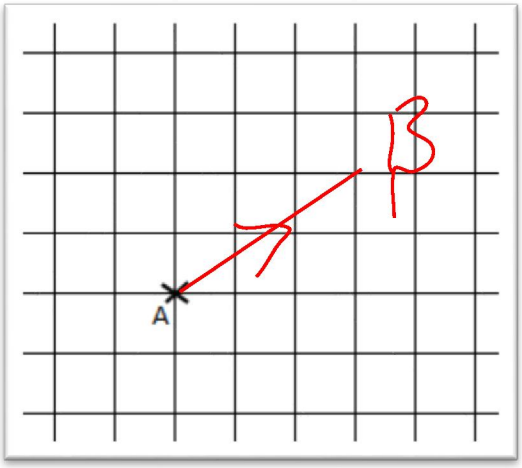
$\frac{76}{110}$

.....

(5 marks)

4) Simple Vectors: Easier

3)

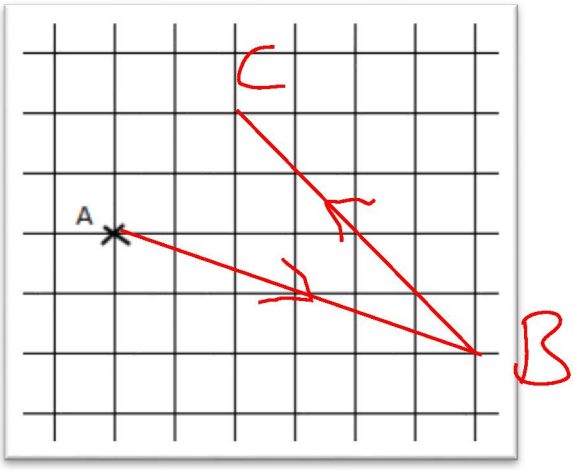


On the grid, draw the Vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ from Point A.

Label the new point B.

(1 Mark)

4)



a) On the grid, draw the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ from Point A

Label the new point B.

(1 Mark)

bi) On the grid draw the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ from Point B

Label the new point C

ii) State the vector $\overrightarrow{AC}$ $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$ (2 Marks)

4) Simple Vectors: Medium

5) Vector $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 11 \end{pmatrix}$

_____

(2 Marks)

6) Vector $\overrightarrow{AB} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$

_____

(2 Marks)

7) Vector $\overrightarrow{AB} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 10 \end{pmatrix}$

State Vector $\overrightarrow{CA}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

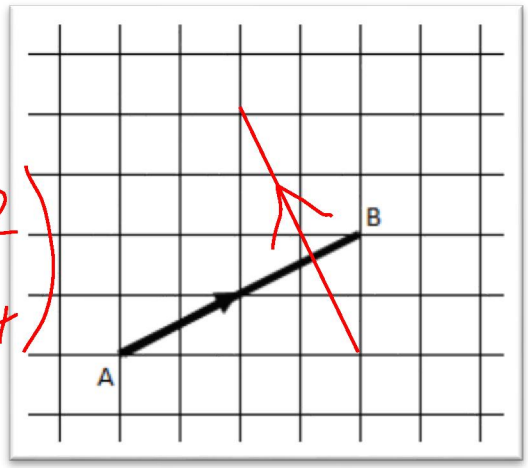
$\begin{pmatrix} -4 \\ -2 \end{pmatrix} + \begin{pmatrix} -2 \\ 10 \end{pmatrix} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}$

$\overrightarrow{CA} = -\overrightarrow{AC} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

(2 Marks)

4) Simple Vectors: Harder

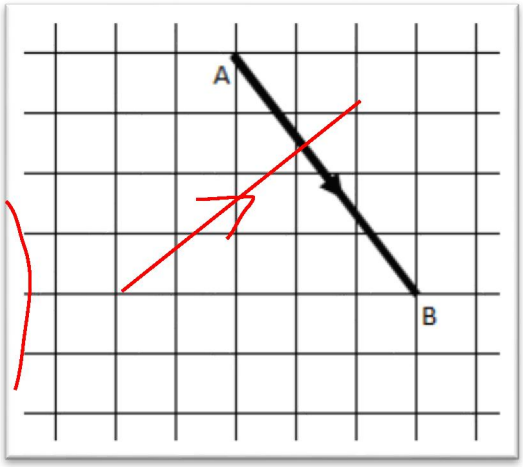
8)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

9)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

5) Non-Calc Trigonometry: Easier

Solutions for Question 1:

a) $\cos 30° = \frac{\sqrt{3}}{2}$

b) $\tan 60° = \sqrt{3}$

c) $\sin 45° = \frac{\sqrt{2}}{2}$

Solutions for Question 2:

a) $\tan 45° = 1$

b) $\cos 45° = \frac{\sqrt{2}}{2}$

c) $\sin 60° = \frac{\sqrt{3}}{2}$

5) Non-Calc Trigonometry: Medium

Solution for Question 3:

$\cos 60° = \frac{A}{H}$

$\cos 60° = \frac{6}{x}$

If $\cos 60° = 0.5$

$0.5 = \frac{6}{x}$

$x = 12cm$

Solution for Question 4:

$\tan 30° = \frac{O}{A}$

$\tan 30° = \frac{y}{9}$

If $\tan 30° = \frac{\sqrt{3}}{3}$

$\frac{\sqrt{3}}{3} = \frac{y}{9}$

$y = \frac{9\sqrt{3}}{3} cm$

$y = 3\sqrt{3}\, cm$

5) Non-Calc Trigonometry: Harder

Solution for Question 5:

$$\sin 30° = \frac{6.1}{x}$$

$$x = \frac{6.1}{\sin 30°}$$

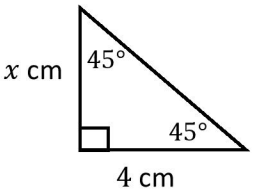
$$x = \frac{6.1}{0.5}$$

$$x = 12.2\ cm$$

Solution for Question 6:

Cut triangle in half

Let x equal the height of the triangle



$$\tan 45° = \frac{x}{4}$$

$$x = 4\ x\ \tan 45$$

$$x = 4cm\text{m}$$

Area of triangle: $\frac{1}{2} \times 8 \times 4$ ...

Area of triangle = 16cm^2

LEIGH-VALERO Tori

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	15 from 27	6 from 12	7 from 10	2 from 4	0 from 1	0 from 0
A02 and 3	35 from 53	8 from 14	8 from 13	5 from 8	8 from 11	6 from 7
Total	50 from 80	14 from 26	15 from 23	7 from 12	8 from 12	6 from 7

Your Pinpoint Topics

Topic 1: Solving simple equations with fractions. MW: 135

Topic 2: Understanding Number. Mathswatch Clip: NA

Topic 3: Speed. Mathswatch Clip: 142

Topic 4: Tree Diagrams. Mathswatch Clip: 151

Topic 5: Estimation and Reasoning. Mathswatch Clip: 91

1) Solving simple equations with fractions: Easier

1) Solve $\frac{x}{2} = 10$

$x = 20$

(multiplying both sides by 2)

_____

(1 Mark)

---

2) Solve $\frac{x}{5} = 6$

(multiplying both sides by 5) $x = 30$

_____

(1 Mark)

---

3) Solve $\frac{3x}{4} = 6$

Multiplying by 4 $3x = 24$

Dividing by 3 $x = 8$

$x = 8$

_____

(2 Marks)

---

4) Solve $\frac{2}{3}x = 4$

Multiplying by 3 $2x = 12$

Dividing by 2 $x = 6$

$x = 6$

_____

(2 Marks)

---

1) Solving simple equations with fractions: Medium

5) Solve $\frac{x}{2} + 1 = 9$

Subtracting 1 $\frac{x}{2} = 8$

Multiplying by 2 $x = 16$

$x = 16$

(2 Marks)

---

6) Solve $\frac{x}{3} - 11 = 9$

Adding 11 $\frac{x}{3} = 20$

Multiplying by 3 $x = 60$

$x = 60$

(2 Marks)

---

7) Solve $\frac{3x}{2} - 5 = 9$

Adding 5 $\frac{3x}{2} = 14$

Multiplying by 2 $3x = 28$

Dividing by 3

$x = \frac{28}{3}$

$x = \frac{28}{3}$

(3 Marks)

---

1) Solving simple equations with fractions: Harder

8) Aurora is solving this equation

$$\frac{2x}{3} + 3 = 12$$

Here is her working

$\frac{2x}{3} = 9$ line 1

$2x = 3$ line 2

$x = \frac{3}{2}$ line 3

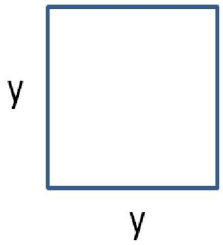
Explain one mistake Aurora has made

From line 1 to line 2 she has multiplied the right hand side of the equation by 3 but divided the left hand side by 3, she should have multiplied both sides by 3 giving $2x = 27$, then her answer would have been $x = \frac{27}{2}$

(1 Mark)

2) Understanding Number: Easier

1. Jim is looking at the area and lengths of squares.



Jim considers a square with area $9m^2$.

Jim works out the length of the square as follows:

$$y^2 = 9$$

$$y = \sqrt{9}$$

$$y = 3cm$$

Jim considers another square with a **different** area.

Please tick below:

	This method will **always** give an answer which is a whole number
/	This method will **sometimes** give an answer which is a whole number
	This method will **never** give an answer which is a whole number

Show working to support your answer

Any area which is a square number will give a whole number using this method

e.g. $y^2 = 16$ gives $y = \sqrt{16} = 4$ cm

Any area that is a non-square number won't give a whole number

e.g. $y^2 = 10$ gives $y = \sqrt{10} = 3.162\ldots$ cm

(3 marks)

2) Understanding Number: Medium

2.a) Anne puts a number in her calculator and squares her number. The number gets a lot bigger.

Anne says "if you square a number it will **always** get bigger".

Please tick below:

	Anne is correct
/	Anne is **not** correct

Show working to support your answer

If you square a number that is between 0 and 1 it will become smaller

e.g. $0.5^2 = 0.25$

(3 marks)

b) Pete says "if you square a number it will **always** be positive".

Please tick below:

	Pete is correct
/	Pete is **not** correct

Show working to support your answer

If you square **zero** the answer is zero, a non-positive number.

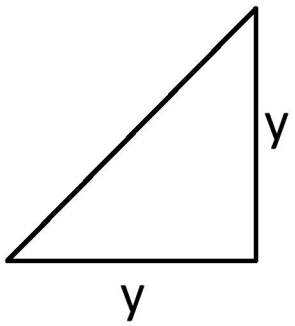
$$0^2 = 0 \times 0 = 0$$

(3 marks)

2) Understanding Number: Harder

3.a) Amir cuts a square in half along the diagonal to produce a right angled triangle.

It has a length, y, which is a whole number.



Amir works out the **area** of the triangle.

Please tick below:

	The area **must** be a whole number.
/	The area will **sometimes** be a whole number.

Show working to support your answer

If y = 3 then the area is $(3 \times 3) \div 2 = 9 \div 2 = 4.5$ a decimal

If y = 4 then the area is $(4 \times 4) \div 2 = 16 \div 2 = 8$ a whole number

(3 marks)

b) Amir is about the work out the **hypotenuse** of the triangle.

Amir says "The hypotenuse of the triangle will **always** be a whole number".

Show that Amir is wrong.

Pythagoras' Theorem: $a^2 + b^2 = c^2$

If $a = 2$ and $b = 3$ then

$$c^2 = 2^2 + 3^2 = 4 + 9 = 13$$

$$c = \sqrt{13} = 3.605 \ldots$$

So the hypotenuse is not a whole number in this case

(3 marks)

3) Speed: Easier

1) Pete drove 50 miles in 4 hours
Work out his average speed in miles per hour.

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{50}{4} = \frac{25}{2} = 12.5 \text{ mph}$$

12.5 miles/hour

(2 Marks)

---

2) Dave cycled 8km in 30 minutes.
Work out Dave's average speed in km/h.

30 mins = 0.5 hours

$$\text{speed} = \frac{8}{0.5} = 16 \text{ km/h}$$

16 Km/h

(3 Marks)

---

3) Jess travels 400km at an average speed of 300 km/h.
How long was she travelling for? Give your answer in minutes.

$$s = \frac{d}{t} \quad \text{so} \quad t = \frac{d}{s} = \frac{400}{300} = \frac{4}{3} = 1\tfrac{1}{3} \text{ h}$$

1 h = 60 mins so $\frac{1}{3}$ h = 20 mins

so total time = 60 + 20 = 80 mins

80 minutes

(3 Marks)

---

4) Jeff set off for work at 3pm. He arrived at his destination at 5pm.
If Jeff travelled at a constant speed of 24 Km/h, how far did he travel?

t = 2 hours

$$s = \frac{d}{t} \quad \text{so} \quad d = s \times t = 24 \times 2 = 48 \text{ km}$$

48 Km

(2 Marks)

---

3) Speed: Medium

Pete needs to catch a ferry.

Pete leaves his home and drives

10 miles towards the motorway

180 miles on the motorway

15 miles from the motorway to the ferry port

Pete

Takes 20 minutes to get to the motorway

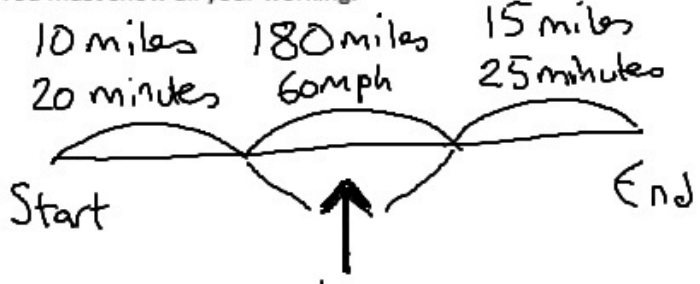
Drives at an average speed of 60mph whilst on the motorway

Takes 25 minutes to get from the motorway to the ferry port.

Pete has to arrive at the ferry port no later than midday.

What is the latest time Pete can leave his house?

You must show all your working.



T = D/S

T = 180/60 = 3 hours

Total time

3 hours

25 minutes

20 minutes +

3hrs 45 mins

Midday = 12:00pm

3hrs 45 mins

Answer = 8:15am

3) Speed: Harder

Abigail is on a bus going into the city.

The bus picks her up and drives

4 miles towards a motorway

45 miles on the motorway

6 miles from the motorway to the city bus depot

The bus

Takes 10 minutes to get to the main road

Drives at an average speed of 60mph whilst on the motorway

Takes 15 minutes to get from the motorway to the bus depot

Abigail gets on the bus at 10:19am. What time will she get off the bus?

You must show all your working.

4miles 10mins | 45mins 60mph | 6miles 15mins

Start → End

$T = D/S$

$T = 45/60 = \frac{3}{4}$

$= 45$mins

Total time taken

45
15
10

70mins
or 1hr 10mins

10:19 + 1hr 10mins

11:29am

4) Tree Diagrams: Easier

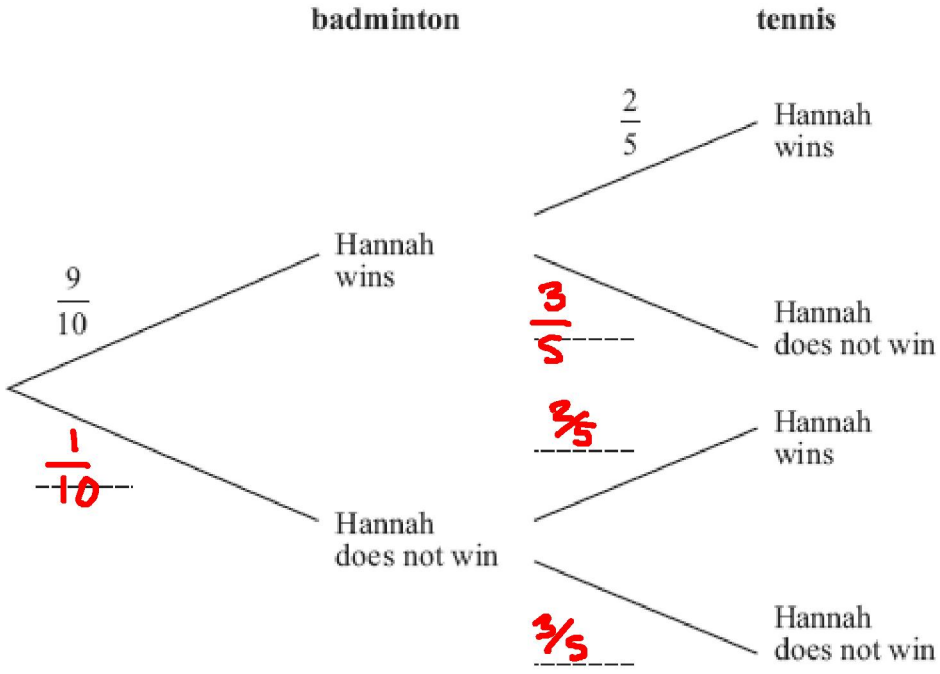
1. Hannah is going to play one badminton match and one tennis match.

The probability that she will win the badminton match is $\frac{9}{10}$

The probability that she will win the tennis match is $\frac{2}{5}$

(a) Complete the probability tree diagram.

(2)



(b) Work out the probability that Hannah will win **both** matches.

(2)

$P(W,W) = \frac{9}{10} \times \frac{2}{5} = \frac{18}{50}$

$\frac{18}{50}$

.....

(4 marks)

4) Tree Diagrams: Medium

6. Here are seven tiles.

Jim takes at random a tile.
He does **not** replace the tile.

Jim then takes at random a second tile.

(a) Calculate the probability that both the tiles Jim takes have the number 1 on them.

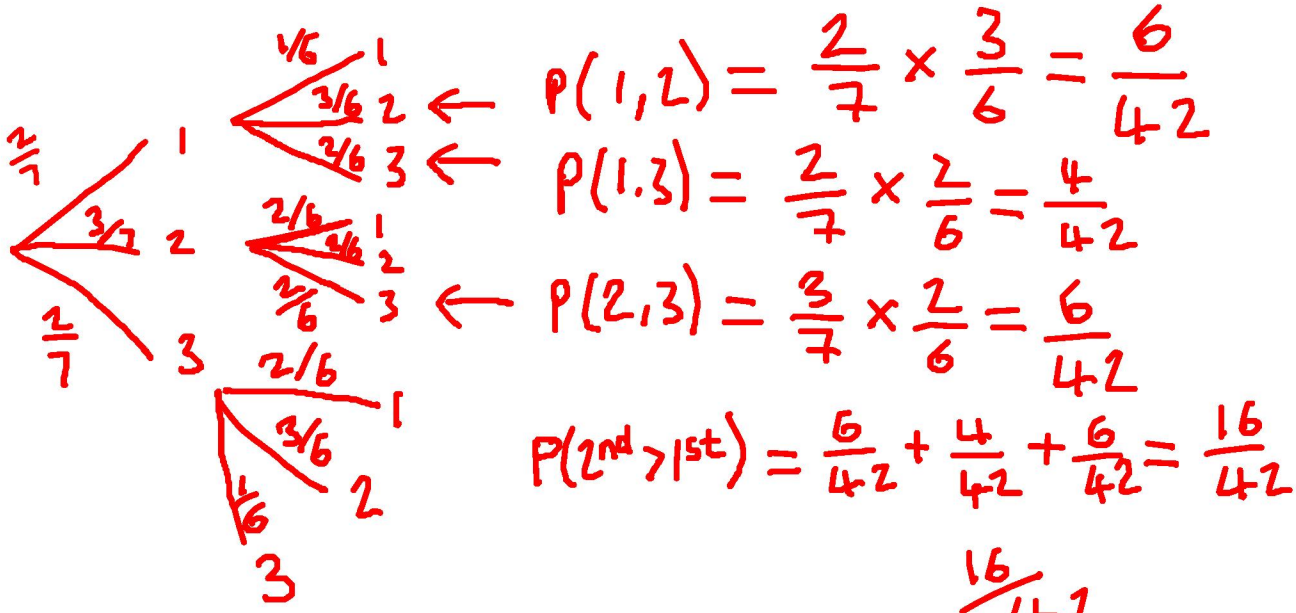
$\frac{2}{7} \times \frac{1}{6} = \frac{2}{42}$

$\frac{2}{42}$

.....

(2)

(b) Calculate the probability that the number on the second tile Jim takes is greater than the number on the first tile he takes.



$P(1,2) = \frac{2}{7} \times \frac{3}{6} = \frac{6}{42}$

$P(1,3) = \frac{2}{7} \times \frac{2}{6} = \frac{4}{42}$

$P(2,3) = \frac{3}{7} \times \frac{2}{6} = \frac{6}{42}$

$P(2^{nd} > 1^{st}) = \frac{6}{42} + \frac{4}{42} + \frac{6}{42} = \frac{16}{42}$

$\frac{16}{42}$

.....

(3)

(5 marks)

4) Tree Diagrams: Harder

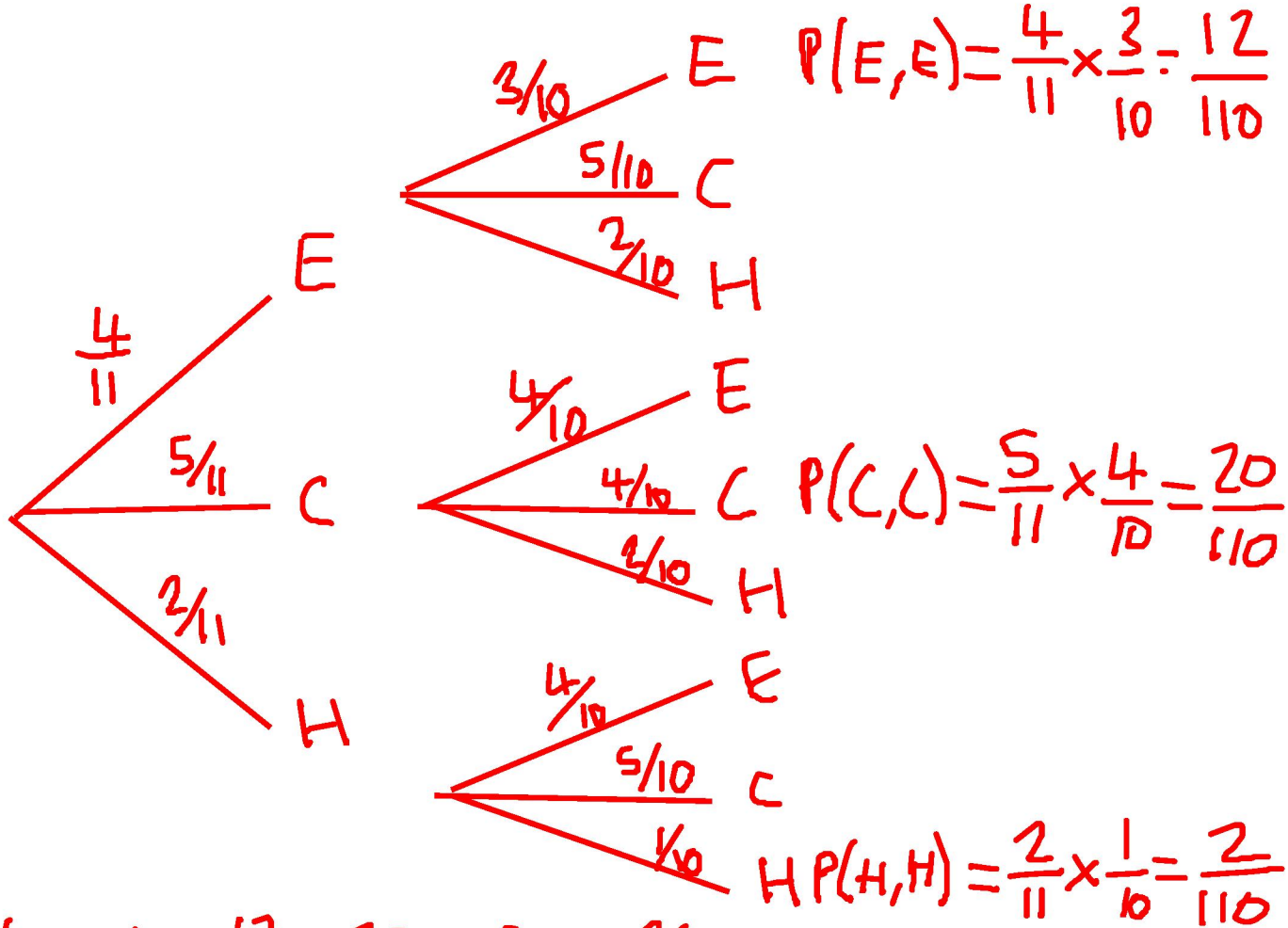
7. There are three different types of sandwiches on a shelf.

There are

4 egg sandwiches,
5 cheese sandwiches
and 2 ham sandwiches.

Erin takes at random 2 of these sandwiches.

Work out the probability that she takes 2 different types of sandwiches.



$P(\text{same}) = \frac{12}{110} + \frac{20}{110} + \frac{2}{110} = \frac{34}{110}$

$P(\text{diff}) = 1 - P(\text{same})$

$P(\text{diff}) = 1 - \frac{34}{110} = \frac{76}{110}$

$\frac{76}{110}$

.....

(5 marks)

5) Estimation and Reasoning: Easier

1) Find an estimate for $\frac{423 \times 69.5}{0.52}$

$$\frac{400 \times 70}{0.5}$$

$$= \frac{28000}{0.5}$$

$= 56000$

(2 Marks)

---

2) a) Estimate the value of $\sqrt{2.9 + 9.6 + 1.98}$

$$\sqrt{3 + 10 + 2}$$

$$= \sqrt{15}$$

3.9

b) Explain if your answer to a) is an overestimate or underestimate

All numbers have been rounded up so it is an overestimate

(3 Marks)

---

3) A water bottling plant has 967 machines, each machine filters on average 2912 litres per day. The water is then put into ½ litre bottles. Estimate how many bottles the plant fills in one day

$$\frac{1000 \times 3000}{0.5}$$

$$\frac{3000000}{0.5}$$

6000000

(2 marks)

5) Estimation and Reasoning: Medium

4) A litre of petrol costs £1.07, Sally's car can travel 9.8Km on one litre of petrol. Sally wants to travel from Manchester to Stoke. The distance from Manchester to Stoke is 71.4km. Estimate the cost of Sally's journey from Manchester to Stoke. Show your working.

$$\frac{70}{10} \times 1$$

£7_____

(2 Marks)

---

5) Jeremy organised a charity celebrity football match. Each ticket for the football match cost £20.05. Jeremy sold 507 tickets. Jeremy had to pay costs of £2980 He gave all money left to the charity.

a) Work out an estimate for the amount of money Jeremy gave to the charity.

$$20 \times 500 = 10000$$

$$10000 - 3000 = £7000$$

£7000_____

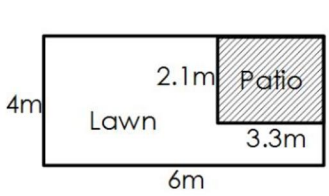
b) Is your answer to (a) an underestimate or an overestimate?
Give a reason for your answer.

An underestimate as the amount of money he made has been rounded down and the cost is rounded up so the difference will be smaller than the actual difference

(4 Marks)

---

6) Elizabeth wants to lay new turf on her lawn. Below is a diagram to show the measurements of the lawn. Each roll of turf covers $3m^2$.



a) Work out an estimate for how many rolls she will need. You must show all working for how you reached your estimate.

Area of Lawn = $(4 \times 6) - (2 \times 3) = 18m^2$

$$\frac{18}{3} = 6\ rolls$$

b) By considering your estimate and no further calculations explain if Elizabeth will have enough rolls to cover the lawn, assuming no turf is wasted

The area of the lawn is actually bigger than estimated as the area of the patio is smaller than estimated as both numbers are rounded down. Since we subtracted a smaller number than the actual number, our estimate is an overestimate so Elizabeth will have enough rolls to cover the lawn.

(3 Marks)

5) Estimation and Reasoning: Harder

7) a) The population of Italy is 59715625. It has an area of 301230Km^2. Population density can be worked out using the formula below. Work out an estimate for the population density of Italy.

$$Population\ Density = \frac{Population}{Area}$$

$$Population\ Density = \frac{60000000}{300000} = 200 population/km^2$$

$200 population/km^2$

b) Explain whether Italy is more densely populated than your estimate or less densely populated.

It is actually less densely populated as the estimate is an overestimate. The population has been rounded up and the area has been rounded down so when we divide an overestimate by an underestimate it becomes even bigger.

(3 Marks)

8) The mass of the Earth is $5.98 \times 10^{24} kg$. Jupiter's mass is 318 times larger than Earth's. Estimate the mass of Jupiter. Give your estimate in standard form. You must show how you reached your estimate.

$$6 \times 10^{24} \times 3 \times 10^{2}$$

$$= 18 \times 10^{26}$$

$$= 1.8 \times 10^{27}\text{Kg}$$

$= 1.8 \times 10^{27}$Kg

(3 Marks)

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9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	18 from 27	9 from 12	7 from 10	2 from 4	0 from 1	0 from 0
A02 and 3	25 from 53	8 from 14	7 from 13	4 from 8	3 from 11	3 from 7
Total	43 from 80	17 from 26	14 from 23	6 from 12	3 from 12	3 from 7

Your Pinpoint Topics

Topic 1: Simple Fibonacci Sequences. Mathswatch Clip: 141

Topic 2: Understanding Number. Mathswatch Clip: NA

Topic 3: Simple Vectors. Mathswatch Clip: 174

Topic 4: Estimation and Reasoning. Mathswatch Clip: 91

Topic 5: Algebraic Equivalence. Mathswatch Clip: NA

1) Simple Fibonacci Sequences: Easier

1. To find the next term in a Fibonacci sequence, you find the sum of the 2 previous terms.

   1 1 2 3 5 8

   a) Find the next term in this sequence $5 + 8$

   13

   (1 mark)

   b) Find the 9th term of this sequence $8 + 13 = 21,\ 21 + 13 = 34$

   34

   (1 mark)

---

2. Below are the first 5 terms of a Fibonacci sequence.

   4 5 9 14 23

   a) Find the next term in this sequence $14 + 23 = 37$ 37

   (1 mark)

   b) Find the 8th term of this sequence $37 + 23 = 60,\ 60 + 27 = 97$

   97

   (1 mark)

---

3. Below are the first 5 terms of a Fibonacci sequence.

   2 4 6 10 16

   a) Find the next term in this sequence $10 + 16 = 26$

   26

   (1 mark)

   b) Will 68 be in this sequence?

   $26 + 16 = 42,\ 42 + 26 = 68$ Yes

   (1 mark)

---

4. The sequence below is a Fibonacci sequence

   2 3 5 8 13

   a) Find the missing number from the sequence

   $8 - 3 = 5$ 5

   (1 mark)

   b) Find the next term in this sequence $13 + 8 = 21$

   21

   (1 mark)

1) Simple Fibonacci Sequences: Medium

5. Here is a Fibonacci-type sequence

2 _5_ _7_ 12 19

Find the 2 missing terms

$19 - 12 = 7,\ 12 - 7 = 5$

_____5___ and ____7___

(2 marks)

---

6. Here are the fourth and fifth terms of a Fibonacci-type sequence

_3_ _7_ _10_ 17 27

Show that the first term is 3

$27 - 17 = 10,$

$17 - 10 = 7,$

$10 - 7 = 3$

(1 mark)

---

7. The first 3 terms of a Fibonacci sequence are

$1 \qquad x \qquad x + 1$

a) Write an expression for the 4^{th} term

$x + (x + 1) = 2x + 1$

_____$2x + 1$___

(1 mark)

b) If the 5^{th} term is 11, find the value of x

5^{th} term: $(2x + 1) + (x + 1) = 3x + 2 = 11$

$3x = 9$

_____$x = 3$____

(2 marks)

1) Simple Fibonacci Sequences: Harder

8. The first three terms of a Fibonacci sequence are

$$x \quad y \quad x+y$$

a) Show that the 5th term of this sequence is $2x+3y$

4^{th} term: $y+(x+y)=x+2y$

5^{th} term: $(x+y)+(x+2y)=2x+3y$ **(2 marks)**

Given that the 3rd term is 5 and the 5th term is 14

b) Find the value of x and the value of y

$x+y=5$ (A) $\quad 2x+3y=14$ (B)

$2\times$(A): $2x+2y=10$ (C) $\quad x =$ 1

(B)- (C): $y=4$, sub into (A): $x+4=5$, $x=1$ $\quad y =$ 4

(3 marks)

---

9. Here are the first and third terms of a Fibonacci sequence

$$p \quad q-p \quad q \quad 2q-p \quad 3q-p$$

a) Write an expression, in terms of p and q, for the second term

$q-p$

(1 mark)

b) Write an expression, in terms of p and q, for the fifth term

4^{th} term: $(q-p)+q=2q-p$

5^{th} term: $(2q-p)+q=3q-p$ $\quad 3q-p$

(1 mark)

---

10. The first and third terms of a Fibonacci sequence are

$$a \quad b+1-a \quad b+1 \quad 2b+2-a \quad 3b+3-a$$

a) Write an expression, in terms of a and b, for the fifth term

2^{nd} term: $(b+1)-a=b+1-a$

4^{th} term: $(b+1)+(b+1-a)=2b+2-a$

5^{th} term: $(2b+2-a)+(b+1)=3b+3-a$ $\quad 3b+3-a$

(2 marks)

Given that the second term is 9 and the fifth term is 35

b) Find the value of a and the value of b

$b+1-a=9 \quad \Rightarrow b-a=8$ (A)

$3b+3-a=35 \Rightarrow 3b-a=32$ (B)

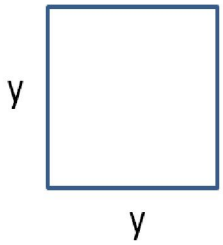
(B) – (A): $2b=24 \Rightarrow b=12$ $\quad a =$ 4

Sub into (A): $12-a=8 \Rightarrow a=4$ $\quad b =$ 12

(3 marks)

2) Understanding Number: Easier

1. Jim is looking at the area and lengths of squares.



Jim considers a square with area $9m^2$.

Jim works out the length of the square as follows:

$$y^2 = 9$$

$$y = \sqrt{9}$$

$$y = 3cm$$

Jim considers another square with a **different** area.

Please tick below:

	This method will **always** give an answer which is a whole number
/	This method will **sometimes** give an answer which is a whole number
	This method will **never** give an answer which is a whole number

Show working to support your answer

Any area which is a square number will give a whole number using this method

e.g. $y^2 = 16$ gives $y = \sqrt{16} = 4$ cm

Any area that is a non-square number won't give a whole number

e.g. $y^2 = 10$ gives $y = \sqrt{10} = 3.162\ldots$ cm

(3 marks)

2) Understanding Number: Medium

2.a) Anne puts a number in her calculator and squares her number. The number gets a lot bigger.

Anne says "if you square a number it will **always** get bigger".

Please tick below:

	Anne is correct
/	Anne is **not** correct

Show working to support your answer

If you square a number that is between 0 and 1 it will become smaller

e.g. $0.5^2 = 0.25$

(3 marks)

b) Pete says "if you square a number it will **always** be positive".

Please tick below:

	Pete is correct
/	Pete is **not** correct

Show working to support your answer

If you square **zero** the answer is zero, a non-positive number.

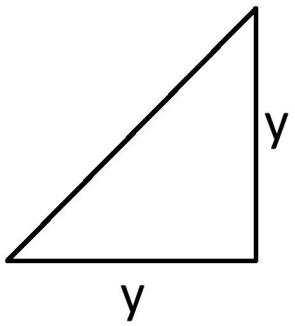
$$0^2 = 0 \times 0 = 0$$

(3 marks)

2) Understanding Number: Harder

3.a) Amir cuts a square in half along the diagonal to produce a right angled triangle.

It has a length, y, which is a whole number.



Amir works out the **area** of the triangle.

Please tick below:

	The area **must** be a whole number.
/	The area will **sometimes** be a whole number.

Show working to support your answer

If y = 3 then the area is $(3 \times 3) \div 2 = 9 \div 2 = 4.5$ a decimal

If y = 4 then the area is $(4 \times 4) \div 2 = 16 \div 2 = 8$ a whole number

(3 marks)

b) Amir is about the work out the **hypotenuse** of the triangle.

Amir says "The hypotenuse of the triangle will **always** be a whole number".

Show that Amir is wrong.

Pythagoras' Theorem: $a^2 + b^2 = c^2$

If $a = 2$ and $b = 3$ then

$$c^2 = 2^2 + 3^2 = 4 + 9 = 13$$

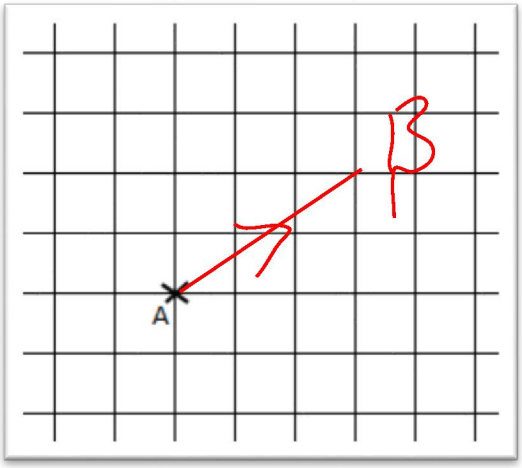
$$c = \sqrt{13} = 3.605 \ldots$$

So the hypotenuse is not a whole number in this case

(3 marks)

3) Simple Vectors: Easier

3)

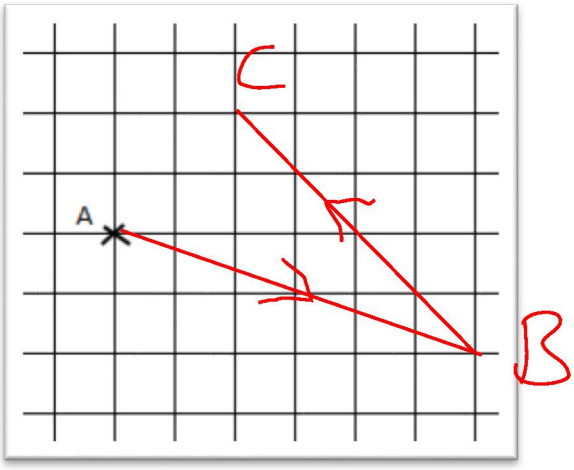


On the grid, draw the Vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ from Point A.

Label the new point B.

(1 Mark)

4)



a) On the grid, draw the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ from Point A

Label the new point B.

(1 Mark)

bi) On the grid draw the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ from Point B

Label the new point C

ii) State the vector $\overrightarrow{AC}$ $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$ (2 Marks)

3) Simple Vectors: Medium

5) Vector $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 11 \end{pmatrix}$

_____

(2 Marks)

6) Vector $\overrightarrow{AB} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$

_____

(2 Marks)

7) Vector $\overrightarrow{AB} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 10 \end{pmatrix}$

State Vector $\overrightarrow{CA}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

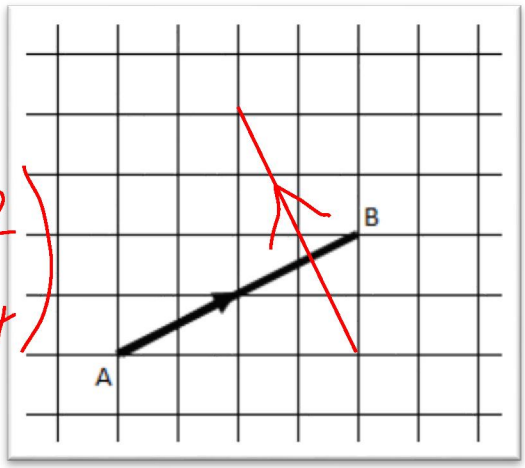
$\begin{pmatrix} -4 \\ -2 \end{pmatrix} + \begin{pmatrix} -2 \\ 10 \end{pmatrix} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}$

$\overrightarrow{CA} = -\overrightarrow{AC} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

(2 Marks)

3) Simple Vectors: Harder

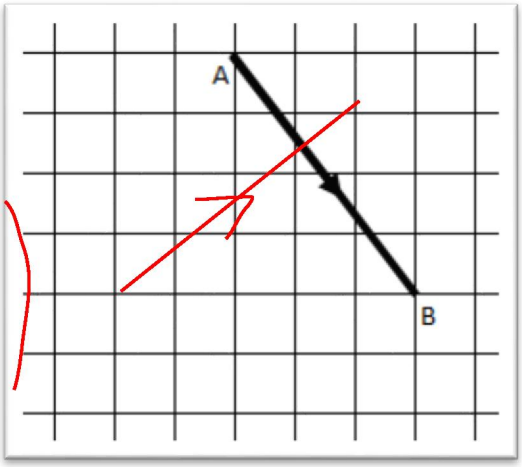
8)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

9)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

4) Estimation and Reasoning: Easier

1) Find an estimate for $\frac{423 \times 69.5}{0.52}$

$$\frac{400 \times 70}{0.5}$$

$$= \frac{28000}{0.5}$$

$= 56000$

(2 Marks)

---

2) a) Estimate the value of $\sqrt{2.9 + 9.6 + 1.98}$

$$\sqrt{3 + 10 + 2}$$

$$= \sqrt{15}$$

3.9

b) Explain if your answer to a) is an overestimate or underestimate

All numbers have been rounded up so it is an overestimate

(3 Marks)

---

3) A water bottling plant has 967 machines, each machine filters on average 2912 litres per day. The water is then put into ½ litre bottles. Estimate how many bottles the plant fills in one day

$$\frac{1000 \times 3000}{0.5}$$

$$\frac{3000000}{0.5}$$

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(2 marks)

4) Estimation and Reasoning: Medium

4) A litre of petrol costs £1.07, Sally's car can travel 9.8Km on one litre of petrol. Sally wants to travel from Manchester to Stoke. The distance from Manchester to Stoke is 71.4km. Estimate the cost of Sally's journey from Manchester to Stoke. Show your working.

$$\frac{70}{10} \times 1$$

£7_____

(2 Marks)

---

5) Jeremy organised a charity celebrity football match. Each ticket for the football match cost £20.05. Jeremy sold 507 tickets. Jeremy had to pay costs of £2980 He gave all money left to the charity.

a) Work out an estimate for the amount of money Jeremy gave to the charity.

$$20 \times 500 = 10000$$

$$10000 - 3000 = £7000$$

£7000_____

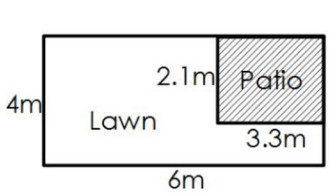
b) Is your answer to (a) an underestimate or an overestimate?
Give a reason for your answer.

An underestimate as the amount of money he made has been rounded down and the cost is rounded up so the difference will be smaller than the actual difference

(4 Marks)

---

6) Elizabeth wants to lay new turf on her lawn. Below is a diagram to show the measurements of the lawn. Each roll of turf covers $3m^2$.



a) Work out an estimate for how many rolls she will need. You must show all working for how you reached your estimate.

Area of Lawn = $(4 \times 6) - (2 \times 3) = 18m^2$

$$\frac{18}{3} = 6\ rolls$$

b) By considering your estimate and no further calculations explain if Elizabeth will have enough rolls to cover the lawn, assuming no turf is wasted

The area of the lawn is actually bigger than estimated as the area of the patio is smaller than estimated as both numbers are rounded down. Since we subtracted a smaller number than the actual number, our estimate is an overestimate so Elizabeth will have enough rolls to cover the lawn.

(3 Marks)

4) Estimation and Reasoning: Harder

7) a) The population of Italy is 59715625. It has an area of 301230Km^2. Population density can be worked out using the formula below. Work out an estimate for the population density of Italy.

$$Population\ Density = \frac{Population}{Area}$$

$$Population\ Density = \frac{60000000}{300000} = 200 population/km^2$$

$200 population/km^2$

b) Explain whether Italy is more densely populated than your estimate or less densely populated.

It is actually less densely populated as the estimate is an overestimate. The population has been rounded up and the area has been rounded down so when we divide an overestimate by an underestimate it becomes even bigger.

(3 Marks)

---

8) The mass of the Earth is $5.98 \times 10^{24} kg$. Jupiter's mass is 318 times larger than Earth's. Estimate the mass of Jupiter. Give your estimate in standard form. You must show how you reached your estimate.

$$6 \times 10^{24} \times 3 \times 10^2$$

$$= 18 \times 10^{26}$$

$$= 1.8 \times 10^{27} \text{Kg}$$

$= 1.8 \times 10^{27}$Kg

(3 Marks)

5) Algebraic Equivalence: Easier

1) Simplify $\frac{3x^2}{x}$

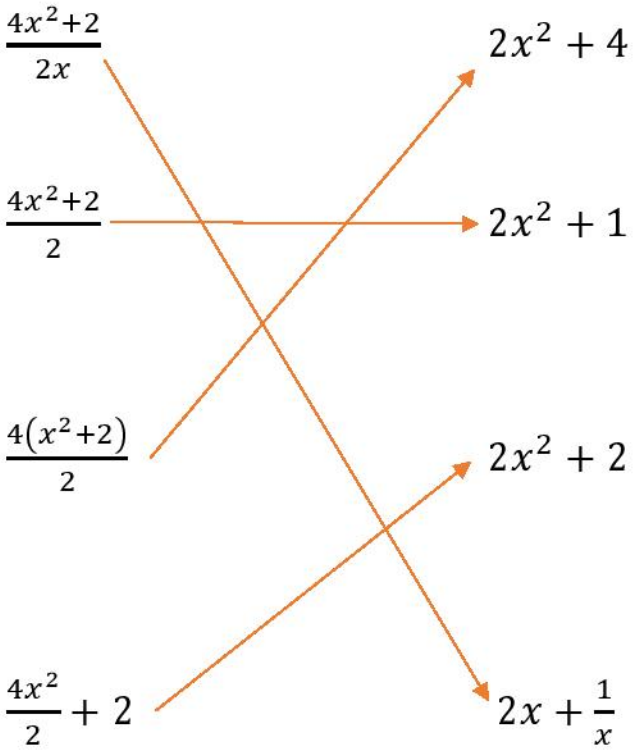
$3x$

_____

(1 Mark)

---

2) Match each of the four expressions on the left hand side with 1 equivalent expression on the right hand side



5) Algebraic Equivalence: Medium

3) Circle the expression that is equivalent to $\frac{3x^2+2}{x}$ where x is not equal to 0

A $3x^3+2$ B $3x+\frac{2}{x}$ C $2x^2+\frac{2}{x}$ D $3x+2$

$$\frac{3x^2+2}{x}$$
$$=\frac{3x^2}{x}+\frac{2}{x}$$
$$=3x+\frac{2}{x}$$

(1 Mark)

---

4) **Two** of these four expressions are equivalent. Circle the two expressions

A $\frac{x}{x+5}$ B $1+\frac{x}{5}$ C $\frac{5+x}{5}$ D $\frac{x^2}{x^2+5}$

(1 mark)

5) Algebraic Equivalence: Harder

5) Fiona tries to simplify this expression

$$\frac{3x}{3+x}$$

She writes

$$\frac{3x}{3}+\frac{3x}{x}$$

$$x+3$$

Explain why Fiona can not rewrite the expression like this

Dividing $3x$ by $3+x$ is not the same as dividing it by 3 and adding it to $\frac{3x}{x}$

Numerical Example

If $x=1$

$$\frac{3x}{3+x}=\frac{3}{4}$$

$$\frac{3x}{3}+\frac{3x}{x}=\frac{3}{3}+\frac{3}{1}=4$$

As you can see, these two expressions are not equal

(1 mark)

---

6) Show that $\frac{2x+5}{1+\frac{2}{x}}$ is equivalent to $\frac{2x^2+5x}{x+2}$

$$\frac{2x+5}{1+\frac{2}{x}}$$

$$=\frac{x(2x+5)}{x(1+\frac{2}{x})}$$

$$=\frac{2x^2+5x}{x+2}$$

(1 mark)

MACKENZIE Jed

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	17 from 27	9 from 12	5 from 10	2 from 4	1 from 1	0 from 0
A02 and 3	28 from 53	8 from 14	6 from 13	5 from 8	3 from 11	6 from 7
Total	45 from 80	17 from 26	11 from 23	7 from 12	4 from 12	6 from 7

Your Pinpoint Topics

Topic 1: Simple Vectors. Mathswatch Clip: 174

Topic 2: Recognising graphs. Mathswatch Clip:

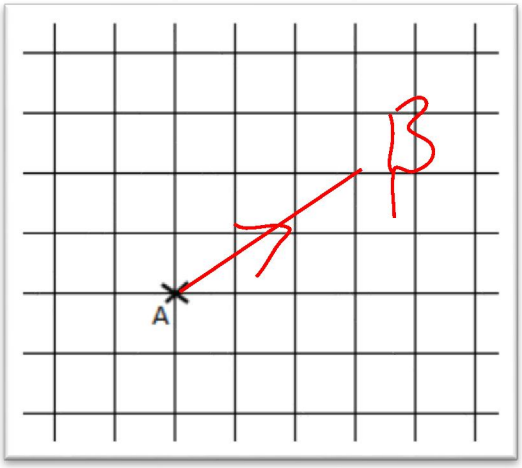
Topic 3: Drawing Quadratic Graphs. Mathswatch Clip: 98

Topic 4: Fractional and Negative Indices. MW: 188

Topic 5: Non-Calc Trigonometry. Mathswatch Clip: 173

1) Simple Vectors: Easier

3)

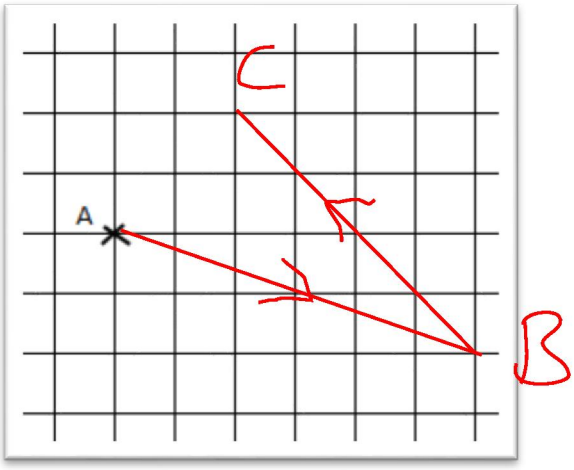


On the grid, draw the Vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ from Point A.

Label the new point B.

(1 Mark)

4)



a) On the grid, draw the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ from Point A

Label the new point B.

(1 Mark)

bi) On the grid draw the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ from Point B

Label the new point C

ii) State the vector $\overrightarrow{AC}$ $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$ (2 Marks)

1) Simple Vectors: Medium

5) Vector $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 11 \end{pmatrix}$

(2 Marks)

6) Vector $\overrightarrow{AB} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$

(2 Marks)

7) Vector $\overrightarrow{AB} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 10 \end{pmatrix}$

State Vector $\overrightarrow{CA}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

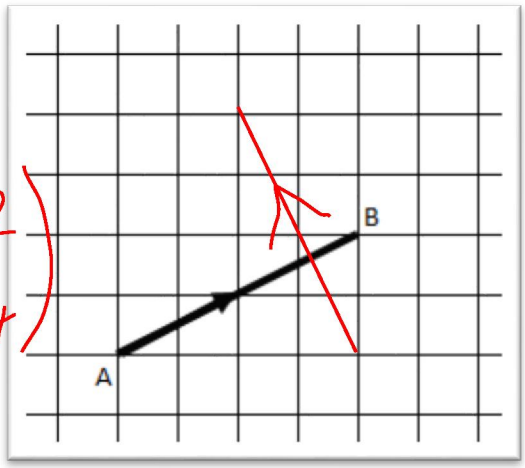
$\begin{pmatrix} -4 \\ -2 \end{pmatrix} + \begin{pmatrix} -2 \\ 10 \end{pmatrix} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}$

$\overrightarrow{CA} = -\overrightarrow{AC} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

(2 Marks)

1) Simple Vectors: Harder

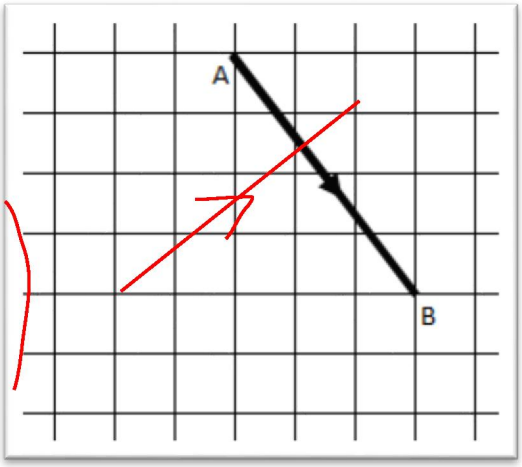
8)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

9)

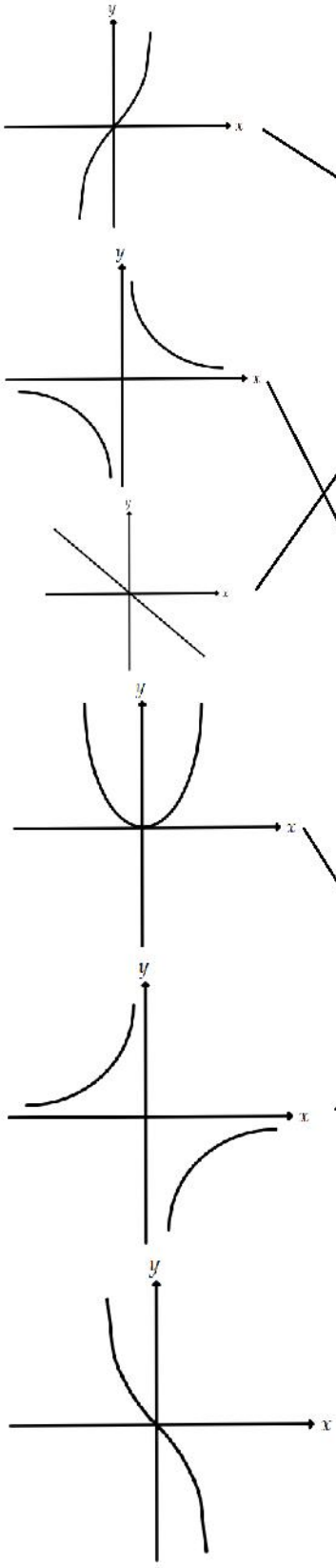


Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

2) Recognising graphs: Easier

1) Match each of the graphs with its equation, the first one is done for you



$y = -x$

$y = x^3$

$y = -x^3$

$y = -\frac{1}{x}$

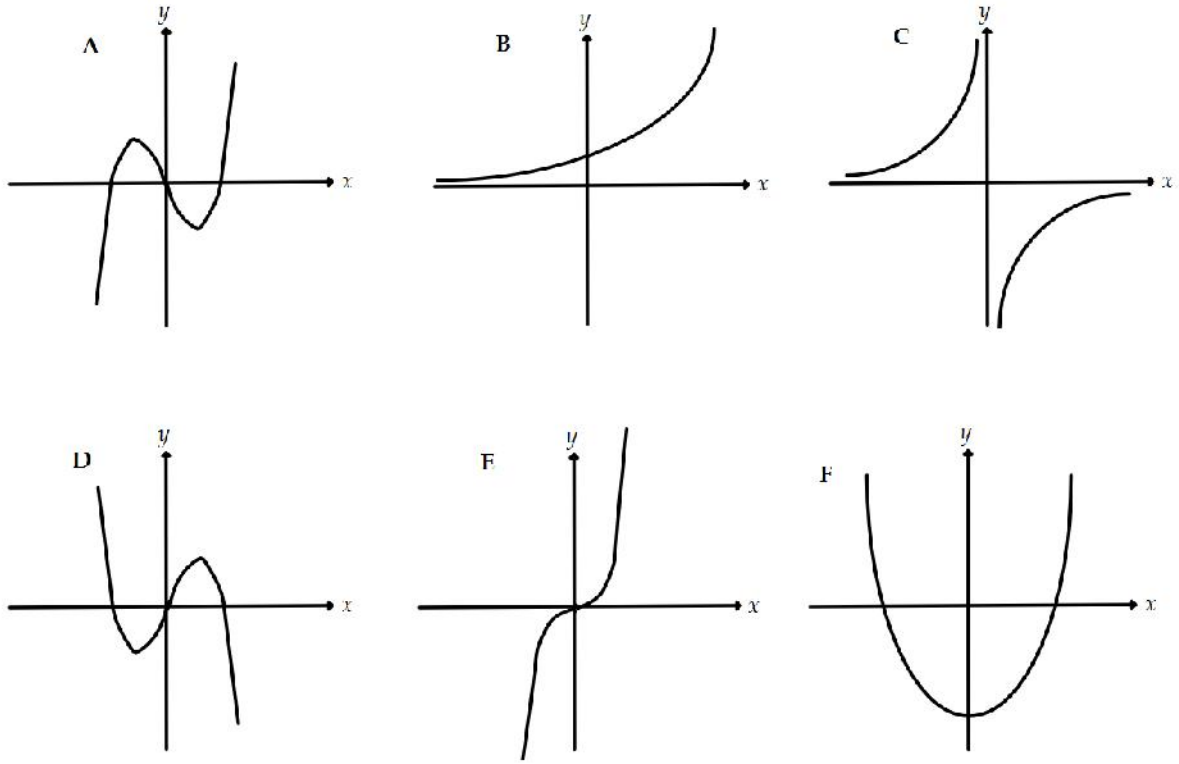
$y = \frac{1}{x}$

$y = x^2$

(3 marks)

2) Recognising graphs: Medium

2) Harry has sketched some graphs



a) Write down the letter of the graph that could have the equation $y = 3^x$

B

_____

(1 Mark)

b) Write down the letter of the graph that could have the equation $y = -\frac{5}{x}$

C

_____

(1 Mark)

c) Write down the letter of the graph that could have the equation $y = 2x - x^3$

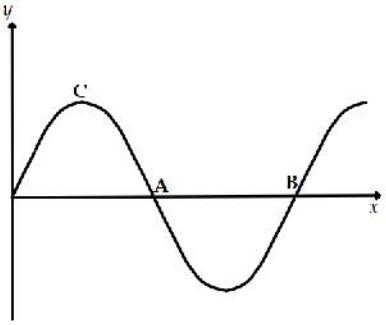
D

_____

(1 Mark)

2) Recognising graphs: Harder

3) A sketch of part of $y = \sin(x)$ is drawn below



a) Write down the coordinates of A

$(180°, 0)$

(1 Mark)

b) Write down the coordinates of B

$(360°, 0)$

(1 Mark)

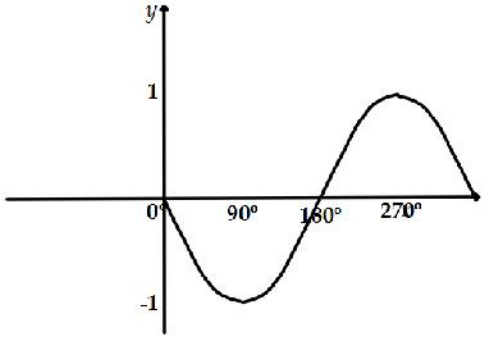
c) Write down the coordinates of C

$(90°, 1)$

(1 Mark)

---

4) Lanre was asked to sketch $y = \cos(x)\ for\ 0° \leq x \leq 360°$. This is what Lanre sketched



Write down one mistake Lanre has made

$y = \cos(x)$ does not go through (0,0) it starts at (0,1) and decreases to (90°,0)

(1 Mark)

3) Drawing Quadratic Graphs: Easier

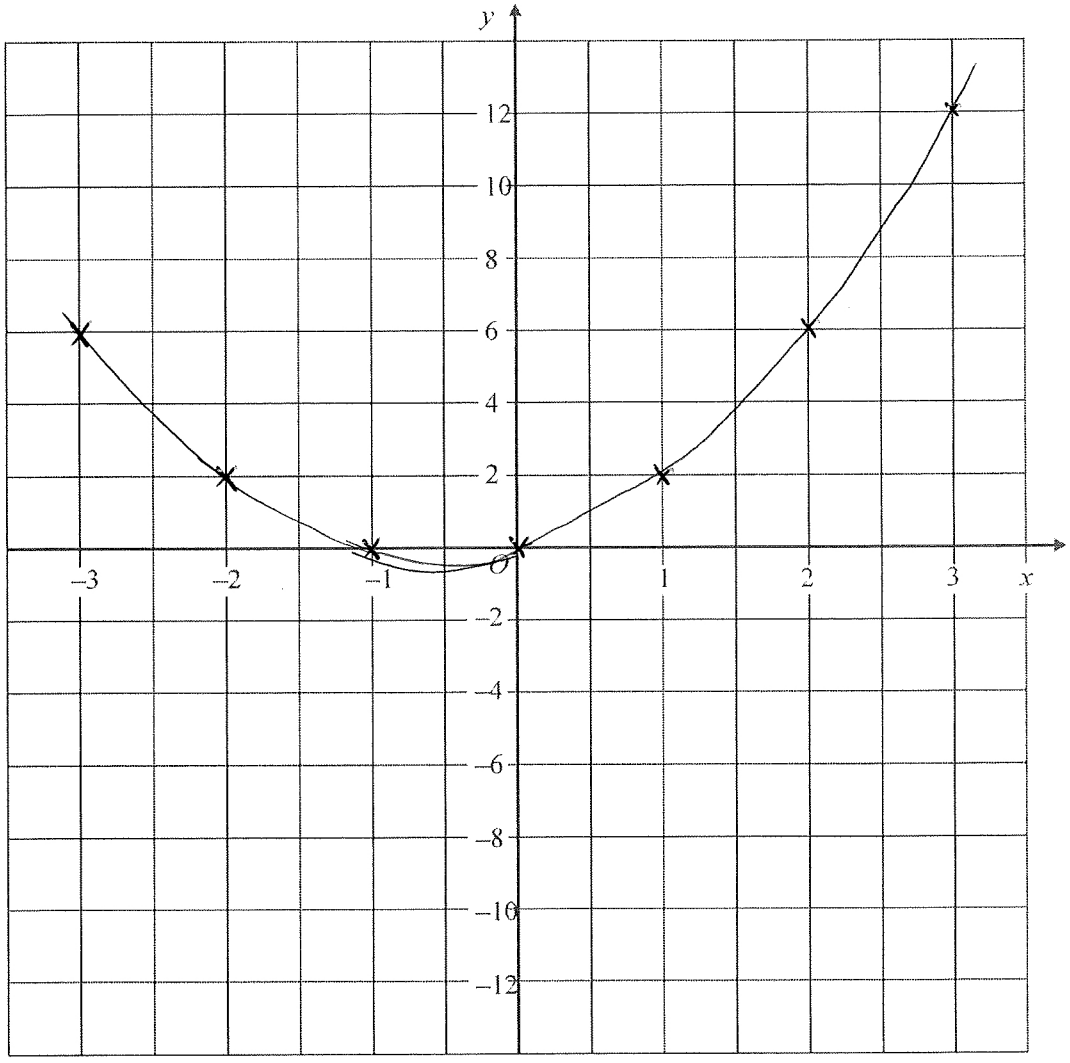
1. (a) Complete the table of values for $y = x^2 + x$.

x	–3	–2	–1	0	1	2	3
y	6	2	0	0	2	6	12

1+1 9+3

(2)

(b) On the grid, draw the graph of $y = x^2 + x$.



(2)

(Total 4 marks)

3) Drawing Quadratic Graphs: Medium

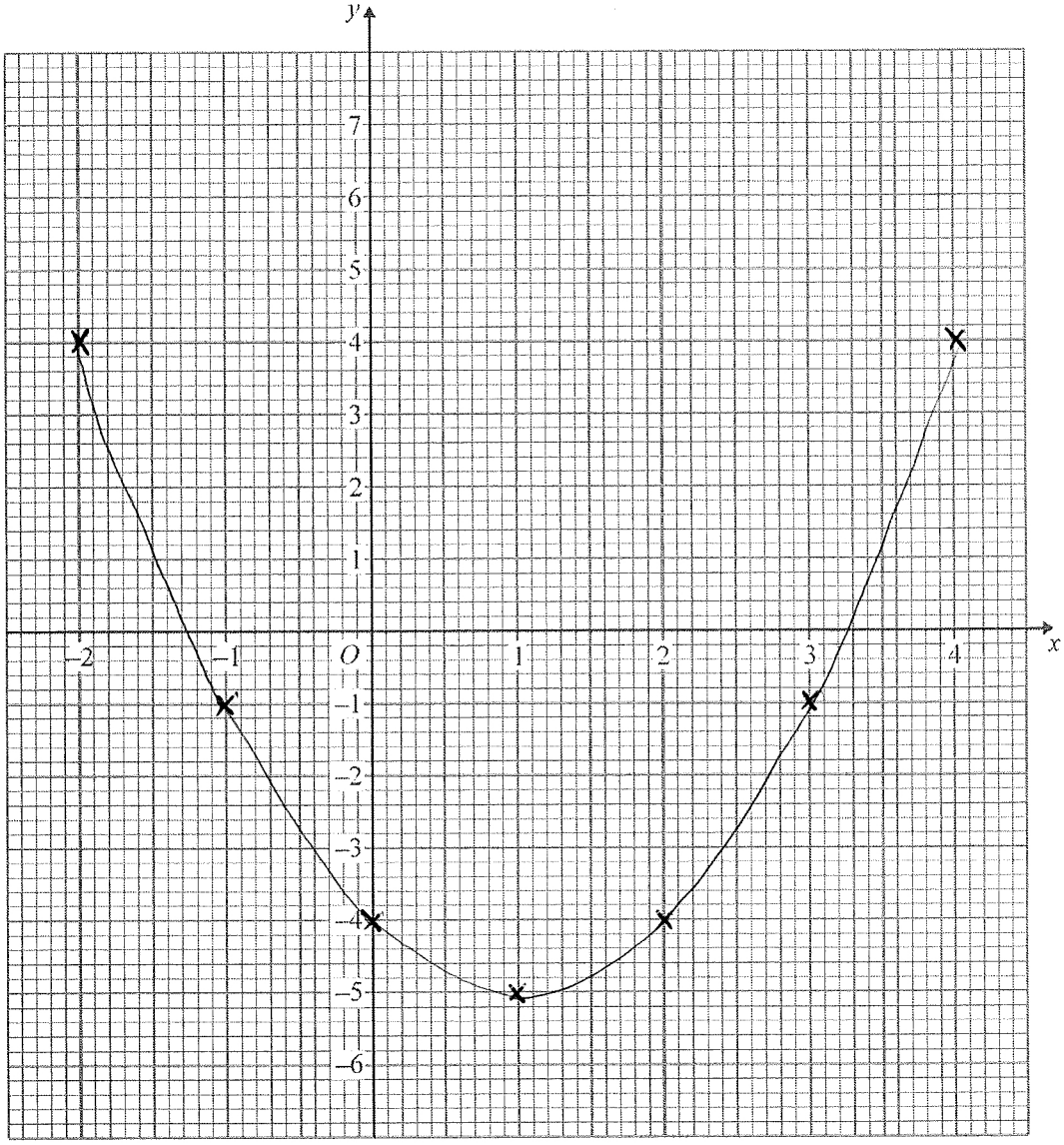
2. (a) Complete the table for $y = x^2 - 2x - 4$

x	–2	–1	0	1	2	3	4
y	4	–1	–4	–5	–4	–1	4

1+2-4 4-4-4 16-8-4

(2)

(b) On the grid, draw the graph of $y = x^2 - 2x - 4$



(2)

(Total 4 marks)

3) Drawing Quadratic Graphs: Harder

(Total 5 marks)

7. (a) Complete the table of values for $y = x^2 - 3x - 1$

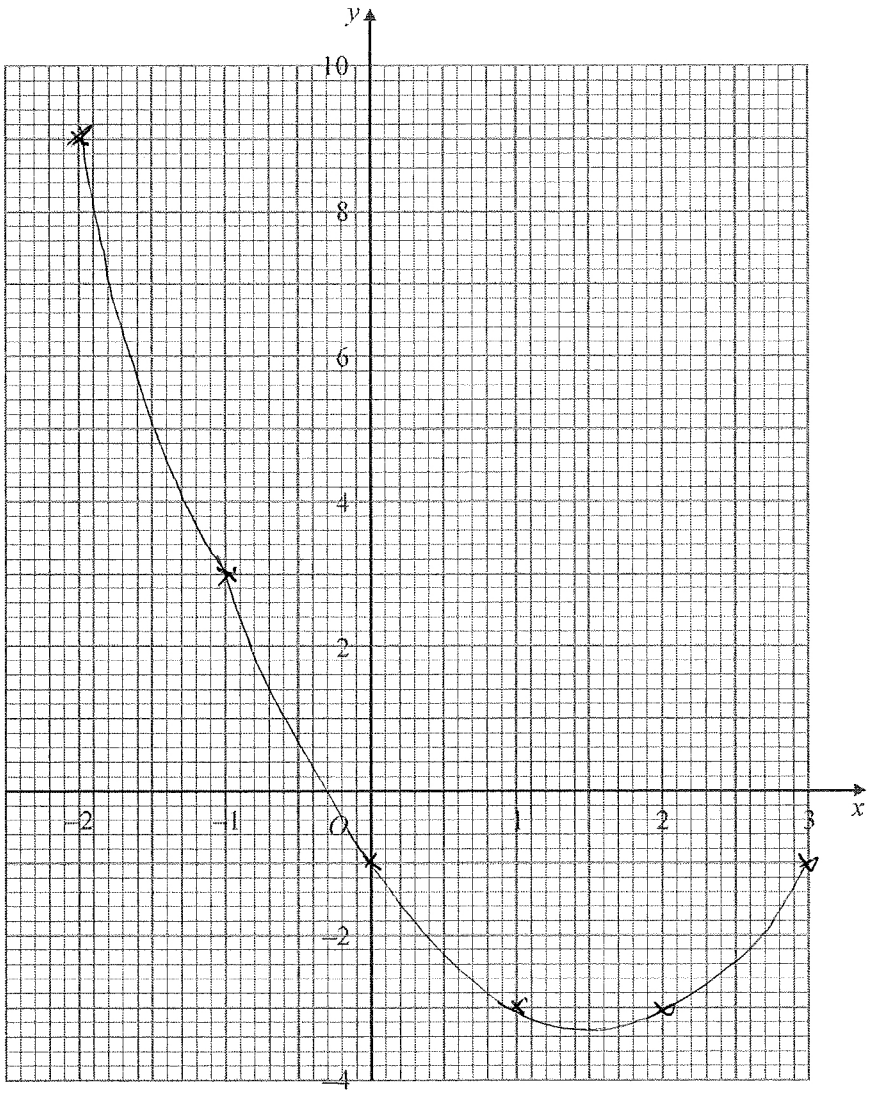
x	−2	−1	0	1	2	3
y	9	3	−1	−3	−3	−1

4+6−1 4−6−1 9−9−1

(2)

(b) On the grid, draw the graph of $y = x^2 - 3x - 1$

(2)



(Total 4 marks)

4) Fractional and Negative Indices: Easier

1) Evaluate

a) 6^0 $= 1$ _____

(1 Mark)

a) $25^{\frac{1}{2}}$ $= \sqrt{25} = 5$ _____

(1 Mark)

c) 3^{-1} $= \frac{1}{3}$ _____

(1 Mark)

---

2) Sarah says that $9^{\frac{1}{2}}$ is 4.5. She is wrong. Explain her mistake.

Solution: $9^{\frac{1}{2}} = \sqrt{9} = 3$

_____

(1 Mark)

---

3) Evaluate

a) $27^{\frac{1}{3}}$ $\sqrt[3]{27} = 3$

_____

(1 Mark)

b) $27^{\frac{2}{3}}$ $\sqrt[3]{27}^2 = 9$ _____

(1 Mark)

c) $27^{\frac{-2}{3}}$ $\frac{1}{\sqrt[3]{27^2}} = \frac{1}{9}$ _____

(1 Mark)

---

4) Fractional and Negative Indices: Medium

4) Evaluate

a) $\left(\frac{25}{81}\right)^{\frac{-1}{2}}$ $\left(\frac{1}{25/81}\right)^{\frac{1}{2}} = \left(\frac{81}{25}\right)^{\frac{1}{2}} = \sqrt{\frac{81}{25}} = \frac{9}{5}$

(1 Mark)

b) $32^{\frac{-3}{5}}$ $\left(\frac{1}{32}\right)^{\frac{3}{5}} = \left(\sqrt[5]{\frac{1}{32}}^{3}\right) = \frac{1}{2^3} = \frac{1}{8}$

(1 Mark)

c) $144^{\frac{-1}{2}} \times 3^{-2}$

$\frac{1}{\sqrt{144}} \times \frac{1}{3^2} = \frac{1}{12} \times \frac{1}{9} = \frac{1}{108}$

(2 Marks)

---

5) Put these numbers in ascending order, show your working.

125^0 $125^{\frac{-1}{3}}$ $\left(\frac{1}{125}\right)^{\frac{-1}{3}}$ $125^{\frac{-2}{3}}$

1 $\frac{1}{\sqrt[3]{125}} = \frac{1}{5}$ $\left(\frac{1}{1/125}\right)^{\frac{1}{3}} = \sqrt[3]{125} = 5$ $\left(\frac{1}{125}\right)^{\frac{2}{3}} = \frac{1}{\sqrt[3]{125^2}} = \frac{1}{5^2} = \frac{1}{25}$

Correct order $\frac{1}{25}$, $\frac{1}{5}$, 1, 5.

(3 Marks)

4) Fractional and Negative Indices: Harder

6) If $2^{2x} = \frac{1}{16}$. Work out the value of x.

$2^{2x} = \frac{1}{4^2}$

$2^{2x} = 4^{-2}$

$2^{2x} = 2^{2(-2)}$

$x = -2$

(2 Marks)

---

7) One of these has a different value to the other two. Decide which one and justify your answer.

$4^{\frac{3}{4}}$ $8^{\frac{1}{4}}$ $2^{\frac{3}{2}}$

$2^{2\left(\frac{3}{4}\right)} = 2^{\frac{6}{4}} = 2^{\frac{3}{2}}$ $2^{3\left(\frac{1}{4}\right)} = 2^{\frac{3}{4}}$

The values that are the same are $4^{\frac{3}{4}}$ and $2^{\frac{3}{2}}$

(3 Marks)

---

8) If $32^{3x} = \frac{1}{8}$. Find the value of x

$2^{5(3x)} = \frac{1}{8}$

$2^{15x} = \frac{1}{2^3}$

$2^{15x} = 2^{-3}$

$15x = -3$

$x = \frac{-3}{15}$

$x = -\frac{1}{5}$

(3 Marks)

5) Non-Calc Trigonometry: Easier

Solutions for Question 1:

a) $\cos 30° = \frac{\sqrt{3}}{2}$

b) $\tan 60° = \sqrt{3}$

c) $\sin 45° = \frac{\sqrt{2}}{2}$

Solutions for Question 2:

a) $\tan 45° = 1$

b) $\cos 45° = \frac{\sqrt{2}}{2}$

c) $\sin 60° = \frac{\sqrt{3}}{2}$

5) Non-Calc Trigonometry: Medium

Solution for Question 3:

$\cos 60° = \frac{A}{H}$

$\cos 60° = \frac{6}{x}$

If $\cos 60° = 0.5$

$0.5 = \frac{6}{x}$

$x = 12cm$

Solution for Question 4:

$\tan 30° = \frac{O}{A}$

$\tan 30° = \frac{y}{9}$

If $\tan 30° = \frac{\sqrt{3}}{3}$

$\frac{\sqrt{3}}{3} = \frac{y}{9}$

$y = \frac{9\sqrt{3}}{3} cm$

$y = 3\sqrt{3}\, cm$

5) Non-Calc Trigonometry: Harder

Solution for Question 5:

$$\sin 30° = \frac{6.1}{x}$$

$$x = \frac{6.1}{\sin 30°}$$

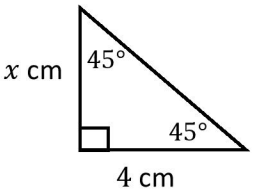
$$x = \frac{6.1}{0.5}$$

$$x = 12.2\ cm$$

Solution for Question 6:

Cut triangle in half

Let x equal the height of the triangle



$$\tan 45° = \frac{x}{4}$$

$$x = 4\ x\ \tan 45$$

$$x = 4cm\text{m}$$

Area of triangle: $\frac{1}{2} \times 8 \times 4$ ...

Area of triangle = 16cm^2

MCLAUGHLIN Laura

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	11 from 27	3 from 12	5 from 10	2 from 4	1 from 1	0 from 0
A02 and 3	30 from 53	7 from 14	6 from 13	5 from 8	5 from 11	7 from 7
Total	41 from 80	10 from 26	11 from 23	7 from 12	6 from 12	7 from 7

Your Pinpoint Topics

Topic 1: Simple Fibonacci Sequences. Mathswatch Clip: 141

Topic 2: Estimation and Reasoning. Mathswatch Clip: 91

Topic 3: Recognising graphs. Mathswatch Clip:

Topic 4: Drawing Quadratic Graphs. Mathswatch Clip: 98

Topic 5: Surds. Mathswatch Clip: 207

1) Simple Fibonacci Sequences: Easier

1. To find the next term in a Fibonacci sequence, you find the sum of the 2 previous terms.

1 1 2 3 5 8

a) Find the next term in this sequence $5 + 8$

13

(1 mark)

b) Find the 9th term of this sequence $8 + 13 = 21,\ 21 + 13 = 34$

34

(1 mark)

---

2. Below are the first 5 terms of a Fibonacci sequence.

4 5 9 14 23

a) Find the next term in this sequence $14 + 23 = 37$ 37

(1 mark)

b) Find the 8th term of this sequence $37 + 23 = 60,\ 60 + 27 = 97$

97

(1 mark)

---

3. Below are the first 5 terms of a Fibonacci sequence.

2 4 6 10 16

a) Find the next term in this sequence $10 + 16 = 26$

26

(1 mark)

b) Will 68 be in this sequence?

$26 + 16 = 42,\ 42 + 26 = 68$ Yes

(1 mark)

---

4. The sequence below is a Fibonacci sequence

2 3 5 8 13

a) Find the missing number from the sequence

$8 - 3 = 5$ 5

(1 mark)

b) Find the next term in this sequence $13 + 8 = 21$

21

(1 mark)

1) Simple Fibonacci Sequences: Medium

5. Here is a Fibonacci-type sequence

2 _5_ _7_ 12 19

Find the 2 missing terms

$19 - 12 = 7,\ 12 - 7 = 5$

_____5___ and ____7___

(2 marks)

---

6. Here are the fourth and fifth terms of a Fibonacci-type sequence

_3_ _7_ _10_ 17 27

Show that the first term is 3

$27 - 17 = 10,$

$17 - 10 = 7,$

$10 - 7 = 3$

(1 mark)

---

7. The first 3 terms of a Fibonacci sequence are

$1 \qquad x \qquad x + 1$

a) Write an expression for the 4th term

$x + (x + 1) = 2x + 1$

_____$2x + 1$___

(1 mark)

b) If the 5th term is 11, find the value of x

5^{th} term: $(2x + 1) + (x + 1) = 3x + 2 = 11$

$3x = 9$

_____$x = 3$____

(2 marks)

1) Simple Fibonacci Sequences: Harder

8. The first three terms of a Fibonacci sequence are

$$x \quad y \quad x+y$$

a) Show that the 5th term of this sequence is $2x+3y$

4^{th} term: $y+(x+y)=x+2y$

5^{th} term: $(x+y)+(x+2y)=2x+3y$ **(2 marks)**

Given that the 3rd term is 5 and the 5th term is 14

b) Find the value of x and the value of y

$x+y=5$ (A) $\quad 2x+3y=14$ (B)

$2\times$(A): $2x+2y=10$ (C) $\quad x =$ 1

(B)- (C): $y=4$, sub into (A): $x+4=5$, $x=1$ $\quad y =$ 4

(3 marks)

---

9. Here are the first and third terms of a Fibonacci sequence

$$p \quad q-p \quad q \quad 2q-p \quad 3q-p$$

a) Write an expression, in terms of p and q, for the second term

$q-p$

(1 mark)

b) Write an expression, in terms of p and q, for the fifth term

4^{th} term: $(q-p)+q=2q-p$

5^{th} term: $(2q-p)+q=3q-p$ $\quad 3q-p$

(1 mark)

---

10. The first and third terms of a Fibonacci sequence are

$$a \quad b+1-a \quad b+1 \quad 2b+2-a \quad 3b+3-a$$

a) Write an expression, in terms of a and b, for the fifth term

2^{nd} term: $(b+1)-a=b+1-a$

4^{th} term: $(b+1)+(b+1-a)=2b+2-a$

5^{th} term: $(2b+2-a)+(b+1)=3b+3-a$ $\quad 3b+3-a$

(2 marks)

Given that the second term is 9 and the fifth term is 35

b) Find the value of a and the value of b

$b+1-a=9 \quad \Rightarrow b-a=8$ (A)

$3b+3-a=35 \Rightarrow 3b-a=32$ (B)

(B) – (A): $2b=24 \Rightarrow b=12$ $\quad a =$ 4

Sub into (A): $12-a=8 \Rightarrow a=4$ $\quad b =$ 12

(3 marks)

2) Estimation and Reasoning: Easier

1) Find an estimate for $\dfrac{423 \times 69.5}{0.52}$

$$\frac{400 \times 70}{0.5}$$

$$= \frac{28000}{0.5}$$

$= 56000$

(2 Marks)

---

2) a) Estimate the value of $\sqrt{2.9 + 9.6 + 1.98}$

$$\sqrt{3 + 10 + 2}$$

$$= \sqrt{15}$$

3.9

b) Explain if your answer to a) is an overestimate or underestimate

All numbers have been rounded up so it is an overestimate

(3 Marks)

---

3) A water bottling plant has 967 machines, each machine filters on average 2912 litres per day. The water is then put into ½ litre bottles. Estimate how many bottles the plant fills in one day

$$\frac{1000 \times 3000}{0.5}$$

$$\frac{3000000}{0.5}$$

6000000

(2 marks)

2) Estimation and Reasoning: Medium

4) A litre of petrol costs £1.07, Sally's car can travel 9.8Km on one litre of petrol. Sally wants to travel from Manchester to Stoke. The distance from Manchester to Stoke is 71.4km. Estimate the cost of Sally's journey from Manchester to Stoke. Show your working.

$$\frac{70}{10} \times 1$$

£7_____

(2 Marks)

---

5) Jeremy organised a charity celebrity football match. Each ticket for the football match cost £20.05. Jeremy sold 507 tickets. Jeremy had to pay costs of £2980 He gave all money left to the charity.

a) Work out an estimate for the amount of money Jeremy gave to the charity.

$$20 \times 500 = 10000$$

$$10000 - 3000 = £7000$$

£7000_____

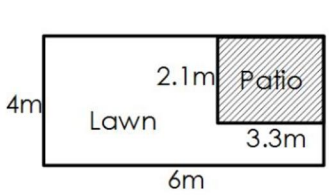
b) Is your answer to (a) an underestimate or an overestimate?
Give a reason for your answer.

An underestimate as the amount of money he made has been rounded down and the cost is rounded up so the difference will be smaller than the actual difference

(4 Marks)

---

6) Elizabeth wants to lay new turf on her lawn. Below is a diagram to show the measurements of the lawn. Each roll of turf covers $3m^2$.



a) Work out an estimate for how many rolls she will need. You must show all working for how you reached your estimate.

Area of Lawn = $(4 \times 6) - (2 \times 3) = 18m^2$

$$\frac{18}{3} = 6\ rolls$$

b) By considering your estimate and no further calculations explain if Elizabeth will have enough rolls to cover the lawn, assuming no turf is wasted

The area of the lawn is actually bigger than estimated as the area of the patio is smaller than estimated as both numbers are rounded down. Since we subtracted a smaller number than the actual number, our estimate is an overestimate so Elizabeth will have enough rolls to cover the lawn.

(3 Marks)

2) Estimation and Reasoning: Harder

7) a) The population of Italy is 59715625. It has an area of 301230Km^2. Population density can be worked out using the formula below. Work out an estimate for the population density of Italy.

$$Population\ Density = \frac{Population}{Area}$$

$$Population\ Density = \frac{60000000}{300000} = 200 population/km^2$$

$200 population/km^2$

b) Explain whether Italy is more densely populated than your estimate or less densely populated.

It is actually less densely populated as the estimate is an overestimate. The population has been rounded up and the area has been rounded down so when we divide an overestimate by an underestimate it becomes even bigger.

(3 Marks)

---

8) The mass of the Earth is $5.98 \times 10^{24} kg$. Jupiter's mass is 318 times larger than Earth's. Estimate the mass of Jupiter. Give your estimate in standard form. You must show how you reached your estimate.

$$6 \times 10^{24} \times 3 \times 10^2$$

$$= 18 \times 10^{26}$$

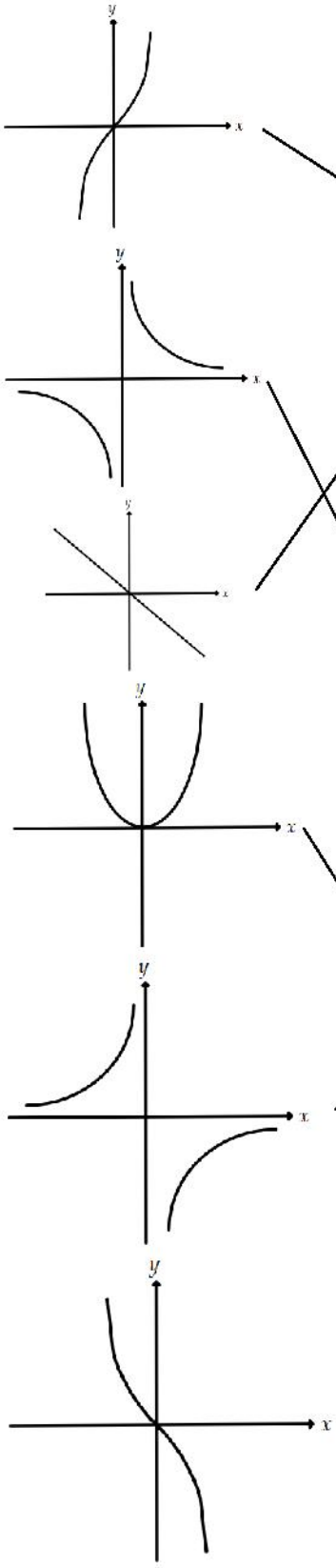
$$= 1.8 \times 10^{27} \text{Kg}$$

$= 1.8 \times 10^{27}$Kg

(3 Marks)

3) Recognising graphs: Easier

1) Match each of the graphs with its equation, the first one is done for you



$y = -x$

$y = x^3$

$y = -x^3$

$y = -\frac{1}{x}$

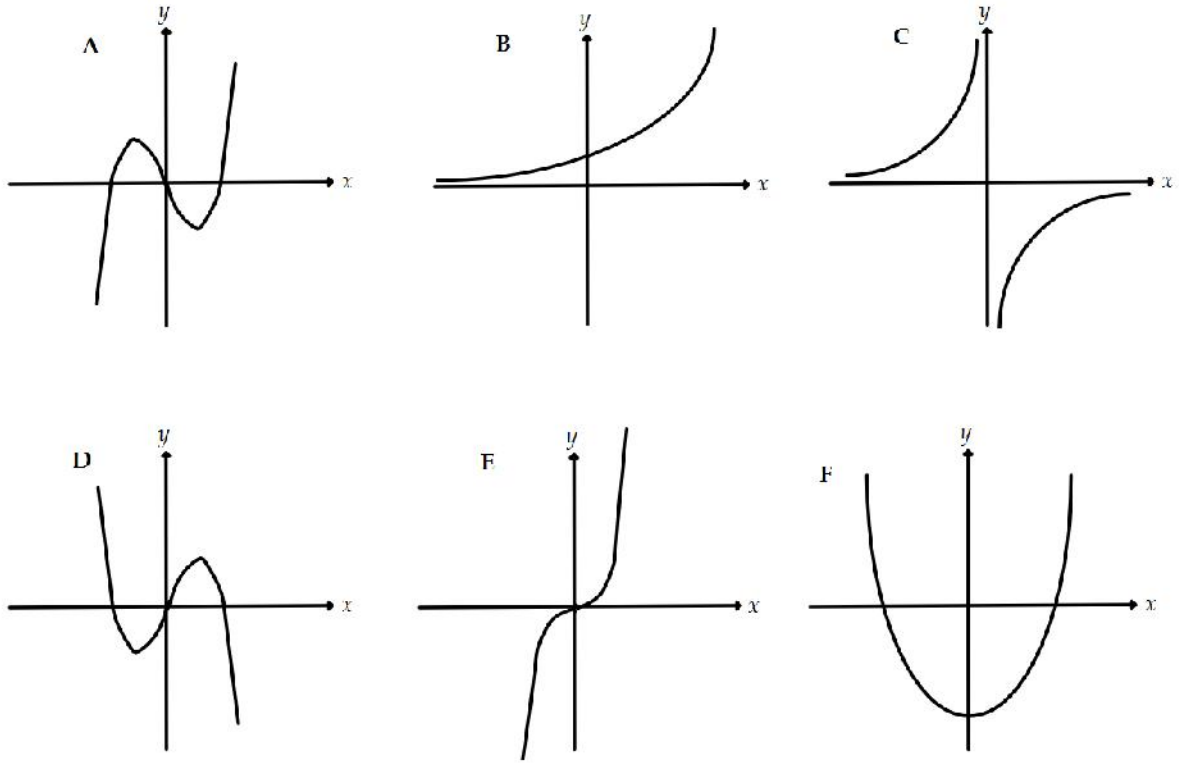
$y = \frac{1}{x}$

$y = x^2$

(3 marks)

3) Recognising graphs: Medium

2) Harry has sketched some graphs



a) Write down the letter of the graph that could have the equation $y = 3^x$

B

_____

(1 Mark)

b) Write down the letter of the graph that could have the equation $y = -\frac{5}{x}$

C

_____

(1 Mark)

c) Write down the letter of the graph that could have the equation $y = 2x - x^3$

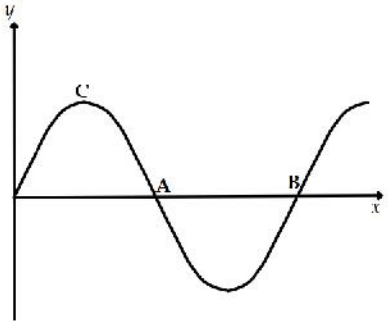
D

_____

(1 Mark)

3) Recognising graphs: Harder

3) A sketch of part of $y = \sin(x)$ is drawn below



a) Write down the coordinates of A

$(180°, 0)$

(1 Mark)

b) Write down the coordinates of B

$(360°, 0)$

(1 Mark)

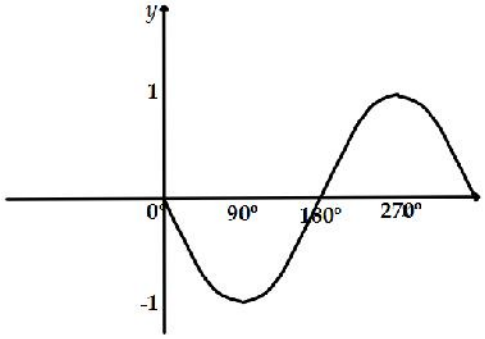
c) Write down the coordinates of C

$(90°, 1)$

(1 Mark)

---

4) Lanre was asked to sketch $y = \cos(x)\ for\ 0° \leq x \leq 360°$. This is what Lanre sketched



Write down one mistake Lanre has made

$y = \cos(x)$ does not go through (0,0) it starts at (0,1) and decreases to (90°,0)

(1 Mark)

4) Drawing Quadratic Graphs: Easier

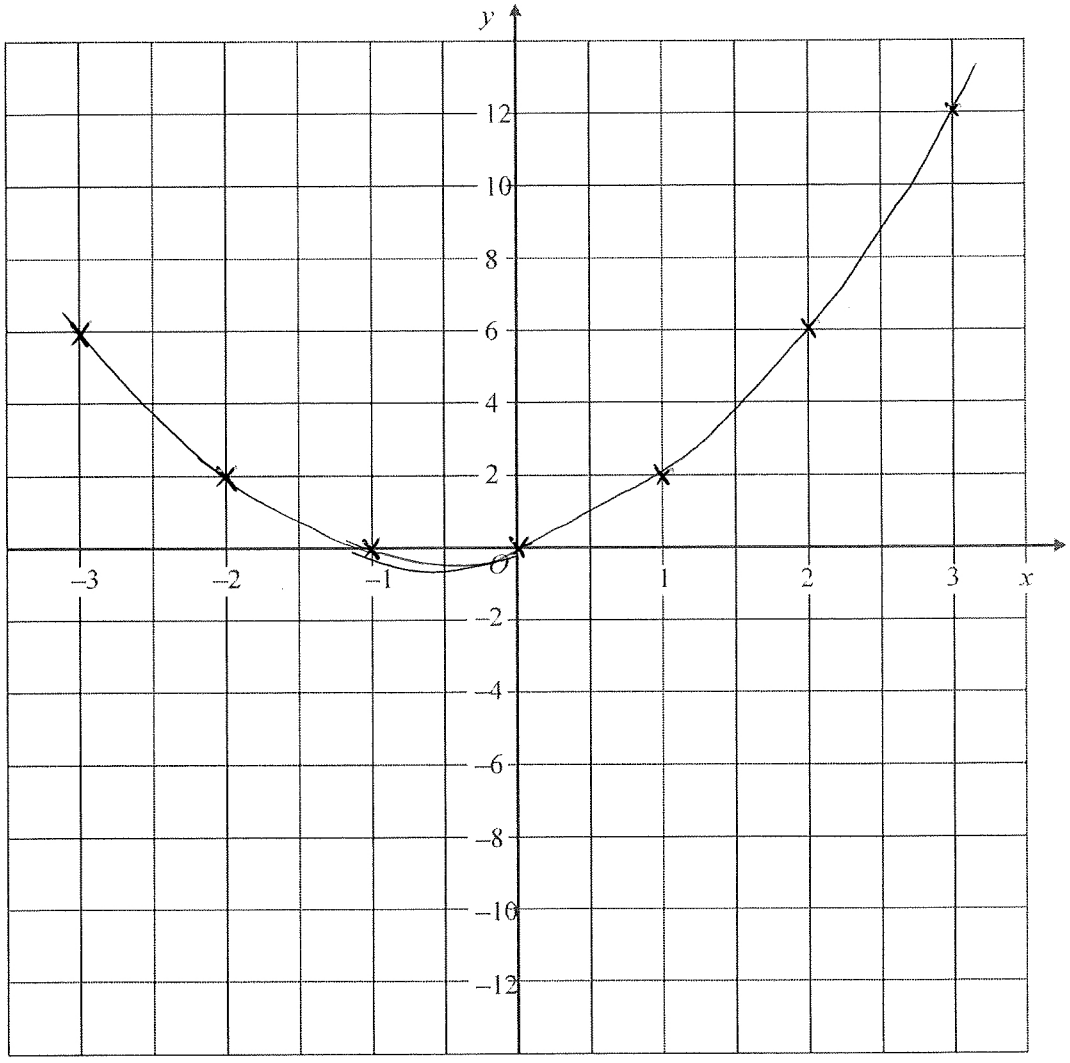
1. (a) Complete the table of values for $y = x^2 + x$.

x	–3	–2	–1	0	1	2	3
y	6	2	0	0	2	6	12

1+1 9+3

(2)

(b) On the grid, draw the graph of $y = x^2 + x$.



(2)

(Total 4 marks)

4) Drawing Quadratic Graphs: Medium

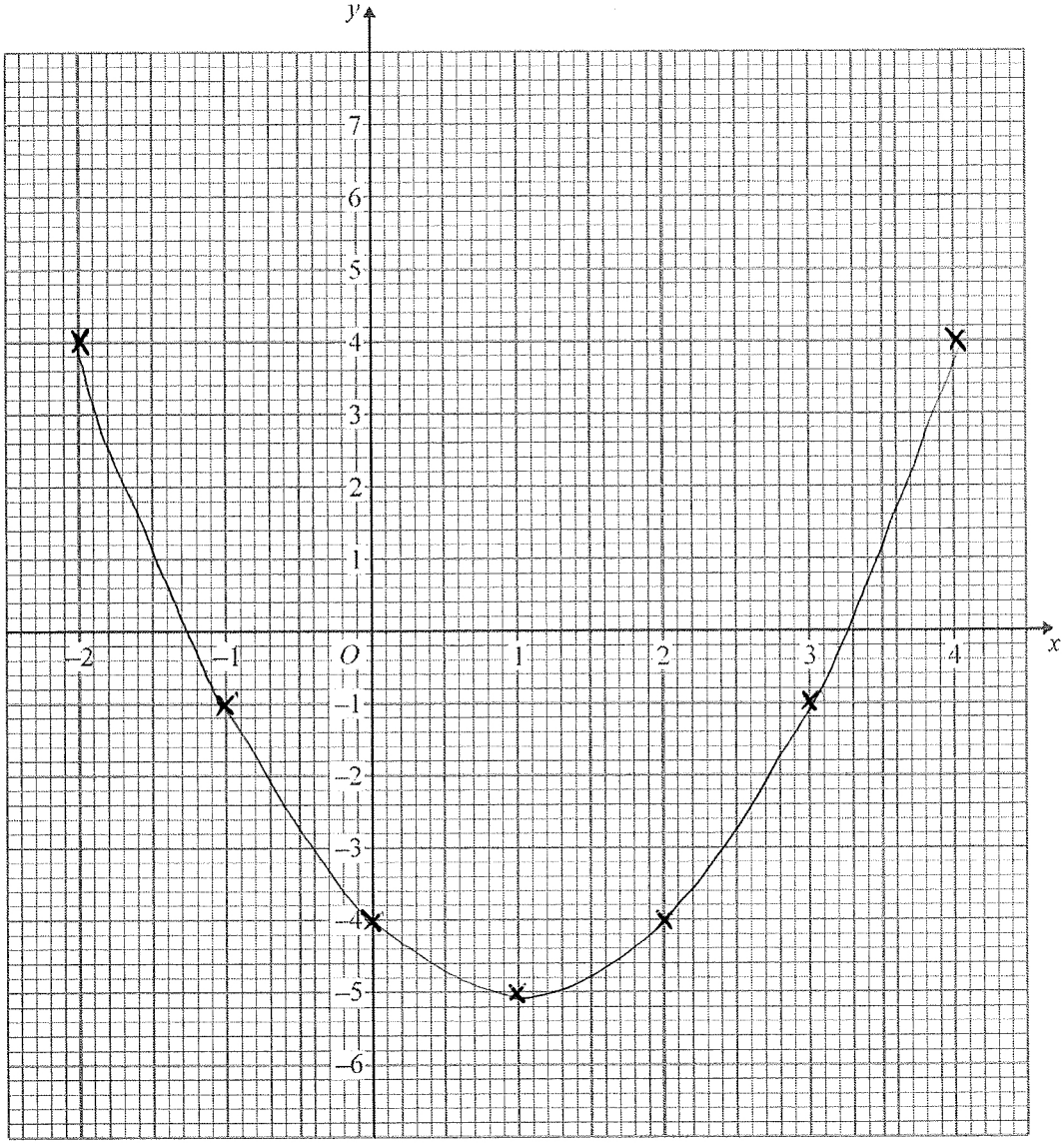
2. (a) Complete the table for $y = x^2 - 2x - 4$

x	–2	–1	0	1	2	3	4
y	4	–1	–4	–5	–4	–1	4

1+2-4 4-4-4 16-8-4

(2)

(b) On the grid, draw the graph of $y = x^2 - 2x - 4$



(2)

(Total 4 marks)

4) Drawing Quadratic Graphs: Harder

(Total 5 marks)

7. (a) Complete the table of values for $y = x^2 - 3x - 1$

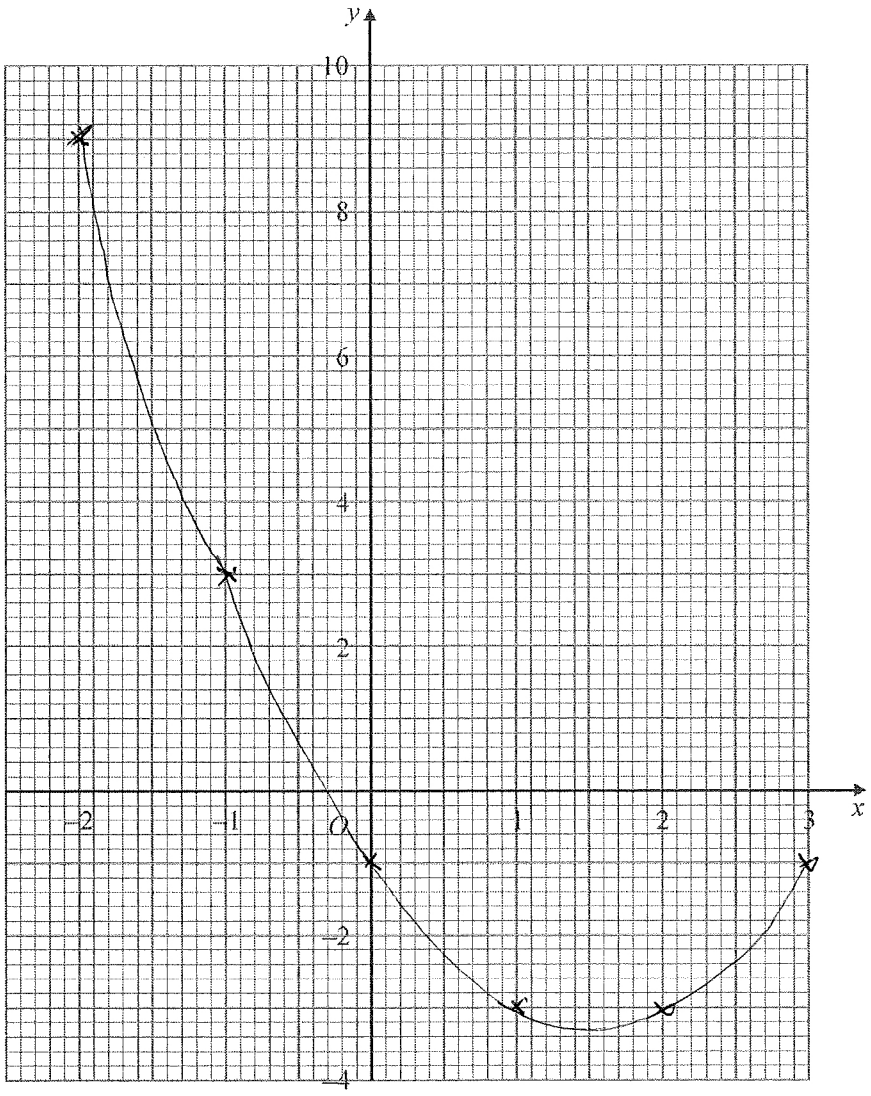
x	−2	−1	0	1	2	3
y	9	3	−1	−3	−3	−1

4+6−1 4−6−1 9−9−1

(2)

(b) On the grid, draw the graph of $y = x^2 - 3x - 1$

(2)



(Total 4 marks)

5) Surds: Easier

1. a) Simplify $\sqrt{75}$

$\sqrt{75} = \sqrt{25 \times 3}$

$= 5\sqrt{3}$

..... **(1)**

b) Express $\sqrt{75} - \sqrt{48}$ in the form $a\sqrt{3}$ where a is an integer.

$5\sqrt{3} - \sqrt{16 \times 3}$

$= 5\sqrt{3} - 4\sqrt{3}$

$\sqrt{3}$

a = 1

..... **(2)**

2. Express $\frac{15}{\sqrt{5}}$ in the form $a\sqrt{b}$ where a and b are positive integers.

$\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{15\sqrt{5}}{5}$

$= 3\sqrt{5}$

..... **(2)**

3. Expand and simplify $(2 + \sqrt{3})(4 + \sqrt{3})$ giving your answer in the $a + b\sqrt{3}$ where a and b are integers.

$(2 + \sqrt{3})(4 + \sqrt{3})$

$= 8 + 2\sqrt{3} + 4\sqrt{3} + 3$

$= 11 + 6\sqrt{3}$

..... **(3)**

5) Surds: Medium

4. Expand and simplify $(4-2\sqrt{3})^2$ giving your answer in the $a+b\sqrt{3}$ where a and b are integers.

$$(4-2\sqrt{3})(4-2\sqrt{3})$$
$$=16-8\sqrt{3}-8\sqrt{3}+12$$
$$=30-16\sqrt{3}$$

…… **(3)**

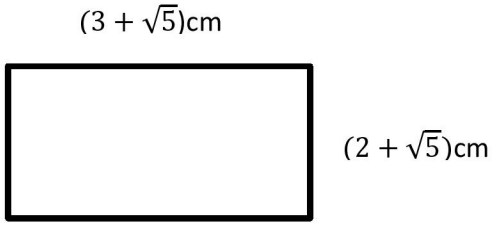
5. Expand and simplify $(\sqrt{5}-\sqrt{10})^2$ giving your answer in the $a+b\sqrt{2}$ where a and b are integers.

$$(\sqrt{5}-\sqrt{10})(\sqrt{5}-\sqrt{10})$$
$$=5-\sqrt{50}-\sqrt{50}+\sqrt{100}$$
$$=15-2\sqrt{50}$$
$$=15-2\sqrt{25\times 2}$$
$$=15-10\sqrt{2}$$

…… **(4)**

5) Surds: Harder

8. Find the area of the rectangle below, give your answer in simplest form.



$(3+\sqrt{5})(2+\sqrt{5})$

$= 6 + 3\sqrt{5} + 2\sqrt{5} + 5$

$= (5\sqrt{5} + 11)\text{cm}^2$

MELLISH Aaron

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	15 from 27	4 from 12	6 from 10	4 from 4	1 from 1	0 from 0
A02 and 3	40 from 53	8 from 14	11 from 13	6 from 8	9 from 11	6 from 7
Total	55 from 80	12 from 26	17 from 23	10 from 12	10 from 12	6 from 7

Your Pinpoint Topics

Topic 1: Flow rates. Mathswatch Clip:

Topic 2: Understanding Number. Mathswatch Clip: NA

Topic 3: Speed. Mathswatch Clip: 142

Topic 4: Estimation and Reasoning. Mathswatch Clip: 91

Topic 5: Recognising graphs. Mathswatch Clip:

1) Flow rates (Non-Calc): Easier

1) A bath holds 120 litres when filled to a suitable height for bathing.
When turned on fully, the bath taps fill the bath at a rate of 15 litres per minute

(a) Assume that the water flow is constant, and the plug is in the bath.
How long will it take to fill the bath from empty?

$120 \div 15$

$= 8$

$= 8$ minutes

(b) If an overflow pipe is fitted in the bath, which allows water to escape once it reaches 150 litres, which is of the following is true?

Tick one box.

- ☐ One the water volume reaches 150 litres, the rate at which the bath fills, **increases**.
- ☐ One the water volume reaches 150 litres, the rate at which the bath fills, **remains constant**.
- ■ One the water volume reaches 150 litres, the rate at which the bath fills, **decreases**.

(3 Marks)

1) Flow rates (Non-Calc): Medium

2) The air pressure in a road bike tyre should be at least 80 psi
An electric bike pump, pumps air at a rate of 0.5 psi per second

(a) Assume that the air flow is constant.
How long will it take the pump to inflate the tyres from 50 psi to 80 psi?

Calculating pressure increase needed:

$80 - 50 = 30\text{psi}$

Calculating time to increase by 30psi (increasing at 0.5psi per sec):

$30 \div 0.5 = 300 \div 5 = 60$ secs

OR

1psi takes 2 secs, so 30psi takes 60 secs

(b) In fact pump is less effective at higher pressures, so pumps at a slower rate, as the tyre pressure increases.
How does this affect your answer to (a)?

It takes longer than the 60 seconds calculated to inflate from 50 to 80psi.

(3 Marks)

1) Flow rates (Non-Calc): Harder

3) A chemical solution is comprised of a solute and 3.1ml of water.
More water is added to the solute, at a rate of 0.3ml every 5 seconds.

(a) How long will it take for the solution be comprised of 5.5ml of water?

Calculating water needing to be added:

$5.5 - 3.1 = 2.4\text{ml}$

Calculating number of 0.3ml drops needed to make 2.4ml:

$2.4 \div 0.3 = 24 \div 3 = 8$ drops

Calculating time to add 8 drops at one every 5 seconds:

$8 \times 5 = 40$ seconds.

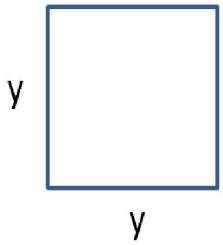
(b) Some students decrease the drip rate, as the experiment goes on.
How does this affect your answer to (a)?

It takes more than the 40 seconds calculated to add the correct amount of water.

(3 Marks)

2) Understanding Number: Easier

1. Jim is looking at the area and lengths of squares.



Jim considers a square with area $9m^2$.

Jim works out the length of the square as follows:

$$y^2 = 9$$

$$y = \sqrt{9}$$

$$y = 3cm$$

Jim considers another square with a **different** area.

Please tick below:

	This method will **always** give an answer which is a whole number
/	This method will **sometimes** give an answer which is a whole number
	This method will **never** give an answer which is a whole number

Show working to support your answer

Any area which is a square number will give a whole number using this method

e.g. $y^2 = 16$ gives $y = \sqrt{16} = 4$ cm

Any area that is a non-square number won't give a whole number

e.g. $y^2 = 10$ gives $y = \sqrt{10} = 3.162\ldots$ cm

(3 marks)

2) Understanding Number: Medium

2.a) Anne puts a number in her calculator and squares her number. The number gets a lot bigger.

Anne says "if you square a number it will **always** get bigger".

Please tick below:

	Anne is correct
/	Anne is **not** correct

Show working to support your answer

If you square a number that is between 0 and 1 it will become smaller

e.g. $0.5^2 = 0.25$

(3 marks)

b) Pete says "if you square a number it will **always** be positive".

Please tick below:

	Pete is correct
/	Pete is **not** correct

Show working to support your answer

If you square **zero** the answer is zero, a non-positive number.

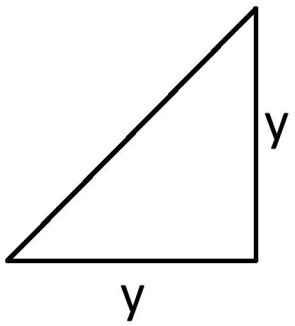
$$0^2 = 0 \times 0 = 0$$

(3 marks)

2) Understanding Number: Harder

3.a) Amir cuts a square in half along the diagonal to produce a right angled triangle.

It has a length, y, which is a whole number.



Amir works out the **area** of the triangle.

Please tick below:

	The area **must** be a whole number.
/	The area will **sometimes** be a whole number.

Show working to support your answer

If y = 3 then the area is $(3 \times 3) \div 2 = 9 \div 2 = 4.5$ a decimal

If y = 4 then the area is $(4 \times 4) \div 2 = 16 \div 2 = 8$ a whole number

(3 marks)

b) Amir is about the work out the **hypotenuse** of the triangle.

Amir says "The hypotenuse of the triangle will **always** be a whole number".

Show that Amir is wrong.

Pythagoras' Theorem: $a^2 + b^2 = c^2$

If $a = 2$ and $b = 3$ then

$$c^2 = 2^2 + 3^2 = 4 + 9 = 13$$

$$c = \sqrt{13} = 3.605 \ldots$$

So the hypotenuse is not a whole number in this case

(3 marks)

3) Speed: Easier

1) Pete drove 50 miles in 4 hours
Work out his average speed in miles per hour.

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{50}{4} = \frac{25}{2} = 12.5 \text{ mph}$$

12.5 miles/hour

(2 Marks)

---

2) Dave cycled 8km in 30 minutes.
Work out Dave's average speed in km/h.

30 mins = 0.5 hours

$$\text{speed} = \frac{8}{0.5} = 16 \text{ km/h}$$

16 Km/h

(3 Marks)

---

3) Jess travels 400km at an average speed of 300 km/h.
How long was she travelling for? Give your answer in minutes.

$$s = \frac{d}{t} \quad \text{so} \quad t = \frac{d}{s} = \frac{400}{300} = \frac{4}{3} = 1\tfrac{1}{3} \text{ h}$$

1 h = 60 mins so $\frac{1}{3}$ h = 20 mins

so total time = 60 + 20 = 80 mins

80 minutes

(3 Marks)

---

4) Jeff set off for work at 3pm. He arrived at his destination at 5pm.
If Jeff travelled at a constant speed of 24 Km/h, how far did he travel?

t = 2 hours

$$s = \frac{d}{t} \quad \text{so} \quad d = s \times t = 24 \times 2 = 48 \text{ km}$$

48 Km

(2 Marks)

---

3) Speed: Medium

Pete needs to catch a ferry.

Pete leaves his home and drives

10 miles towards the motorway

180 miles on the motorway

15 miles from the motorway to the ferry port

Pete

Takes 20 minutes to get to the motorway

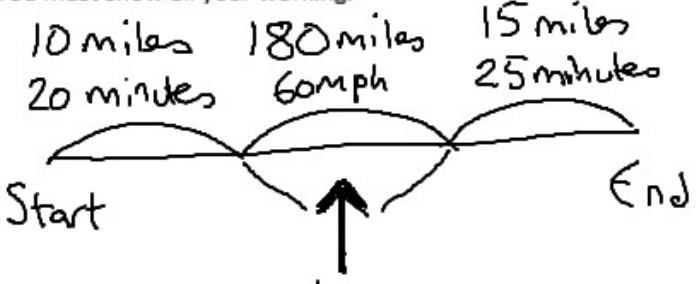
Drives at an average speed of 60mph whilst on the motorway

Takes 25 minutes to get from the motorway to the ferry port.

Pete has to arrive at the ferry port no later than midday.

What is the latest time Pete can leave his house?

You must show all your working.



$T = D/S$

$T = 180/60 = 3$ hours

Total time

3 hours

25 minutes

20 minutes +

3hrs 45 mins

Midday = 12:00pm

3hrs 45 mins

Answer = 8:15am

3) Speed: Harder

Abigail is on a bus going into the city.

The bus picks her up and drives

4 miles towards a motorway

45 miles on the motorway

6 miles from the motorway to the city bus depot

The bus

Takes 10 minutes to get to the main road

Drives at an average speed of 60mph whilst on the motorway

Takes 15 minutes to get from the motorway to the bus depot

Abigail gets on the bus at 10:19am. What time will she get off the bus?

You must show all your working.

$T = D/S$

$T = 45/60 = \frac{3}{4}$

$= 45$mins

Total time taken

45
15
10
70mins
or 1hr 10mins

10:19 + 1hr 10mins

11:29am

4) Estimation and Reasoning: Easier

1) Find an estimate for $\frac{423 \times 69.5}{0.52}$

$$\frac{400 \times 70}{0.5}$$

$$= \frac{28000}{0.5}$$

$= 56000$

(2 Marks)

---

2) a) Estimate the value of $\sqrt{2.9 + 9.6 + 1.98}$

$$\sqrt{3 + 10 + 2}$$

$$= \sqrt{15}$$

3.9

b) Explain if your answer to a) is an overestimate or underestimate

All numbers have been rounded up so it is an overestimate

(3 Marks)

---

3) A water bottling plant has 967 machines, each machine filters on average 2912 litres per day. The water is then put into ½ litre bottles. Estimate how many bottles the plant fills in one day

$$\frac{1000 \times 3000}{0.5}$$

$$\frac{3000000}{0.5}$$

6000000

(2 marks)

4) Estimation and Reasoning: Medium

4) A litre of petrol costs £1.07, Sally's car can travel 9.8Km on one litre of petrol. Sally wants to travel from Manchester to Stoke. The distance from Manchester to Stoke is 71.4km. Estimate the cost of Sally's journey from Manchester to Stoke. Show your working.

$$\frac{70}{10} \times 1$$

£7_____

(2 Marks)

---

5) Jeremy organised a charity celebrity football match. Each ticket for the football match cost £20.05. Jeremy sold 507 tickets. Jeremy had to pay costs of £2980 He gave all money left to the charity.

a) Work out an estimate for the amount of money Jeremy gave to the charity.

$$20 \times 500 = 10000$$

$$10000 - 3000 = £7000$$

£7000_____

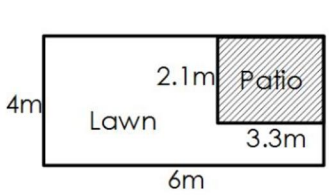
b) Is your answer to (a) an underestimate or an overestimate? Give a reason for your answer.

An underestimate as the amount of money he made has been rounded down and the cost is rounded up so the difference will be smaller than the actual difference

(4 Marks)

---

6) Elizabeth wants to lay new turf on her lawn. Below is a diagram to show the measurements of the lawn. Each roll of turf covers $3m^2$.



a) Work out an estimate for how many rolls she will need. You must show all working for how you reached your estimate.

Area of Lawn = $(4 \times 6) - (2 \times 3) = 18m^2$

$$\frac{18}{3} = 6\ rolls$$

b) By considering your estimate and no further calculations explain if Elizabeth will have enough rolls to cover the lawn, assuming no turf is wasted

The area of the lawn is actually bigger than estimated as the area of the patio is smaller than estimated as both numbers are rounded down. Since we subtracted a smaller number than the actual number, our estimate is an overestimate so Elizabeth will have enough rolls to cover the lawn.

(3 Marks)

4) Estimation and Reasoning: Harder

7) a) The population of Italy is 59715625. It has an area of 301230Km^2. Population density can be worked out using the formula below. Work out an estimate for the population density of Italy.

$$Population\ Density = \frac{Population}{Area}$$

$$Population\ Density = \frac{60000000}{300000} = 200 population/km^2$$

$200 population/km^2$

b) Explain whether Italy is more densely populated than your estimate or less densely populated.

It is actually less densely populated as the estimate is an overestimate. The population has been rounded up and the area has been rounded down so when we divide an overestimate by an underestimate it becomes even bigger.

(3 Marks)

8) The mass of the Earth is $5.98 \times 10^{24} kg$. Jupiter's mass is 318 times larger than Earth's. Estimate the mass of Jupiter. Give your estimate in standard form. You must show how you reached your estimate.

$$6 \times 10^{24} \times 3 \times 10^{2}$$

$$= 18 \times 10^{26}$$

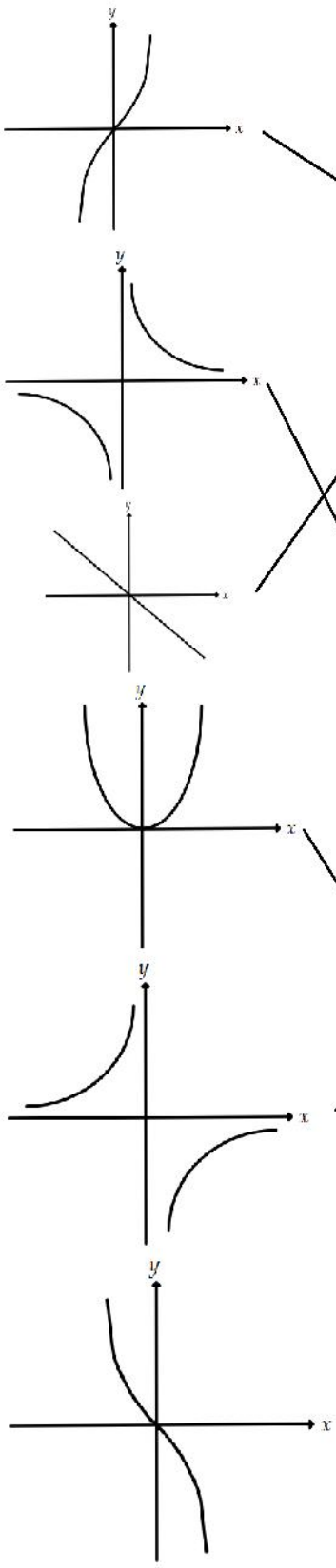
$$= 1.8 \times 10^{27}\text{Kg}$$

$= 1.8 \times 10^{27}$Kg

(3 Marks)

5) Recognising graphs: Easier

1) Match each of the graphs with its equation, the first one is done for you



$y = -x$

$y = x^3$

$y = -x^3$

$y = -\frac{1}{x}$

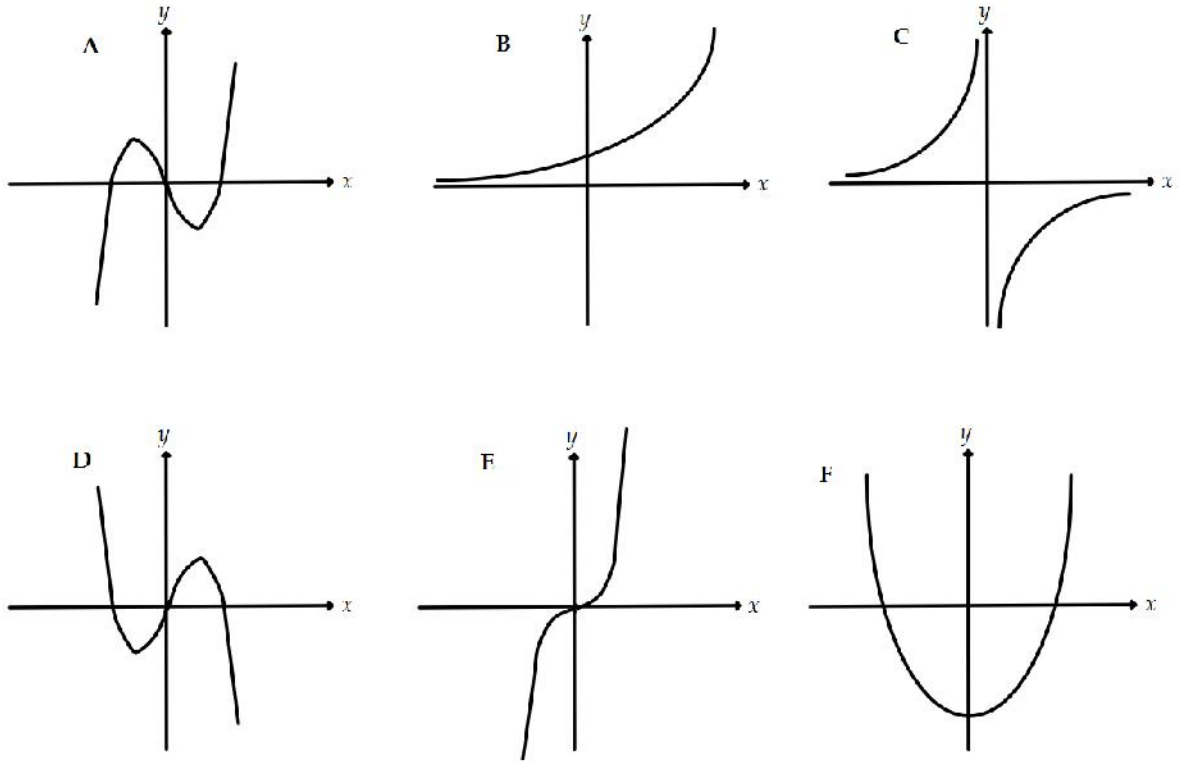
$y = \frac{1}{x}$

$y = x^2$

(3 marks)

5) Recognising graphs: Medium

2) Harry has sketched some graphs



a) Write down the letter of the graph that could have the equation $y = 3^x$

B

_____

(1 Mark)

b) Write down the letter of the graph that could have the equation $y = -\frac{5}{x}$

C

_____

(1 Mark)

c) Write down the letter of the graph that could have the equation $y = 2x - x^3$

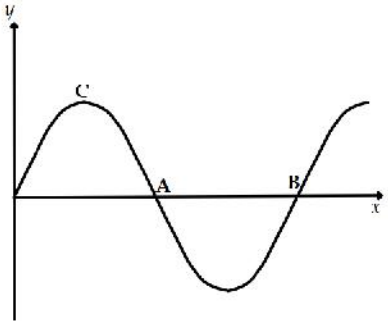
D

_____

(1 Mark)

5) Recognising graphs: Harder

3) A sketch of part of $y = \sin(x)$ is drawn below



a) Write down the coordinates of A

$(180°, 0)$

(1 Mark)

b) Write down the coordinates of B

$(360°, 0)$

(1 Mark)

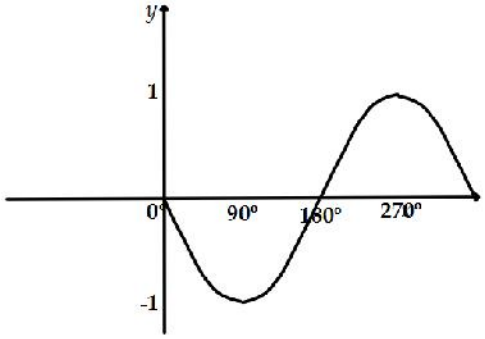
c) Write down the coordinates of C

$(90°, 1)$

(1 Mark)

---

4) Lanre was asked to sketch $y = \cos(x)\ for\ 0° \leq x \leq 360°$. This is what Lanre sketched



Write down one mistake Lanre has made

$y = \cos(x)$ does not go through (0,0) it starts at (0,1) and decreases to (90°,0)

(1 Mark)

PAVEY Samuel

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
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Total	51 from 80	15 from 26	18 from 23	8 from 12	6 from 12	4 from 7

Your Pinpoint Topics

Topic 1: Parallelogram Angle Reasoning. Mathswatch Clip: NA

Topic 2: Understanding Number. Mathswatch Clip: NA

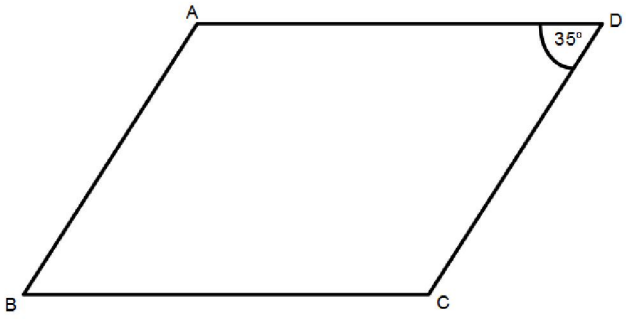
Topic 3: Simple Vectors. Mathswatch Clip: 174

Topic 4: Estimation and Reasoning. Mathswatch Clip: 91

Topic 5: Direct and Inverse Proportion. Mathswatch Clip: 199

1) Parallelogram Angle Reasoning: Easier

1) ABCD is a parallelogram



a) Work out the size of angle BCD

$180^o - 35^o = 145^o$

145^o

.....

b) Work out the size angle of ABC

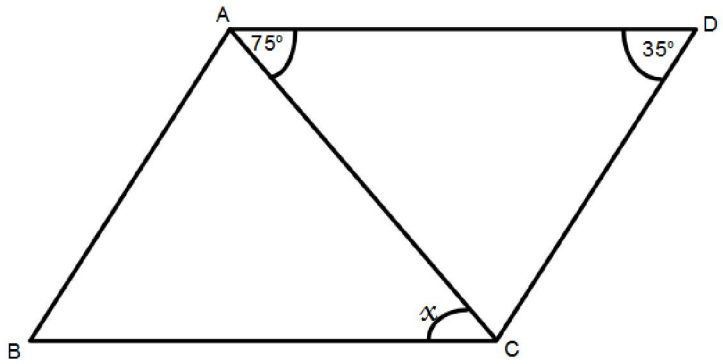
35^o

.....

(2 Marks)

---

2) ABCD is a parallelogram



a) Work out the size of angle x giving reasons for your answer

75^o

.....

Reason:

Alternate angles are equal

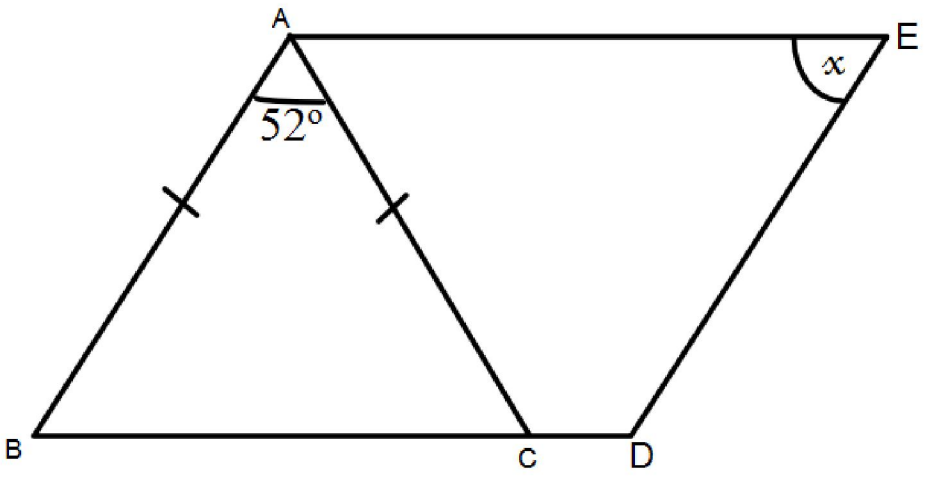
(2 Marks)

---

1) Parallelogram Angle Reasoning: Medium

3) ABDE is a parallelogram.

ABC is an isosceles triangle. AB=AC



Show that angle x is 64°. Give reasons at each stage

Angle ABC=ACB

180°- 52° =128°

128°÷2=64°

Base angles of an isosceles triangle are equal and angles in a triangle add up to 180°

Angle EDB=180°-64°=116°

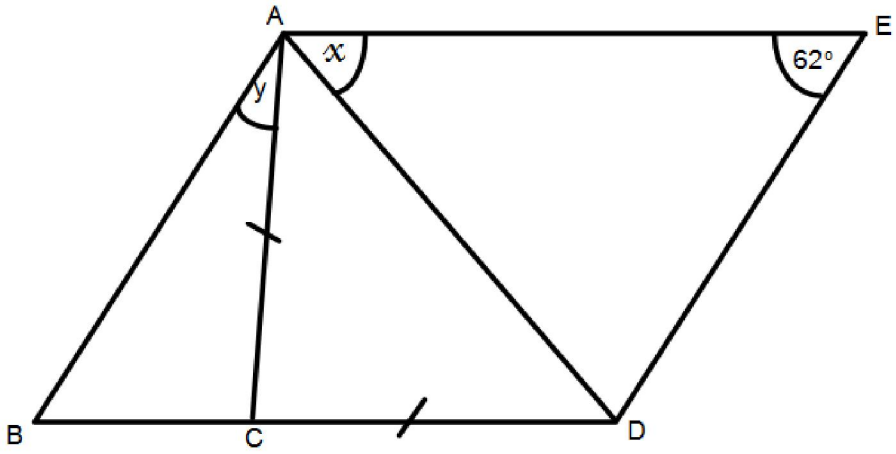
Angle x = 64° cointerior angles add to 180°.

.

(3 Marks)

1) Parallelogram Angle Reasoning: Harder

4) ABDE is a parallelogram.
AB=CD



Show that $2x + y = 118^o$

Angle ADC is x (alternate angles are equal)

Angle CAD is x (base angles of an isosceles triangle are equal)

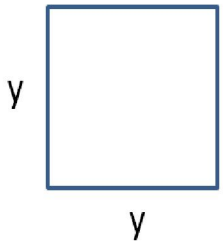
Angle BAE is 118^o (cointerior angles are equal)

Therefore $2x + y = 118^o$

(3 marks)

2) Understanding Number: Easier

1. Jim is looking at the area and lengths of squares.



Jim considers a square with area $9m^2$.

Jim works out the length of the square as follows:

$$y^2 = 9$$

$$y = \sqrt{9}$$

$$y = 3cm$$

Jim considers another square with a **different** area.

Please tick below:

☐	This method will **always** give an answer which is a whole number
/	This method will **sometimes** give an answer which is a whole number
☐	This method will **never** give an answer which is a whole number

Show working to support your answer

Any area which is a square number will give a whole number using this method

e.g. $y^2 = 16$ gives $y = \sqrt{16} = 4$ cm

Any area that is a non-square number won't give a whole number

e.g. $y^2 = 10$ gives $y = \sqrt{10} = 3.162\ldots$ cm

(3 marks)

2) Understanding Number: Medium

2.a) Anne puts a number in her calculator and squares her number. The number gets a lot bigger.

Anne says "if you square a number it will **always** get bigger".

Please tick below:

☐	Anne is correct
/	Anne is **not** correct

Show working to support your answer

If you square a number that is between 0 and 1 it will become smaller

e.g. $0.5^2 = 0.25$

(3 marks)

b) Pete says "if you square a number it will **always** be positive".

Please tick below:

☐	Pete is correct
/	Pete is **not** correct

Show working to support your answer

If you square **zero** the answer is zero, a non-positive number.

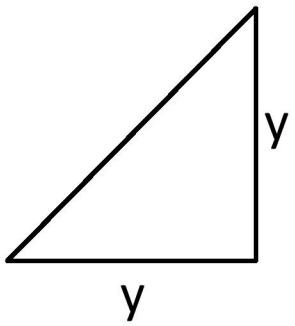
$$0^2 = 0 \times 0 = 0$$

(3 marks)

2) Understanding Number: Harder

3.a) Amir cuts a square in half along the diagonal to produce a right angled triangle.

It has a length, y, which is a whole number.



Amir works out the **area** of the triangle.

Please tick below:

	The area **must** be a whole number.
/	The area will **sometimes** be a whole number.

Show working to support your answer

If y = 3 then the area is $(3 \times 3) \div 2 = 9 \div 2 = 4.5$ a decimal

If y = 4 then the area is $(4 \times 4) \div 2 = 16 \div 2 = 8$ a whole number

(3 marks)

b) Amir is about the work out the **hypotenuse** of the triangle.

Amir says "The hypotenuse of the triangle will **always** be a whole number".

Show that Amir is wrong.

Pythagoras' Theorem: $a^2 + b^2 = c^2$

If $a = 2$ and $b = 3$ then

$$c^2 = 2^2 + 3^2 = 4 + 9 = 13$$

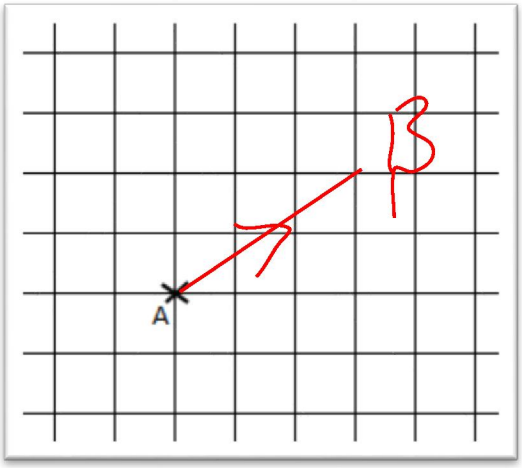
$$c = \sqrt{13} = 3.605 \ldots$$

So the hypotenuse is not a whole number in this case

(3 marks)

3) Simple Vectors: Easier

3)

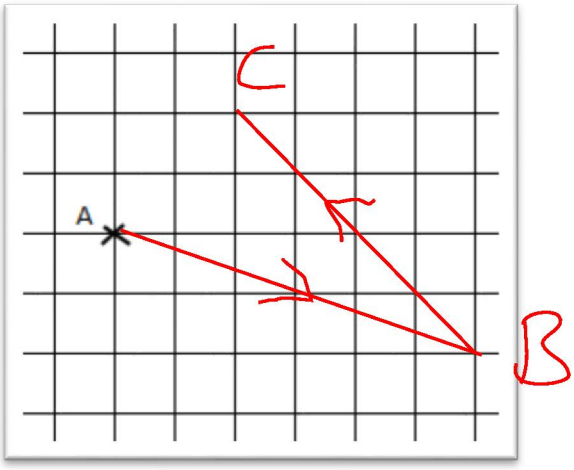


On the grid, draw the Vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ from Point A.

Label the new point B.

(1 Mark)

4)



a) On the grid, draw the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ from Point A

Label the new point B.

(1 Mark)

bi) On the grid draw the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ from Point B

Label the new point C

ii) State the vector $\overrightarrow{AC}$ $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$ (2 Marks)

3) Simple Vectors: Medium

5) Vector $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 11 \end{pmatrix}$

_____

(2 Marks)

6) Vector $\overrightarrow{AB} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$

_____

(2 Marks)

7) Vector $\overrightarrow{AB} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 10 \end{pmatrix}$

State Vector $\overrightarrow{CA}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

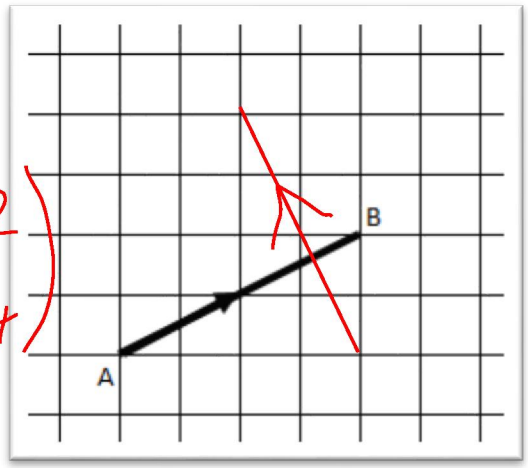
$\begin{pmatrix} -4 \\ -2 \end{pmatrix} + \begin{pmatrix} -2 \\ 10 \end{pmatrix} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}$

$\overrightarrow{CA} = -\overrightarrow{AC} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

(2 Marks)

3) Simple Vectors: Harder

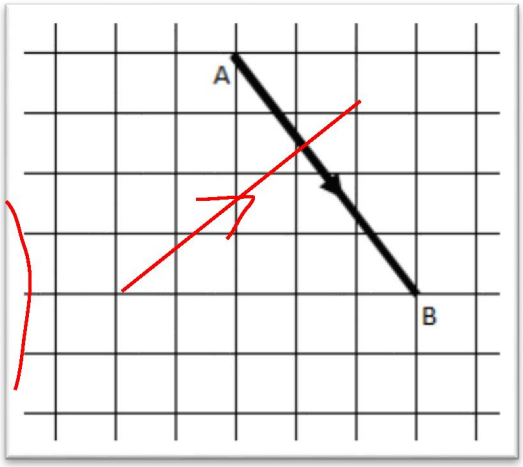
8)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

9)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

4) Estimation and Reasoning: Easier

1) Find an estimate for $\frac{423 \times 69.5}{0.52}$

$$\frac{400 \times 70}{0.5}$$

$$= \frac{28000}{0.5}$$

$$= 56000$$

(2 Marks)

---

2) a) Estimate the value of $\sqrt{2.9 + 9.6 + 1.98}$

$$\sqrt{3 + 10 + 2}$$

$$= \sqrt{15}$$

3.9

b) Explain if your answer to a) is an overestimate or underestimate

All numbers have been rounded up so it is an overestimate

(3 Marks)

---

3) A water bottling plant has 967 machines, each machine filters on average 2912 litres per day. The water is then put into ½ litre bottles. Estimate how many bottles the plant fills in one day

$$\frac{1000 \times 3000}{0.5}$$

$$\frac{3000000}{0.5}$$

6000000

(2 marks)

4) Estimation and Reasoning: Medium

4) A litre of petrol costs £1.07, Sally's car can travel 9.8Km on one litre of petrol. Sally wants to travel from Manchester to Stoke. The distance from Manchester to Stoke is 71.4km. Estimate the cost of Sally's journey from Manchester to Stoke. Show your working.

$$\frac{70}{10} \times 1$$

£7_____

(2 Marks)

---

5) Jeremy organised a charity celebrity football match. Each ticket for the football match cost £20.05. Jeremy sold 507 tickets. Jeremy had to pay costs of £2980 He gave all money left to the charity.

a) Work out an estimate for the amount of money Jeremy gave to the charity.

$$20 \times 500 = 10000$$

$$10000 - 3000 = £7000$$

£7000_____

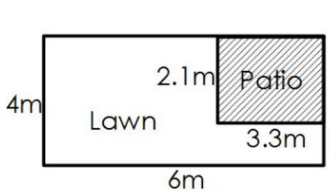
b) Is your answer to (a) an underestimate or an overestimate? Give a reason for your answer.

An underestimate as the amount of money he made has been rounded down and the cost is rounded up so the difference will be smaller than the actual difference

(4 Marks)

---

6) Elizabeth wants to lay new turf on her lawn. Below is a diagram to show the measurements of the lawn. Each roll of turf covers $3m^2$.



a) Work out an estimate for how many rolls she will need. You must show all working for how you reached your estimate.

Area of Lawn = $(4 \times 6) - (2 \times 3) = 18m^2$

$$\frac{18}{3} = 6\ rolls$$

b) By considering your estimate and no further calculations explain if Elizabeth will have enough rolls to cover the lawn, assuming no turf is wasted

The area of the lawn is actually bigger than estimated as the area of the patio is smaller than estimated as both numbers are rounded down. Since we subtracted a smaller number than the actual number, our estimate is an overestimate so Elizabeth will have enough rolls to cover the lawn.

(3 Marks)

4) Estimation and Reasoning: Harder

7) a) The population of Italy is 59715625. It has an area of 301230Km^2. Population density can be worked out using the formula below. Work out an estimate for the population density of Italy.

$$Population\ Density = \frac{Population}{Area}$$

$$Population\ Density = \frac{60000000}{300000} = 200 population/km^2$$

$200 population/km^2$

b) Explain whether Italy is more densely populated than your estimate or less densely populated.

It is actually less densely populated as the estimate is an overestimate. The population has been rounded up and the area has been rounded down so when we divide an overestimate by an underestimate it becomes even bigger.

(3 Marks)

---

8) The mass of the Earth is $5.98 \times 10^{24} kg$. Jupiter's mass is 318 times larger than Earth's. Estimate the mass of Jupiter. Give your estimate in standard form. You must show how you reached your estimate.

$$6 \times 10^{24} \times 3 \times 10^{2}$$

$$= 18 \times 10^{26}$$

$$= 1.8 \times 10^{27}\text{Kg}$$

$= 1.8 \times 10^{27}$Kg

(3 Marks)

5) Direct and Inverse Proportion: Easier

1. The weight of a piece of wire is directly proportional to its length.

A piece of wire is 25 cm long and has a weight of 6 grams.
Another piece of the same wire is 30 cm long.

Calculate the weight of the 30 cm piece of wire.

$W = kl$

$6 = 25k$

$k = 0.24$

$w = 0.24l$

$w = 0.24 \times 30$

$w = 7.2$

7.2 ..... grams

(Total 2 marks)

2. A ball falls vertically after being dropped.
The ball falls a distance d metres in a time of t seconds.
d is directly proportional to the square of t. $d = kt^2$

The ball falls 20 metres in a time of 2 seconds.

(a) Find a formula for d in terms of t.

$20 = k \times 2^2$

$20 = 4k$

$k = 5$

$d =$ $5t^2$

(3)

(b) Calculate the distance the ball falls in 3 seconds.

$d = 5 \times 3^2$

$d = 5 \times 9 = 45$

45 ..... m

(1)

(c) Calculate the time the ball takes to fall 605 m.

$d = 5t^2$

$605 = 5t^2$

$t^2 = 121$

$t = \pm 11$

(ignore -11 as time can't be -ve)

11 ..... seconds

(3)

(Total 7 marks)

5) Direct and Inverse Proportion: Medium

16. P is inversely proportional to V.

$P = \frac{k}{V}$

When $V = 8$, $P = 5$

(a) Find a formula for P in terms of V.

$5 = \frac{k}{8}$

$k = 5 \times 8$

$k = 40$

$P = \frac{40}{V}$

(3)

(b) Calculate the value of P when $V = 2$

$P = \frac{40}{2}$

$P = 20$

20

(1)

(Total 4 marks)

17. The force, F, between two magnets is inversely proportional to the square of the distance, x, between them.

$F = \frac{k}{x^2}$

When $x = 3$, $F = 4$.

(a) Calculate F when $x = 2$.

$4 = \frac{k}{9}$

$k = 36$

$F = \frac{36}{x^2}$

$F = \frac{36}{2^2}$

$F = \frac{36}{4} = 9$

$F = 9$

(4)

(b) Calculate x when $F = 64$.

$F = \frac{36}{x^2}$

$64 = \frac{36}{x^2}$

$64x^2 = 36$

$x^2 = \frac{36}{64}$

$x = \pm\frac{6}{8}$

$x = \frac{3}{4}$

(2)

(Total 6 marks)

5) Direct and Inverse Proportion: Harder

1) A is inversely proportional to the square root of B. Jim says if B is very large A will be negative. Is he right?

Solution: $A \propto \frac{1}{\sqrt{B}}$

$$A = \frac{k}{\sqrt{B}}$$

Jim is wrong. If B is very large $\sqrt{B}$ will be positive, therefore A will also be positive.

(As B becomes very large, A becomes very small)

(4 Marks)

---

2) If Sally drives to work 25% faster than she did yesterday. What would be her percentage decrease in the time taken to get to work?

Solution: $Time = \frac{Distance}{Speed}$

$$Time = \frac{D}{1.25}$$

$$Time = \frac{1}{1.25}$$

$$Time = \frac{4}{5}$$

$$\frac{4}{5} = 80\%$$

She will get there 20% faster.

(4Marks)

RYAN Natalie

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	15 from 27	7 from 12	6 from 10	2 from 4	0 from 1	0 from 0
A02 and 3	29 from 53	8 from 14	6 from 13	3 from 8	5 from 11	7 from 7
Total	44 from 80	15 from 26	12 from 23	5 from 12	5 from 12	7 from 7

Your Pinpoint Topics

Topic 1: Simple Fibonacci Sequences. Mathswatch Clip: 141

Topic 2: Algebraic Equivalence. Mathswatch Clip: NA

Topic 3: Recognising graphs. Mathswatch Clip:

Topic 4: Surds. Mathswatch Clip: 207

Topic 5: Fractional and Negative Indices. MW: 188

1) Simple Fibonacci Sequences: Easier

1. To find the next term in a Fibonacci sequence, you find the sum of the 2 previous terms.

   1 1 2 3 5 8

   a) Find the next term in this sequence $5 + 8$

   _____13_____

   (1 mark)

   b) Find the 9th term of this sequence $8 + 13 = 21,\ 21 + 13 = 34$

   _____34_____

   (1 mark)

---

2. Below are the first 5 terms of a Fibonacci sequence.

   4 5 9 14 23

   a) Find the next term in this sequence $14 + 23 = 37$ _____37_____

   (1 mark)

   b) Find the 8th term of this sequence $37 + 23 = 60,\ 60 + 27 = 97$

   _____97_____

   (1 mark)

---

3. Below are the first 5 terms of a Fibonacci sequence.

   2 4 6 10 16

   a) Find the next term in this sequence $10 + 16 = 26$

   _____26_____

   (1 mark)

   b) Will 68 be in this sequence?

   $26 + 16 = 42,\ 42 + 26 = 68$ _____Yes_____

   (1 mark)

---

4. The sequence below is a Fibonacci sequence

   2 3 __5__ 8 13

   a) Find the missing number from the sequence

   $8 - 3 = 5$ _____5_____

   (1 mark)

   b) Find the next term in this sequence $13 + 8 = 21$

   _____21_____

   (1 mark)

1) Simple Fibonacci Sequences: Medium

5. Here is a Fibonacci-type sequence

2 _5_ _7_ 12 19

Find the 2 missing terms

$19 - 12 = 7,\ 12 - 7 = 5$

_____5___ and ____7___

(2 marks)

---

6. Here are the fourth and fifth terms of a Fibonacci-type sequence

_3_ _7_ _10_ 17 27

Show that the first term is 3

$27 - 17 = 10,$

$17 - 10 = 7,$

$10 - 7 = 3$

(1 mark)

---

7. The first 3 terms of a Fibonacci sequence are

$1 \qquad x \qquad x + 1$

a) Write an expression for the 4th term

$x + (x + 1) = 2x + 1$

_____$2x + 1$___

(1 mark)

b) If the 5th term is 11, find the value of x

5^{th} term: $(2x + 1) + (x + 1) = 3x + 2 = 11$

$3x = 9$

_____$x = 3$____

(2 marks)

1) Simple Fibonacci Sequences: Harder

8. The first three terms of a Fibonacci sequence are

$$x \quad y \quad x+y$$

a) Show that the 5th term of this sequence is $2x+3y$

4^{th} term: $y+(x+y)=x+2y$

5^{th} term: $(x+y)+(x+2y)=2x+3y$ **(2 marks)**

Given that the 3rd term is 5 and the 5th term is 14

b) Find the value of x and the value of y

$x+y=5$ (A) $\quad 2x+3y=14$ (B)

$2\times$(A): $2x+2y=10$ (C) $\quad x =$ 1

(B)- (C): $y=4$, sub into (A): $x+4=5$, $x=1$ $\quad y =$ 4

(3 marks)

---

9. Here are the first and third terms of a Fibonacci sequence

$$p \quad q-p \quad q \quad 2q-p \quad 3q-p$$

a) Write an expression, in terms of p and q, for the second term

$q-p$

(1 mark)

b) Write an expression, in terms of p and q, for the fifth term

4^{th} term: $(q-p)+q=2q-p$

5^{th} term: $(2q-p)+q=3q-p$ $\quad 3q-p$

(1 mark)

---

10. The first and third terms of a Fibonacci sequence are

$$a \quad b+1-a \quad b+1 \quad 2b+2-a \quad 3b+3-a$$

a) Write an expression, in terms of a and b, for the fifth term

2^{nd} term: $(b+1)-a=b+1-a$

4^{th} term: $(b+1)+(b+1-a)=2b+2-a$

5^{th} term: $(2b+2-a)+(b+1)=3b+3-a$ $\quad 3b+3-a$

(2 marks)

Given that the second term is 9 and the fifth term is 35

b) Find the value of a and the value of b

$b+1-a=9 \quad \Rightarrow b-a=8$ (A)

$3b+3-a=35 \Rightarrow 3b-a=32$ (B)

(B) – (A): $2b=24 \Rightarrow b=12$ $\quad a =$ 4

Sub into (A): $12-a=8 \Rightarrow a=4$ $\quad b =$ 12

(3 marks)

2) Algebraic Equivalence: Easier

1) Simplify $\frac{3x^2}{x}$

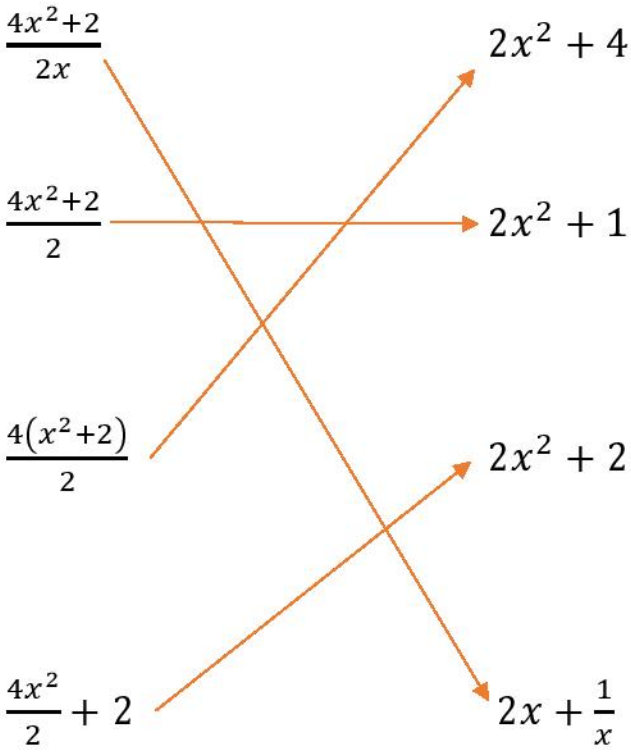
$3x$

_____

(1 Mark)

---

2) Match each of the four expressions on the left hand side with 1 equivalent expression on the right hand side



2) Algebraic Equivalence: Medium

3) Circle the expression that is equivalent to $\frac{3x^2+2}{x}$ where x is not equal to 0

A $3x^3+2$ B $3x+\frac{2}{x}$ C $2x^2+\frac{2}{x}$ D $3x+2$

$$\frac{3x^2+2}{x}$$

$$=\frac{3x^2}{x}+\frac{2}{x}$$

$$=3x+\frac{2}{x}$$

(1 Mark)

---

4) **Two** of these four expressions are equivalent. Circle the two expressions

A $\frac{x}{x+5}$ B $1+\frac{x}{5}$ C $\frac{5+x}{5}$ D $\frac{x^2}{x^2+5}$

(1 mark)

2) Algebraic Equivalence: Harder

5) Fiona tries to simplify this expression

$$\frac{3x}{3+x}$$

She writes

$$\frac{3x}{3}+\frac{3x}{x}$$

$$x+3$$

Explain why Fiona can not rewrite the expression like this

Dividing $3x$ by $3+x$ is not the same as dividing it by 3 and adding it to $\frac{3x}{x}$

Numerical Example

If $x=1$

$$\frac{3x}{3+x}=\frac{3}{4}$$

$$\frac{3x}{3}+\frac{3x}{x}=\frac{3}{3}+\frac{3}{1}=4$$

As you can see, these two expressions are not equal

(1 mark)

---

6) Show that $\frac{2x+5}{1+\frac{2}{x}}$ is equivalent to $\frac{2x^2+5x}{x+2}$

$$\frac{2x+5}{1+\frac{2}{x}}$$

$$=\frac{x(2x+5)}{x(1+\frac{2}{x})}$$

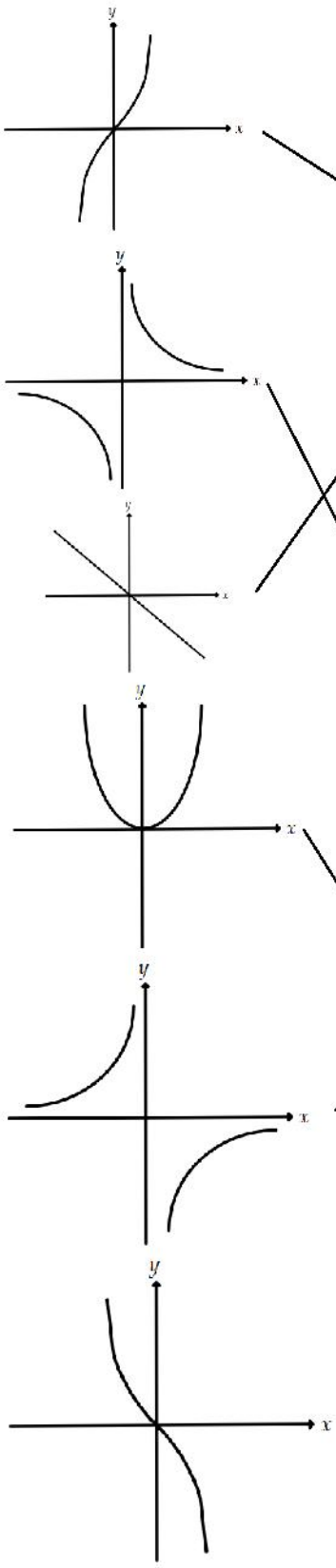
$$=\frac{2x^2+5x}{x+2}$$

(1 mark)

---

3) Recognising graphs: Easier

1) Match each of the graphs with its equation, the first one is done for you



$y = -x$

$y = x^3$

$y = -x^3$

$y = -\frac{1}{x}$

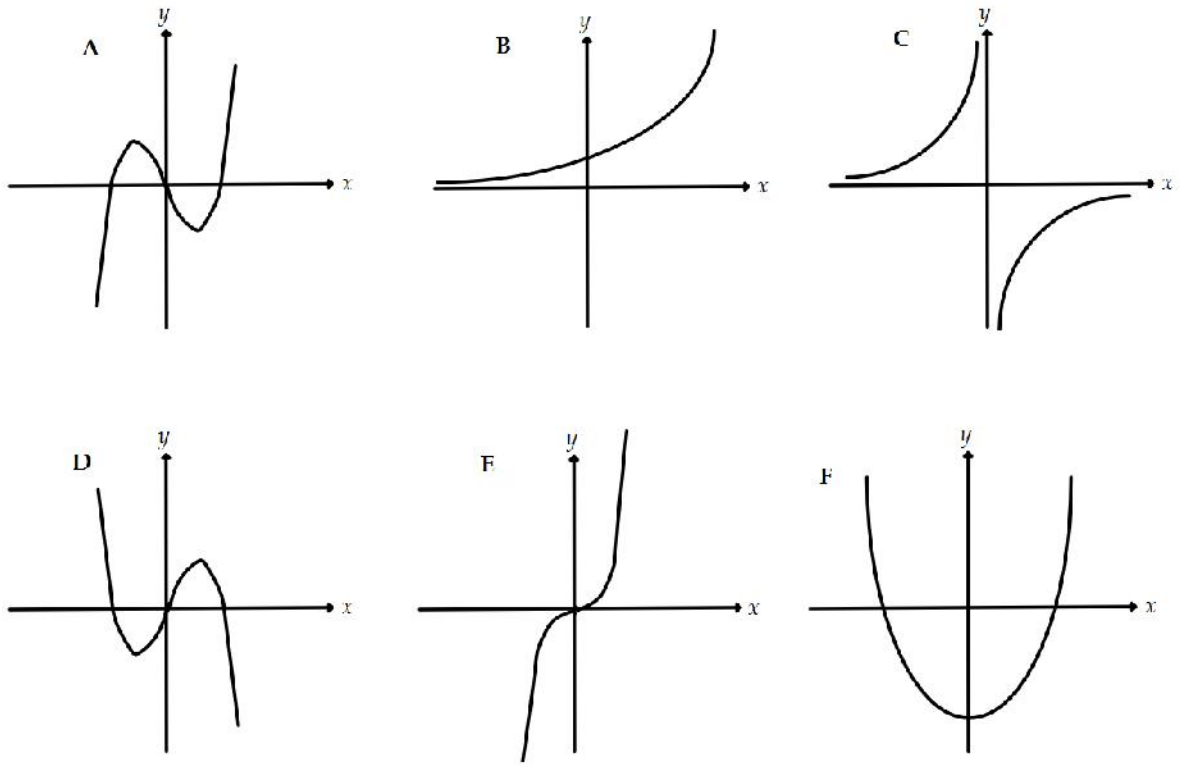
$y = \frac{1}{x}$

$y = x^2$

(3 marks)

3) Recognising graphs: Medium

2) Harry has sketched some graphs



a) Write down the letter of the graph that could have the equation $y = 3^x$

B

_____

(1 Mark)

b) Write down the letter of the graph that could have the equation $y = -\frac{5}{x}$

C

_____

(1 Mark)

c) Write down the letter of the graph that could have the equation $y = 2x - x^3$

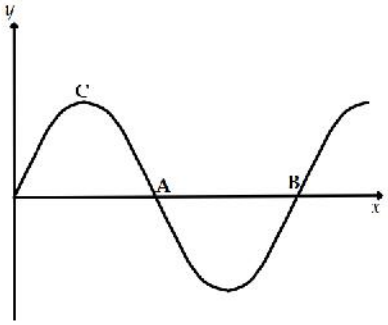
D

_____

(1 Mark)

3) Recognising graphs: Harder

3) A sketch of part of $y = \sin(x)$ is drawn below



a) Write down the coordinates of A

$(180°, 0)$

_____

(1 Mark)

b) Write down the coordinates of B

$(360°, 0)$

_____

(1 Mark)

c) Write down the coordinates of C

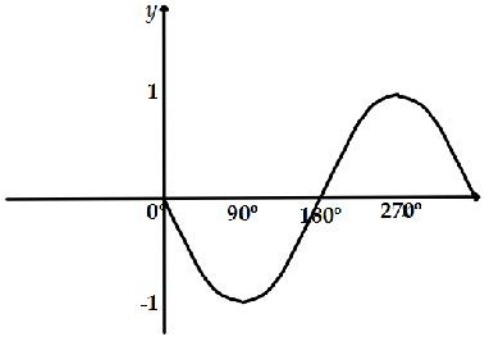
$(90°, 1)$

_____

(1 Mark)

---

4) Lanre was asked to sketch $y = \cos(x)\ for\ 0° \leq x \leq 360°$. This is what Lanre sketched



Write down one mistake Lanre has made

$y = \cos(x)$ does not go through (0,0) it starts at (0,1) and decreases to (90°,0)

(1 Mark)

4) Surds: Easier

1. a) Simplify $\sqrt{75}$

$\sqrt{75} = \sqrt{25 \times 3}$

$= 5\sqrt{3}$

..... **(1)**

b) Express $\sqrt{75} - \sqrt{48}$ in the form $a\sqrt{3}$ where a is an integer.

$5\sqrt{3} - \sqrt{16 \times 3}$

$= 5\sqrt{3} - 4\sqrt{3}$

$\sqrt{3}$

a = 1

..... **(2)**

2. Express $\frac{15}{\sqrt{5}}$ in the form $a\sqrt{b}$ where a and b are positive integers.

$\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{15\sqrt{5}}{5}$

$= 3\sqrt{5}$

..... **(2)**

3. Expand and simplify $(2 + \sqrt{3})(4 + \sqrt{3})$ giving your answer in the $a + b\sqrt{3}$ where a and b are integers.

$(2 + \sqrt{3})(4 + \sqrt{3})$

$= 8 + 2\sqrt{3} + 4\sqrt{3} + 3$

$= 11 + 6\sqrt{3}$

..... **(3)**

4) Surds: Medium

4. Expand and simplify $(4-2\sqrt{3})^2$ giving your answer in the $a+b\sqrt{3}$ where a and b are integers.

$$(4-2\sqrt{3})(4-2\sqrt{3})$$
$$=16-8\sqrt{3}-8\sqrt{3}+12$$
$$=30-16\sqrt{3}$$

…… **(3)**

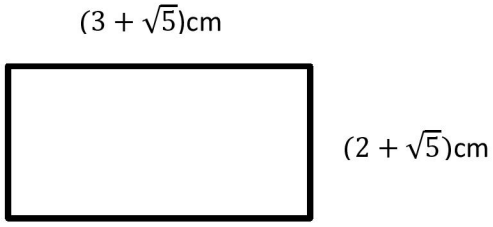
5. Expand and simplify $(\sqrt{5}-\sqrt{10})^2$ giving your answer in the $a+b\sqrt{2}$ where a and b are integers.

$$(\sqrt{5}-\sqrt{10})(\sqrt{5}-\sqrt{10})$$
$$=5-\sqrt{50}-\sqrt{50}+\sqrt{100}$$
$$=15-2\sqrt{50}$$
$$=15-2\sqrt{25\times 2}$$
$$=15-10\sqrt{2}$$

…… **(4)**

4) Surds: Harder

8. Find the area of the rectangle below, give your answer in simplest form.



$(3+\sqrt{5})(2+\sqrt{5})$

$= 6 + 3\sqrt{5} + 2\sqrt{5} + 5$

$= (5\sqrt{5} + 11)\text{cm}^2$

5) Fractional and Negative Indices: Easier

1) Evaluate

a) 6^0 $= 1$ _____

(1 Mark)

a) $25^{\frac{1}{2}}$ $= \sqrt{25} = 5$ _____

(1 Mark)

c) 3^{-1} $= \frac{1}{3}$ _____

(1 Mark)

---

2) Sarah says that $9^{\frac{1}{2}}$ is 4.5. She is wrong. Explain her mistake.

Solution: $9^{\frac{1}{2}} = \sqrt{9} = 3$

_____

(1 Mark)

---

3) Evaluate

a) $27^{\frac{1}{3}}$ $\sqrt[3]{27} = 3$

_____

(1 Mark)

b) $27^{\frac{2}{3}}$ $\sqrt[3]{27}^2 = 9$ _____

(1 Mark)

c) $27^{\frac{-2}{3}}$ $\frac{1}{\sqrt[3]{27^2}} = \frac{1}{9}$ _____

(1 Mark)

---

5) Fractional and Negative Indices: Medium

4) Evaluate

a) $\left(\frac{25}{81}\right)^{\frac{-1}{2}}$ $\left(\frac{1}{25/81}\right)^{\frac{1}{2}} = \left(\frac{81}{25}\right)^{\frac{1}{2}} = \sqrt{\frac{81}{25}} = \frac{9}{5}$

(1 Mark)

b) $32^{\frac{-3}{5}}$ $\left(\frac{1}{32}\right)^{\frac{3}{5}} = \left(\sqrt[5]{\frac{1}{32}}^{3}\right) = \frac{1}{2^3} = \frac{1}{8}$

(1 Mark)

c) $144^{\frac{-1}{2}} \times 3^{-2}$ $\frac{1}{\sqrt{144}} \times \frac{1}{3^2} = \frac{1}{12} \times \frac{1}{9} = \frac{1}{108}$

(2 Marks)

---

5) Put these numbers in ascending order, show your working.

125^0 $125^{\frac{-1}{3}}$ $\left(\frac{1}{125}\right)^{\frac{-1}{3}}$ $125^{\frac{-2}{3}}$

1 $\frac{1}{\sqrt[3]{125}} = \frac{1}{5}$ $\left(\frac{1}{1/125}\right)^{\frac{1}{3}} = \sqrt[3]{125} = 5$ $\left(\frac{1}{125}\right)^{\frac{2}{3}} = \frac{1}{\sqrt[3]{125^2}} = \frac{1}{5^2} = \frac{1}{25}$

Correct order $\frac{1}{25}, \frac{1}{5}, 1, 5$.

(3 Marks)

5) Fractional and Negative Indices: Harder

6) If $2^{2x} = \frac{1}{16}$. Work out the value of x.

$2^{2x} = \frac{1}{4^2}$

$2^{2x} = 4^{-2}$

$2^{2x} = 2^{2(-2)}$

$x = -2$

(2 Marks)

---

7) One of these has a different value to the other two. Decide which one and justify your answer.

$4^{\frac{3}{4}}$ $8^{\frac{1}{4}}$ $2^{\frac{3}{2}}$

$2^{2\left(\frac{3}{4}\right)} = 2^{\frac{6}{4}} = 2^{\frac{3}{2}}$ $2^{3\left(\frac{1}{4}\right)} = 2^{\frac{3}{4}}$

The values that are the same are $4^{\frac{3}{4}}$ and $2^{\frac{3}{2}}$

(3 Marks)

---

8) If $32^{3x} = \frac{1}{8}$. Find the value of x

$2^{5(3x)} = \frac{1}{8}$

$2^{15x} = \frac{1}{2^3}$

$2^{15x} = 2^{-3}$

$15x = -3$

$x = \frac{-3}{15}$

$x = -\frac{1}{5}$

(3 Marks)

STREET Tom

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	11 from 27	5 from 12	4 from 10	2 from 4	0 from 1	0 from 0
A02 and 3	25 from 53	6 from 14	8 from 13	4 from 8	6 from 11	1 from 7
Total	36 from 80	11 from 26	12 from 23	6 from 12	6 from 12	1 from 7

Your Pinpoint Topics

Topic 1: Flow rates. Mathswatch Clip:

Topic 2: Simple Fibonacci Sequences. Mathswatch Clip: 141

Topic 3: Understanding Number. Mathswatch Clip: NA

Topic 4: Estimation and Reasoning. Mathswatch Clip: 91

Topic 5: Algebraic Equivalence. Mathswatch Clip: NA

1) Flow rates: Easier

1) A bath holds 120 litres when filled to a suitable height for bathing.
When turned on fully, the bath taps fill the bath at a rate of 15 litres per minute

(a) Assume that the water flow is constant, and the plug is in the bath.
How long will it take to fill the bath from empty?

120 ÷ 15

= 8

= 8 minutes

(b) If an overflow pipe is fitted in the bath, which allows water to escape once it reaches 150 litres, which is of the following is true?

Tick one box.

- ☐ One the water volume reaches 150 litres, the rate at which the bath fills, **increases**.
- ☐ One the water volume reaches 150 litres, the rate at which the bath fills, **remains constant**.
- ☒ One the water volume reaches 150 litres, the rate at which the bath fills, **decreases**.

(3 Marks)

1) Flow rates: Medium

2) The air pressure in a road bike tyre should be at least 80 psi
An electric bike pump, pumps air at a rate of 0.5 psi per second

(a) Assume that the air flow is constant.
How long will it take the pump to inflate the tyres from 50 psi to 80 psi?

Calculating pressure increase needed:

80 – 50 = 30psi

Calculating time to increase by 30psi (increasing at 0.5psi per sec):

30 ÷ 0.5 = 300 ÷ 5 = 60 secs

OR

1psi takes 2 secs, so 30psi takes 60 secs

(b) In fact pump is less effective at higher pressures, so pumps at a slower rate, as the tyre pressure increases.
How does this affect your answer to (a)?

It takes longer than the 60 seconds calculated to inflate from 50 to 80psi.

(3 Marks)

1) Flow rates: Harder

3) A chemical solution is comprised of a solute and 3.1ml of water.
More water is added to the solute, at a rate of 0.3ml every 5 seconds.

(a) How long will it take for the solution be comprised of 5.5ml of water?

Calculating water needing to be added:

$5.5 - 3.1 = 2.4\text{ml}$

Calculating number of 0.3ml drops needed to make 2.4ml:

$2.4 \div 0.3 = 24 \div 3 = 8$ drops

Calculating time to add 8 drops at one every 5 seconds:

$8 \times 5 = 40$ seconds.

(b) Some students decrease the drip rate, as the experiment goes on.
How does this affect your answer to (a)?

It takes more than the 40 seconds calculated to add the correct amount of water.

(3 Marks)

2) Simple Fibonacci Sequences: Easier

1. To find the next term in a Fibonacci sequence, you find the sum of the 2 previous terms.

   1 1 2 3 5 8

   a) Find the next term in this sequence $5 + 8$

   13

   (1 mark)

   b) Find the 9th term of this sequence $8 + 13 = 21,\ 21 + 13 = 34$

   34

   (1 mark)

---

2. Below are the first 5 terms of a Fibonacci sequence.

   4 5 9 14 23

   a) Find the next term in this sequence $14 + 23 = 37$ 37

   (1 mark)

   b) Find the 8th term of this sequence $37 + 23 = 60,\ 60 + 27 = 97$

   97

   (1 mark)

---

3. Below are the first 5 terms of a Fibonacci sequence.

   2 4 6 10 16

   a) Find the next term in this sequence $10 + 16 = 26$

   26

   (1 mark)

   b) Will 68 be in this sequence?

   $26 + 16 = 42,\ 42 + 26 = 68$ Yes

   (1 mark)

---

4. The sequence below is a Fibonacci sequence

   2 3 _5_ 8 13

   a) Find the missing number from the sequence

   $8 - 3 = 5$ 5

   (1 mark)

   b) Find the next term in this sequence $13 + 8 = 21$

   21

   (1 mark)

2) Simple Fibonacci Sequences: Medium

5. Here is a Fibonacci-type sequence

2 _5_ _7_ 12 19

Find the 2 missing terms

$19 - 12 = 7,\ 12 - 7 = 5$

_____5___ and ____7___

(2 marks)

---

6. Here are the fourth and fifth terms of a Fibonacci-type sequence

_3_ _7_ _10_ 17 27

Show that the first term is 3

$27 - 17 = 10,$

$17 - 10 = 7,$

$10 - 7 = 3$

(1 mark)

---

7. The first 3 terms of a Fibonacci sequence are

$1 \qquad x \qquad x + 1$

a) Write an expression for the 4th term

$x + (x + 1) = 2x + 1$

_____$2x + 1$___

(1 mark)

b) If the 5th term is 11, find the value of x

5^{th} term: $(2x + 1) + (x + 1) = 3x + 2 = 11$

$3x = 9$

_____$x = 3$____

(2 marks)

2) Simple Fibonacci Sequences: Harder

8. The first three terms of a Fibonacci sequence are

$$x \quad y \quad x+y$$

a) Show that the 5th term of this sequence is $2x+3y$

4^{th} term: $y+(x+y)=x+2y$

5^{th} term: $(x+y)+(x+2y)=2x+3y$ **(2 marks)**

Given that the 3rd term is 5 and the 5th term is 14

b) Find the value of x and the value of y

$x+y=5$ (A) $\quad 2x+3y=14$ (B)

$2\times$(A): $2x+2y=10$ (C) $\quad x =$ 1

(B)- (C): $y=4$, sub into (A): $x+4=5$, $x=1$ $\quad y =$ 4

(3 marks)

---

9. Here are the first and third terms of a Fibonacci sequence

$$p \quad q-p \quad q \quad 2q-p \quad 3q-p$$

a) Write an expression, in terms of p and q, for the second term

$q-p$

(1 mark)

b) Write an expression, in terms of p and q, for the fifth term

4^{th} term: $(q-p)+q=2q-p$

5^{th} term: $(2q-p)+q=3q-p$ $\quad 3q-p$

(1 mark)

---

10. The first and third terms of a Fibonacci sequence are

$$a \quad b+1-a \quad b+1 \quad 2b+2-a \quad 3b+3-a$$

a) Write an expression, in terms of a and b, for the fifth term

2^{nd} term: $(b+1)-a=b+1-a$

4^{th} term: $(b+1)+(b+1-a)=2b+2-a$

5^{th} term: $(2b+2-a)+(b+1)=3b+3-a$ $\quad 3b+3-a$

(2 marks)

Given that the second term is 9 and the fifth term is 35

b) Find the value of a and the value of b

$b+1-a=9 \Rightarrow b-a=8$ (A)

$3b+3-a=35 \Rightarrow 3b-a=32$ (B)

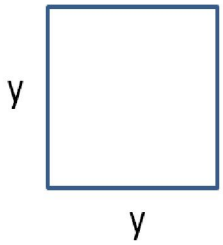
(B) – (A): $2b=24 \Rightarrow b=12$ $\quad a =$ 4

Sub into (A): $12-a=8 \Rightarrow a=4$ $\quad b =$ 12

(3 marks)

3) Understanding Number: Easier

1. Jim is looking at the area and lengths of squares.



Jim considers a square with area $9m^2$.

Jim works out the length of the square as follows:

$$y^2 = 9$$

$$y = \sqrt{9}$$

$$y = 3cm$$

Jim considers another square with a **different** area.

Please tick below:

	This method will **always** give an answer which is a whole number
/	This method will **sometimes** give an answer which is a whole number
	This method will **never** give an answer which is a whole number

Show working to support your answer

Any area which is a square number will give a whole number using this method

e.g. $y^2 = 16$ gives $y = \sqrt{16} = 4$ cm

Any area that is a non-square number won't give a whole number

e.g. $y^2 = 10$ gives $y = \sqrt{10} = 3.162\ldots$ cm

(3 marks)

3) Understanding Number: Medium

2.a) Anne puts a number in her calculator and squares her number. The number gets a lot bigger.

Anne says "if you square a number it will **always** get bigger".

Please tick below:

☐	Anne is correct
/	Anne is **not** correct

Show working to support your answer

If you square a number that is between 0 and 1 it will become smaller

e.g. $0.5^2 = 0.25$

(3 marks)

b) Pete says "if you square a number it will **always** be positive".

Please tick below:

☐	Pete is correct
/	Pete is **not** correct

Show working to support your answer

If you square **zero** the answer is zero, a non-positive number.

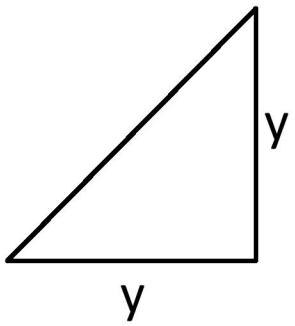
$$0^2 = 0 \times 0 = 0$$

(3 marks)

3) Understanding Number: Harder

3.a) Amir cuts a square in half along the diagonal to produce a right angled triangle.

It has a length, y, which is a whole number.



Amir works out the **area** of the triangle.

Please tick below:

	The area **must** be a whole number.
/	The area will **sometimes** be a whole number.

Show working to support your answer

If y = 3 then the area is $(3 \times 3) \div 2 = 9 \div 2 = 4.5$ a decimal

If y = 4 then the area is $(4 \times 4) \div 2 = 16 \div 2 = 8$ a whole number

(3 marks)

b) Amir is about the work out the **hypotenuse** of the triangle.

Amir says "The hypotenuse of the triangle will **always** be a whole number".

Show that Amir is wrong.

Pythagoras' Theorem: $a^2 + b^2 = c^2$

If $a = 2$ and $b = 3$ then

$$c^2 = 2^2 + 3^2 = 4 + 9 = 13$$

$$c = \sqrt{13} = 3.605 \ldots$$

So the hypotenuse is not a whole number in this case

(3 marks)

4) Estimation and Reasoning: Easier

1) Find an estimate for $\frac{423 \times 69.5}{0.52}$

$$\frac{400 \times 70}{0.5}$$

$$= \frac{28000}{0.5}$$

$$= 56000$$

(2 Marks)

---

2) a) Estimate the value of $\sqrt{2.9 + 9.6 + 1.98}$

$$\sqrt{3 + 10 + 2}$$

$$= \sqrt{15}$$

3.9

b) Explain if your answer to a) is an overestimate or underestimate

All numbers have been rounded up so it is an overestimate

(3 Marks)

---

3) A water bottling plant has 967 machines, each machine filters on average 2912 litres per day. The water is then put into ½ litre bottles. Estimate how many bottles the plant fills in one day

$$\frac{1000 \times 3000}{0.5}$$

$$\frac{3000000}{0.5}$$

6000000

(2 marks)

---

4) Estimation and Reasoning: Medium

4) A litre of petrol costs £1.07, Sally's car can travel 9.8Km on one litre of petrol. Sally wants to travel from Manchester to Stoke. The distance from Manchester to Stoke is 71.4km. Estimate the cost of Sally's journey from Manchester to Stoke. Show your working.

$$\frac{70}{10} \times 1$$

£7_____

(2 Marks)

---

5) Jeremy organised a charity celebrity football match. Each ticket for the football match cost £20.05. Jeremy sold 507 tickets. Jeremy had to pay costs of £2980 He gave all money left to the charity.

a) Work out an estimate for the amount of money Jeremy gave to the charity.

$$20 \times 500 = 10000$$

$$10000 - 3000 = £7000$$

£7000_____

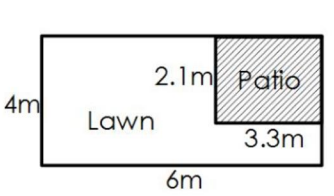
b) Is your answer to (a) an underestimate or an overestimate?
Give a reason for your answer.

An underestimate as the amount of money he made has been rounded down and the cost is rounded up so the difference will be smaller than the actual difference

(4 Marks)

---

6) Elizabeth wants to lay new turf on her lawn. Below is a diagram to show the measurements of the lawn. Each roll of turf covers $3m^2$.



a) Work out an estimate for how many rolls she will need. You must show all working for how you reached your estimate.

Area of Lawn = $(4 \times 6) - (2 \times 3) = 18m^2$

$$\frac{18}{3} = 6\ rolls$$

b) By considering your estimate and no further calculations explain if Elizabeth will have enough rolls to cover the lawn, assuming no turf is wasted

The area of the lawn is actually bigger than estimated as the area of the patio is smaller than estimated as both numbers are rounded down. Since we subtracted a smaller number than the actual number, our estimate is an overestimate so Elizabeth will have enough rolls to cover the lawn.

(3 Marks)

4) Estimation and Reasoning: Harder

7) a) The population of Italy is 59715625. It has an area of 301230Km^2. Population density can be worked out using the formula below. Work out an estimate for the population density of Italy.

$$Population\ Density = \frac{Population}{Area}$$

$$Population\ Density = \frac{60000000}{300000} = 200 population/km^2$$

$200 population/km^2$

b) Explain whether Italy is more densely populated than your estimate or less densely populated.

It is actually less densely populated as the estimate is an overestimate. The population has been rounded up and the area has been rounded down so when we divide an overestimate by an underestimate it becomes even bigger.

(3 Marks)

8) The mass of the Earth is $5.98 \times 10^{24} kg$. Jupiter's mass is 318 times larger than Earth's. Estimate the mass of Jupiter. Give your estimate in standard form. You must show how you reached your estimate.

$$6 \times 10^{24} \times 3 \times 10^{2}$$

$$= 18 \times 10^{26}$$

$$= 1.8 \times 10^{27}\text{Kg}$$

$= 1.8 \times 10^{27}$Kg

(3 Marks)

5) Algebraic Equivalence: Easier

1) Simplify $\frac{3x^2}{x}$

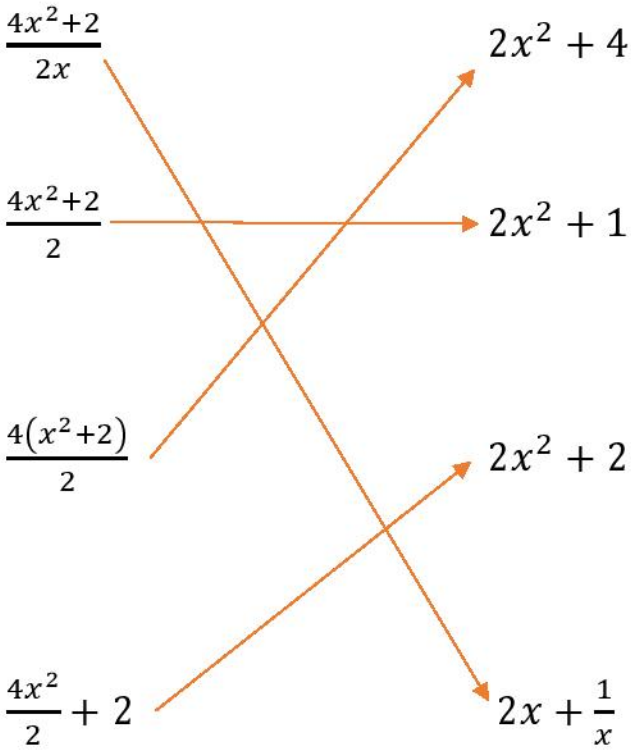
$3x$

_____

(1 Mark)

---

2) Match each of the four expressions on the left hand side with 1 equivalent expression on the right hand side



5) Algebraic Equivalence: Medium

3) Circle the expression that is equivalent to $\frac{3x^2+2}{x}$ where x is not equal to 0

A $3x^3+2$ B $3x+\frac{2}{x}$ C $2x^2+\frac{2}{x}$ D $3x+2$

$$\frac{3x^2+2}{x}$$

$$=\frac{3x^2}{x}+\frac{2}{x}$$

$$=3x+\frac{2}{x}$$

(1 Mark)

---

4) **Two** of these four expressions are equivalent. Circle the two expressions

A $\frac{x}{x+5}$ B $1+\frac{x}{5}$ C $\frac{5+x}{5}$ D $\frac{x^2}{x^2+5}$

(1 mark)

5) Algebraic Equivalence: Harder

5) Fiona tries to simplify this expression

$$\frac{3x}{3+x}$$

She writes

$$\frac{3x}{3}+\frac{3x}{x}$$

$$x+3$$

Explain why Fiona can not rewrite the expression like this

Dividing $3x$ by $3+x$ is not the same as dividing it by 3 and adding it to $\frac{3x}{x}$

Numerical Example

If $x=1$

$$\frac{3x}{3+x}=\frac{3}{4}$$

$$\frac{3x}{3}+\frac{3x}{x}=\frac{3}{3}+\frac{3}{1}=4$$

As you can see, these two expressions are not equal

(1 mark)

---

6) Show that $\frac{2x+5}{1+\frac{2}{x}}$ is equivalent to $\frac{2x^2+5x}{x+2}$

$$\frac{2x+5}{1+\frac{2}{x}}$$

$$=\frac{x(2x+5)}{x(1+\frac{2}{x})}$$

$$=\frac{2x^2+5x}{x+2}$$

(1 mark)

TALMAGE Rheanna

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	13 from 27	6 from 12	5 from 10	1 from 4	1 from 1	0 from 0
A02 and 3	21 from 53	4 from 14	5 from 13	5 from 8	3 from 11	4 from 7
Total	34 from 80	10 from 26	10 from 23	6 from 12	4 from 12	4 from 7

Your Pinpoint Topics

Topic 1: Flow rates. Mathswatch Clip:

Topic 2: Parallelogram Angle Reasoning. Mathswatch Clip: NA

Topic 3: Simple Fibonacci Sequences. Mathswatch Clip: 141

Topic 4: Understanding Number. Mathswatch Clip: NA

Topic 5: Tree Diagrams. Mathswatch Clip: 151

1) Flow rates: Easier

1) A bath holds 120 litres when filled to a suitable height for bathing.
When turned on fully, the bath taps fill the bath at a rate of 15 litres per minute

(a) Assume that the water flow is constant, and the plug is in the bath.
How long will it take to fill the bath from empty?

120 ÷ 15

= 8

= 8 minutes

(b) If an overflow pipe is fitted in the bath, which allows water to escape once it reaches 150 litres, which is of the following is true?

Tick one box.

- ☐ One the water volume reaches 150 litres, the rate at which the bath fills, **increases**.
- ☐ One the water volume reaches 150 litres, the rate at which the bath fills, **remains constant**.
- ■ One the water volume reaches 150 litres, the rate at which the bath fills, **decreases**.

(3 Marks)

1) Flow rates: Medium

2) The air pressure in a road bike tyre should be at least 80 psi
An electric bike pump, pumps air at a rate of 0.5 psi per second

(a) Assume that the air flow is constant.
How long will it take the pump to inflate the tyres from 50 psi to 80 psi?

Calculating pressure increase needed:

80 – 50 = 30psi

Calculating time to increase by 30psi (increasing at 0.5psi per sec):

30 ÷ 0.5 = 300 ÷ 5 = 60 secs

OR

1psi takes 2 secs, so 30psi takes 60 secs

(b) In fact pump is less effective at higher pressures, so pumps at a slower rate, as the tyre pressure increases.
How does this affect your answer to (a)?

It takes longer than the 60 seconds calculated to inflate from 50 to 80psi.

(3 Marks)

1) Flow rates: Harder

3) A chemical solution is comprised of a solute and 3.1ml of water.
More water is added to the solute, at a rate of 0.3ml every 5 seconds.

(a) How long will it take for the solution be comprised of 5.5ml of water?

Calculating water needing to be added:

$5.5 - 3.1 = 2.4\text{ml}$

Calculating number of 0.3ml drops needed to make 2.4ml:

$2.4 \div 0.3 = 24 \div 3 = 8$ drops

Calculating time to add 8 drops at one every 5 seconds:

$8 \times 5 = 40$ seconds.

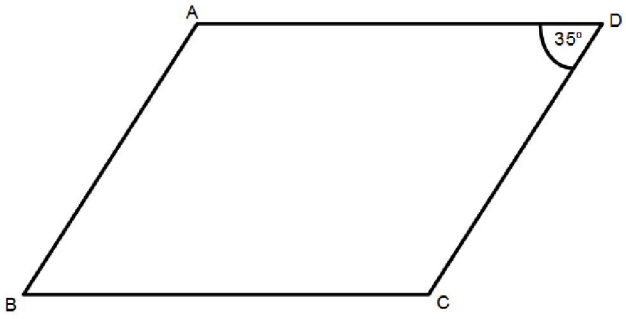
(b) Some students decrease the drip rate, as the experiment goes on.
How does this affect your answer to (a)?

It takes more than the 40 seconds calculated to add the correct amount of water.

(3 Marks)

2) Parallelogram Angle Reasoning: Easier

1) ABCD is a parallelogram



a) Work out the size of angle BCD

$180^o - 35^o = 145^o$

145^o

.....

b) Work out the size angle of ABC

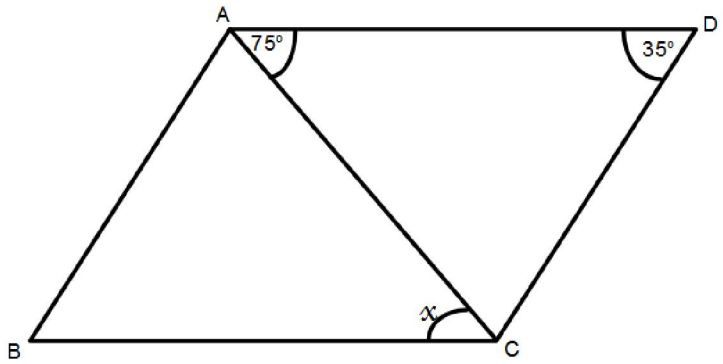
35^o

.....

(2 Marks)

---

2) ABCD is a parallelogram



a) Work out the size of angle x giving reasons for your answer

75^o

.....

Reason:

Alternate angles are equal

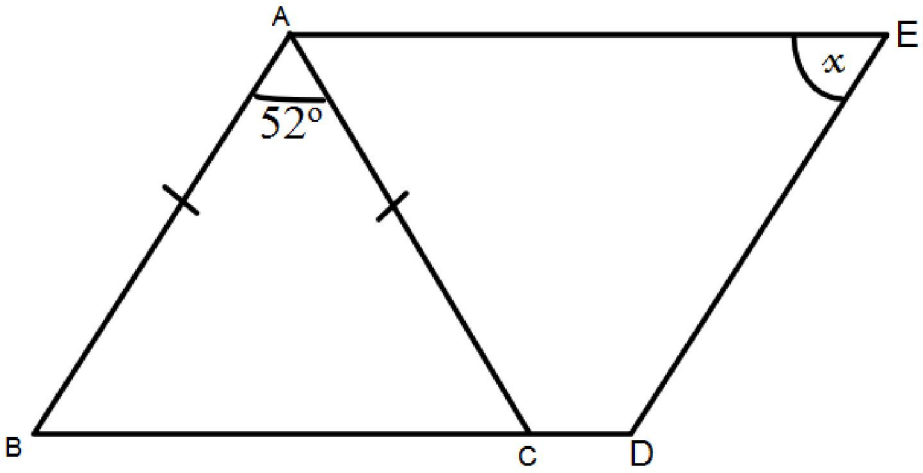
(2 Marks)

---

2) Parallelogram Angle Reasoning: Medium

3) ABDE is a parallelogram.

ABC is an isosceles triangle. AB=AC



Show that angle x is 64°. Give reasons at each stage

Angle ABC=ACB

180°- 52° =128°

128°÷2=64°

Base angles of an isosceles triangle are equal and angles in a triangle add up to 180°

Angle EDB=180°-64°=116°

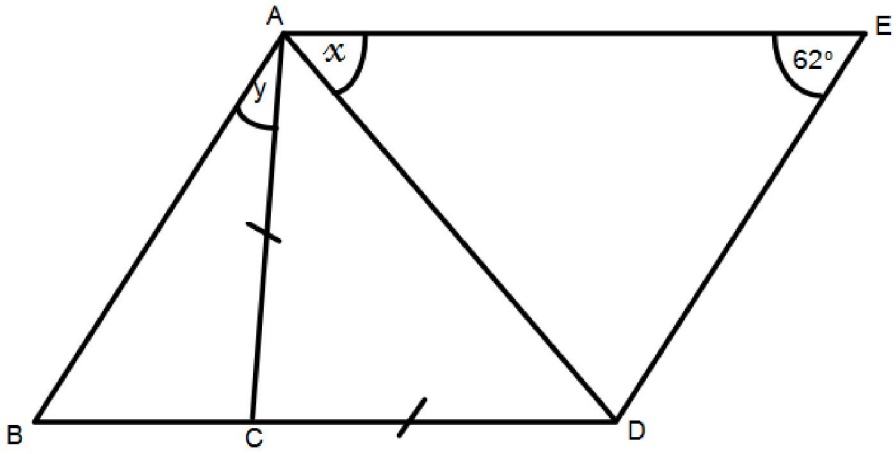
Angle x = 64° cointerior angles add to 180°.

.

(3 Marks)

2) Parallelogram Angle Reasoning: Harder

4) ABDE is a parallelogram.
AB=CD



Show that $2x + y = 118^o$

Angle ADC is x (alternate angles are equal)

Angle CAD is x (base angles of an isosceles triangle are equal)

Angle BAE is 118^o (cointerior angles are equal)

Therefore $2x$ + y =118^o

(3 marks)

3) Simple Fibonacci Sequences: Easier

1. To find the next term in a Fibonacci sequence, you find the sum of the 2 previous terms.

   1 1 2 3 5 8

   a) Find the next term in this sequence $5 + 8$

   _____13_____

   (1 mark)

   b) Find the 9th term of this sequence $8 + 13 = 21,\ 21 + 13 = 34$

   _____34_____

   (1 mark)

---

2. Below are the first 5 terms of a Fibonacci sequence.

   4 5 9 14 23

   a) Find the next term in this sequence $14 + 23 = 37$ _____37_____

   (1 mark)

   b) Find the 8th term of this sequence $37 + 23 = 60,\ 60 + 27 = 97$

   _____97_____

   (1 mark)

---

3. Below are the first 5 terms of a Fibonacci sequence.

   2 4 6 10 16

   a) Find the next term in this sequence $10 + 16 = 26$

   _____26_____

   (1 mark)

   b) Will 68 be in this sequence?

   $26 + 16 = 42,\ 42 + 26 = 68$ _____Yes_____

   (1 mark)

---

4. The sequence below is a Fibonacci sequence

   2 3 _5_ 8 13

   a) Find the missing number from the sequence

   $8 - 3 = 5$ _____5_____

   (1 mark)

   b) Find the next term in this sequence $13 + 8 = 21$

   _____21_____

   (1 mark)

3) Simple Fibonacci Sequences: Medium

5. Here is a Fibonacci-type sequence

2 _5_ _7_ 12 19

Find the 2 missing terms

$19 - 12 = 7,\ 12 - 7 = 5$

_____5___ and ____7___

(2 marks)

---

6. Here are the fourth and fifth terms of a Fibonacci-type sequence

_3_ _7_ _10_ 17 27

Show that the first term is 3

$27 - 17 = 10,$

$17 - 10 = 7,$

$10 - 7 = 3$

(1 mark)

---

7. The first 3 terms of a Fibonacci sequence are

$1 \qquad x \qquad x + 1$

a) Write an expression for the 4th term

$x + (x + 1) = 2x + 1$

_____$2x + 1$___

(1 mark)

b) If the 5th term is 11, find the value of x

5^{th} term: $(2x + 1) + (x + 1) = 3x + 2 = 11$

$3x = 9$

_____$x = 3$____

(2 marks)

3) Simple Fibonacci Sequences: Harder

8. The first three terms of a Fibonacci sequence are

$$x \quad y \quad x+y$$

a) Show that the 5th term of this sequence is $2x+3y$

4^{th} term: $y+(x+y)=x+2y$

5^{th} term: $(x+y)+(x+2y)=2x+3y$ **(2 marks)**

Given that the 3rd term is 5 and the 5th term is 14

b) Find the value of x and the value of y

$x+y=5$ (A) $\quad 2x+3y=14$ (B)

$2\times$(A): $2x+2y=10$ (C) $\quad x =$ 1

(B)- (C): $y=4$, sub into (A): $x+4=5$, $x=1$ $\quad y =$ 4

(3 marks)

---

9. Here are the first and third terms of a Fibonacci sequence

$$p \quad q-p \quad q \quad 2q-p \quad 3q-p$$

a) Write an expression, in terms of p and q, for the second term

$q-p$

(1 mark)

b) Write an expression, in terms of p and q, for the fifth term

4^{th} term: $(q-p)+q=2q-p$

5^{th} term: $(2q-p)+q=3q-p$ $\quad 3q-p$

(1 mark)

---

10. The first and third terms of a Fibonacci sequence are

$$a \quad b+1-a \quad b+1 \quad 2b+2-a \quad 3b+3-a$$

a) Write an expression, in terms of a and b, for the fifth term

2^{nd} term: $(b+1)-a=b+1-a$

4^{th} term: $(b+1)+(b+1-a)=2b+2-a$

5^{th} term: $(2b+2-a)+(b+1)=3b+3-a$ $\quad 3b+3-a$

(2 marks)

Given that the second term is 9 and the fifth term is 35

b) Find the value of a and the value of b

$b+1-a=9 \Rightarrow b-a=8$ (A)

$3b+3-a=35 \Rightarrow 3b-a=32$ (B)

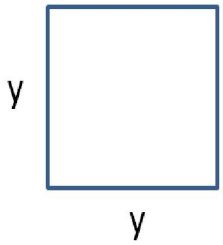
(B) – (A): $2b=24 \Rightarrow b=12$ $\quad a =$ 4

Sub into (A): $12-a=8 \Rightarrow a=4$ $\quad b =$ 12

(3 marks)

4) Understanding Number: Easier

1. Jim is looking at the area and lengths of squares.



Jim considers a square with area $9m^2$.

Jim works out the length of the square as follows:

$$y^2 = 9$$

$$y = \sqrt{9}$$

$$y = 3cm$$

Jim considers another square with a **different** area.

Please tick below:

	This method will **always** give an answer which is a whole number
/	This method will **sometimes** give an answer which is a whole number
	This method will **never** give an answer which is a whole number

Show working to support your answer

Any area which is a square number will give a whole number using this method

e.g. $y^2 = 16$ gives $y = \sqrt{16} = 4$ cm

Any area that is a non-square number won't give a whole number

e.g. $y^2 = 10$ gives $y = \sqrt{10} = 3.162\ldots$ cm

(3 marks)

4) Understanding Number: Medium

2.a) Anne puts a number in her calculator and squares her number. The number gets a lot bigger.

Anne says "if you square a number it will **always** get bigger".

Please tick below:

☐	Anne is correct
/	Anne is **not** correct

Show working to support your answer

If you square a number that is between 0 and 1 it will become smaller

e.g. $0.5^2 = 0.25$

(3 marks)

b) Pete says "if you square a number it will **always** be positive".

Please tick below:

☐	Pete is correct
/	Pete is **not** correct

Show working to support your answer

If you square **zero** the answer is zero, a non-positive number.

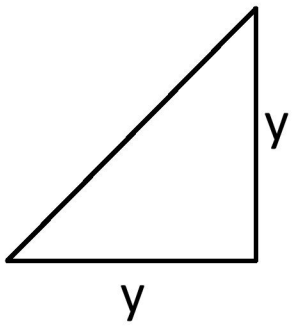
$$0^2 = 0 \times 0 = 0$$

(3 marks)

4) Understanding Number: Harder

3.a) Amir cuts a square in half along the diagonal to produce a right angled triangle.

It has a length, y, which is a whole number.



Amir works out the **area** of the triangle.

Please tick below:

	The area **must** be a whole number.
/	The area will **sometimes** be a whole number.

Show working to support your answer

If y = 3 then the area is $(3 \times 3) \div 2 = 9 \div 2 = 4.5$ a decimal

If y = 4 then the area is $(4 \times 4) \div 2 = 16 \div 2 = 8$ a whole number

(3 marks)

b) Amir is about the work out the **hypotenuse** of the triangle.

Amir says "The hypotenuse of the triangle will **always** be a whole number".

Show that Amir is wrong.

Pythagoras' Theorem: $a^2 + b^2 = c^2$

If $a = 2$ and $b = 3$ then

$$c^2 = 2^2 + 3^2 = 4 + 9 = 13$$

$$c = \sqrt{13} = 3.605 \ldots$$

So the hypotenuse is not a whole number in this case

(3 marks)

5) Tree Diagrams: Easier

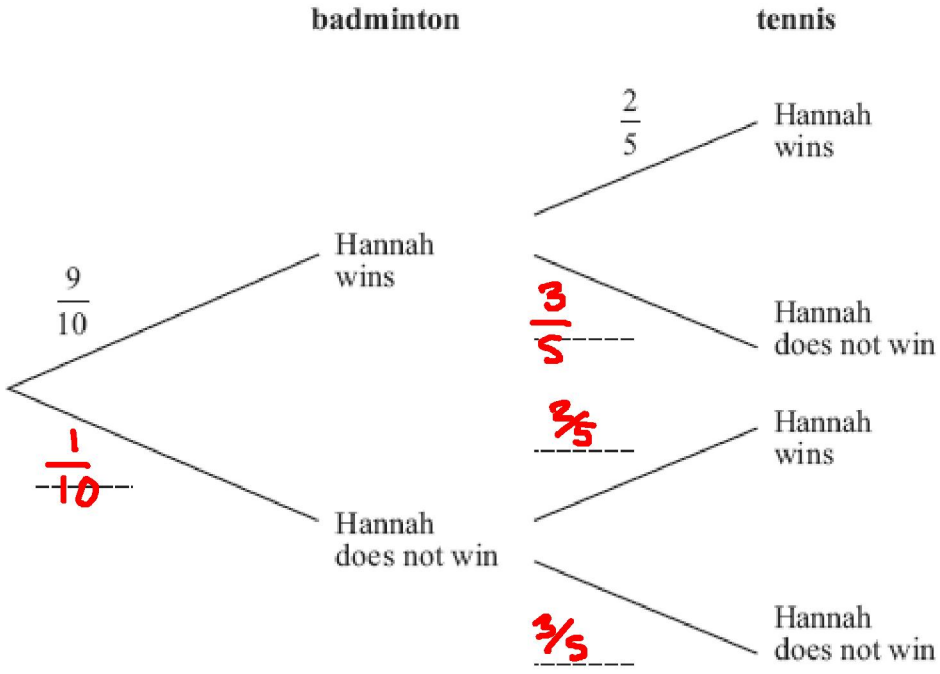
1. Hannah is going to play one badminton match and one tennis match.

The probability that she will win the badminton match is $\frac{9}{10}$

The probability that she will win the tennis match is $\frac{2}{5}$

(a) Complete the probability tree diagram.

(2)



(b) Work out the probability that Hannah will win **both** matches.

(2)

$P(W,W) = \frac{9}{10} \times \frac{2}{5} = \frac{18}{50}$

$\frac{18}{50}$

(4 marks)

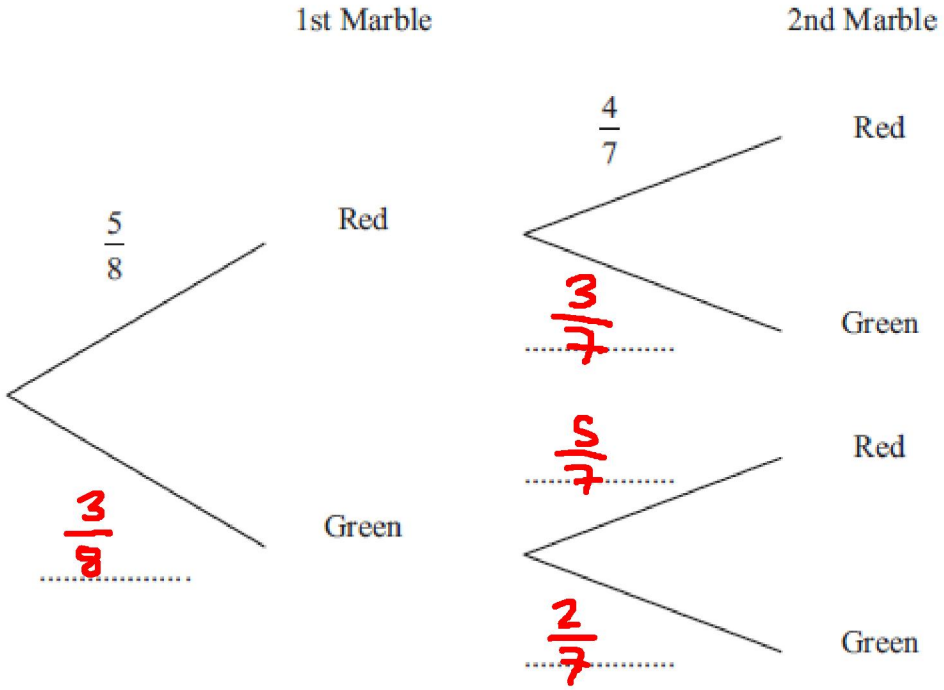
5) Tree Diagrams: Medium

2. There are only red marbles and green marbles in a bag.
There are 5 red marbles and 3 green marbles.

Dwayne takes at random a marble from the bag.
He does not put the marble back in the bag.

Dwayne takes at random a second marble from the bag.

(a) Complete the probability tree diagram.



(2)

(b) Work out the probability that Dwayne takes marbles of different colours.

$P(R,G) = \frac{5}{8} \times \frac{3}{7} = \frac{15}{56}$

$P(G,R) = \frac{3}{8} \times \frac{5}{7} = \frac{15}{56}$

$P(\text{diff colours}) = \frac{15}{56} + \frac{15}{56} = \frac{30}{56}$

$\frac{30}{56}$

(3)

(5 marks)

5) Tree Diagrams: Harder

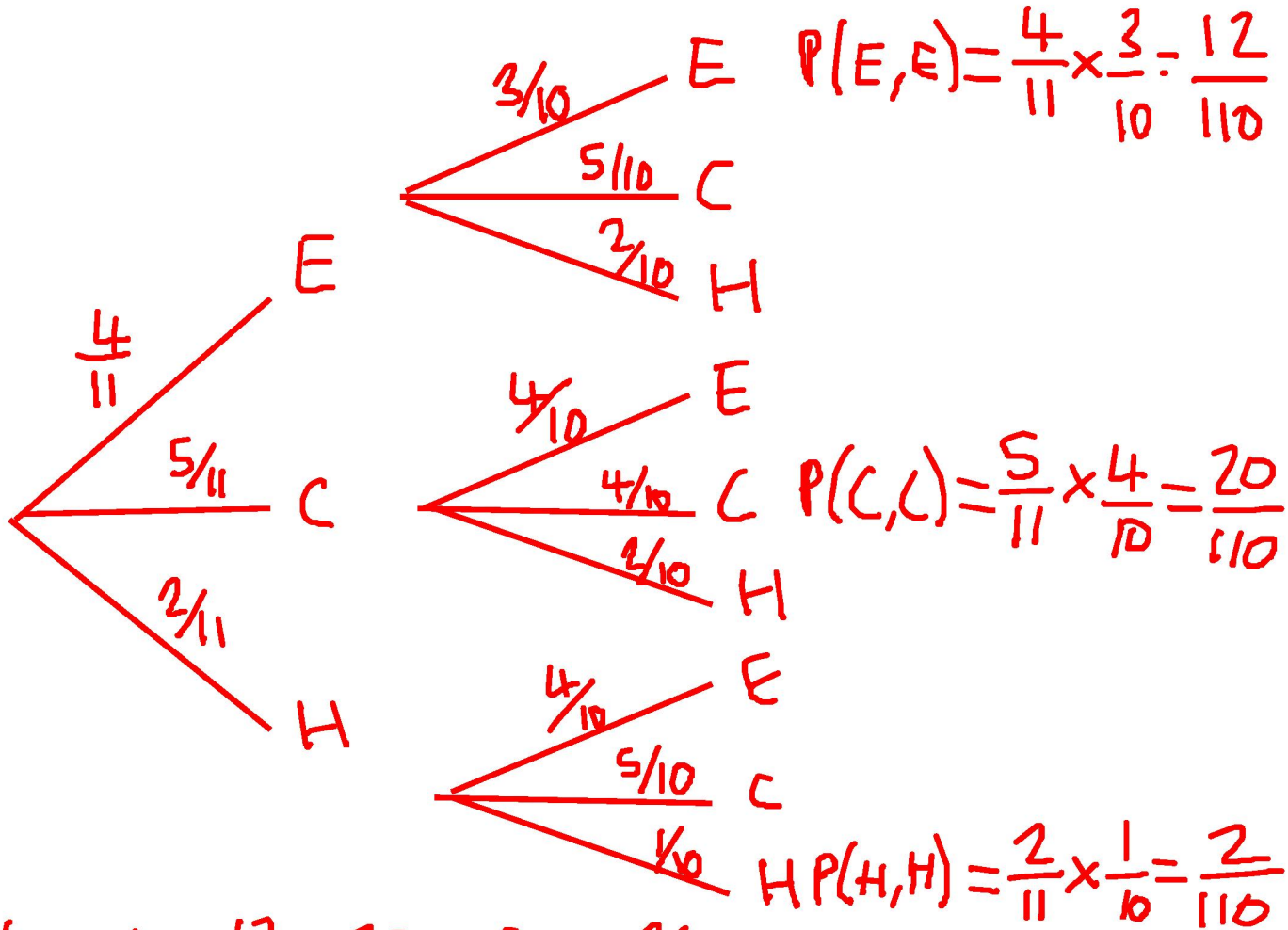
7. There are three different types of sandwiches on a shelf.

There are

4 egg sandwiches,
5 cheese sandwiches
and 2 ham sandwiches.

Erin takes at random 2 of these sandwiches.

Work out the probability that she takes 2 different types of sandwiches.



$P(\text{same}) = \frac{12}{110} + \frac{20}{110} + \frac{2}{110} = \frac{34}{110}$

$P(\text{diff}) = 1 - P(\text{same})$

$P(\text{diff}) = 1 - \frac{34}{110} = \frac{76}{110}$

$\frac{76}{110}$

.....

(5 marks)

THOMPSON Angus

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	22 from 27	10 from 12	8 from 10	4 from 4	0 from 1	0 from 0
A02 and 3	32 from 53	13 from 14	5 from 13	4 from 8	5 from 11	5 from 7
Total	54 from 80	23 from 26	13 from 23	8 from 12	5 from 12	5 from 7

Your Pinpoint Topics

Topic 1: Simple Fibonacci Sequences. Mathswatch Clip: 141

Topic 2: Speed. Mathswatch Clip: 142

Topic 3: Simple Vectors. Mathswatch Clip: 174

Topic 4: Estimation and Reasoning. Mathswatch Clip: 91

Topic 5: Algebraic Equivalence. Mathswatch Clip: NA

1) Simple Fibonacci Sequences: Easier

1. To find the next term in a Fibonacci sequence, you find the sum of the 2 previous terms.

1 1 2 3 5 8

a) Find the next term in this sequence $5 + 8$

13

(1 mark)

b) Find the 9th term of this sequence $8 + 13 = 21,\ 21 + 13 = 34$

34

(1 mark)

---

2. Below are the first 5 terms of a Fibonacci sequence.

4 5 9 14 23

a) Find the next term in this sequence $14 + 23 = 37$ 37

(1 mark)

b) Find the 8th term of this sequence $37 + 23 = 60,\ 60 + 27 = 97$

97

(1 mark)

---

3. Below are the first 5 terms of a Fibonacci sequence.

2 4 6 10 16

a) Find the next term in this sequence $10 + 16 = 26$

26

(1 mark)

b) Will 68 be in this sequence?

$26 + 16 = 42,\ 42 + 26 = 68$ Yes

(1 mark)

---

4. The sequence below is a Fibonacci sequence

2 3 5 8 13

a) Find the missing number from the sequence

$8 - 3 = 5$ 5

(1 mark)

b) Find the next term in this sequence $13 + 8 = 21$

21

(1 mark)

1) Simple Fibonacci Sequences: Medium

5. Here is a Fibonacci-type sequence

2 _5_ _7_ 12 19

Find the 2 missing terms

$19 - 12 = 7,\ 12 - 7 = 5$

_____5___ and ____7___

(2 marks)

---

6. Here are the fourth and fifth terms of a Fibonacci-type sequence

_3_ _7_ _10_ 17 27

Show that the first term is 3

$27 - 17 = 10,$

$17 - 10 = 7,$

$10 - 7 = 3$

(1 mark)

---

7. The first 3 terms of a Fibonacci sequence are

$1 \qquad x \qquad x + 1$

a) Write an expression for the 4th term

$x + (x + 1) = 2x + 1$

_____$2x + 1$___

(1 mark)

b) If the 5th term is 11, find the value of x

5^{th} term: $(2x + 1) + (x + 1) = 3x + 2 = 11$

$3x = 9$

_____$x = 3$____

(2 marks)

1) Simple Fibonacci Sequences: Harder

8. The first three terms of a Fibonacci sequence are

$$x \quad y \quad x+y$$

a) Show that the 5th term of this sequence is $2x+3y$

4^{th} term: $y+(x+y)=x+2y$

5^{th} term: $(x+y)+(x+2y)=2x+3y$ **(2 marks)**

Given that the 3rd term is 5 and the 5th term is 14

b) Find the value of x and the value of y

$x+y=5$ (A) $\quad 2x+3y=14$ (B)

$2\times$(A): $2x+2y=10$ (C) $\quad x =$ 1

(B)- (C): $y=4$, sub into (A): $x+4=5$, $x=1$ $\quad y =$ 4

(3 marks)

---

9. Here are the first and third terms of a Fibonacci sequence

$$p \quad q-p \quad q \quad 2q-p \quad 3q-p$$

a) Write an expression, in terms of p and q, for the second term

$q-p$

(1 mark)

b) Write an expression, in terms of p and q, for the fifth term

4^{th} term: $(q-p)+q=2q-p$

5^{th} term: $(2q-p)+q=3q-p$ $\quad 3q-p$

(1 mark)

---

10. The first and third terms of a Fibonacci sequence are

$$a \quad b+1-a \quad b+1 \quad 2b+2-a \quad 3b+3-a$$

a) Write an expression, in terms of a and b, for the fifth term

2^{nd} term: $(b+1)-a=b+1-a$

4^{th} term: $(b+1)+(b+1-a)=2b+2-a$

5^{th} term: $(2b+2-a)+(b+1)=3b+3-a$ $\quad 3b+3-a$

(2 marks)

Given that the second term is 9 and the fifth term is 35

b) Find the value of a and the value of b

$b+1-a=9 \quad \Rightarrow b-a=8$ (A)

$3b+3-a=35 \Rightarrow 3b-a=32$ (B)

(B) – (A): $2b=24 \Rightarrow b=12$ $\quad a =$ 4

Sub into (A): $12-a=8 \Rightarrow a=4$ $\quad b =$ 12

(3 marks)

2) Speed: Easier

1) Pete drove 50 miles in 4 hours
Work out his average speed in miles per hour.

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{50}{4} = \frac{25}{2} = 12.5 \text{ mph}$$

12.5 miles/hour

(2 Marks)

---

2) Dave cycled 8km in 30 minutes.
Work out Dave's average speed in km/h.

30 mins = 0.5 hours

$$\text{speed} = \frac{8}{0.5} = 16 \text{ km/h}$$

16 Km/h

(3 Marks)

---

3) Jess travels 400km at an average speed of 300 km/h.
How long was she travelling for? Give your answer in minutes.

$$s = \frac{d}{t} \quad \text{so} \quad t = \frac{d}{s} = \frac{400}{300} = \frac{4}{3} = 1\tfrac{1}{3} \text{ h}$$

1 h = 60 mins so $\frac{1}{3}$ h = 20 mins

so total time = 60 + 20 = 80 mins

80 minutes

(3 Marks)

---

4) Jeff set off for work at 3pm. He arrived at his destination at 5pm.
If Jeff travelled at a constant speed of 24 Km/h, how far did he travel?

t = 2 hours

$$s = \frac{d}{t} \quad \text{so} \quad d = s \times t = 24 \times 2 = 48 \text{ km}$$

48 Km

(2 Marks)

---

2) Speed: Medium

Pete needs to catch a ferry.

Pete leaves his home and drives

10 miles towards the motorway

180 miles on the motorway

15 miles from the motorway to the ferry port

Pete

Takes 20 minutes to get to the motorway

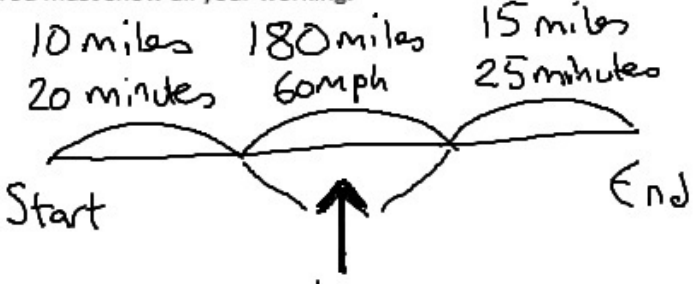
Drives at an average speed of 60mph whilst on the motorway

Takes 25 minutes to get from the motorway to the ferry port.

Pete has to arrive at the ferry port no later than midday.

What is the latest time Pete can leave his house?

You must show all your working.



T = D/S

T = 180/60 = 3 hours

Total time

3 hours

25 minutes

20 minutes +

3hrs 45 mins

Midday = 12:00pm

3hrs 45 mins

Answer = 8:15am

2) Speed: Harder

Abigail is on a bus going into the city.

The bus picks her up and drives

4 miles towards a motorway

45 miles on the motorway

6 miles from the motorway to the city bus depot

The bus

Takes 10 minutes to get to the main road

Drives at an average speed of 60mph whilst on the motorway

Takes 15 minutes to get from the motorway to the bus depot

Abigail gets on the bus at 10:19am. What time will she get off the bus?

You must show all your working.

4miles 10mins | 45mins 60mph | 6miles 15mins

Start — End

T = D/S

T = 45/60 = 3/4

= 45mins

Total time taken

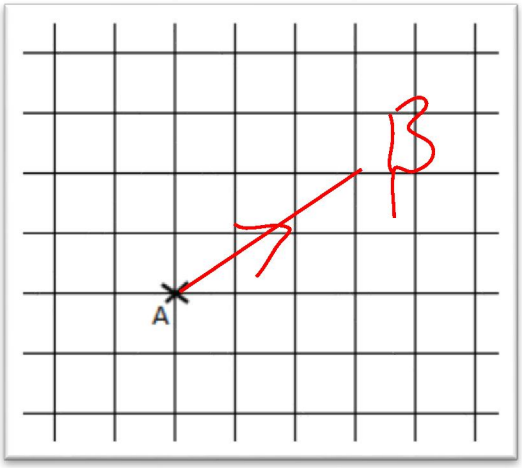
45
15
10
70mins
or 1hr 10mins

10:19 + 1hr 10mins

11:29am

3) Simple Vectors: Easier

3)

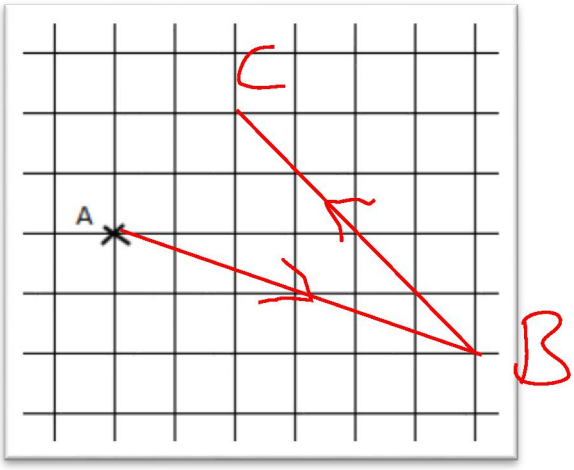


On the grid, draw the Vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ from Point A.

Label the new point B.

(1 Mark)

4)



a) On the grid, draw the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ from Point A

Label the new point B.

(1 Mark)

bi) On the grid draw the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ from Point B

Label the new point C

ii) State the vector $\overrightarrow{AC}$ $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$ (2 Marks)

3) Simple Vectors: Medium

5) Vector $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 11 \end{pmatrix}$

(2 Marks)

6) Vector $\overrightarrow{AB} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$

(2 Marks)

7) Vector $\overrightarrow{AB} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 10 \end{pmatrix}$

State Vector $\overrightarrow{CA}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

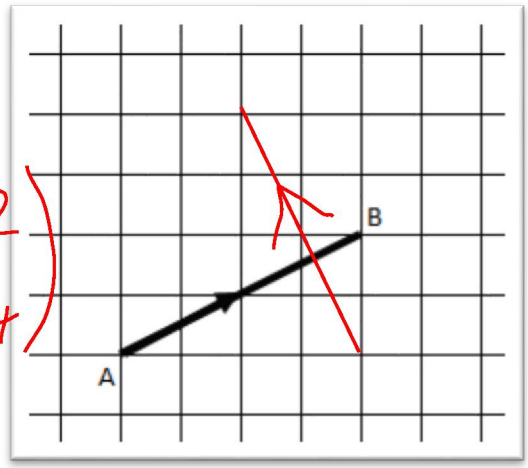
$\begin{pmatrix} -4 \\ -2 \end{pmatrix} + \begin{pmatrix} -2 \\ 10 \end{pmatrix} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}$

$\overrightarrow{CA} = -\overrightarrow{AC} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

(2 Marks)

3) Simple Vectors: Harder

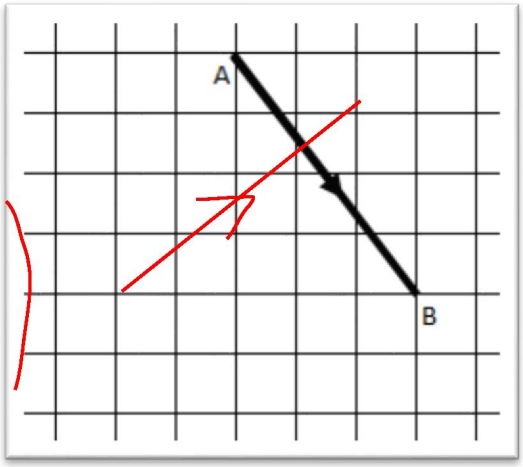
8)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

9)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

4) Estimation and Reasoning: Easier

1) Find an estimate for $\frac{423 \times 69.5}{0.52}$

$$\frac{400 \times 70}{0.5}$$

$$= \frac{28000}{0.5}$$

$= 56000$

(2 Marks)

---

2) a) Estimate the value of $\sqrt{2.9 + 9.6 + 1.98}$

$$\sqrt{3 + 10 + 2}$$

$$= \sqrt{15}$$

3.9

b) Explain if your answer to a) is an overestimate or underestimate

All numbers have been rounded up so it is an overestimate

(3 Marks)

---

3) A water bottling plant has 967 machines, each machine filters on average 2912 litres per day. The water is then put into ½ litre bottles. Estimate how many bottles the plant fills in one day

$$\frac{1000 \times 3000}{0.5}$$

$$\frac{3000000}{0.5}$$

6000000

(2 marks)

4) Estimation and Reasoning: Medium

4) A litre of petrol costs £1.07, Sally's car can travel 9.8Km on one litre of petrol. Sally wants to travel from Manchester to Stoke. The distance from Manchester to Stoke is 71.4km. Estimate the cost of Sally's journey from Manchester to Stoke. Show your working.

$$\frac{70}{10} \times 1$$

£7_____

(2 Marks)

---

5) Jeremy organised a charity celebrity football match. Each ticket for the football match cost £20.05. Jeremy sold 507 tickets. Jeremy had to pay costs of £2980 He gave all money left to the charity.

a) Work out an estimate for the amount of money Jeremy gave to the charity.

$$20 \times 500 = 10000$$

$$10000 - 3000 = £7000$$

£7000_____

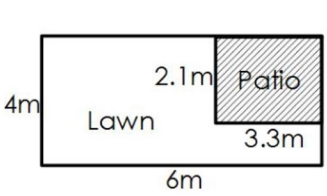
b) Is your answer to (a) an underestimate or an overestimate?
Give a reason for your answer.

An underestimate as the amount of money he made has been rounded down and the cost is rounded up so the difference will be smaller than the actual difference

(4 Marks)

---

6) Elizabeth wants to lay new turf on her lawn. Below is a diagram to show the measurements of the lawn. Each roll of turf covers $3m^2$.



a) Work out an estimate for how many rolls she will need. You must show all working for how you reached your estimate.

Area of Lawn = $(4 \times 6) - (2 \times 3) = 18m^2$

$$\frac{18}{3} = 6\ rolls$$

b) By considering your estimate and no further calculations explain if Elizabeth will have enough rolls to cover the lawn, assuming no turf is wasted

The area of the lawn is actually bigger than estimated as the area of the patio is smaller than estimated as both numbers are rounded down. Since we subtracted a smaller number than the actual number, our estimate is an overestimate so Elizabeth will have enough rolls to cover the lawn.

(3 Marks)

4) Estimation and Reasoning: Harder

7) a) The population of Italy is 59715625. It has an area of 301230Km^2. Population density can be worked out using the formula below. Work out an estimate for the population density of Italy.

$$Population\ Density = \frac{Population}{Area}$$

$$Population\ Density = \frac{60000000}{300000} = 200 population/km^2$$

$200 population/km^2$

b) Explain whether Italy is more densely populated than your estimate or less densely populated.

It is actually less densely populated as the estimate is an overestimate. The population has been rounded up and the area has been rounded down so when we divide an overestimate by an underestimate it becomes even bigger.

(3 Marks)

---

8) The mass of the Earth is $5.98 \times 10^{24} kg$. Jupiter's mass is 318 times larger than Earth's. Estimate the mass of Jupiter. Give your estimate in standard form. You must show how you reached your estimate.

$$6 \times 10^{24} \times 3 \times 10^2$$

$$= 18 \times 10^{26}$$

$$= 1.8 \times 10^{27} \text{Kg}$$

$= 1.8 \times 10^{27}$Kg

(3 Marks)

5) Algebraic Equivalence: Easier

1) Simplify $\frac{3x^2}{x}$

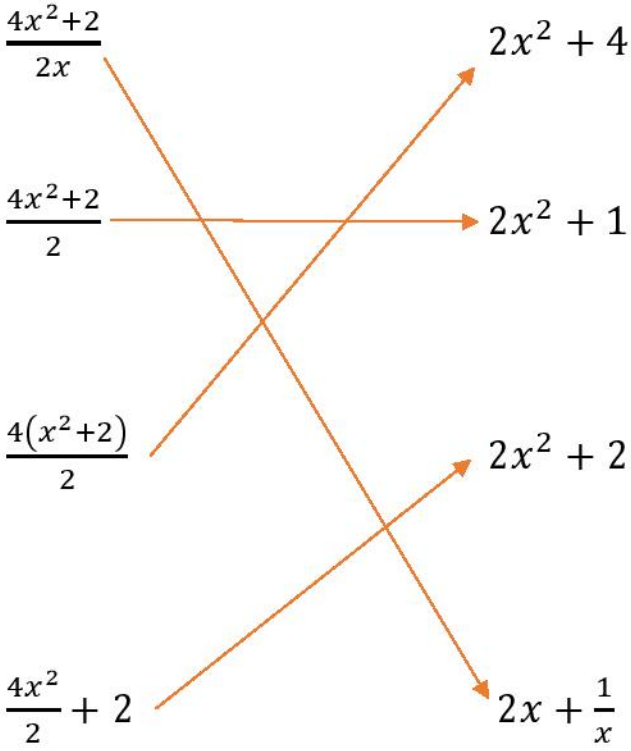
$3x$

_____

(1 Mark)

---

2) Match each of the four expressions on the left hand side with 1 equivalent expression on the right hand side



5) Algebraic Equivalence: Medium

3) Circle the expression that is equivalent to $\frac{3x^2+2}{x}$ where x is not equal to 0

A $3x^3+2$ B $3x+\frac{2}{x}$ C $2x^2+\frac{2}{x}$ D $3x+2$

$$\frac{3x^2+2}{x}$$

$$=\frac{3x^2}{x}+\frac{2}{x}$$

$$=3x+\frac{2}{x}$$

(1 Mark)

---

4) **Two** of these four expressions are equivalent. Circle the two expressions

A $\frac{x}{x+5}$ B $1+\frac{x}{5}$ C $\frac{5+x}{5}$ D $\frac{x^2}{x^2+5}$

(1 mark)

5) Algebraic Equivalence: Harder

5) Fiona tries to simplify this expression

$$\frac{3x}{3+x}$$

She writes

$$\frac{3x}{3}+\frac{3x}{x}$$

$$x+3$$

Explain why Fiona can not rewrite the expression like this

Dividing $3x$ by $3+x$ is not the same as dividing it by 3 and adding it to $\frac{3x}{x}$

Numerical Example

If $x=1$

$$\frac{3x}{3+x}=\frac{3}{4}$$

$$\frac{3x}{3}+\frac{3x}{x}=\frac{3}{3}+\frac{3}{1}=4$$

As you can see, these two expressions are not equal

(1 mark)

---

6) Show that $\frac{2x+5}{1+\frac{2}{x}}$ is equivalent to $\frac{2x^2+5x}{x+2}$

$$\frac{2x+5}{1+\frac{2}{x}}$$

$$=\frac{x(2x+5)}{x(1+\frac{2}{x})}$$

$$=\frac{2x^2+5x}{x+2}$$

(1 mark)

THOMPSON Daniel

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	21 from 27	10 from 12	7 from 10	4 from 4	0 from 1	0 from 0
A02 and 3	37 from 53	7 from 14	10 from 13	7 from 8	8 from 11	5 from 7
Total	58 from 80	17 from 26	17 from 23	11 from 12	8 from 12	5 from 7

Your Pinpoint Topics

Topic 1: Understanding Number. Mathswatch Clip: NA

Topic 2: Speed. Mathswatch Clip: 142

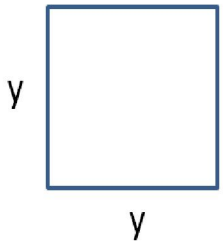
Topic 3: Algebraic Equivalence. Mathswatch Clip: NA

Topic 4: Direct and Inverse Proportion. Mathswatch Clip: 199

Topic 5: Drawing Quadratic Graphs. Mathswatch Clip: 98

1) Understanding Number: Easier

1. Jim is looking at the area and lengths of squares.



Jim considers a square with area $9m^2$.

Jim works out the length of the square as follows:

$$y^2 = 9$$

$$y = \sqrt{9}$$

$$y = 3cm$$

Jim considers another square with a **different** area.

Please tick below:

	This method will **always** give an answer which is a whole number
/	This method will **sometimes** give an answer which is a whole number
	This method will **never** give an answer which is a whole number

Show working to support your answer

Any area which is a square number will give a whole number using this method

e.g. $y^2 = 16$ gives $y = \sqrt{16} = 4$ cm

Any area that is a non-square number won't give a whole number

e.g. $y^2 = 10$ gives $y = \sqrt{10} = 3.162\ldots$ cm

(3 marks)

1) Understanding Number: Medium

2.a) Anne puts a number in her calculator and squares her number. The number gets a lot bigger.

Anne says "if you square a number it will **always** get bigger".

Please tick below:

	Anne is correct
/	Anne is **not** correct

Show working to support your answer

If you square a number that is between 0 and 1 it will become smaller

e.g. $0.5^2 = 0.25$

(3 marks)

b) Pete says "if you square a number it will **always** be positive".

Please tick below:

	Pete is correct
/	Pete is **not** correct

Show working to support your answer

If you square **zero** the answer is zero, a non-positive number.

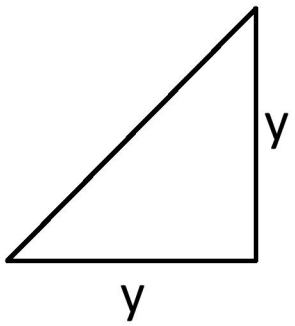
$$0^2 = 0 \times 0 = 0$$

(3 marks)

1) Understanding Number: Harder

3.a) Amir cuts a square in half along the diagonal to produce a right angled triangle.

It has a length, y, which is a whole number.



Amir works out the **area** of the triangle.

Please tick below:

	The area **must** be a whole number.
/	The area will **sometimes** be a whole number.

Show working to support your answer

If y = 3 then the area is $(3 \times 3) \div 2 = 9 \div 2 = 4.5$ a decimal

If y = 4 then the area is $(4 \times 4) \div 2 = 16 \div 2 = 8$ a whole number

(3 marks)

b) Amir is about the work out the **hypotenuse** of the triangle.

Amir says "The hypotenuse of the triangle will **always** be a whole number".

Show that Amir is wrong.

Pythagoras' Theorem: $a^2 + b^2 = c^2$

If $a = 2$ and $b = 3$ then

$$c^2 = 2^2 + 3^2 = 4 + 9 = 13$$

$$c = \sqrt{13} = 3.605 \ldots$$

So the hypotenuse is not a whole number in this case

(3 marks)

2) Speed: Easier

1) Pete drove 50 miles in 4 hours
Work out his average speed in miles per hour.

$$\text{speed} = \frac{\text{distance}}{\text{time}} = \frac{50}{4} = \frac{25}{2} = 12.5 \text{ mph}$$

12.5 miles/hour

(2 Marks)

---

2) Dave cycled 8km in 30 minutes.
Work out Dave's average speed in km/h.

30 mins = 0.5 hours

$$\text{speed} = \frac{8}{0.5} = 16 \text{ km/h}$$

16 Km/h

(3 Marks)

---

3) Jess travels 400km at an average speed of 300 km/h.
How long was she travelling for? Give your answer in minutes.

$$s = \frac{d}{t} \quad \text{so} \quad t = \frac{d}{s} = \frac{400}{300} = \frac{4}{3} = 1\tfrac{1}{3} \text{ h}$$

1 h = 60 mins so $\frac{1}{3}$ h = 20 mins

so total time = 60 + 20 = 80 mins

80 minutes

(3 Marks)

---

4) Jeff set off for work at 3pm. He arrived at his destination at 5pm.
If Jeff travelled at a constant speed of 24 Km/h, how far did he travel?

t = 2 hours

$$s = \frac{d}{t} \quad \text{so} \quad d = s \times t = 24 \times 2 = 48 \text{ km}$$

48 Km

(2 Marks)

---

2) Speed: Medium

Pete needs to catch a ferry.

Pete leaves his home and drives

10 miles towards the motorway

180 miles on the motorway

15 miles from the motorway to the ferry port

Pete

Takes 20 minutes to get to the motorway

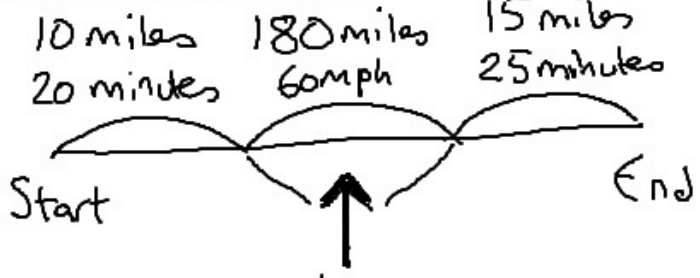
Drives at an average speed of 60mph whilst on the motorway

Takes 25 minutes to get from the motorway to the ferry port.

Pete has to arrive at the ferry port no later than midday.

What is the latest time Pete can leave his house?

You must show all your working.



T = D/S

T = 180/60 = 3 hours

Total time

3 hours

25 minutes

20 minutes +

3hrs 45 mins

Midday = 12:00pm

3hrs 45 mins

Answer = 8:15am

2) Speed: Harder

Abigail is on a bus going into the city.

The bus picks her up and drives

4 miles towards a motorway

45 miles on the motorway

6 miles from the motorway to the city bus depot

The bus

Takes 10 minutes to get to the main road

Drives at an average speed of 60mph whilst on the motorway

Takes 15 minutes to get from the motorway to the bus depot

Abigail gets on the bus at 10:19am. What time will she get off the bus?

You must show all your working.

4miles 10mins | 45mins 60mph | 6miles 15mins

Start → End

T = D/S

T = 45/60 = 3/4

= 45mins

Total time taken

45

15

10

70mins

or 1hr 10mins

10:19 + 1hr 10mins

11:29am

3) Algebraic Equivalence: Easier

1) Simplify $\frac{3x^2}{x}$

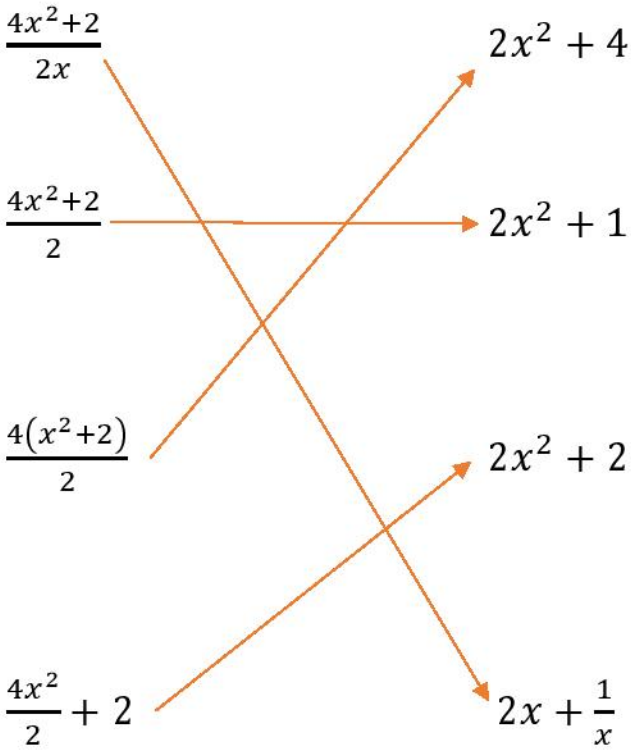
$3x$

_____

(1 Mark)

---

2) Match each of the four expressions on the left hand side with 1 equivalent expression on the right hand side



3) Algebraic Equivalence: Medium

3) Circle the expression that is equivalent to $\frac{3x^2+2}{x}$ where x is not equal to 0

A $3x^3+2$ B $3x+\frac{2}{x}$ C $2x^2+\frac{2}{x}$ D $3x+2$

$$\frac{3x^2+2}{x}$$

$$=\frac{3x^2}{x}+\frac{2}{x}$$

$$=3x+\frac{2}{x}$$

(1 Mark)

---

4) **Two** of these four expressions are equivalent. Circle the two expressions

A $\frac{x}{x+5}$ B $1+\frac{x}{5}$ C $\frac{5+x}{5}$ D $\frac{x^2}{x^2+5}$

(1 mark)

3) Algebraic Equivalence: Harder

5) Fiona tries to simplify this expression

$$\frac{3x}{3+x}$$

She writes

$$\frac{3x}{3}+\frac{3x}{x}$$

$$x+3$$

Explain why Fiona can not rewrite the expression like this

Dividing $3x$ by $3+x$ is not the same as dividing it by 3 and adding it to $\frac{3x}{x}$

Numerical Example

If $x=1$

$$\frac{3x}{3+x}=\frac{3}{4}$$

$$\frac{3x}{3}+\frac{3x}{x}=\frac{3}{3}+\frac{3}{1}=4$$

As you can see, these two expressions are not equal

(1 mark)

---

6) Show that $\frac{2x+5}{1+\frac{2}{x}}$ is equivalent to $\frac{2x^2+5x}{x+2}$

$$\frac{2x+5}{1+\frac{2}{x}}$$

$$=\frac{x(2x+5)}{x(1+\frac{2}{x})}$$

$$=\frac{2x^2+5x}{x+2}$$

(1 mark)

---

4) Direct and Inverse Proportion: Easier

1. The weight of a piece of wire is directly proportional to its length.

A piece of wire is 25 cm long and has a weight of 6 grams.
Another piece of the same wire is 30 cm long.

Calculate the weight of the 30 cm piece of wire.

$W = kl$

$6 = 25k$

$k = 0.24$

$w = 0.24l$

$w = 0.24 \times 30$

$w = 7.2$

7.2 ..... grams

(Total 2 marks)

2. A ball falls vertically after being dropped.
The ball falls a distance d metres in a time of t seconds.
d is directly proportional to the square of t. $d = kt^2$

The ball falls 20 metres in a time of 2 seconds.

(a) Find a formula for d in terms of t.

$20 = k \times 2^2$

$20 = 4k$

$k = 5$

$d =$ $5t^2$

(3)

(b) Calculate the distance the ball falls in 3 seconds.

$d = 5 \times 3^2$

$d = 5 \times 9 = 45$

45 ..... m

(1)

(c) Calculate the time the ball takes to fall 605 m.

$d = 5t^2$

$605 = 5t^2$

$t^2 = 121$

$t = \pm 11$

(ignore -11 as time can't be -ve)

11 ..... seconds

(3)

(Total 7 marks)

4) Direct and Inverse Proportion: Medium

16. P is inversely proportional to V.

$P = \frac{k}{V}$

When $V = 8$, $P = 5$

(a) Find a formula for P in terms of V.

$5 = \frac{k}{8}$

$k = 5 \times 8$

$k = 40$

$P = \frac{40}{V}$

(3)

(b) Calculate the value of P when $V = 2$

$P = \frac{40}{2}$

$P = 20$

20

(1)

(Total 4 marks)

17. The force, F, between two magnets is inversely proportional to the square of the distance, x, between them.

$F = \frac{k}{x^2}$

When $x = 3$, $F = 4$.

(a) Calculate F when $x = 2$.

$4 = \frac{k}{9}$

$k = 36$

$F = \frac{36}{x^2}$

$F = \frac{36}{2^2}$

$F = \frac{36}{4} = 9$

$F = 9$

(4)

(b) Calculate x when $F = 64$.

$F = \frac{36}{x^2}$

$64 = \frac{36}{x^2}$

$64x^2 = 36$

$x^2 = \frac{36}{64}$

$x = \pm\frac{6}{8}$

$x = \frac{3}{4}$

(2)

(Total 6 marks)

4) Direct and Inverse Proportion: Harder

1) A is inversely proportional to the square root of B. Jim says if B is very large A will be negative. Is he right?

Solution: $A \propto \frac{1}{\sqrt{B}}$

$$A = \frac{k}{\sqrt{B}}$$

Jim is wrong. If B is very large $\sqrt{B}$ will be positive, therefore A will also be positive.

(As B becomes very large, A becomes very small)

_____

(4 Marks)

---

2) If Sally drives to work 25% faster than she did yesterday. What would be her percentage decrease in the time taken to get to work?

Solution: $Time = \frac{Distance}{Speed}$

$$Time = \frac{D}{1.25}$$

$$Time = \frac{1}{1.25}$$

$$Time = \frac{4}{5}$$

$$\frac{4}{5} = 80\%$$

She will get there 20% faster.

_____

(4Marks)

---

5) Drawing Quadratic Graphs: Easier

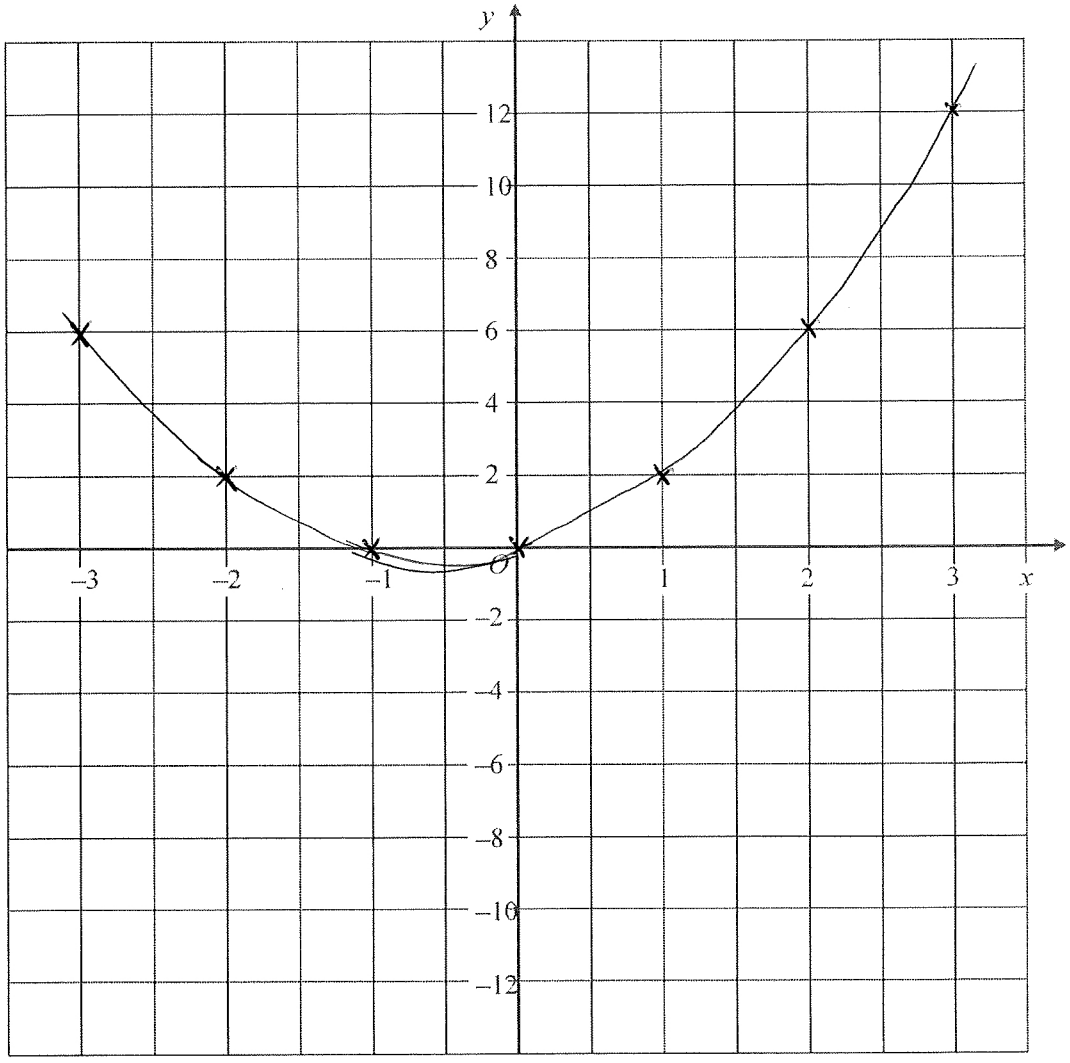
1. (a) Complete the table of values for $y = x^2 + x$.

x	–3	–2	–1	0	1	2	3
y	6	2	0	0	2	6	12

1+1 9+3

(2)

(b) On the grid, draw the graph of $y = x^2 + x$.



(2)

(Total 4 marks)

5) Drawing Quadratic Graphs: Medium

6. (a) Complete the table for $y = x^2 - 3x + 1$

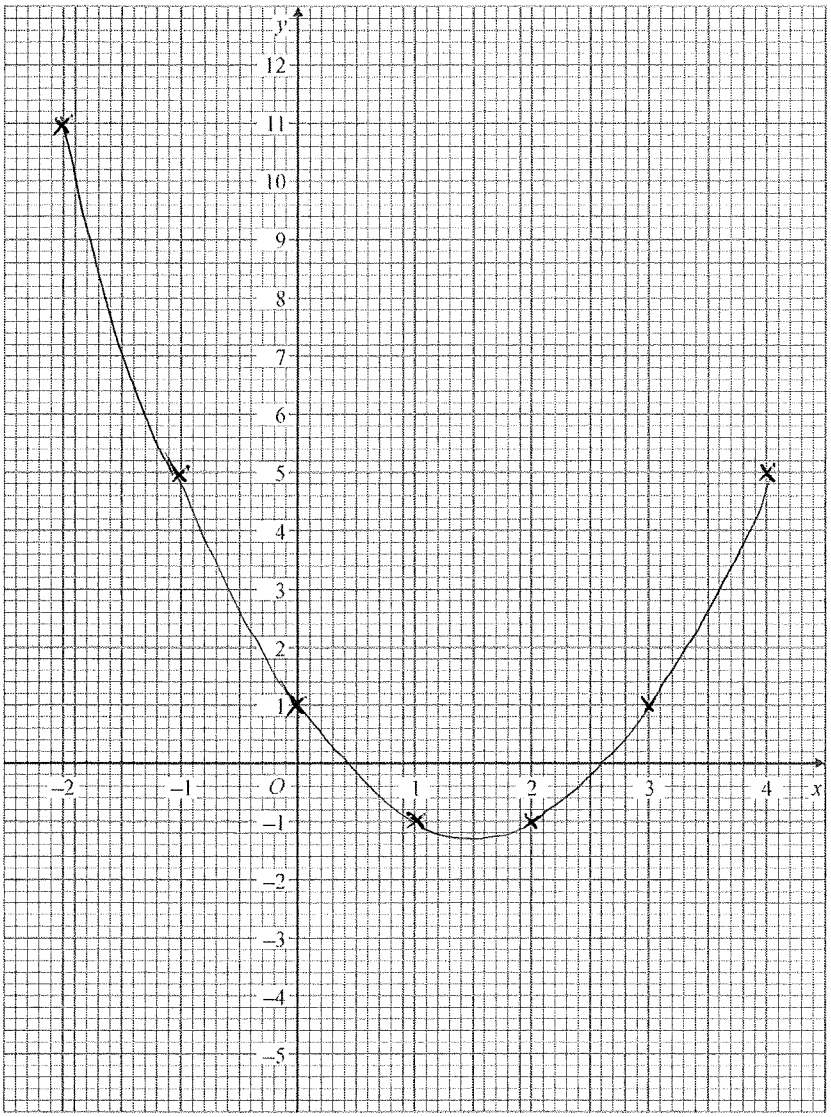
x	−2	−1	0	1	2	3	4
y	11	5	1	−1	−1	1	5

1 + 3 + 1 4 − 6 + 1

(2)

(b) On the grid below, draw the graph of $y = x^2 - 3x + 1$

(2)



(c) Use your graph to find an estimate for the minimum value of y.

$y =$ −1.3

(1)

5) Drawing Quadratic Graphs: Harder

(Total 5 marks)

7. (a) Complete the table of values for $y = x^2 - 3x - 1$

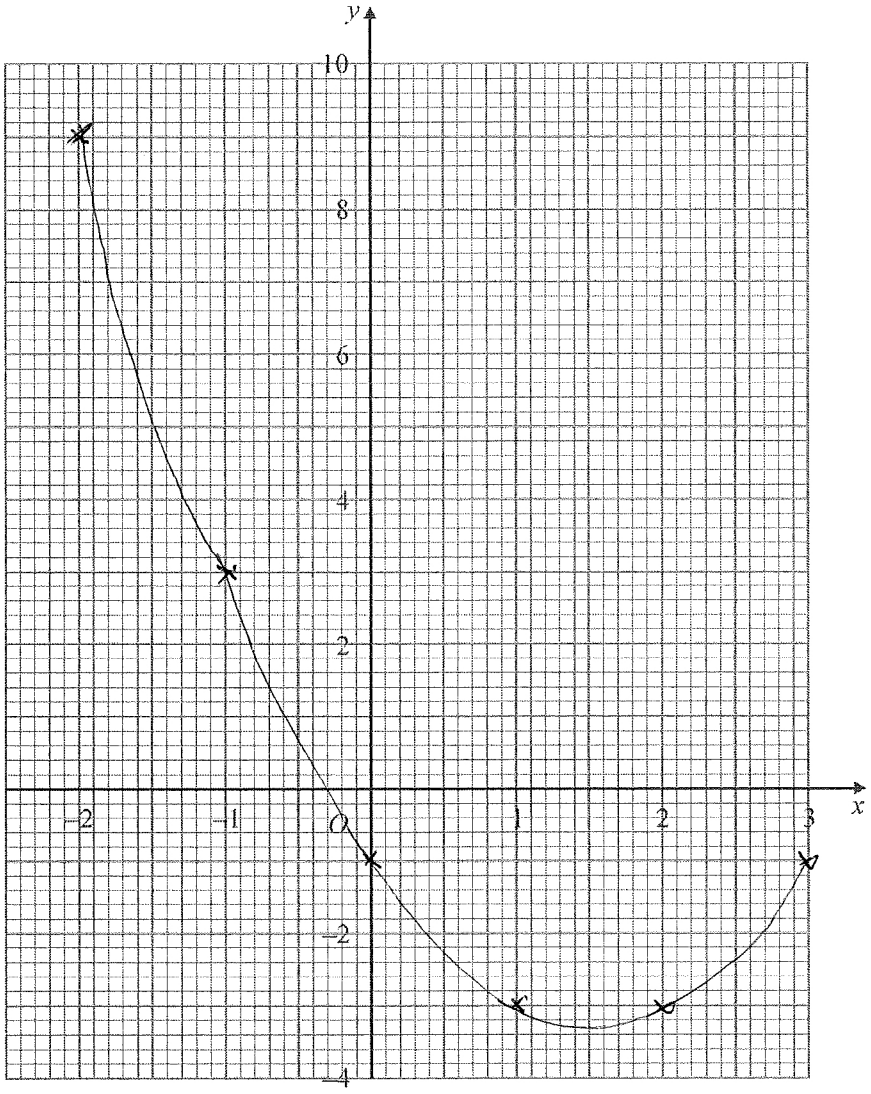
x	−2	−1	0	1	2	3
y	9	3	−1	−3	−3	−1

4+6-1 4-6-1 9-9-1

(2)

(b) On the grid, draw the graph of $y = x^2 - 3x - 1$

(2)



(Total 4 marks)

WATERS Tom

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	14 from 27	4 from 12	6 from 10	3 from 4	1 from 1	0 from 0
A02 and 3	25 from 53	9 from 14	3 from 13	3 from 8	3 from 11	7 from 7
Total	39 from 80	13 from 26	9 from 23	6 from 12	4 from 12	7 from 7

Your Pinpoint Topics

Topic 1: Simple Fibonacci Sequences. Mathswatch Clip: 141

Topic 2: Simple Vectors. Mathswatch Clip: 174

Topic 3: Estimation and Reasoning. Mathswatch Clip: 91

Topic 4: Drawing Quadratic Graphs. Mathswatch Clip: 98

Topic 5: Surds. Mathswatch Clip: 207

1) Simple Fibonacci Sequences: Easier

1. To find the next term in a Fibonacci sequence, you find the sum of the 2 previous terms.

1 1 2 3 5 8

a) Find the next term in this sequence $5 + 8$

13

(1 mark)

b) Find the 9th term of this sequence $8 + 13 = 21,\ 21 + 13 = 34$

34

(1 mark)

---

2. Below are the first 5 terms of a Fibonacci sequence.

4 5 9 14 23

a) Find the next term in this sequence $14 + 23 = 37$ 37

(1 mark)

b) Find the 8th term of this sequence $37 + 23 = 60,\ 60 + 27 = 97$

97

(1 mark)

---

3. Below are the first 5 terms of a Fibonacci sequence.

2 4 6 10 16

a) Find the next term in this sequence $10 + 16 = 26$

26

(1 mark)

b) Will 68 be in this sequence?

$26 + 16 = 42,\ 42 + 26 = 68$ Yes

(1 mark)

---

4. The sequence below is a Fibonacci sequence

2 3 _5_ 8 13

a) Find the missing number from the sequence

$8 - 3 = 5$ 5

(1 mark)

b) Find the next term in this sequence $13 + 8 = 21$

21

(1 mark)

1) Simple Fibonacci Sequences: Medium

5. Here is a Fibonacci-type sequence

2 _5_ _7_ 12 19

Find the 2 missing terms

$19 - 12 = 7,\ 12 - 7 = 5$

_____5___ and ____7___

(2 marks)

---

6. Here are the fourth and fifth terms of a Fibonacci-type sequence

_3_ _7_ _10_ 17 27

Show that the first term is 3

$27 - 17 = 10,$

$17 - 10 = 7,$

$10 - 7 = 3$

(1 mark)

---

7. The first 3 terms of a Fibonacci sequence are

$1 \qquad x \qquad x + 1$

a) Write an expression for the 4th term

$x + (x + 1) = 2x + 1$

_____$2x + 1$___

(1 mark)

b) If the 5th term is 11, find the value of x

5^{th} term: $(2x + 1) + (x + 1) = 3x + 2 = 11$

$3x = 9$

_____$x = 3$____

(2 marks)

1) Simple Fibonacci Sequences: Harder

8. The first three terms of a Fibonacci sequence are

$$x \quad y \quad x+y$$

a) Show that the 5th term of this sequence is $2x+3y$

4^{th} term: $y+(x+y)=x+2y$

5^{th} term: $(x+y)+(x+2y)=2x+3y$ **(2 marks)**

Given that the 3rd term is 5 and the 5th term is 14

b) Find the value of x and the value of y

$x+y=5$ (A) $\quad 2x+3y=14$ (B)

$2\times$(A): $2x+2y=10$ (C) $\quad x =$ 1

(B)- (C): $y=4$, sub into (A): $x+4=5$, $x=1$ $\quad y =$ 4

(3 marks)

---

9. Here are the first and third terms of a Fibonacci sequence

$$p \quad q-p \quad q \quad 2q-p \quad 3q-p$$

a) Write an expression, in terms of p and q, for the second term

$q-p$

(1 mark)

b) Write an expression, in terms of p and q, for the fifth term

4^{th} term: $(q-p)+q=2q-p$

5^{th} term: $(2q-p)+q=3q-p$ $\quad 3q-p$

(1 mark)

---

10. The first and third terms of a Fibonacci sequence are

$$a \quad b+1-a \quad b+1 \quad 2b+2-a \quad 3b+3-a$$

a) Write an expression, in terms of a and b, for the fifth term

2^{nd} term: $(b+1)-a=b+1-a$

4^{th} term: $(b+1)+(b+1-a)=2b+2-a$

5^{th} term: $(2b+2-a)+(b+1)=3b+3-a$ $\quad 3b+3-a$

(2 marks)

Given that the second term is 9 and the fifth term is 35

b) Find the value of a and the value of b

$b+1-a=9 \quad \Rightarrow b-a=8$ (A)

$3b+3-a=35 \Rightarrow 3b-a=32$ (B)

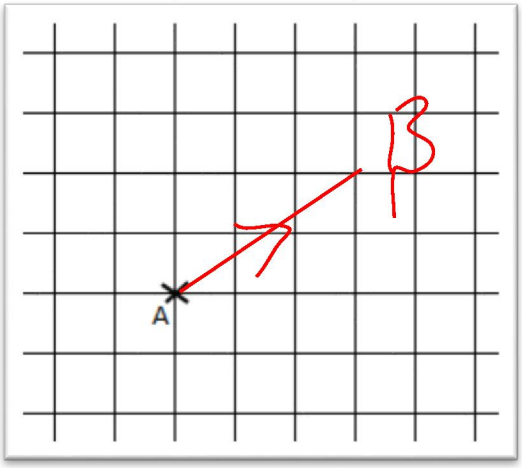
(B) – (A): $2b=24 \Rightarrow b=12$ $\quad a =$ 4

Sub into (A): $12-a=8 \Rightarrow a=4$ $\quad b =$ 12

(3 marks)

2) Simple Vectors: Easier

3)

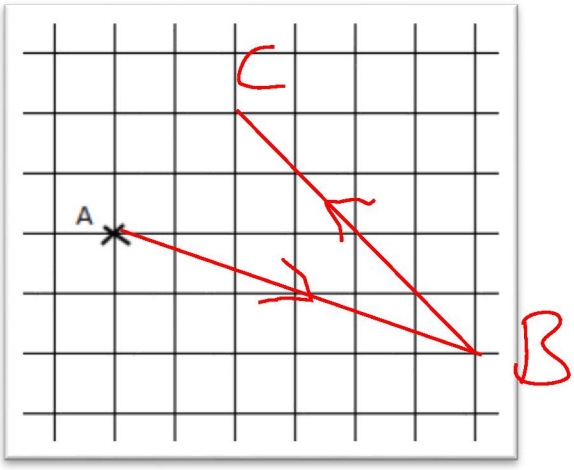


On the grid, draw the Vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ from Point A.

Label the new point B.

(1 Mark)

4)



a) On the grid, draw the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ from Point A

Label the new point B.

(1 Mark)

bi) On the grid draw the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ from Point B

Label the new point C

ii) State the vector $\overrightarrow{AC}$ $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$ (2 Marks)

2) Simple Vectors: Medium

5) Vector $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 11 \end{pmatrix}$

_____

(2 Marks)

6) Vector $\overrightarrow{AB} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$

_____

(2 Marks)

7) Vector $\overrightarrow{AB} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 10 \end{pmatrix}$

State Vector $\overrightarrow{CA}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

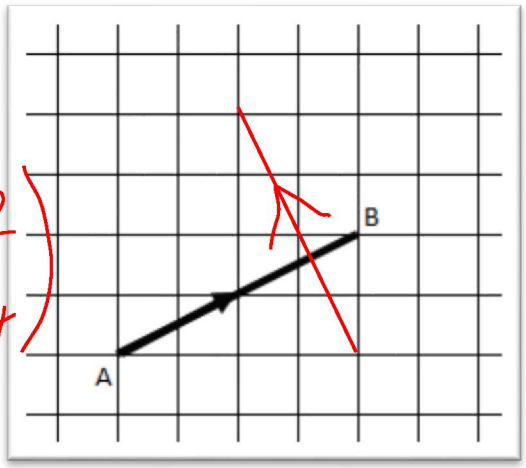
$\begin{pmatrix} -4 \\ -2 \end{pmatrix} + \begin{pmatrix} -2 \\ 10 \end{pmatrix} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}$

$\overrightarrow{CA} = -\overrightarrow{AC} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

(2 Marks)

2) Simple Vectors: Harder

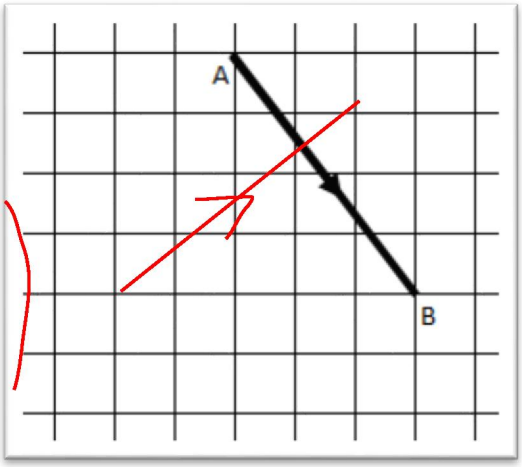
8)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

9)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

3) Estimation and Reasoning: Easier

1) Find an estimate for $\frac{423 \times 69.5}{0.52}$

$$\frac{400 \times 70}{0.5}$$

$$= \frac{28000}{0.5}$$

$= 56000$

(2 Marks)

---

2) a) Estimate the value of $\sqrt{2.9 + 9.6 + 1.98}$

$$\sqrt{3 + 10 + 2}$$

$$= \sqrt{15}$$

3.9

b) Explain if your answer to a) is an overestimate or underestimate

All numbers have been rounded up so it is an overestimate

(3 Marks)

---

3) A water bottling plant has 967 machines, each machine filters on average 2912 litres per day. The water is then put into ½ litre bottles. Estimate how many bottles the plant fills in one day

$$\frac{1000 \times 3000}{0.5}$$

$$\frac{3000000}{0.5}$$

6000000

(2 marks)

3) Estimation and Reasoning: Medium

4) A litre of petrol costs £1.07, Sally's car can travel 9.8Km on one litre of petrol. Sally wants to travel from Manchester to Stoke. The distance from Manchester to Stoke is 71.4km. Estimate the cost of Sally's journey from Manchester to Stoke. Show your working.

$$\frac{70}{10} \times 1$$

£7_____

(2 Marks)

---

5) Jeremy organised a charity celebrity football match. Each ticket for the football match cost £20.05. Jeremy sold 507 tickets. Jeremy had to pay costs of £2980 He gave all money left to the charity.

a) Work out an estimate for the amount of money Jeremy gave to the charity.

$$20 \times 500 = 10000$$

$$10000 - 3000 = £7000$$

£7000_____

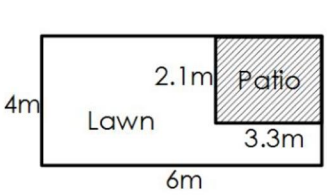
b) Is your answer to (a) an underestimate or an overestimate? Give a reason for your answer.

An underestimate as the amount of money he made has been rounded down and the cost is rounded up so the difference will be smaller than the actual difference

(4 Marks)

---

6) Elizabeth wants to lay new turf on her lawn. Below is a diagram to show the measurements of the lawn. Each roll of turf covers $3m^2$.



a) Work out an estimate for how many rolls she will need. You must show all working for how you reached your estimate.

Area of Lawn = $(4 \times 6) - (2 \times 3) = 18m^2$

$$\frac{18}{3} = 6\ rolls$$

b) By considering your estimate and no further calculations explain if Elizabeth will have enough rolls to cover the lawn, assuming no turf is wasted

The area of the lawn is actually bigger than estimated as the area of the patio is smaller than estimated as both numbers are rounded down. Since we subtracted a smaller number than the actual number, our estimate is an overestimate so Elizabeth will have enough rolls to cover the lawn.

(3 Marks)

3) Estimation and Reasoning: Harder

7) a) The population of Italy is 59715625. It has an area of 301230Km^2. Population density can be worked out using the formula below. Work out an estimate for the population density of Italy.

$$Population\ Density = \frac{Population}{Area}$$

$$Population\ Density = \frac{60000000}{300000} = 200 population/km^2$$

$200 population/km^2$

b) Explain whether Italy is more densely populated than your estimate or less densely populated.

It is actually less densely populated as the estimate is an overestimate. The population has been rounded up and the area has been rounded down so when we divide an overestimate by an underestimate it becomes even bigger.

(3 Marks)

---

8) The mass of the Earth is $5.98 \times 10^{24} kg$. Jupiter's mass is 318 times larger than Earth's. Estimate the mass of Jupiter. Give your estimate in standard form. You must show how you reached your estimate.

$$6 \times 10^{24} \times 3 \times 10^2$$

$$= 18 \times 10^{26}$$

$$= 1.8 \times 10^{27} \text{Kg}$$

$= 1.8 \times 10^{27}$Kg

(3 Marks)

4) Drawing Quadratic Graphs: Easier

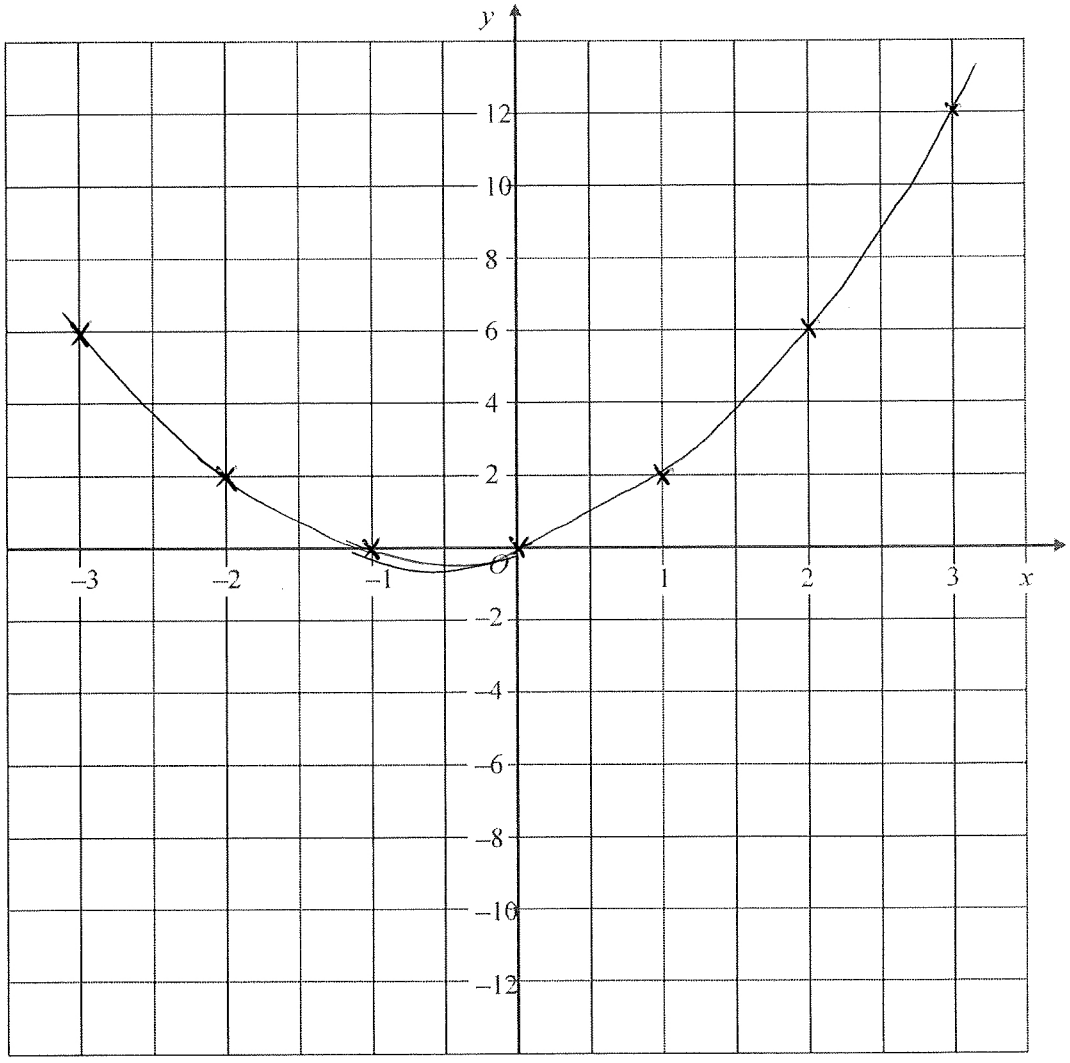
1. (a) Complete the table of values for $y = x^2 + x$.

x	−3	−2	−1	0	1	2	3
y	6	2	0	0	2	6	12

1+1 9+3

(2)

(b) On the grid, draw the graph of $y = x^2 + x$.



(2)

(Total 4 marks)

4) Drawing Quadratic Graphs: Medium

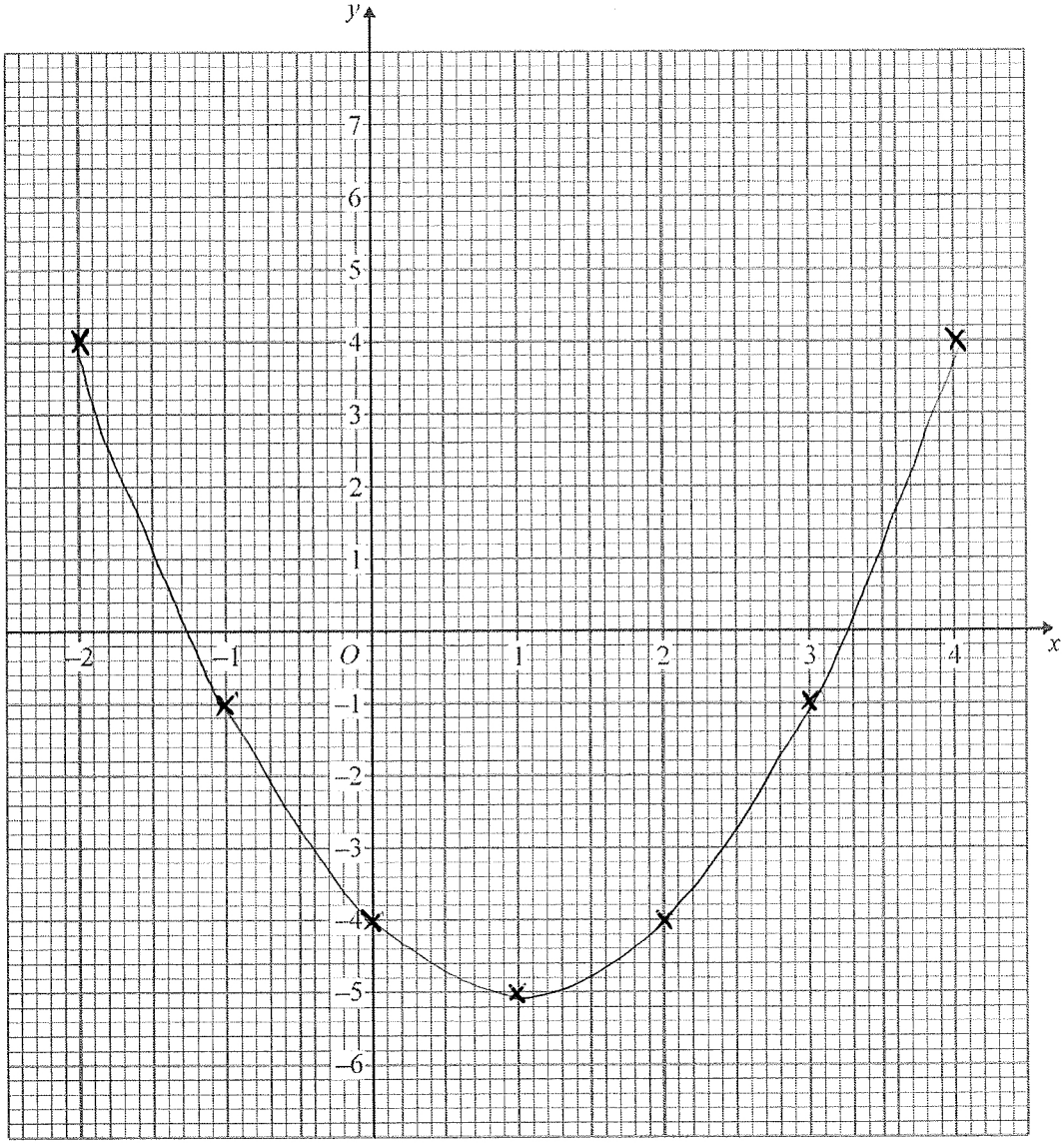
2. (a) Complete the table for $y = x^2 - 2x - 4$

x	−2	−1	0	1	2	3	4
y	4	−1	−4	−5	−4	−1	4

1+2-4 4-4-4 16-8-4

(2)

(b) On the grid, draw the graph of $y = x^2 - 2x - 4$



(2)
(Total 4 marks)

4) Drawing Quadratic Graphs: Harder

(Total 5 marks)

7. (a) Complete the table of values for $y = x^2 - 3x - 1$

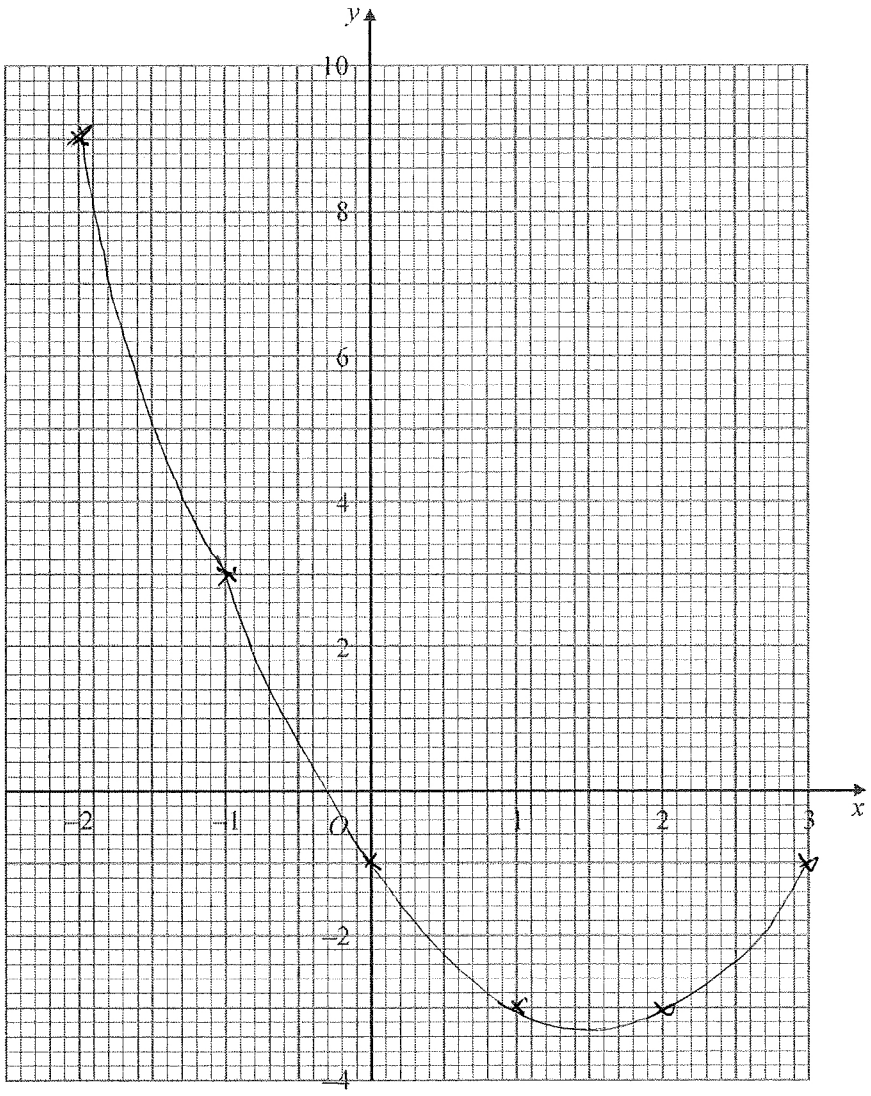
x	−2	−1	0	1	2	3
y	9	3	−1	−3	−3	−1

4+6−1 4−6−1 9−9−1

(2)

(b) On the grid, draw the graph of $y = x^2 - 3x - 1$

(2)



(Total 4 marks)

5) Surds: Easier

1. a) Simplify $\sqrt{75}$

$\sqrt{75} = \sqrt{25 \times 3}$

$= 5\sqrt{3}$

..... **(1)**

b) Express $\sqrt{75} - \sqrt{48}$ in the form $a\sqrt{3}$ where a is an integer.

$5\sqrt{3} - \sqrt{16 \times 3}$

$= 5\sqrt{3} - 4\sqrt{3}$

$\sqrt{3}$

a = 1

..... **(2)**

2. Express $\frac{15}{\sqrt{5}}$ in the form $a\sqrt{b}$ where a and b are positive integers.

$\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{15\sqrt{5}}{5}$

$= 3\sqrt{5}$

..... **(2)**

3. Expand and simplify $(2 + \sqrt{3})(4 + \sqrt{3})$ giving your answer in the $a + b\sqrt{3}$ where a and b are integers.

$(2 + \sqrt{3})(4 + \sqrt{3})$

$= 8 + 2\sqrt{3} + 4\sqrt{3} + 3$

$= 11 + 6\sqrt{3}$

..... **(3)**

5) Surds: Medium

4. Expand and simplify $(4-2\sqrt{3})^2$ giving your answer in the $a+b\sqrt{3}$ where a and b are integers.

$$(4-2\sqrt{3})(4-2\sqrt{3})$$
$$=16-8\sqrt{3}-8\sqrt{3}+12$$
$$=30-16\sqrt{3}$$

…… **(3)**

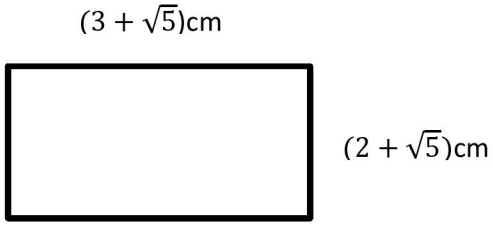
5. Expand and simplify $(\sqrt{5}-\sqrt{10})^2$ giving your answer in the $a+b\sqrt{2}$ where a and b are integers.

$$(\sqrt{5}-\sqrt{10})(\sqrt{5}-\sqrt{10})$$
$$=5-\sqrt{50}-\sqrt{50}+\sqrt{100}$$
$$=15-2\sqrt{50}$$
$$=15-2\sqrt{25\times 2}$$
$$=15-10\sqrt{2}$$

…… **(4)**

5) Surds: Harder

8. Find the area of the rectangle below, give your answer in simplest form.



$(3+\sqrt{5})(2+\sqrt{5})$

$= 6 + 3\sqrt{5} + 2\sqrt{5} + 5$

$= (5\sqrt{5} + 11)\text{cm}^2$

WATKINS Tom

9to1_AQA_PracticeSet3_1H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	12 from 27	2 from 12	6 from 10	4 from 4	0 from 1	0 from 0
A02 and 3	29 from 53	10 from 14	6 from 13	6 from 8	1 from 11	6 from 7
Total	41 from 80	12 from 26	12 from 23	10 from 12	1 from 12	6 from 7

Your Pinpoint Topics

Topic 1: Parallelogram Angle Reasoning. Mathswatch Clip: NA

Topic 2: Simple Vectors. Mathswatch Clip: 174

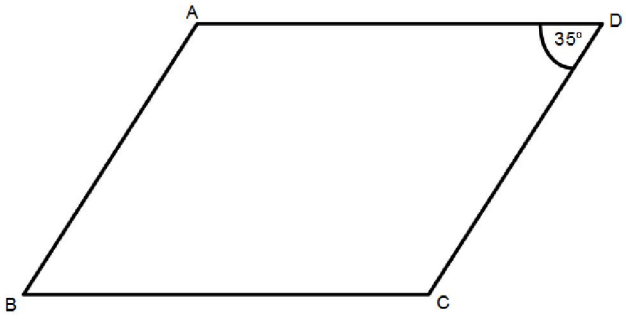
Topic 3: Recognising graphs. Mathswatch Clip:

Topic 4: Surds. Mathswatch Clip: 207

Topic 5: Fractional and Negative Indices. MW: 188

1) Parallelogram Angle Reasoning: Easier

1) ABCD is a parallelogram



a) Work out the size of angle BCD

$180^o - 35^o = 145^o$ 145^o

.....

b) Work out the size angle of ABC

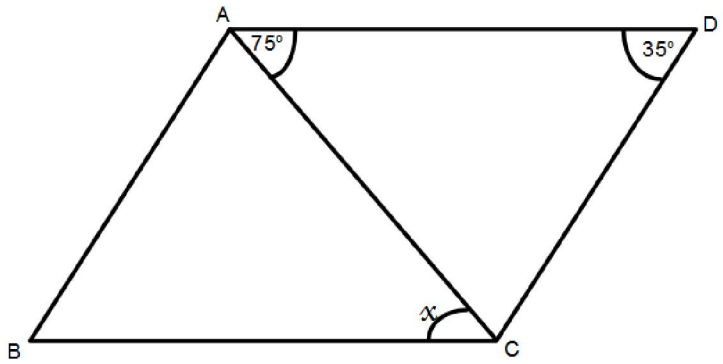
35^o

.....

(2 Marks)

---

2) ABCD is a parallelogram



a) Work out the size of angle x giving reasons for your answer

75^o

.....

Reason:

Alternate angles are equal

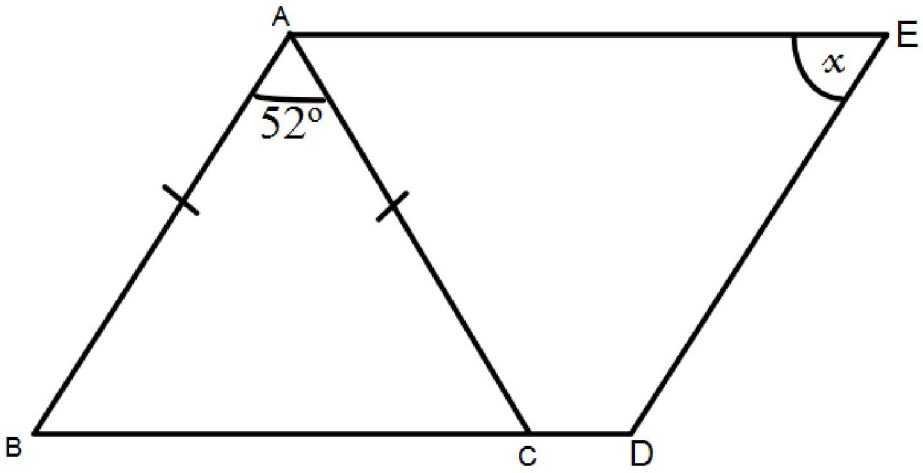
(2 Marks)

---

1) Parallelogram Angle Reasoning: Medium

3) ABDE is a parallelogram.

ABC is an isosceles triangle. AB=AC



Show that angle x is 64°. Give reasons at each stage

Angle ABC=ACB

180°- 52° =128°

128°÷2=64°

Base angles of an isosceles triangle are equal and angles in a triangle add up to 180°

Angle EDB=180°-64°=116°

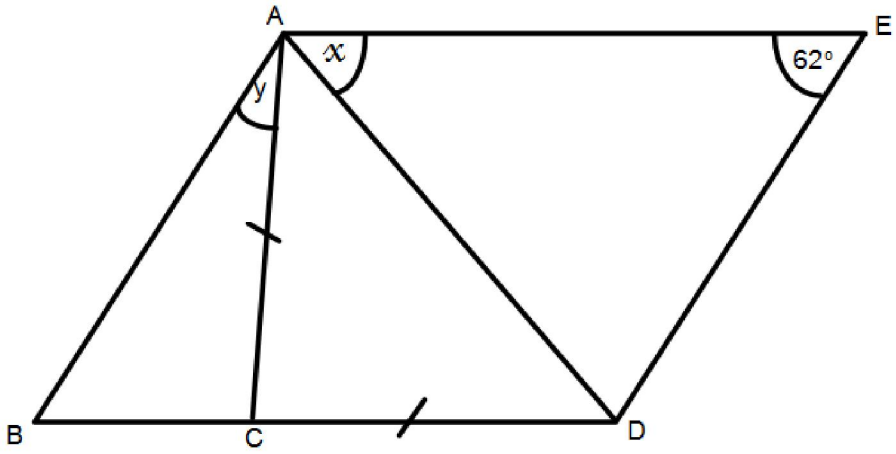
Angle x = 64° cointerior angles add to 180°.

.

(3 Marks)

1) Parallelogram Angle Reasoning: Harder

4) ABDE is a parallelogram.
AB=CD



Show that $2x + y = 118^o$

Angle ADC is x (alternate angles are equal)

Angle CAD is x (base angles of an isosceles triangle are equal)

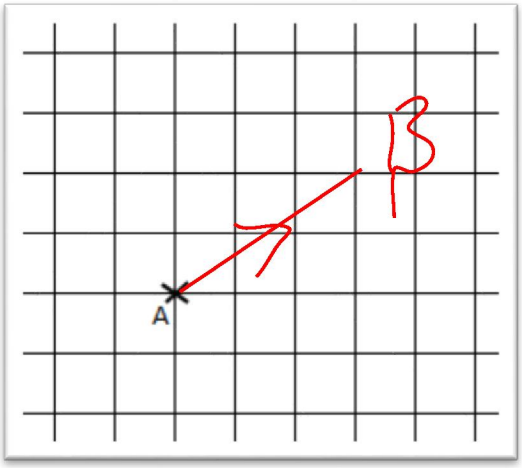
Angle BAE is 118^o (cointerior angles are equal)

Therefore $2x$ + y =118^o

(3 marks)

2) Simple Vectors: Easier

3)

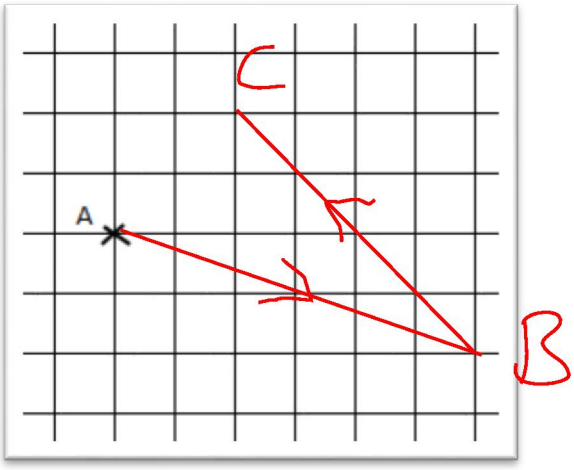


On the grid, draw the Vector $\begin{pmatrix} 3 \\ 2 \end{pmatrix}$ from Point A.

Label the new point B.

(1 Mark)

4)



a) On the grid, draw the vector $\begin{pmatrix} 6 \\ -2 \end{pmatrix}$ from Point A

Label the new point B.

(1 Mark)

bi) On the grid draw the vector $\begin{pmatrix} -4 \\ 4 \end{pmatrix}$ from Point B

Label the new point C

ii) State the vector $\overrightarrow{AC}$ $\begin{pmatrix} 2 \\ 2 \end{pmatrix}$ (2 Marks)

2) Simple Vectors: Medium

5) Vector $\overrightarrow{AB} = \begin{pmatrix} 3 \\ 7 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ 4 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} 3 \\ 7 \end{pmatrix} + \begin{pmatrix} 2 \\ 4 \end{pmatrix} = \begin{pmatrix} 5 \\ 11 \end{pmatrix}$

_____

(2 Marks)

6) Vector $\overrightarrow{AB} = \begin{pmatrix} -2 \\ 3 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} 2 \\ -1 \end{pmatrix}$

State Vector $\overrightarrow{AC}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

$\begin{pmatrix} -2 \\ 3 \end{pmatrix} + \begin{pmatrix} 2 \\ -1 \end{pmatrix} = \begin{pmatrix} 0 \\ 2 \end{pmatrix}$

_____

(2 Marks)

7) Vector $\overrightarrow{AB} = \begin{pmatrix} -4 \\ -2 \end{pmatrix}$

Vector $\overrightarrow{BC} = \begin{pmatrix} -2 \\ 10 \end{pmatrix}$

State Vector $\overrightarrow{CA}$

$\overrightarrow{AB} + \overrightarrow{BC} = \overrightarrow{AC}$

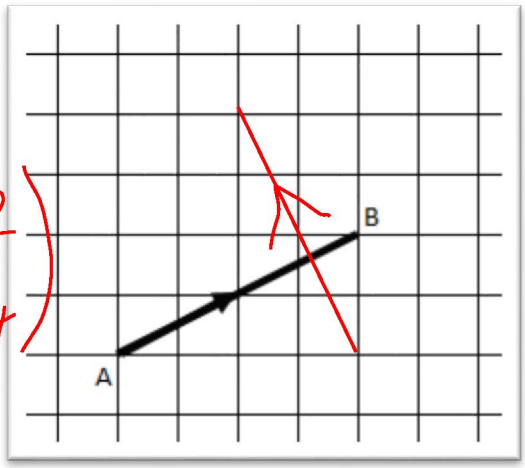
$\begin{pmatrix} -4 \\ -2 \end{pmatrix} + \begin{pmatrix} -2 \\ 10 \end{pmatrix} = \begin{pmatrix} -6 \\ 8 \end{pmatrix}$

$\overrightarrow{CA} = -\overrightarrow{AC} = \begin{pmatrix} 6 \\ -8 \end{pmatrix}$

(2 Marks)

2) Simple Vectors: Harder

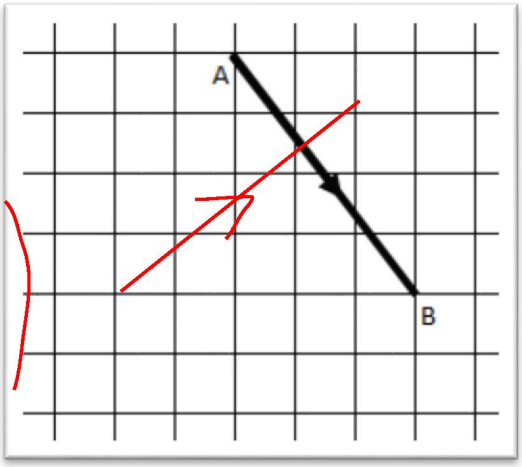
8)



Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

9)

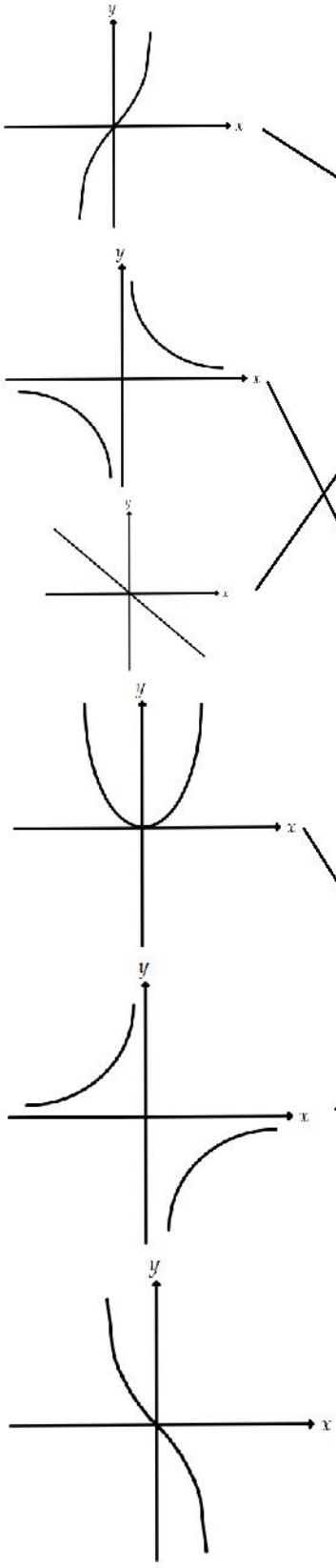


Draw a line that has both the magnitude as $\overrightarrow{AB}$ and is perpendicular to $\overrightarrow{AB}$.

(2 Marks)

3) Recognising graphs: Easier

1) Match each of the graphs with its equation, the first one is done for you



$y = -x$

$y = x^3$

$y = -x^3$

$y = -\frac{1}{x}$

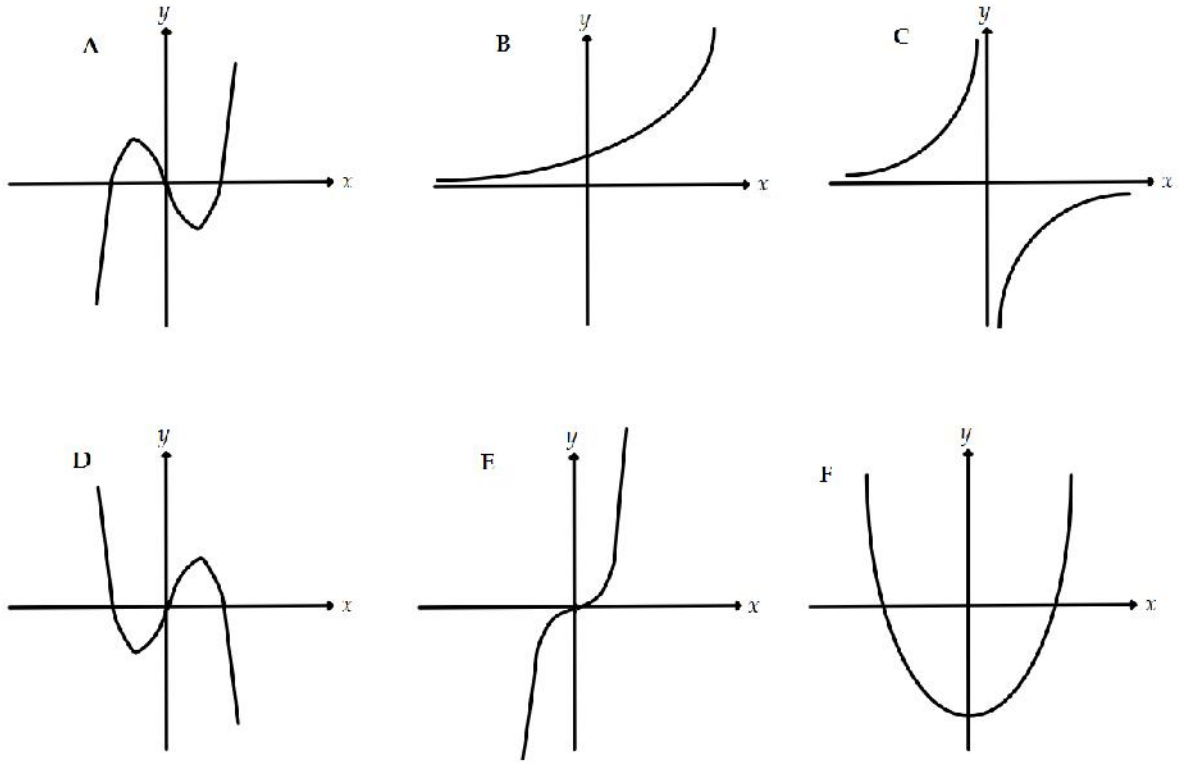
$y = \frac{1}{x}$

$y = x^2$

(3 marks)

3) Recognising graphs: Medium

2) Harry has sketched some graphs



a) Write down the letter of the graph that could have the equation $y = 3^x$

B

_____

(1 Mark)

b) Write down the letter of the graph that could have the equation $y = -\frac{5}{x}$

C

_____

(1 Mark)

c) Write down the letter of the graph that could have the equation $y = 2x - x^3$

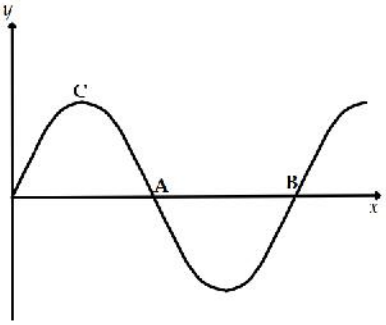
D

_____

(1 Mark)

3) Recognising graphs: Harder

3) A sketch of part of $y = \sin(x)$ is drawn below



a) Write down the coordinates of A

$(180°, 0)$

(1 Mark)

b) Write down the coordinates of B

$(360°, 0)$

(1 Mark)

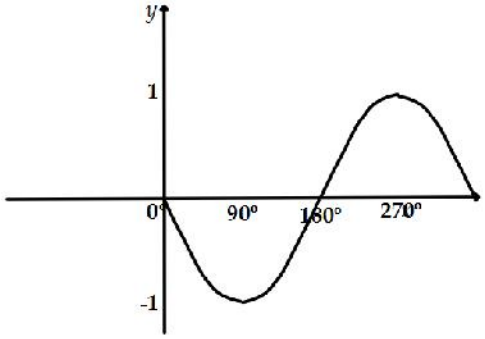
c) Write down the coordinates of C

$(90°, 1)$

(1 Mark)

---

4) Lanre was asked to sketch $y = \cos(x)\ for\ 0° \leq x \leq 360°$. This is what Lanre sketched



Write down one mistake Lanre has made

$y = \cos(x)$ does not go through (0,0) it starts at (0,1) and decreases to (90°,0)

(1 Mark)

4) Surds: Easier

1. a) Simplify $\sqrt{75}$

$\sqrt{75} = \sqrt{25 \times 3}$

$= 5\sqrt{3}$

..... **(1)**

b) Express $\sqrt{75} - \sqrt{48}$ in the form $a\sqrt{3}$ where a is an integer.

$5\sqrt{3} - \sqrt{16 \times 3}$

$= 5\sqrt{3} - 4\sqrt{3}$

$\sqrt{3}$

a = 1

..... **(2)**

2. Express $\frac{15}{\sqrt{5}}$ in the form $a\sqrt{b}$ where a and b are positive integers.

$\frac{15}{\sqrt{5}} \times \frac{\sqrt{5}}{\sqrt{5}}$

$= \frac{15\sqrt{5}}{5}$

$= 3\sqrt{5}$

..... **(2)**

3. Expand and simplify $(2 + \sqrt{3})(4 + \sqrt{3})$ giving your answer in the $a + b\sqrt{3}$ where a and b are integers.

$(2 + \sqrt{3})(4 + \sqrt{3})$

$= 8 + 2\sqrt{3} + 4\sqrt{3} + 3$

$= 11 + 6\sqrt{3}$

..... **(3)**

4) Surds: Medium

4. Expand and simplify $(4-2\sqrt{3})^2$ giving your answer in the $a+b\sqrt{3}$ where a and b are integers.

$$(4-2\sqrt{3})(4-2\sqrt{3})$$
$$=16-8\sqrt{3}-8\sqrt{3}+12$$
$$=30-16\sqrt{3}$$

…… **(3)**

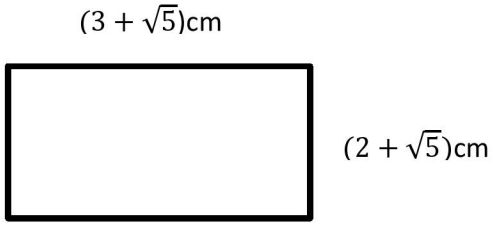
5. Expand and simplify $(\sqrt{5}-\sqrt{10})^2$ giving your answer in the $a+b\sqrt{2}$ where a and b are integers.

$$(\sqrt{5}-\sqrt{10})(\sqrt{5}-\sqrt{10})$$
$$=5-\sqrt{50}-\sqrt{50}+\sqrt{100}$$
$$=15-2\sqrt{50}$$
$$=15-2\sqrt{25\times 2}$$
$$=15-10\sqrt{2}$$

…… **(4)**

4) Surds: Harder

8. Find the area of the rectangle below, give your answer in simplest form.



$(3+\sqrt{5})(2+\sqrt{5})$

$= 6 + 3\sqrt{5} + 2\sqrt{5} + 5$

$= (5\sqrt{5} + 11)\text{cm}^2$

5) Fractional and Negative Indices: Easier

1) Evaluate

a) 6^0 $= 1$ _____

(1 Mark)

a) $25^{\frac{1}{2}}$ $= \sqrt{25} = 5$ _____

(1 Mark)

c) 3^{-1} $= \frac{1}{3}$ _____

(1 Mark)

---

2) Sarah says that $9^{\frac{1}{2}}$ is 4.5. She is wrong. Explain her mistake.

Solution: $9^{\frac{1}{2}} = \sqrt{9} = 3$

_____

(1 Mark)

---

3) Evaluate

a) $27^{\frac{1}{3}}$ $\sqrt[3]{27} = 3$

_____

(1 Mark)

b) $27^{\frac{2}{3}}$ $\sqrt[3]{27}^2 = 9$ _____

(1 Mark)

c) $27^{\frac{-2}{3}}$ $\frac{1}{\sqrt[3]{27^2}} = \frac{1}{9}$ _____

(1 Mark)

---

5) Fractional and Negative Indices: Medium

4) Evaluate

a) $\left(\frac{25}{81}\right)^{\frac{-1}{2}}$ $\left(\frac{1}{25/81}\right)^{\frac{1}{2}} = \left(\frac{81}{25}\right)^{\frac{1}{2}} = \sqrt{\frac{81}{25}} = \frac{9}{5}$

(1 Mark)

b) $32^{\frac{-3}{5}}$ $\left(\frac{1}{32}\right)^{\frac{3}{5}} = \left(\sqrt[5]{\frac{1}{32}}^{3}\right) = \frac{1}{2^3} = \frac{1}{8}$

(1 Mark)

c) $144^{\frac{-1}{2}} \times 3^{-2}$ $\frac{1}{\sqrt{144}} \times \frac{1}{3^2} = \frac{1}{12} \times \frac{1}{9} = \frac{1}{108}$

(2 Marks)

---

5) Put these numbers in ascending order, show your working.

125^0 $125^{\frac{-1}{3}}$ $\left(\frac{1}{125}\right)^{\frac{-1}{3}}$ $125^{\frac{-2}{3}}$

1 $\frac{1}{\sqrt[3]{125}} = \frac{1}{5}$ $\left(\frac{1}{1/125}\right)^{\frac{1}{3}} = \sqrt[3]{125} = 5$ $\left(\frac{1}{125}\right)^{\frac{2}{3}} = \frac{1}{\sqrt[3]{125^2}} = \frac{1}{5^2} = \frac{1}{25}$

Correct order $\frac{1}{25}$, $\frac{1}{5}$, 1, 5.

(3 Marks)

5) Fractional and Negative Indices: Harder

6) If $2^{2x} = \frac{1}{16}$. Work out the value of x.

$2^{2x} = \frac{1}{4^2}$

$2^{2x} = 4^{-2}$

$2^{2x} = 2^{2(-2)}$

$x = -2$

(2 Marks)

---

7) One of these has a different value to the other two. Decide which one and justify your answer.

$4^{\frac{3}{4}}$ $8^{\frac{1}{4}}$ $2^{\frac{3}{2}}$

$2^{2\left(\frac{3}{4}\right)} = 2^{\frac{6}{4}} = 2^{\frac{3}{2}}$ $2^{3\left(\frac{1}{4}\right)} = 2^{\frac{3}{4}}$

The values that are the same are $4^{\frac{3}{4}}$ and $2^{\frac{3}{2}}$

(3 Marks)

---

8) If $32^{3x} = \frac{1}{8}$. Find the value of x

$2^{5(3x)} = \frac{1}{8}$

$2^{15x} = \frac{1}{2^3}$

$2^{15x} = 2^{-3}$

$15x = -3$

$x = \frac{-3}{15}$

$x = -\frac{1}{5}$

(3 Marks)