

BAKASH Sophie

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Bearings. Mathswatch Clip: 124

Topic 2: Simple Bounds. Mathswatch Clip: 132

Topic 3: Missing Mean Questions. Mathswatch Clip: NA

Topic 4: Standard Form. Mathswatch Clip: 83

Topic 5: Changing Ratios. Mathswatch Clip: NA

1) Bearings: Easier

1.

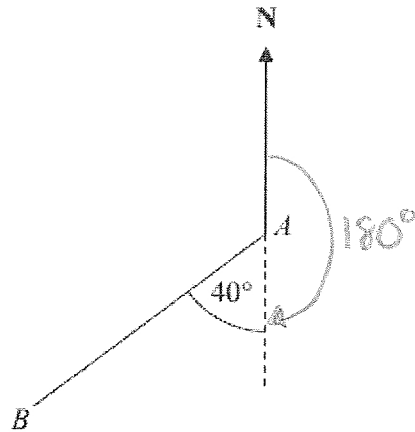


Diagram NOT accurately drawn

$180 + 40$

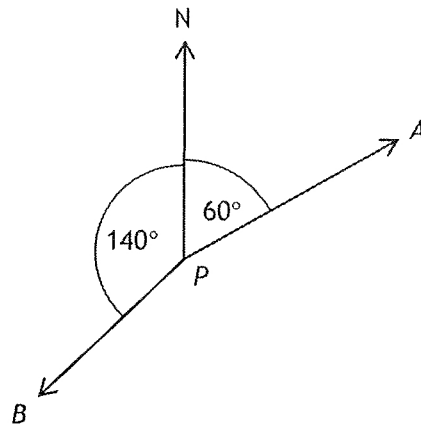
Work out the bearing of B from A.

START POINT

.....220.....°

(2 marks)

2.



(a) Write down the bearing of A from P.

Bearings are always 3 digits

.....060.....°

(b) Work out the bearing of B from P.

$360 - 140$

.....220.....°

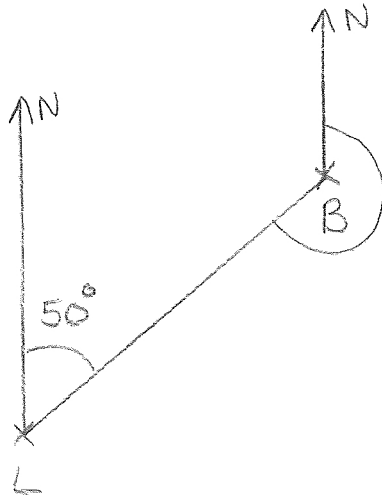
(3 marks)

1) Bearings: Medium

9. The bearing of a ship from a lighthouse is 050°

Work out the bearing of the lighthouse from the ship.

DRAW A SKETCH!
If accurate, you can measure the bearing



.....
230.....°

(2 marks)

1) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

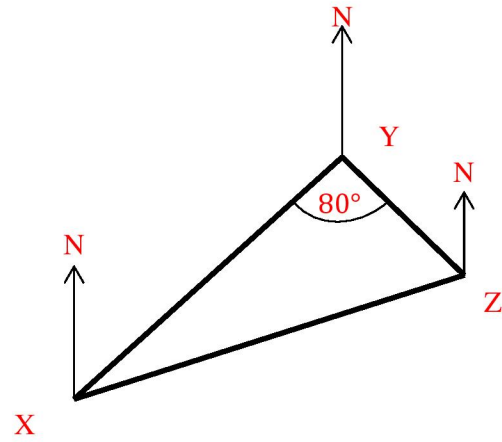
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

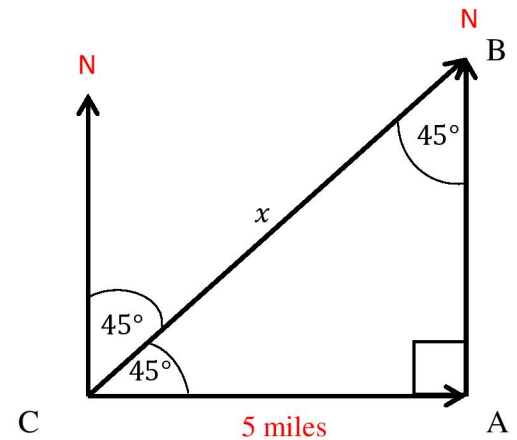
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



2) Simple Bounds: Easier

1. A piece of string has a length of 55 mm to the nearest mm.

(a) Write down the shortest possible length of the piece of string.

_____ 54.5 _____ mm (1)

(b) Write down the greatest possible length of the piece of string.

_____ 55.5 _____ mm (1)
(2 marks)

2. Chelsea's height is 158 cm to the nearest cm.

(a) Write down Chelsea's minimum possible height.

_____ 157.5 _____ cm (1)

(b) Write down Chelsea's maximum possible height.

_____ 158.5 _____ cm (1)
(2 marks)

2) Simple Bounds: Medium

3. A is 4.2 correct to the nearest decimal place.
B is 13 correct to the nearest whole number.

a) What is the error interval for A?

$$4.15 \leq A < 4.25$$

_____ cm

(1)

b) What is the lower bound of B?

$$12.5$$

_____ cm

(1)

c) What is the error interval of A + B?

$$\text{Lower bound } A+B \quad 4.15 + 12.5 = 16.65$$

$$\text{Upper bound } A+B \quad 4.25 + 13.5 = 17.75$$

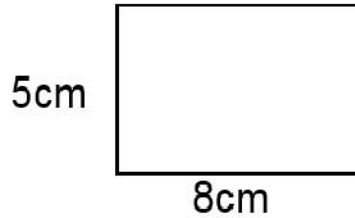
$$16.65 \leq A + B < 17.75$$

_____ cm

(1)

2) Simple Bounds: Harder

4.



The sides of the rectangle above are measured to the nearest cm.

a) Work out a lower bound for the perimeter.

Lower bounds for the sides are 4.5cm and 7.5cm

So lower bounds for perimeter is $2 \times 4.5 + 2 \times 7.5 = 9 + 15 = 24\text{cm}$

24cm

b) Work out the upper bound for the perimeter.

Upper bounds for the sides are 5.5cm and 8.5cm

So lower bounds for perimeter is $2 \times 5.5 + 2 \times 8.5 = 11 + 17 = 28\text{cm}$

28cm

(4 marks)

5. Tom has 100 identical pens.

Each of these pen weighs 5 grams to the nearest gram.

Work out the greatest possible total weight of all 100 pens.

Give your answer in kilograms.

Upper bound for weight of one pen: 5.5 g

So for 100 pens upper bound is $100 \times 5.5 = 550\text{g}$

One kilogram = 1000 grams so

$$550\text{g} = 0.55\text{kg}$$

0.55 kg

(3 marks)

3) Missing Mean Questions: Easier

1) The mean of 8 and another number is 13.

What is the other number?

$$\begin{aligned} \text{Solution: } (8+x)/2 &= 13 && \times 2 \\ 8 + x &= 26 && - 8 \\ x &= 18 \end{aligned}$$

_____18_____

(3 Marks)

2) The mean of 2, 5, 8 and x is 4

Find x

$$\begin{aligned} \text{Solution: } (2 + 5 + 8 + x) / 4 &= 4 && \times 4 \\ 15 + x &= 16 && -15 \\ x &= 1 \end{aligned}$$

_____x = 1_____

(3 Marks)

3) After measuring the heights of 7 people, they have an average height of 156cm. After measuring the heights of 8 people they have an average height of 158cm. How tall is the 8th person?

$$\begin{aligned} \text{Solution: } 7 \times 156 &= 1092 \\ 8 \times 158 &= 1264 \\ 1092 - 1264 &= 172 \end{aligned}$$

(3 Marks)

_____172_____

3) Missing Mean Questions: Medium

4) The mean weight of a group of 7 girls is 58kg

a) Work out their total weight

Solution: $7 \times 58 = 406\text{kg}$

_____406_____Kg

When a 8th girl joins the group, the mean weight goes up to 59kg.

b) What is the weight of the 8th girl?

Solution: $59 \times 8 = 472$

$472 - 406 = 66 \text{ Kg}$

_____66_____Kg

(3 Marks)

5) The mean distance that Jack runs in his last 10 runs is 5.7 miles. Work out the distance that he would need to run to make this exactly 6 miles.

Solution: $10 \times 5.7 = 57$

$11 \times 6 = 66$

$66 - 57 = 9$

_____9 miles_____

(2 Marks)

3) Missing Mean Questions: Harder

- 6) Waitresses and kitchen staff in a restaurant decide to share their tips. There are 8 kitchen staff 10 waitresses. The kitchen staff receives a mean of £23 weekly and the waitresses receive a mean of £28 weekly.

Work out the mean of all 18 members of staff.

$$\begin{aligned} \text{Solution: } 23 \times 8 &= 184 \\ 28 \times 10 &= 280 \end{aligned}$$

$$\text{Total} = 184 + 280 = 464$$

$$\text{Mean} = 464/18 = 25.78$$

_____ £25.78 _____

(3 Marks)

- 7) The mean of a, a, b is 30

The mean of a, a, b, b, b is 20

Find the values of a and b

Solution:

$$(2a + b) / 3 = 30 \quad \times 3$$

$$(2a + 3b) / 5 = 20 \quad \times 5$$

$$2a + b = 90 \quad - \quad \text{solve simultaneously}$$

$$2a + 3b = 100$$

$$-2b = -10$$

$$b = 5$$

$$2a + 5 = 90$$

$$2a = 85$$

$$a = 42.5$$

$a = 42.5 \quad b = 5$ _____

(5 Marks)

4) Standard Form: Easier

1. (a) Write the number 0.00037 in standard form.

(1)

$$3.7 \times 10^{-4}$$

- (b) Write 8.25×10^3 as an ordinary number.

(1)

$$8250$$

- (c) Work out $(2.1 \times 10^8) \times (6 \times 10^{-5})$.
Write your answer in standard form.

$$\begin{aligned} 2.1 \times 10^8 \times 6 \times 10^{-5} \\ = 12.6 \times 10^3 \\ = 1.26 \times 10^4 \end{aligned}$$

(2)

$$1.26 \times 10^4$$

(4 marks)

2. (a) Write 6.43×10^5 as an ordinary number.

$$643000$$

(1)

- (b) Work out the value of $2 \times 10^7 \times 8 \times 10^{-12}$.
Give your answer in standard form.

$$\begin{aligned} 2 \times 10^7 \times 8 \times 10^{-12} \\ = 16 \times 10^{-5} \\ = 1.6 \times 10^{-4} \end{aligned}$$

$$1.6 \times 10^{-4}$$

(2)

(3 marks)

4) Standard Form: Medium

15.
$$p^2 = \frac{x-y}{xy}$$

$$x = 8.5 \times 10^9$$

$$y = 4 \times 10^8$$

Find the value of p .

Give your answer in standard form correct to 2 significant figures.

$$p^2 = \frac{8.5 \times 10^9 - 4 \times 10^8}{8.5 \times 10^9 \times 4 \times 10^8} = \frac{8.1 \times 10^9}{3.4 \times 10^{18}}$$

$$= 2.38235... \times 10^{-9}$$

$$= 2.4 \times 10^{-9} \text{ (2sf)}$$

$$p = \sqrt{2.38235... \times 10^{-9}}$$

$$= 4.880935... \times 10^{-5}$$

$$= 4.9 \times 10^{-5} \text{ (2sf)}$$

$$4.9 \times 10^{-5} \text{ (2sf)}$$

$$\underline{\underline{4.9 \times 10^{-5}}}$$

(4 marks)

16.

$$y^2 = \frac{ab}{a+b}$$

$$a = 3 \times 10^8$$

$$b = 2 \times 10^7$$

Find y .

Give your answer in standard form correct to 2 significant figures.

$$y^2 = \frac{3 \times 10^8 \times 2 \times 10^7}{3 \times 10^8 + 2 \times 10^7}$$

$$= \frac{6 \times 10^{15}}{3.2 \times 10^8}$$

$$= 18750000$$

$$y = \sqrt{18750000}$$

$$= 4330.127...$$

$$= 4300 \text{ (2sf)}$$

$$= 4.3 \times 10^3 \text{ (2sf)}$$

$$y = \underline{\underline{4.3 \times 10^3 \text{ (2sf)}}}$$

(4 marks)

4) Standard Form: Harder

Worded Standard Form

1) The world's smallest snail travels 4×10^{-3} m a month.

How many months would it take for the snail to travel?

2×10^{-1} m?

$$\frac{2 \times 10^{-1}}{4 \times 10^{-3}} = \frac{2}{4} \times 10^2$$

$$= 0.5 \times 10^2$$

$$= 5 \times 10^3$$

(-1 - -3 = 2)

2)

The time taken for light to reach Earth from the edge of the known universe is 14 000 000 000 years.

Light travels at the speed of 9.46×10^{12} km/year.

Work out the distance, in kilometres, from the edge of the known universe to Earth.
Give your answer in standard form.

$$S = \frac{D}{T}$$

$$D = ST$$

$$D = 9.46 \times 10^{12} \times 1.4 \times 10^{10}$$

$$= 13.244 \times 10^{22}$$

$$= 1.3244 \times 10^{23}$$

5) Changing Ratios: Easier

Solution for Question 1:

a) Red : Blue = 8:12

Divide through by 4 to simplify: 2:3

b) Red : Blue = 8:10

Divide through by 2 to simplify: 4:5

Solution for Question 2:

a) Pen : Pencils = 2:3

Equivalent to 20:30

30 pencils in pencil case

b) Only pencils removed so still 20 pens, ratio 4:3 equivalent to 20:15 so removed 15 pencils

5) Changing Ratios: Medium

Solution for Question 3:

$$1:3:5$$

$$1:3+5 = 1:8$$

Solution for Question 4:

$$\text{Orange : Red} = 2:3$$

$$2:3 = 5$$

$$x:51 = y$$

$$\frac{51}{3} = 17$$

$$x = 2 \times 17 = 34$$

$$y = 5 \times 17 = 85$$

$$\text{Ratio of Orange to Red} = 34:51$$

Compare 2:3 to 10:17, achieving same number for red sweets

$$2:3 = 34:51$$

Multiply ratio 10:17 by 3

$$30:51$$

4 orange sweets were eaten by Solomon.

Solution for Question 5:

$$\text{HW : No HW} = 5:4$$

$$5:4 = 9$$

$$15:x = y$$

$$\frac{15}{5} = 3$$

$$x = 4 \times 3 = 12$$

$$y = 9 \times 3 = 27$$

$$\text{Ratio of HW done to HW not done} = 15:12$$

Compare 5:4 to 2:1

$$5:4 = 15:12$$

$$2:1 = ?:?$$

Same number of pupils in the class = 27

Multiply ratio 2:1 by 9 ($\frac{27}{3}$)

$$18:9$$

3 more pupils did do their homework, the teacher was correct.

5) Changing Ratios: Harder

Solution for Question 6:

Sedimentary : Metamorphic = 2:3

Metamorphic : Igneous = 9:10

Multiply ratio 2:3 by 3 = 6:9

Therefore, sedimentary to igneous = 6:10

Solution for Question 7:

Road bikes: Mountain bikes

3:5

The minimum number of bikes sold is 3 road and 5 mountain, if the ratio changes to 2:1 but no more mountain bikes are sold then ratio is 10:5 so 7 more road bikes must have been sold.

It is not the only answer as there could have been many numbers of bikes sold, the ratio is 3:5 this could be 6:10 or any equivalent ratio. If it was 6 to 10 for example to change to 2:1 ratio must be 20:10 which would mean 14 more road bikes sold, so the number more road bikes sold is any multiple of 7

BROOKES Max

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Your Pinpoint Topics

Topic 1: Missing Mean Questions. Mathswatch Clip: NA

Topic 2: Venn diagrams.. Mathswatch Clip: 127

Topic 3: Inequalities Regions. Mathswatch Clip: 198

Topic 4: More Difficult Rearranging Formulae. MW: 190

Topic 5: Pythagoras. Mathswatch Clip: 150

1) Missing Mean Questions: Easier

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_____18_____

(3 Marks)

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(3 Marks)

_____172_____

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_____66_____Kg

(3 Marks)

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$66 - 57 = 9$

_____9 miles_____

(2 Marks)

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$$\underline{\quad \quad \quad \text{£}25.78 \quad \quad \quad \underline{\quad \quad \quad}}$$

(3 Marks)

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The mean of a, a, b, b, b is 20

Find the values of a and b

Solution:

$$(2a + b) / 3 = 30 \quad \times 3$$

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$$2a + b = 90 \quad - \quad \text{solve simultaneously}$$

$$2a + 3b = 100$$

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$$b = 5$$

$$2a + 5 = 90$$

$$2a = 85$$

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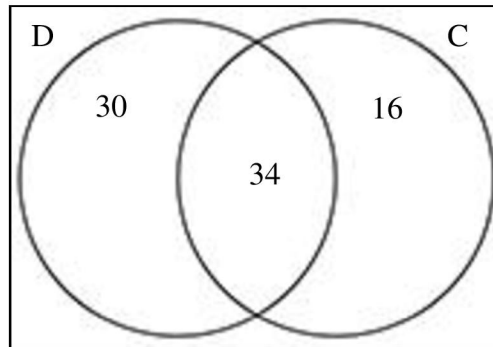
(5 Marks)

2) Venn diagrams.: Easier

Solution for Question 1:

Number of people that owned dogs only: $64 - 34 = 30$

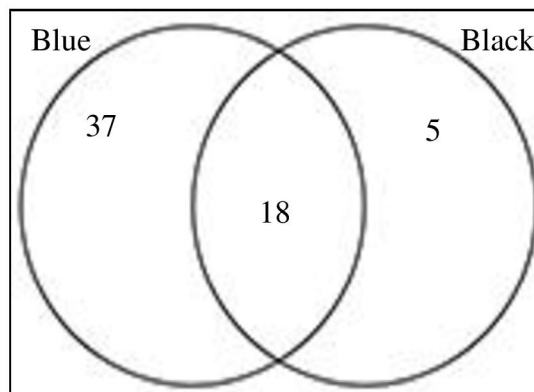
Number of people that owned cats only: $80 - 34 - 30 = 16$



Solution for Question 2:

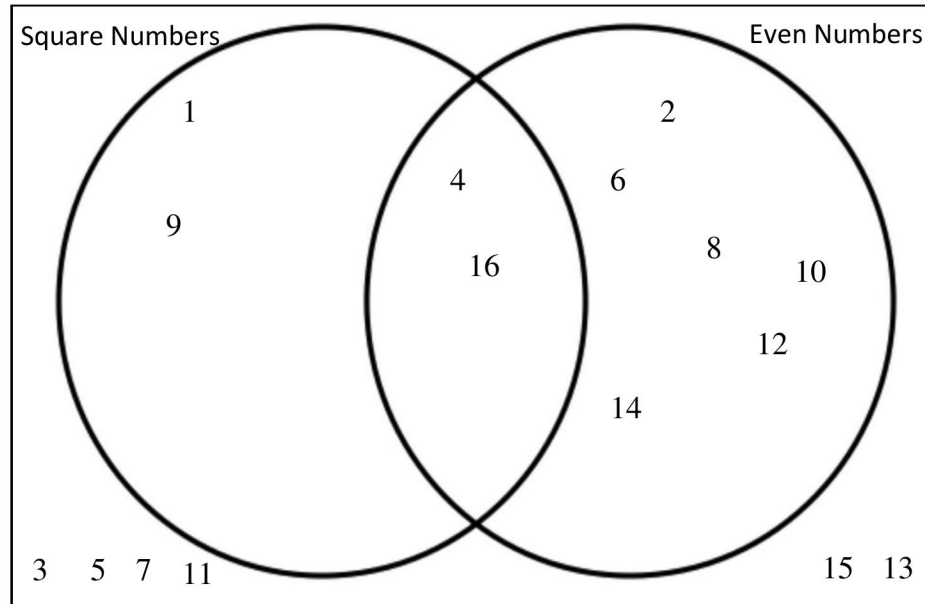
a) Number of people that only had a black pen:
 $60 - 37 - 18 = 5$

b) Probability of a person owning both types of pen:
 $\frac{18}{60} = \frac{3}{10}$



2) Venn diagrams.: Medium

Solution for Question 3:



Solution for Question 4:

- a) Tea: $6 + 12 = 18$
 Coffee: $9 + 12 = 21$
 Therefore, False
- b) False
- c) False

Solution for Question 5:

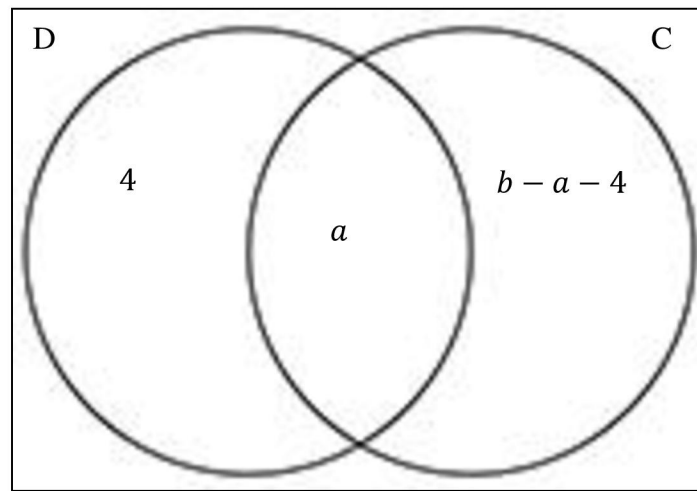
- a)
- i) $A \cap B = A$ and $B = \{9, 15\}$
- ii) $A \cup B = A$ or $B = \{3, 5, 6, 12, 18\}$

2) Venn diagrams.: Harder

Solution for Question 6:

Number of people who replied with cats only:

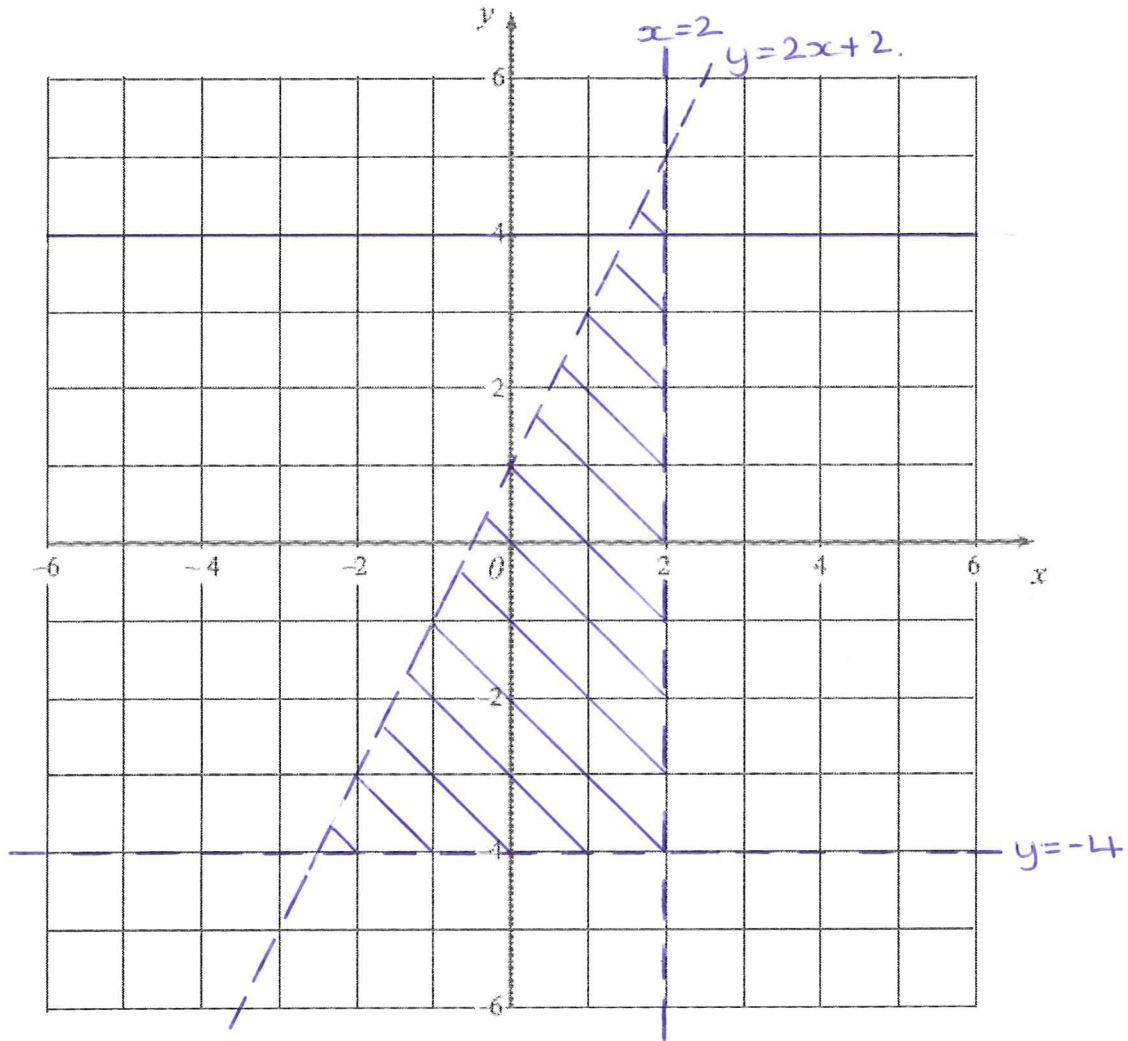
$$b - a - 4$$



3) Inequalities Regions: Easier

1. On the grid, shade the region that satisfies all three of these inequalities

$$y > -4 \quad x < 2 \quad y < 2x + 1$$



(Total for Question 19 = 4 marks)

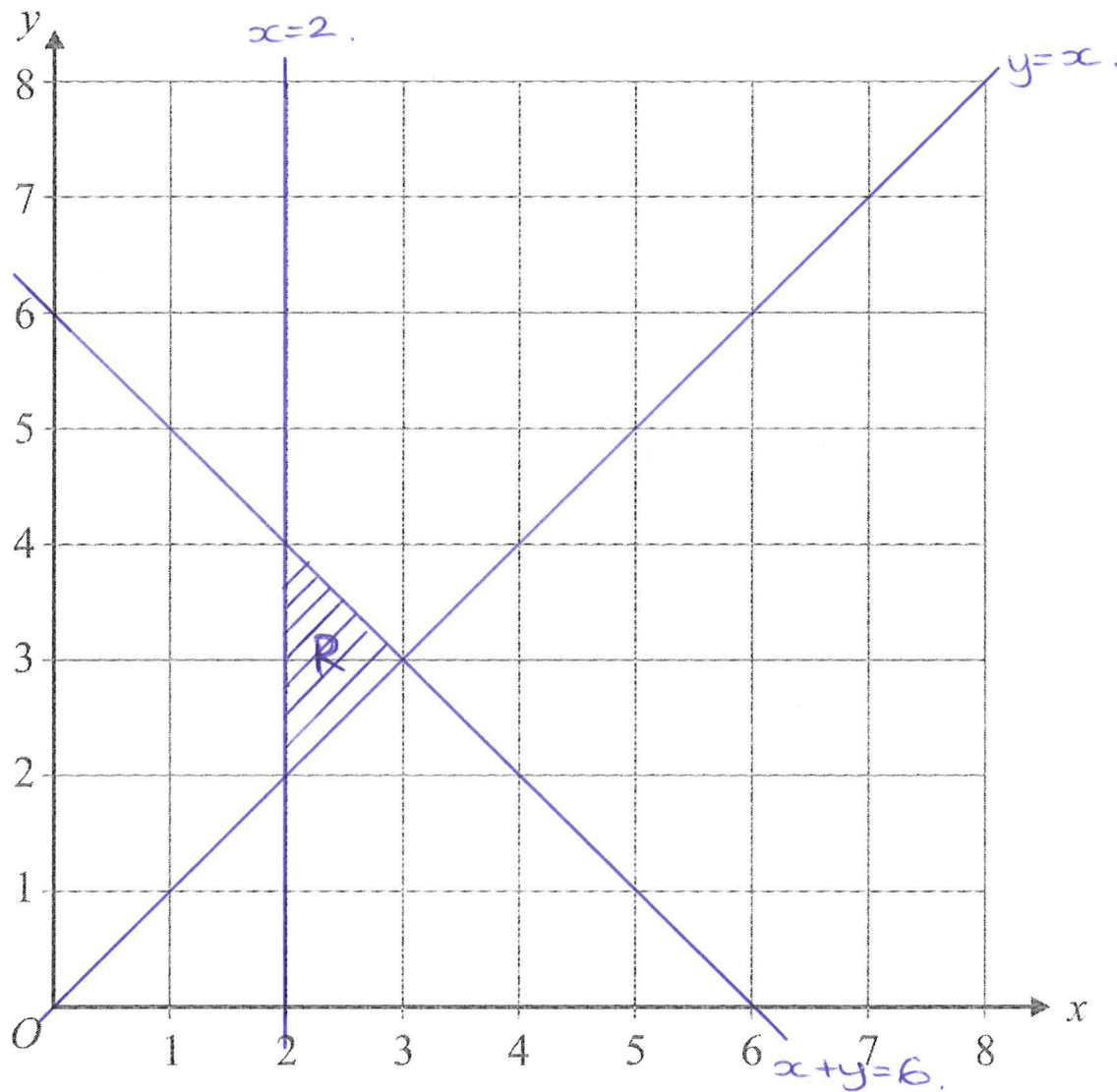
3) Inequalities Regions: Medium

6. (a) On the grid below, draw straight lines and use shading to show the region **R** that satisfies the inequalities

$$x \geq 2$$

$$y \geq x$$

$$x + y \leq 6$$



(3)

The point P with coordinates (x, y) lies inside the region **R**.
 x and y are **integers**.

- (b) Write down the coordinates of **all** the points of **R** whose coordinates are both integers.

$(2, 2)$ $(2, 3)$ $(2, 4)$ $(3, 3)$

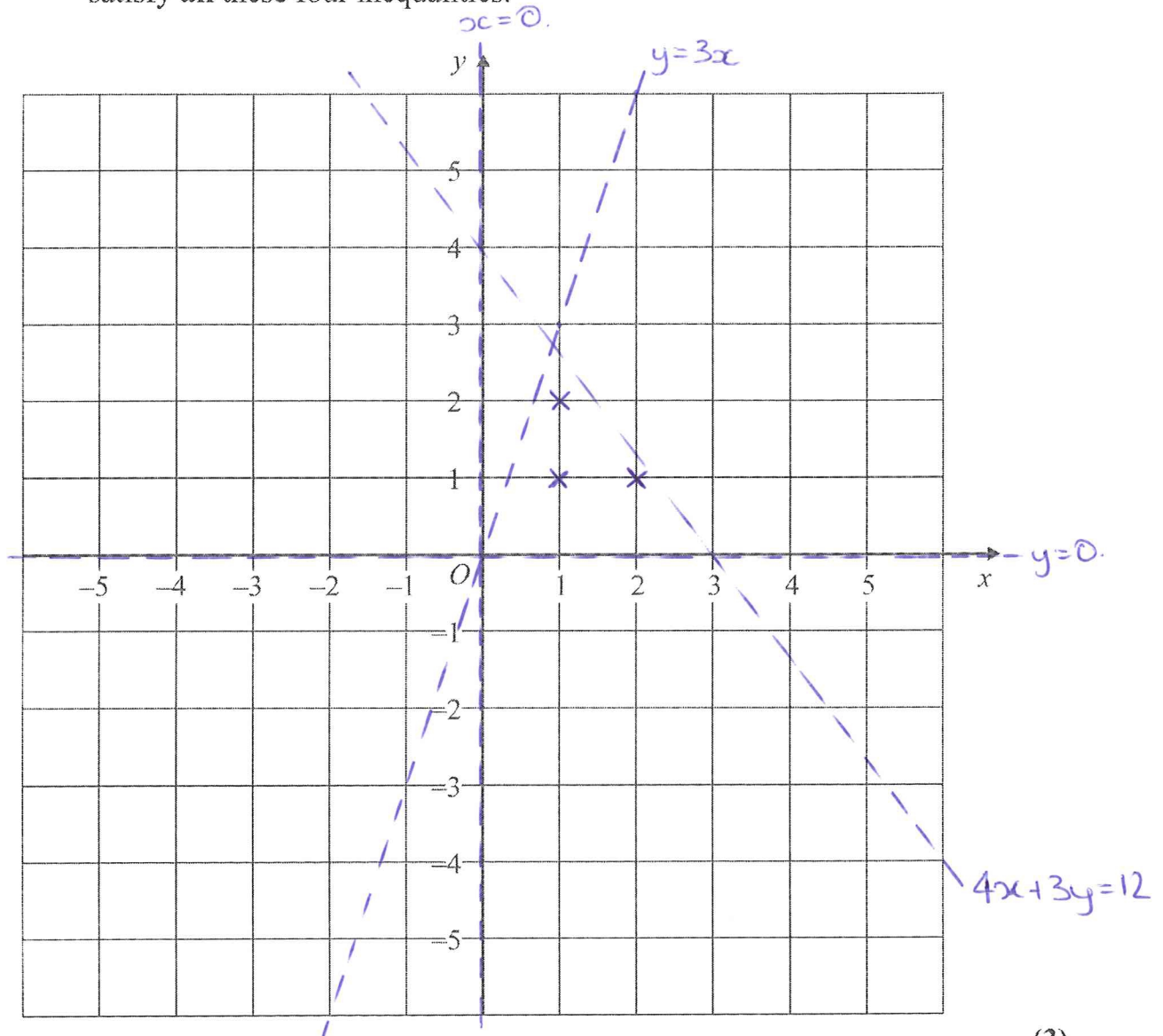
(2)

3) Inequalities Regions: Harder

7. $4x + 3y < 12$, $y < 3x$, $y > 0$, $x > 0$

x and y are both integers.

On the grid, mark with a cross (\times), each of the **three** points which satisfy **all** these four inequalities.



(3)
(Total 5 marks)

4) More Difficult Rearranging Formulae: Easier

1. Rearrange $a(q - c) = d$ to make q the subject.

$$aq - ac = d$$

$$aq = d + ac$$

$$q = \frac{d + ac}{a}$$

$$q = \frac{d + ac}{a} \dots \dots \dots (3)$$

(Total 5 marks)

2. (a) Make n the subject of the formula $m = 5n - 21$

$$m + 21 = 5n$$

$$n = \frac{m + 21}{5}$$

4) More Difficult Rearranging Formulae: Medium

10. $P = \frac{n^2 + a}{n + a}$

Rearrange the formula to make a the subject.

$$p(n+a) = n^2 + a$$

$$pn + pa = n^2 + a$$

$$pa - a = n^2$$

$$a(p-1) = n^2$$

$$a = \frac{n^2}{p-1}$$

$$a = \dots\dots\dots$$

(Total 4 marks)

11. $\frac{x}{x+c} = \frac{p}{q}$

Make x the subject of the formula.

$$xq = p(x+c)$$

$$xq = px + cp$$

$$x(q-p) = cp$$

$$x = \frac{cp}{q-p}$$

$$x = \dots\dots\dots$$

(Total 4 marks)

4) More Difficult Rearranging Formulae: Harder

12. Rearrange $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

to make u the subject of the formula.

Give your answer in its simplest form.

$$fv + fu = uv$$

$$fu - uv = fv$$

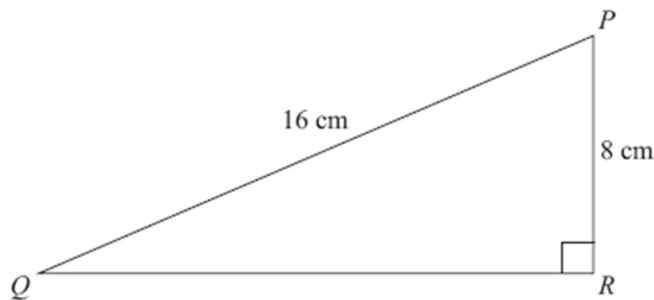
$$u(f - v) = fv$$

$$u = \frac{fv}{f - v}$$

5) Pythagoras: Easier

1.

Diagram NOT
accurately drawn



PQR is a right-angled triangle.

$PQ = 16$ cm.

$PR = 8$ cm.

Calculate the length of QR .

Give your answer correct to 2 decimal places.

$$QR^2 = 16^2 - 8^2 = 192$$

$$QR = \sqrt{192} = 13.86 \text{ cm}$$

..... **13.86** cm

(3 marks)

2.

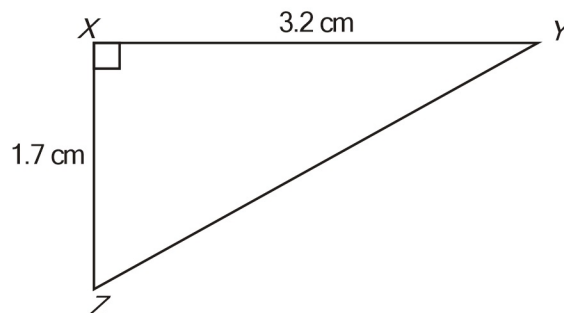


Diagram NOT
accurately drawn

XYZ is a right-angled triangle.

$XY = 3.2$ cm.

$XZ = 1.7$ cm.

Calculate the length of YZ .

Give your answer correct to 3 significant figures.

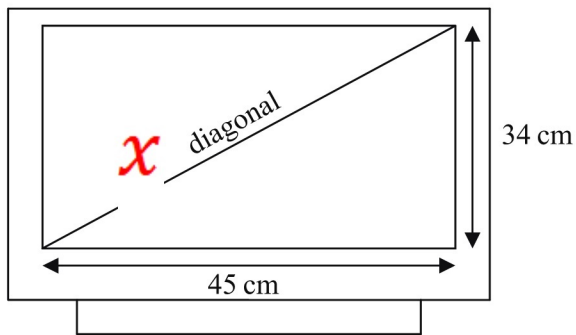
$$YZ^2 = 3.2^2 + 1.7^2 = 13.13$$

$$YZ = \sqrt{13.13} = 3.62 \text{ cm}$$

..... **3.62** cm

5) Pythagoras: Medium

7.



old version answers:

Q11 22.4 cm

Q12 11.9cm

Diagram NOT accurately drawn

A rectangular television screen has a width of 45 cm and a height of 34 cm.

Work out the length of the diagonal of the screen.
Give your answer correct to the nearest centimetre.

$$x^2 = 45^2 + 34^2 = 3181$$

$$x = \sqrt{3181} = 56 \text{ cm}$$

..... 56 cm
(4 marks)

8.

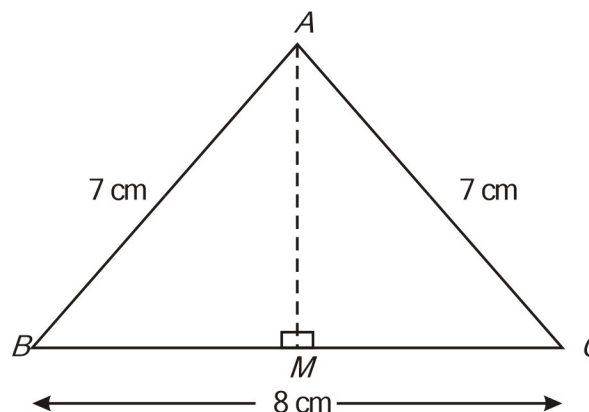


Diagram NOT accurately drawn

Work out the length, in centimetres, of AM .
Give your answer correct to 2 decimal places.

$$BM = \frac{1}{2} BC = 4 \text{ cm}$$

$$AM^2 = 7^2 - 4^2 = 33$$

$$AM = \sqrt{33} = 5.74$$

..... 5.74 cm
(3 marks)

5) Pythagoras: Harder

13. $ABCD$ is a trapezium.

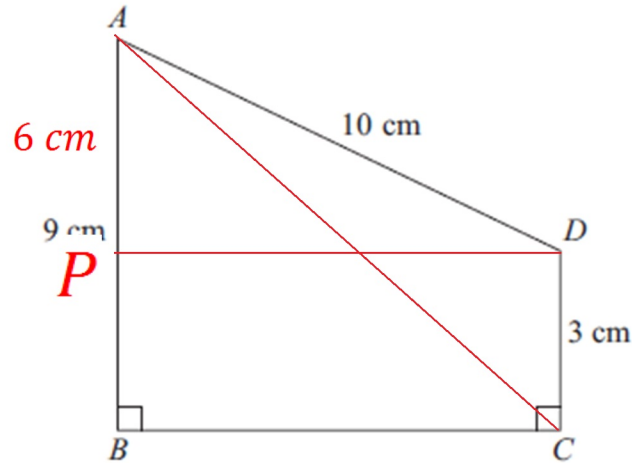


Diagram **NOT** accurately drawn

$AD = 10$ cm
 $AB = 9$ cm
 $DC = 3$ cm
 Angle $ABC =$ angle $BCD = 90^\circ$

Calculate the length of AC .
 Give your answer correct to 3 significant figures.

$$AP = 9 - 3 = 6 \text{ cm}$$

$$PD^2 = 10^2 - 6^2 = 64$$

$$BC = PD = \sqrt{64} = 8 \text{ cm}$$

$$AC^2 = 9^2 + 8^2 = 145$$

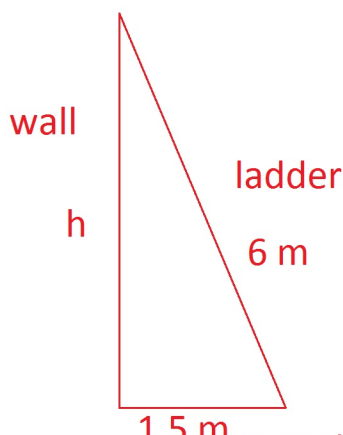
$$AC = \sqrt{145} = 12.0 \dots\dots\dots \text{ cm}$$

(5 marks)

14. A ladder is 6 m long.
 The ladder is placed on horizontal ground, resting against a vertical wall.

The instructions for using the ladder say that the bottom of the ladder must not be closer than 1.5 m from the bottom of the wall.

How far up the wall can the ladder reach?
 Give your answer correct to 1 decimal place.



$$h^2 = 6^2 - 1.5^2 = 33.75$$

$$h = \sqrt{33.75} = 5.8 \text{ m}$$

BURNS Megan

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Angles in Polygons. Mathswatch Clip: 123

Topic 2: Bearings. Mathswatch Clip: 124

Topic 3: Solving Quadratics Using the Formula. MW: 191

Topic 4: Venn diagrams.. Mathswatch Clip: 127

Topic 5: Pythagoras. Mathswatch Clip: 150

1) Angles in Polygons: Easier

1. Each exterior angle of a regular polygon is 30° .

Work out the number of sides of the polygon.

$$360 \div 30 = 12$$

.....
12

(2 marks)

- 2.

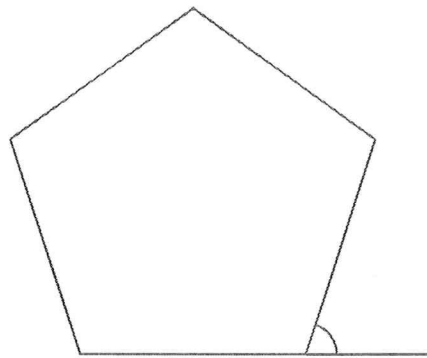


Diagram NOT accurately drawn

Work out the size of an exterior angle of a regular pentagon.

$$360 \div 5 = 72$$

.....
72°

(2 marks)

- 3.

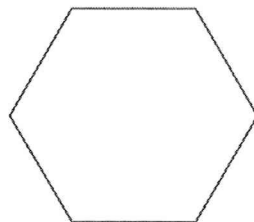


Diagram NOT accurately drawn

Calculate the size of the exterior angle of a regular hexagon.

$$360 \div 6 = 60$$

.....
60°

(2 marks)

1) Angles in Polygons: Medium

4. The size of each exterior angle of a regular polygon is 40° .

Work out the number of sides of the regular polygon.

$$360 \div 40 = 9$$

..... 9

(2 marks)

5. The size of each interior angle of a regular polygon is 156° .

Work out the number of sides of the polygon.

$$180 - 156 = 24 \text{ (Exterior angle)}$$

$$360 \div 24 = 15$$

..... 15

(3 marks)

6. Here is a regular polygon with 9 sides.

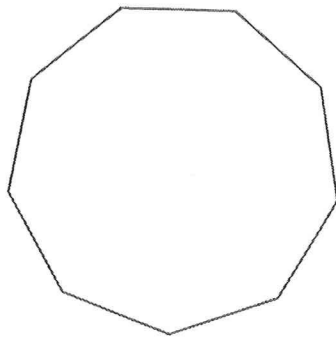


Diagram **NOT** accurately drawn

Work out the size of an exterior angle.

$$360 \div 9 = 40$$

..... 40

(2 marks)

1) Angles in Polygons: Harder

11.

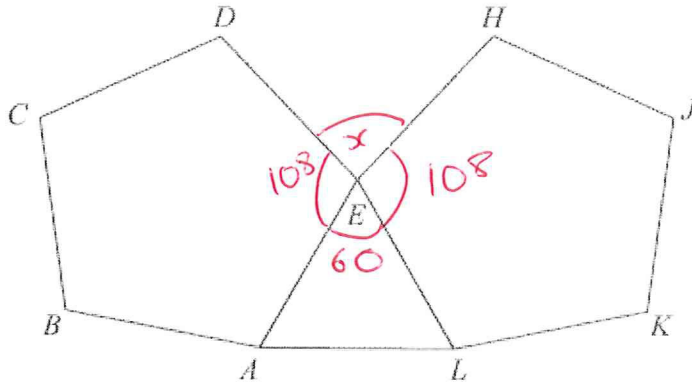


Diagram NOT accurately drawn

ABCDE and *EHJKL* are regular pentagons.
AEL is an equilateral triangle.

Work out the size of angle *DEH*.

$$\begin{aligned} \text{Pentagon} &= \frac{180 \times (n-2)}{n} \\ &= \frac{180 \times 3}{5} = \frac{540}{5} = 108 \end{aligned}$$

$$360 - 108 - 108 - 60 = 84$$

84

.....°
 (4 marks)

2) Bearings: Easier

1.

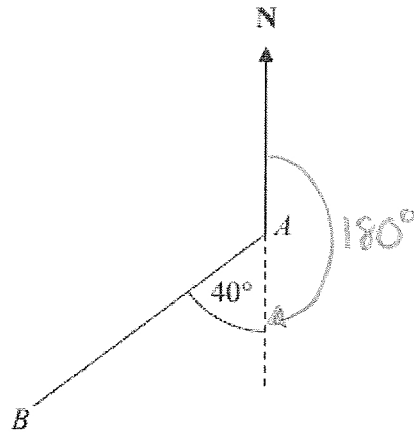


Diagram NOT accurately drawn

$$180 + 40$$

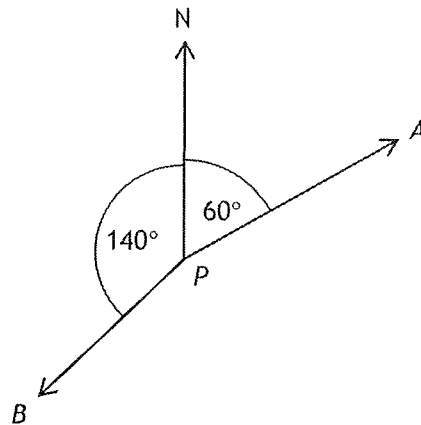
Work out the bearing of B from A.

START POINT

.....220.....°

(2 marks)

2.



(a) Write down the bearing of A from P.

Bearings are always 3 digits

.....060.....°

(b) Work out the bearing of B from P.

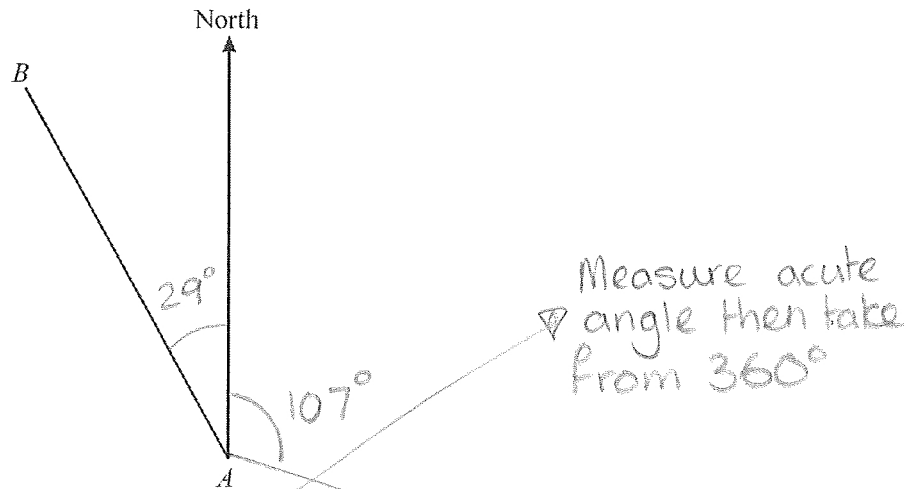
$$360 - 140$$

.....220.....°

(3 marks)

2) Bearings: Medium

3.



(a) Measure and write down the bearing of B from A.

$$360 - 29$$

Measure acute angle then take from 360°
 $\dots\dots\dots 331^\circ$

(1)

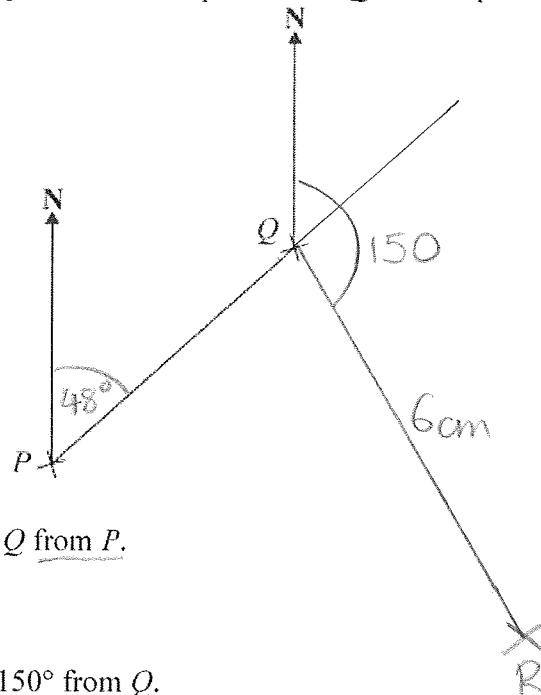
(b) On the diagram, draw a line on a bearing of 107° from A.

clockwise

(1)

(2 marks)

4. The diagram shows the position of two ports P and Q on a map.



(a) Measure the bearing of Q from P.

$\dots\dots\dots 048^\circ$

(1)

A rock R is on a bearing of 150° from Q.
 On the map R is 6 cm from Q.

(b) Mark the position of R with a cross (x) and label it R.

(2)

2) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

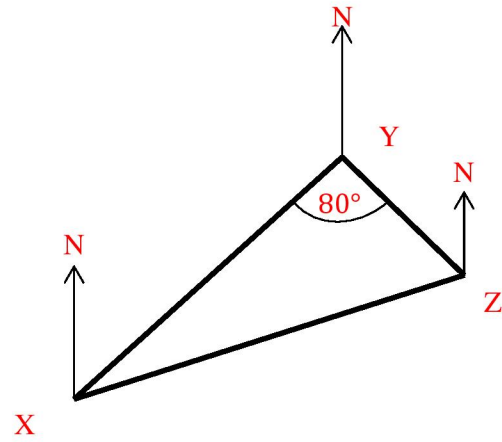
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

$$70^\circ$$



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

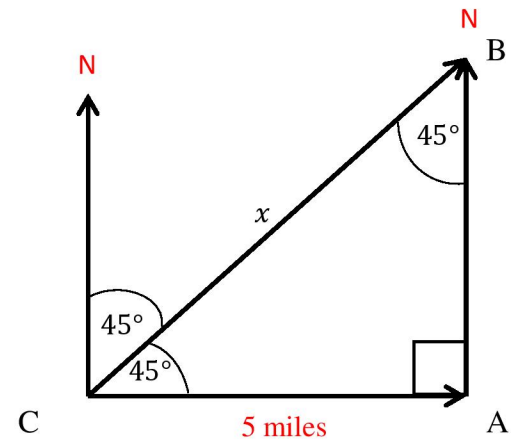
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



3) Solving Quadratics Using the Formula: Easier

1. Solve $3x^2 + 7x - 13 = 0$
Give your solutions correct to 2 decimal places.

$$a = 3 \quad b = 7 \quad c = -13$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-7 \pm \sqrt{7^2 - 4 \times 3 \times -13}}{2 \times 3} = \frac{-7 \pm \sqrt{205}}{6}$$

$$= 1.219636844 \quad \text{or} \quad -3.552970177$$

$$x = \underline{1.22} \dots \dots \dots \text{or } x = \underline{-3.55} \dots \dots \dots$$

(3 marks)

2. Solve the equation

$$2x^2 + 6x - 95 = 0$$

Give your solutions correct to 3 significant figures.

$$a = 2 \quad b = 6 \quad c = -95$$

$$x = \frac{-6 \pm \sqrt{36 - (4 \times 2 \times -95)}}{4}$$

$$= \frac{-6 \pm \sqrt{796}}{4}$$

$$= 5.55336799 \quad \text{or} \quad -8.55336799$$

$$x = \underline{5.55} \dots \dots \dots \text{or } x = \underline{-8.55} \dots \dots \dots$$

(3 marks)

3) Solving Quadratics Using the Formula: Medium

3. Solve $x^2 + 3x - 5 = 0$
Give your solutions correct to 4 significant figures.

$$a = 1 \quad b = 3 \quad c = -5$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-3 \pm \sqrt{9 - (4 \times 1 \times -5)}}{2}$$

$$= \frac{-3 \pm \sqrt{29}}{2}$$

$$x = 1.192582404 \text{ or } -4.192582404$$

$$x = 1.193 \text{ or } -4.193$$

(3 marks)

4. Solve this quadratic equation.

$$x^2 - 5x - 8 = 0$$

Give your answers correct to 3 significant figures.

$$a = 1 \quad b = -5 \quad c = -8$$

$$x = \frac{5 \pm \sqrt{25 - (4 \times 1 \times -8)}}{2}$$

$$= \frac{5 \pm \sqrt{57}}{2}$$

$$x = 6.274917218 \text{ or } -1.274917218$$

$$x = 6.27 \text{ or } -1.27$$

(3 marks)

3) Solving Quadratics Using the Formula: Harder

9. The diagram shows a 6-sided shape.
All the corners are right angles.
All the measurements are given in centimetres.

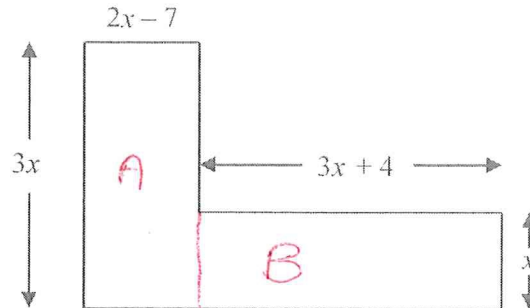


Diagram NOT accurately drawn

The area of the shape is 85 cm^2 .

- (a) Show that $9x^2 - 17x - 85 = 0$

$$A = 3x(2x-7) \quad B = x(3x+4)$$

$$= 6x^2 - 21x \quad = 3x^2 + 4x$$

$$6x^2 - 21x + 3x^2 + 4x = 85$$

$$9x^2 - 17x - 85 = 0 \quad (3)$$

- (b) (i) Solve $9x^2 - 17x - 85 = 0$

Give your solutions correct to 3 significant figures.

$$a=9 \quad b=-17 \quad c=-85$$

$$x = \frac{17 \pm \sqrt{17^2 - 4(9)(-85)}}{18}$$

$$x = 4.159474732 \quad \text{or} \quad x = -2.270585844$$

$$x = 4.16 \dots \quad \text{or} \quad x = -2.27 \dots$$

- (ii) Hence, work out the length of the shortest side of the 6-sided shape.

$$2x-7$$

$$\dots 1.38 \dots \text{ cm}$$

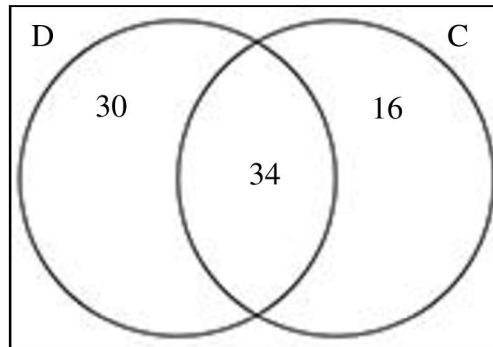
(4)

4) Venn diagrams.: Easier

Solution for Question 1:

Number of people that owned dogs only: $64 - 34 = 30$

Number of people that owned cats only: $80 - 34 - 30 = 16$



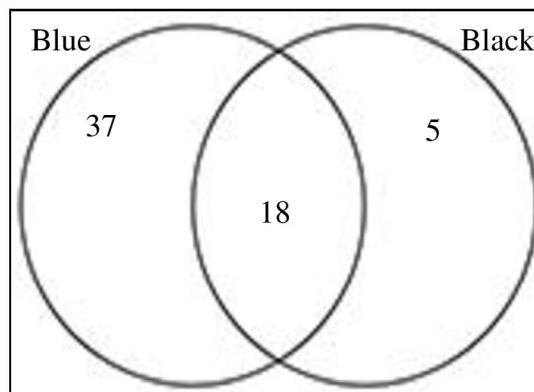
Solution for Question 2:

a) Number of people that only had a black pen:

$$60 - 37 - 18 = 5$$

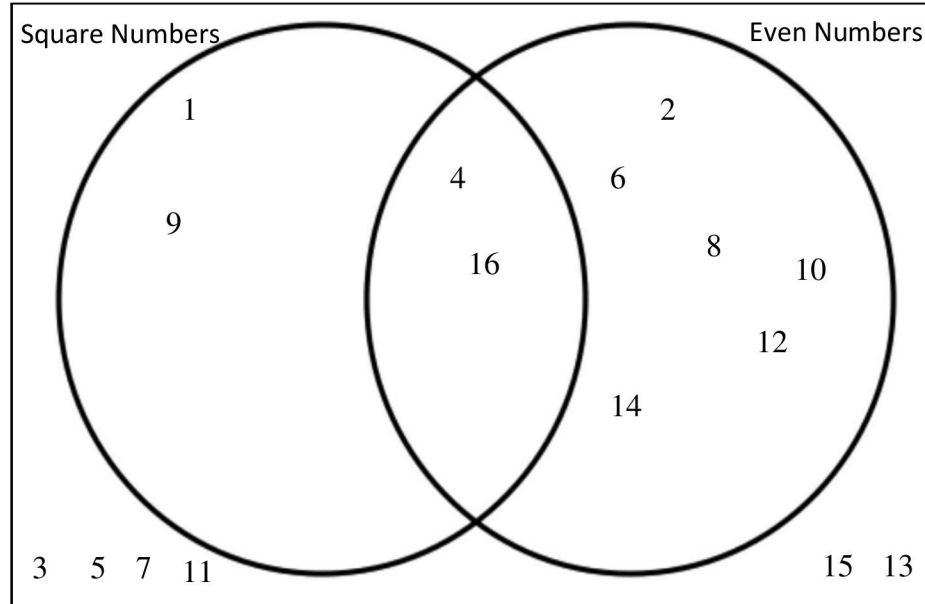
b) Probability of a person owning both types of pen:

$$\frac{18}{60} = \frac{3}{10}$$



4) Venn diagrams.: Medium

Solution for Question 3:



Solution for Question 4:

- a) Tea: $6 + 12 = 18$
 Coffee: $9 + 12 = 21$
 Therefore, False
- b) False
- c) False

Solution for Question 5:

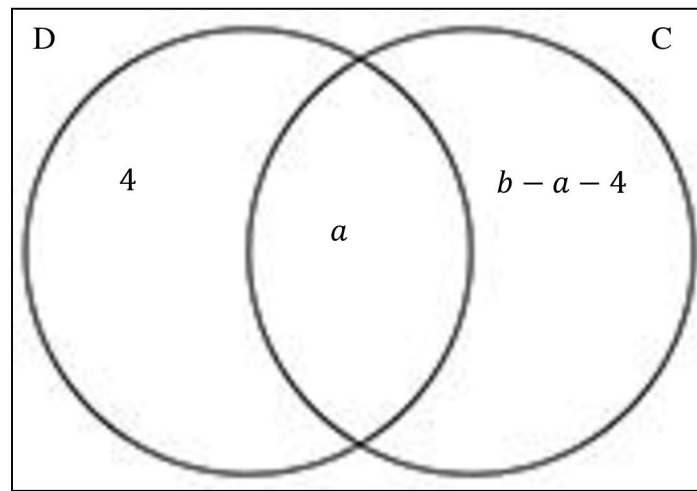
- a)
- i) $A \cap B = A$ and $B = \{9, 15\}$
- ii) $A \cup B = A$ or $B = \{3, 5, 6, 12, 18\}$

4) Venn diagrams.: Harder

Solution for Question 6:

Number of people who replied with cats only:

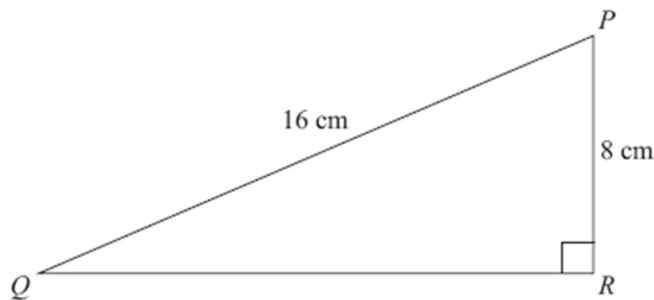
$$b - a - 4$$



5) Pythagoras: Easier

1.

Diagram NOT
accurately drawn



PQR is a right-angled triangle.
 $PQ = 16$ cm.
 $PR = 8$ cm.

Calculate the length of QR .
 Give your answer correct to 2 decimal places.

$$QR^2 = 16^2 - 8^2 = 192$$

$$QR = \sqrt{192} = 13.86 \text{ cm}$$

..... **13.86** cm

(3 marks)

2.

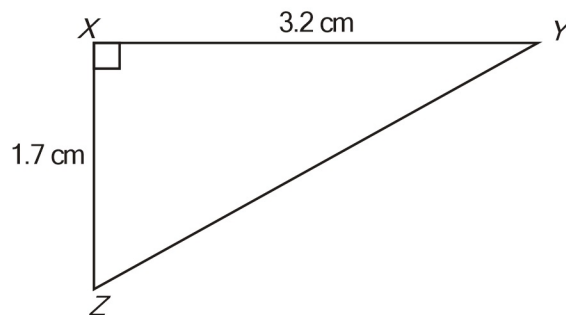


Diagram NOT
accurately drawn

XYZ is a right-angled triangle.
 $XY = 3.2$ cm.
 $XZ = 1.7$ cm.

Calculate the length of YZ .

Give your answer correct to 3 significant figures.

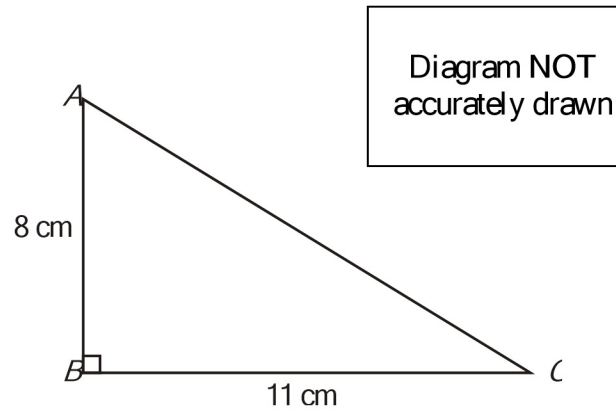
$$YZ^2 = 3.2^2 + 1.7^2 = 13.13$$

$$YZ = \sqrt{13.13} = 3.62 \text{ cm}$$

..... **3.62** cm

5) Pythagoras: Medium

3.



ABC is a right-angled triangle.

$AB = 8$ cm,
 $BC = 11$ cm.

Calculate the length of AC .
Give your answer correct to 3 significant figures.

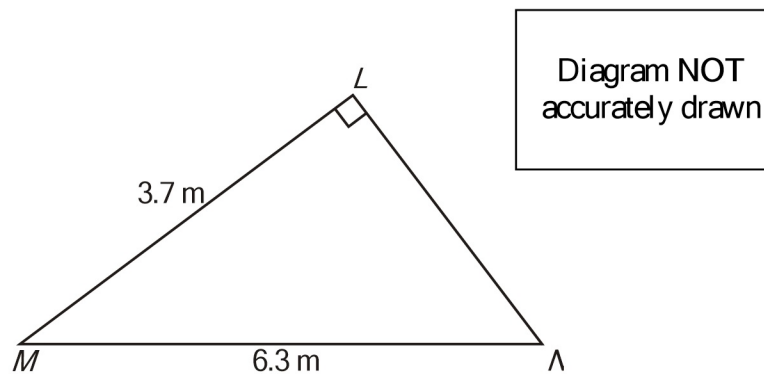
$$AC^2 = 8^2 + 11^2 = 185$$

$$AC = \sqrt{185} = 13.6 \text{ cm}$$

..... 13.6 cm

(3 marks)

4.



Angle $MLN = 90^\circ$.

$LM = 3.7$ m.
 $MN = 6.3$ m.

Work out the length of LN .
Give your answer correct to 3 significant figures.

$$LN^2 = 6.3^2 - 3.7^2 = 26$$

$$LN = \sqrt{26} = 5.10 \text{ m}$$

$LN =$ 5.10 m

5) Pythagoras: Harder

13. $ABCD$ is a trapezium.

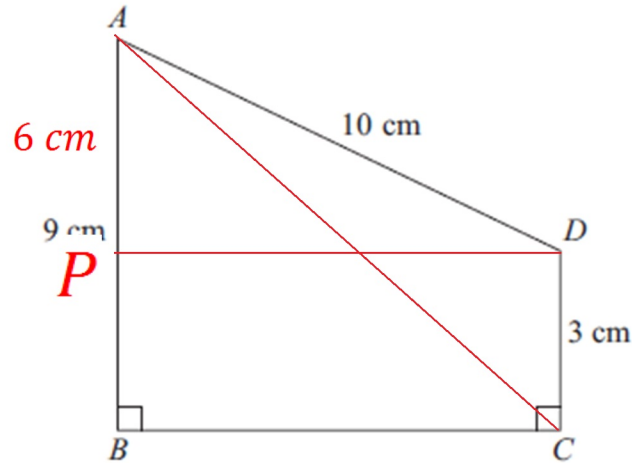


Diagram **NOT** accurately drawn

$AD = 10$ cm
 $AB = 9$ cm
 $DC = 3$ cm
 Angle $ABC =$ angle $BCD = 90^\circ$

Calculate the length of AC .
 Give your answer correct to 3 significant figures.

$$AP = 9 - 3 = 6 \text{ cm}$$

$$PD^2 = 10^2 - 6^2 = 64$$

$$BC = PD = \sqrt{64} = 8 \text{ cm}$$

$$AC^2 = 9^2 + 8^2 = 145$$

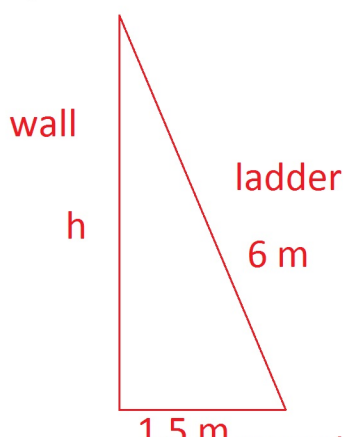
$$AC = \sqrt{145} = 12.0 \dots\dots\dots \text{ cm}$$

(5 marks)

14. A ladder is 6 m long.
 The ladder is placed on horizontal ground, resting against a vertical wall.

The instructions for using the ladder say that the bottom of the ladder must not be closer than 1.5 m from the bottom of the wall.

How far up the wall can the ladder reach?
 Give your answer correct to 1 decimal place.



$$h^2 = 6^2 - 1.5^2 = 33.75$$

$$h = \sqrt{33.75} = 5.8 \text{ m}$$

FARTHING Rachel

9to1_AQA_PracticeSet2_3H

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Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Angles in Polygons. Mathswatch Clip: 123

Topic 2: Bearings. Mathswatch Clip: 124

Topic 3: Writing one number as % of another. MW: 88

Topic 4: Changing Ratios. Mathswatch Clip: NA

Topic 5: Inequalities Regions. Mathswatch Clip: 198

1) Angles in Polygons: Easier

1. Each exterior angle of a regular polygon is 30° .

Work out the number of sides of the polygon.

$$360 \div 30 = 12$$

.....
12

(2 marks)

- 2.

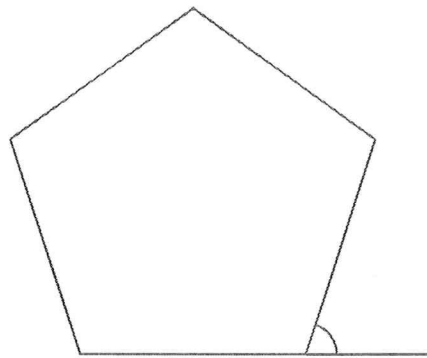


Diagram NOT accurately drawn

Work out the size of an exterior angle of a regular pentagon.

$$360 \div 5 = 72$$

.....
72°

(2 marks)

- 3.

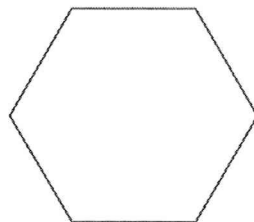


Diagram NOT accurately drawn

Calculate the size of the exterior angle of a regular hexagon.

$$360 \div 6 = 60$$

.....
60°

(2 marks)

1) Angles in Polygons: Medium

4. The size of each exterior angle of a regular polygon is 40° .

Work out the number of sides of the regular polygon.

$$360 \div 40 = 9$$

..... 9

(2 marks)

5. The size of each interior angle of a regular polygon is 156° .

Work out the number of sides of the polygon.

$$180 - 156 = 24 \text{ (Exterior angle)}$$

$$360 \div 24 = 15$$

..... 15

(3 marks)

6. Here is a regular polygon with 9 sides.

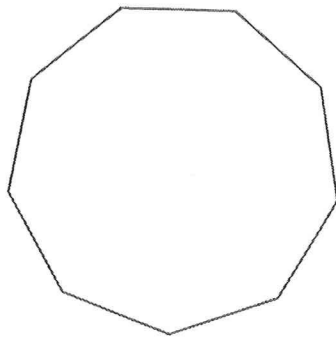


Diagram **NOT** accurately drawn

Work out the size of an exterior angle.

$$360 \div 9 = 40$$

..... 40

(2 marks)

1) Angles in Polygons: Harder

11.

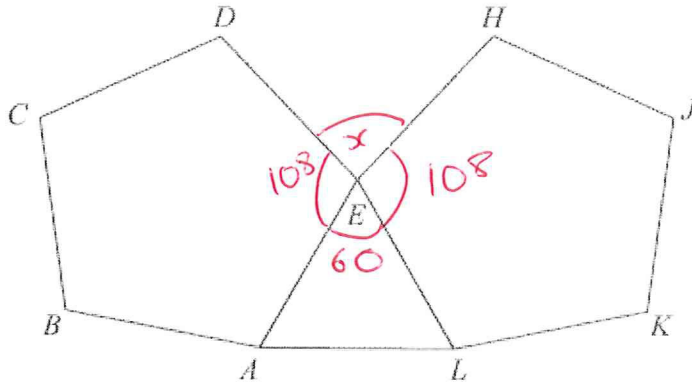


Diagram NOT accurately drawn

ABCDE and *EHJKL* are regular pentagons.
AEL is an equilateral triangle.

Work out the size of angle *DEH*.

$$\begin{aligned} \text{Pentagon} &= \frac{180 \times (n-2)}{n} \\ &= \frac{180 \times 3}{5} = \frac{540}{5} = 108 \end{aligned}$$

$$360 - 108 - 108 - 60 = 84$$

84

.....°
 (4 marks)

2) Bearings: Easier

1.

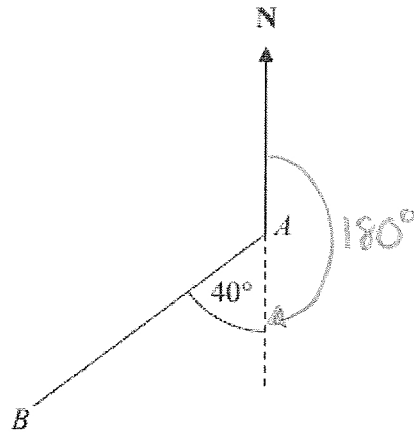


Diagram NOT accurately drawn

$$180 + 40$$

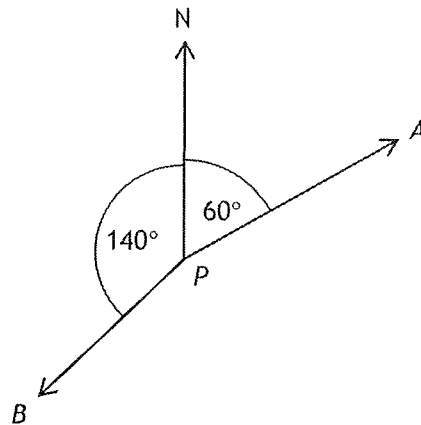
Work out the bearing of B from A.

START POINT

.....220.....°

(2 marks)

2.



(a) Write down the bearing of A from P.

Bearings are always 3 digits

.....060.....°

(b) Work out the bearing of B from P.

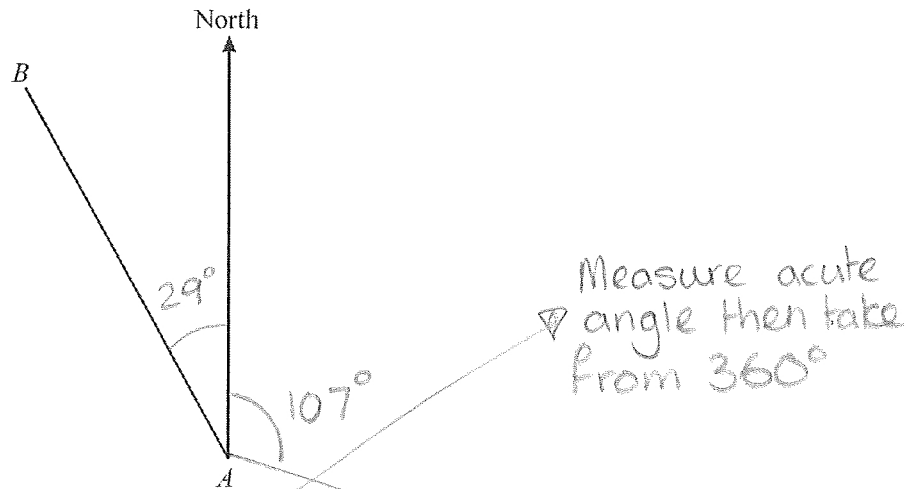
$$360 - 140$$

.....220.....°

(3 marks)

2) Bearings: Medium

3.



- (a) Measure and write down the bearing of B from A.

$$360 - 29$$

Measure acute angle then take from 360°
 331°

(1)

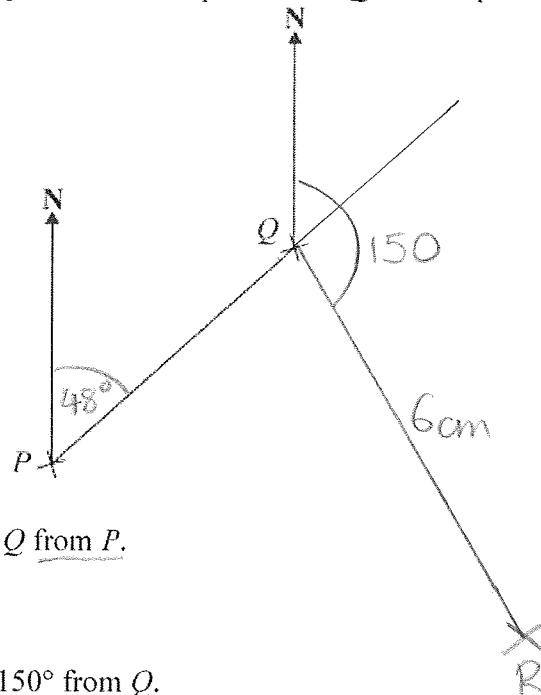
- (b) On the diagram, draw a line on a bearing of 107° from A.

clockwise

(1)

(2 marks)

4. The diagram shows the position of two ports P and Q on a map.



- (a) Measure the bearing of Q from P.

..... 048°

(1)

A rock R is on a bearing of 150° from Q.
 On the map R is 6 cm from Q.

- (b) Mark the position of R with a cross (x) and label it R.

(2)

2) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

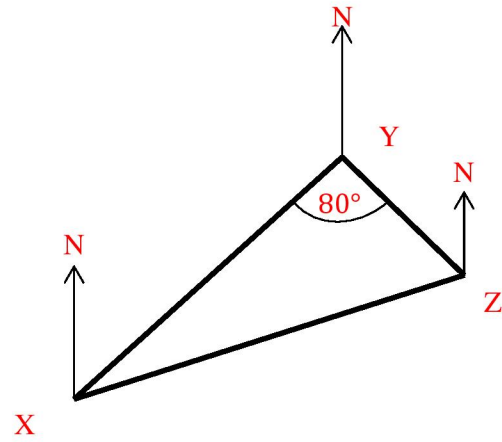
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

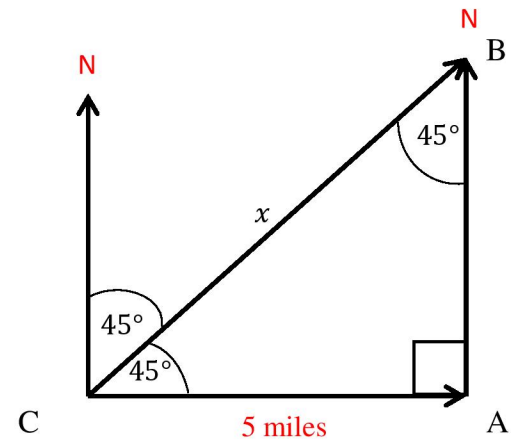
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



3) Writing one number as % of another: Easier

1) Write 24 as a percentage of 40

$$\frac{24}{40} \times 100 = 60\% \qquad 60\%$$

.....

(1 Mark)

2) Write 62 as a percentage of 50

$$\frac{62}{50} \times 100 = 124\%$$

124%.....

(1 Mark)

3) Sally gets 32% in a test. Hawys got twenty seven out of the seventy marks available. Who did better on the test?

$$\frac{27}{70} \times 100 = 38.57\%$$

Hawys did better as she got 39% which is higher than 32%

.....

(1 Mark)

4) In 2001, 2050 attended a theatre in December. In 2002, 3501 attended the same theatre in December. Work out the percentage increase in theatre attendees. Give your answer to 3 significant figures.

$$\text{Percentage increase} = \frac{\text{actual increase}}{\text{original amount}} \times 100$$

$$\text{actual increase} = 3501 - 2050 = 1451$$

$$\text{Percentage increase} = \frac{1451}{2050} \times 100 = 70.8\%$$

70.8%

.....

(2 Marks)

3) Writing one number as % of another: Medium

- 5) In a sale a coat costs £240. Before the sale the coat was priced at £350. Work out the percentage reduction.

$$\text{Percentage reduction} = \frac{\text{actual reduction}}{\text{original amount}} \times 100$$

$$\text{actual reduction} = 350 - 240 = 110$$

$$\text{Percentage reduction} = \frac{110}{350} \times 100 = 31.4\%$$

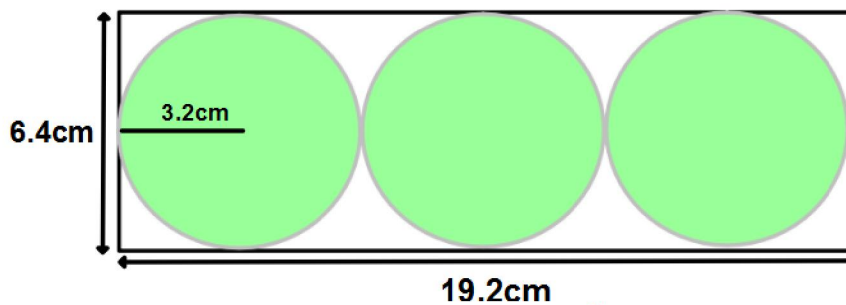
31.4%

.....

(2 Marks)

- 6) The diagram shows the side elevation of a cylinder container of tennis balls. Each tennis ball has a radius of 3.2cm. What percentage of the volume of the container is filled by tennis balls?

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$



$$\text{Volume of cylinder} = \pi r^2 h$$

$$\text{Volume of cylinder} = \pi(3.2)^2(19.2) = 617.7\text{cm}^3$$

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

$$\text{Volume of sphere} = \frac{4}{3}\pi(3.2)^3 = 137.258277\text{cm}^3$$

$$3 \text{ tennis balls so } 137.258277\text{cm}^3 \times 3 = 411.7748\text{cm}^3$$

$$\text{Percentage volume taken up by tennis balls} = \frac{411.77}{617.7} \times 100 = 66.7\%$$

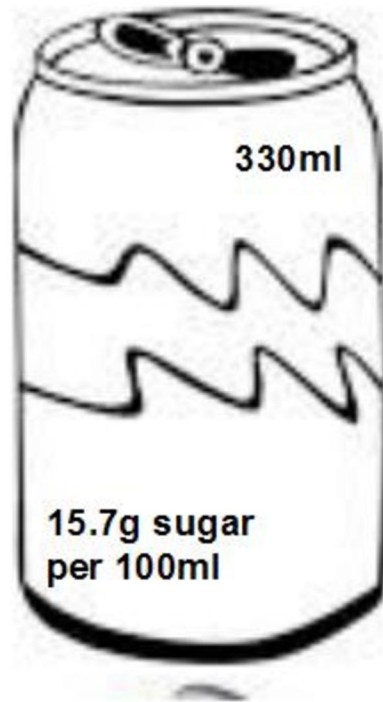
66.7%

.....

(5 Marks)

3) Writing one number as % of another: Harder

7) The average adult should have a maximum of 90g of sugar a day.



Tom buys this can of soft drink. His friend tells him that it is over 55% of his daily allowance. Is she correct? You **must** show your working.

$$1\text{ml contains } \frac{15.7}{100} = 0.157\text{g sugar}$$

$$330\text{ml contains } 0.157 \times 330 = 51.81\text{g sugar}$$

$$\frac{51.81}{90} \times 100 = 57.6\%$$

His friend is correct. The drink is 57.6% of his daily sugar allowance.

(4 Marks)

4) Changing Ratios: Easier

Solution for Question 1:

a) Red : Blue = 8:12

Divide through by 4 to simplify: 2:3

b) Red : Blue = 8:10

Divide through by 2 to simplify: 4:5

Solution for Question 2:

a) Pen : Pencils = 2:3

Equivalent to 20:30

30 pencils in pencil case

b) Only pencils removed so still 20 pens, ratio 4:3 equivalent to 20:15 so removed 15 pencils

4) Changing Ratios: Medium

Solution for Question 3:

$$1:3:5$$

$$1:3+5 = 1:8$$

Solution for Question 4:

$$\text{Orange : Red} = 2:3$$

$$2:3 = 5$$

$$x:51 = y$$

$$\frac{51}{3} = 17$$

$$x = 2 \times 17 = 34$$

$$y = 5 \times 17 = 85$$

$$\text{Ratio of Orange to Red} = 34:51$$

Compare 2:3 to 10:17, achieving same number for red sweets

$$2:3 = 34:51$$

Multiply ratio 10:17 by 3

$$30:51$$

4 orange sweets were eaten by Solomon.

Solution for Question 5:

$$\text{HW : No HW} = 5:4$$

$$5:4 = 9$$

$$15:x = y$$

$$\frac{15}{5} = 3$$

$$x = 4 \times 3 = 12$$

$$y = 9 \times 3 = 27$$

$$\text{Ratio of HW done to HW not done} = 15:12$$

Compare 5:4 to 2:1

$$5:4 = 15:12$$

$$2:1 = ?:?$$

Same number of pupils in the class = 27

Multiply ratio 2:1 by 9 ($\frac{27}{3}$)

$$18:9$$

3 more pupils did do their homework, the teacher was correct.

4) Changing Ratios: Harder

Solution for Question 6:

Sedimentary : Metamorphic = 2:3

Metamorphic : Igneous = 9:10

Multiply ratio 2:3 by 3 = 6:9

Therefore, sedimentary to igneous = 6:10

Solution for Question 7:

Road bikes: Mountain bikes

3:5

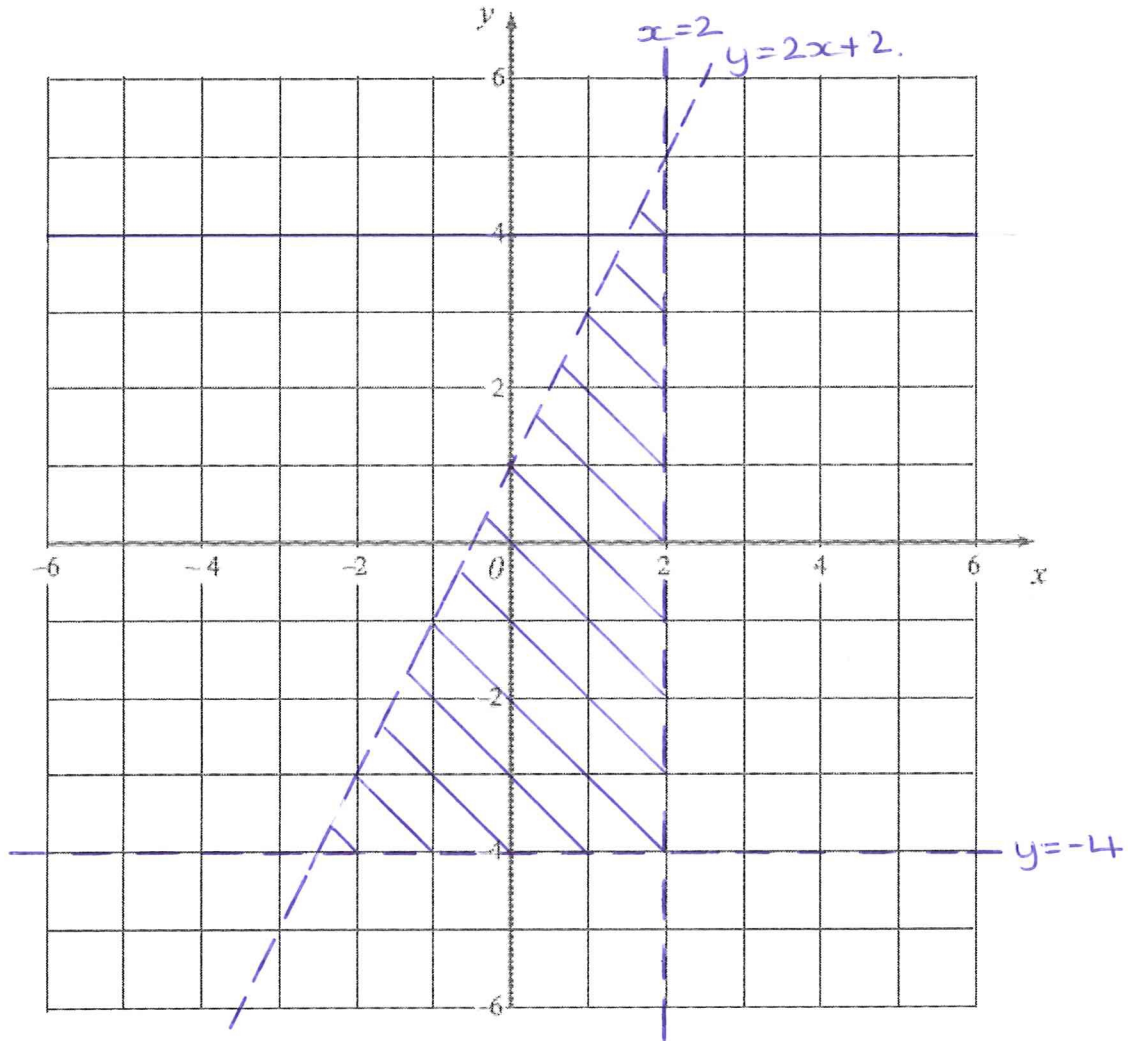
The minimum number of bikes sold is 3 road and 5 mountain, if the ratio changes to 2:1 but no more mountain bikes are sold then ratio is 10:5 so 7 more road bikes must have been sold.

It is not the only answer as there could have been many numbers of bikes sold, the ratio is 3:5 this could be 6:10 or any equivalent ratio. If it was 6 to 10 for example to change to 2:1 ratio must be 20:10 which would mean 14 more road bikes sold, so the number more road bikes sold is any multiple of 7

5) Inequalities Regions: Easier

1. On the grid, shade the region that satisfies all three of these inequalities

$$y > -4 \quad x < 2 \quad y < 2x + 1$$



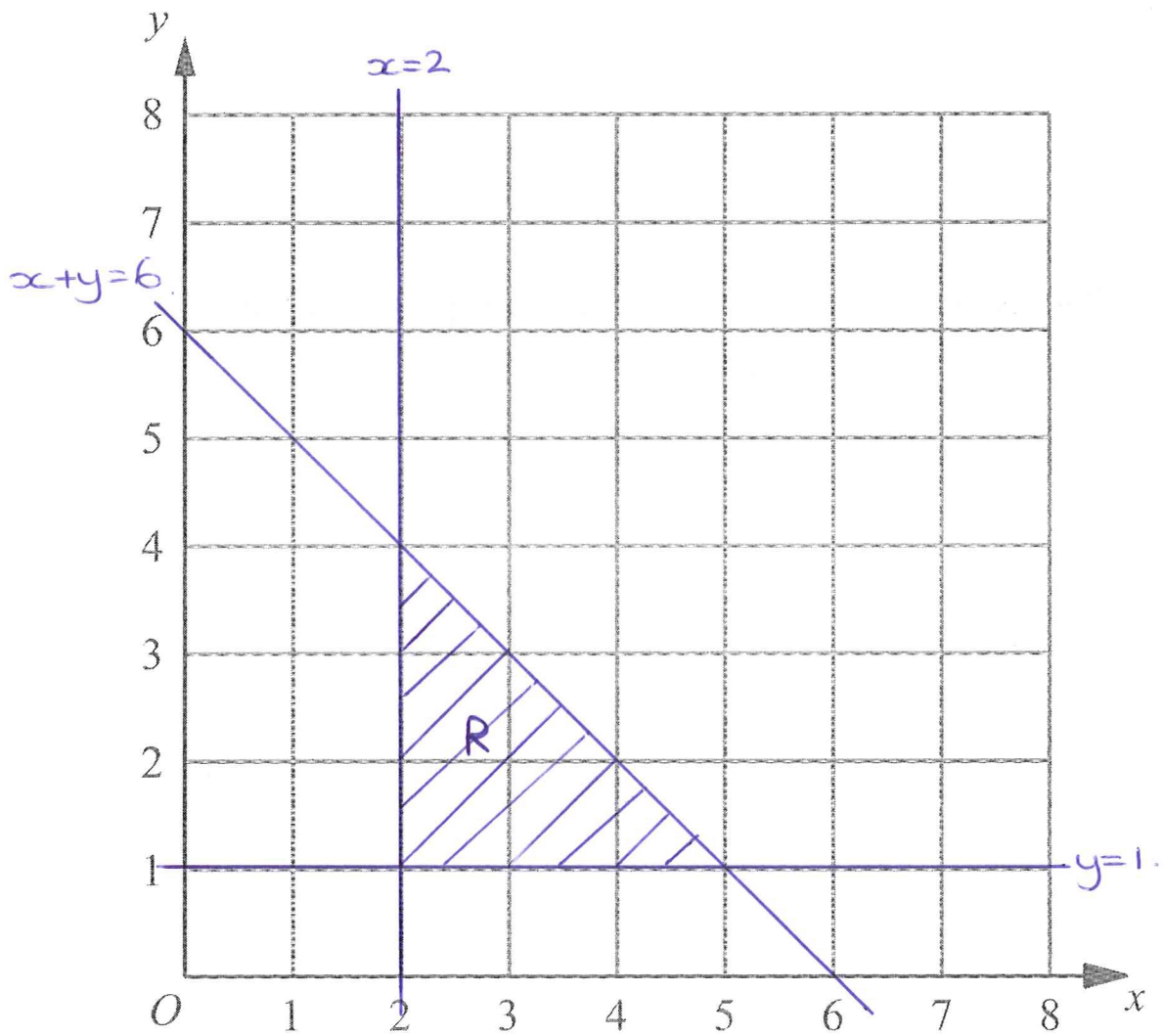
(Total for Question 19 = 4 marks)

5) Inequalities Regions: Medium

2. The region **R** satisfies the inequalities

$$x \geq 2, \quad y \geq 1, \quad x + y \leq 6$$

On the grid below, draw straight lines and use shading to show the region **R**.



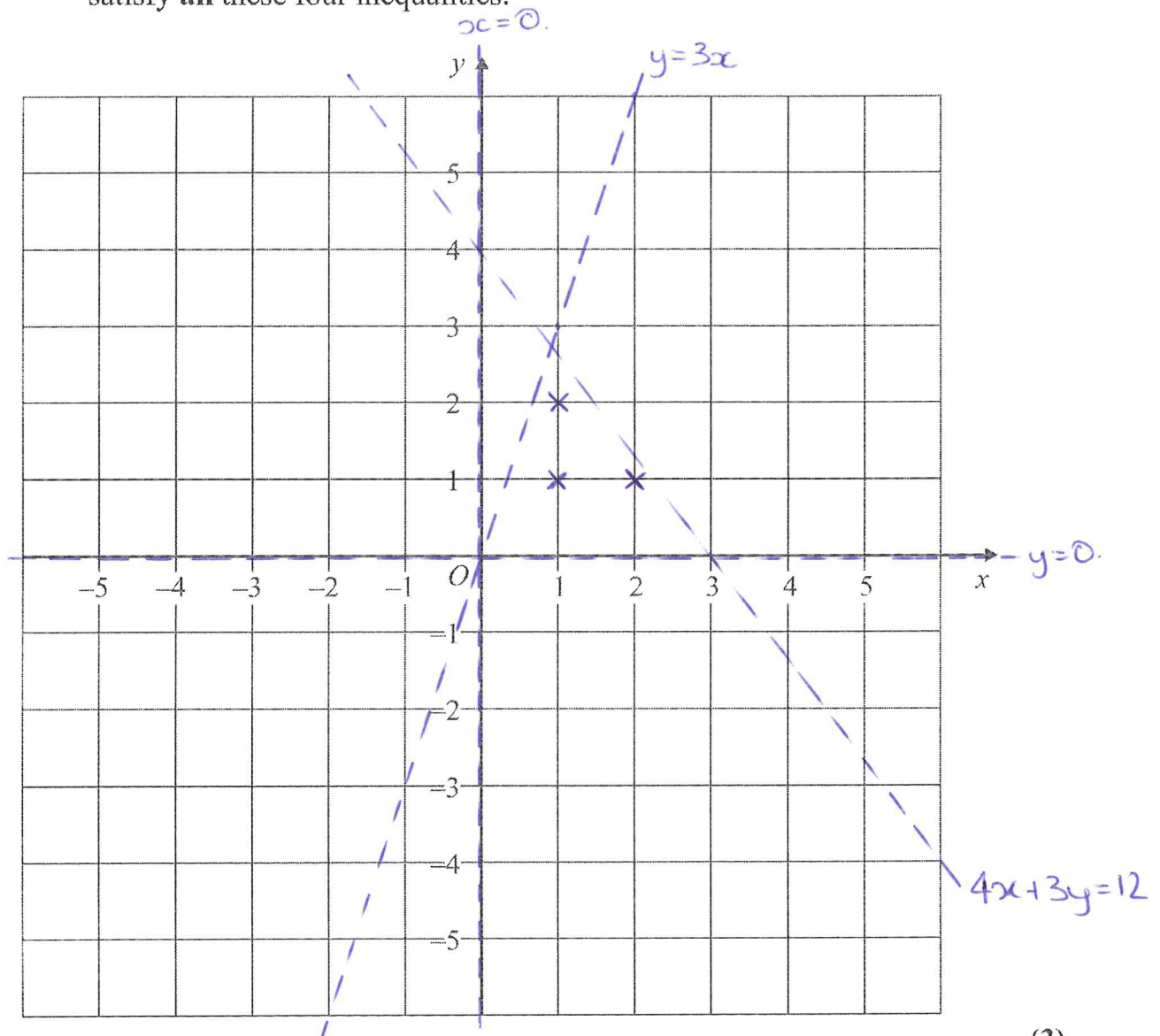
(Total 3 marks)

5) Inequalities Regions: Harder

7. $4x + 3y < 12$, $y < 3x$, $y > 0$, $x > 0$

x and y are both integers.

On the grid, mark with a cross (\times), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

GREAVES Will

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Index Notation. Mathswatch Clip: 131

Topic 2: Bearings. Mathswatch Clip: 124

Topic 3: Standard Form. Mathswatch Clip: 83

Topic 4: Changing Ratios. Mathswatch Clip: NA

Topic 5: Inequalities Regions. Mathswatch Clip: 198

1) Index Notation: Easier

1. (a) Simplify $m^3 \times m^6 = m^{3+6}$ m^9
.....
(1)

(b) Simplify $\frac{p^8}{p^2} = p^{8-2}$ p^6
.....
(1)

(c) Simplify $(2n^3)^4 = 16n^{3 \times 4}$ $16n^{12}$
.....
(2)

(4 marks)

2. (a) Simplify $m^6 \times m^7 = m^{6+7}$ m^{13}
.....
(1)

(b) Simplify x^0 1
.....
(1)

(c) Simplify $(16y^6)^{\frac{1}{2}} = \sqrt{16} y^{\frac{6}{2}}$ $4y^3$
.....
(2)

(4 marks)

3. (a) Simplify $m^5 \div m^3 = m^{5-3}$ m^2
.....
(1)

(b) Simplify $5x^4y^3 \times x^2y = 5x^{4+2}y^{3+1}$ $5x^6y^4$
.....
(2)

(3 marks)

1) Index Notation: Medium

4. (a) Simplify $a^4 \times a^5$ a^{4+5} a^9 (1)

(b) Simplify $\frac{45e^6 f^8}{5ef^2}$ $9e^{6-1} f^{8-2}$ $9e^5 f^6$ (2)

(c) Write down the value of $9^{\frac{1}{2}}$ $\sqrt{9}$ 3 (1)

(4 marks)

5. (a) Simplify $m^2 \times m^4$ m^{2+4} m^6 (1)

(b) Simplify $y^7 \div y^5$ y^{7-5} y^2 (1)

(c) Simplify $(m^3)^5$ $m^{3 \times 5}$ m^{15} (2)

(4 marks)

6. Simplify fully

(a) $p^2 \times p^7$ p^{2+7} p^9 (1)

(b) $\frac{3q^4 \times 2q^5}{q^3}$ $\frac{(3 \times 2)q^{4+5}}{q^3} = 6q^{9-3}$ $6q^6$ (2)

(c) $(2xy^3)^5$ $2^5 x^5 y^{3 \times 5}$ $32x^5 y^{15}$ (2)

(4 marks)

1) Index Notation: Harder

20. (a) Find the value of

(i) 64^0

1

(ii) $64^{\frac{1}{2}}$

$\sqrt{64}$

8

(iii) $64^{-\frac{2}{3}}$

$= \frac{1}{64^{\frac{2}{3}}}$
 $= \frac{1}{(\sqrt[3]{64})^2} = \frac{1}{4^2}$

$\frac{1}{16}$ or 0.0625

(4 marks)

2) Bearings: Easier

1.

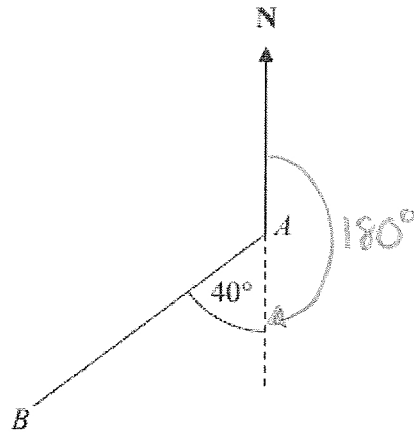


Diagram NOT accurately drawn

$$180 + 40$$

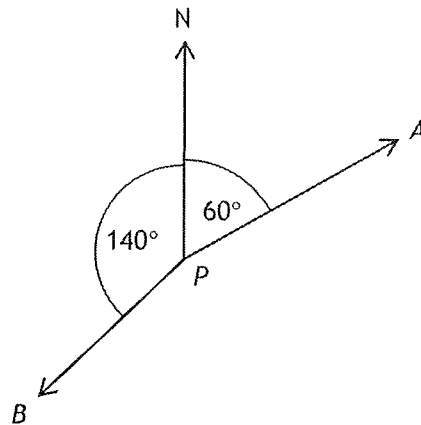
Work out the bearing of B from A .

START POINT

..... 220 °

(2 marks)

2.



(a) Write down the bearing of A from P .

Bearings are always 3 digits

..... 060 °

(b) Work out the bearing of B from P .

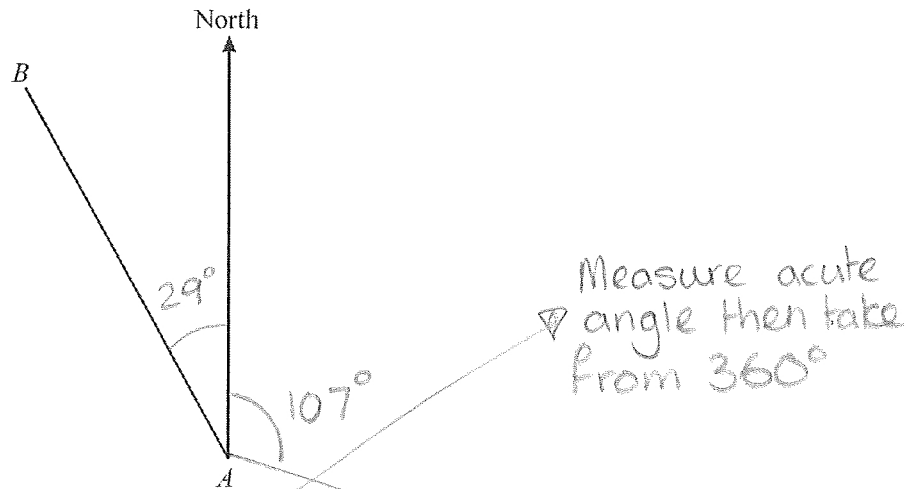
$$360 - 140$$

..... 220 °

(3 marks)

2) Bearings: Medium

3.



(a) Measure and write down the bearing of B from A.

$$360 - 29$$

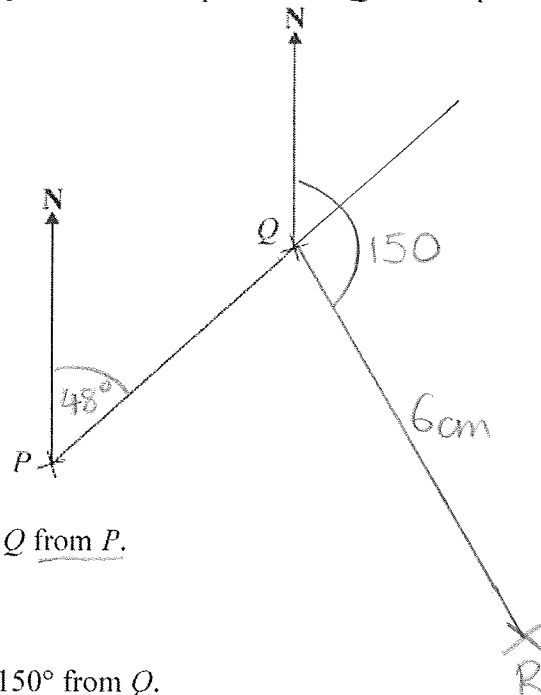
Measure acute angle then take from 360°
 331 ^o
 (1)

(b) On the diagram, draw a line on a bearing of 107° from A.

clockwise

(1)
 (2 marks)

4. The diagram shows the position of two ports P and Q on a map.



(a) Measure the bearing of Q from P.

..... 048 ^o
 (1)

A rock R is on a bearing of 150° from Q.
 On the map R is 6 cm from Q.

(b) Mark the position of R with a cross (x) and label it R.

(2)

2) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

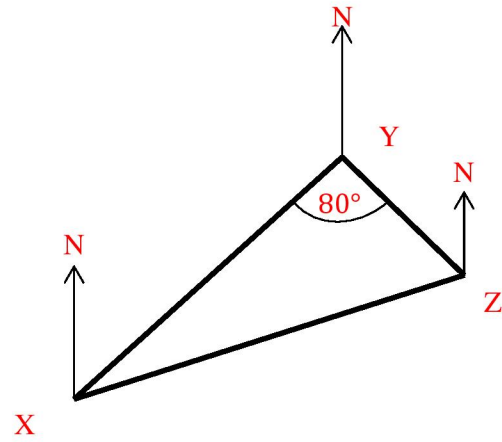
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

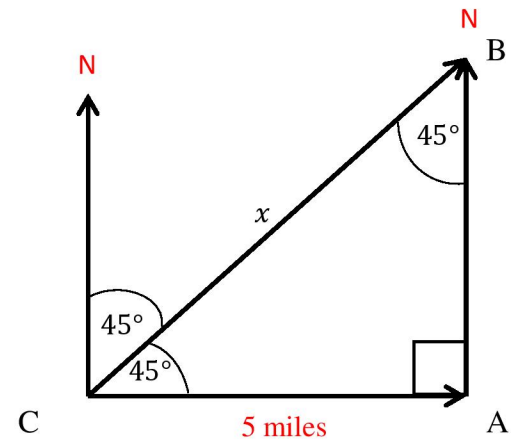
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



3) Standard Form: Easier

1. (a) Write the number 0.00037 in standard form.

(1)

$$3.7 \times 10^4$$

- (b) Write 8.25×10^3 as an ordinary number.

(1)

$$8250$$

- (c) Work out $(2.1 \times 10^8) \times (6 \times 10^{-5})$.
Write your answer in standard form.

$$\begin{aligned} 2.1 \times 10^8 \times 6 \times 10^{-5} \\ = 12.6 \times 10^3 \\ = 1.26 \times 10^4 \end{aligned}$$

(2)

$$1.26 \times 10^4$$

(4 marks)

2. (a) Write 6.43×10^5 as an ordinary number.

$$643000$$

(1)

- (b) Work out the value of $2 \times 10^7 \times 8 \times 10^{-12}$.
Give your answer in standard form.

$$\begin{aligned} 2 \times 10^7 \times 8 \times 10^{-12} \\ = 16 \times 10^{-5} \\ = 1.6 \times 10^{-4} \end{aligned}$$

$$1.6 \times 10^{-4}$$

(2)

(3 marks)

3) Standard Form: Medium

3. (a) Write down the value of 10^0

1
.....
(1)

- (b) Write 6.7×10^{-5} as an ordinary number.

0.000067
.....
(1)

- (c) Work out the value of $(3 \times 10^7) \times (9 \times 10^6)$
Give your answer in standard form.

$$\begin{aligned} 3 \times 10^7 \times 9 \times 10^6 \\ = 27 \times 10^{13} \\ = 2.7 \times 10^{14} \end{aligned}$$

2.7×10^{14}
.....
(2)

(4 marks)

4. (a) Write 8.2×10^5 as an ordinary number.

820000
.....
(1)

- (b) Write 0.000 376 in standard form.

3.76×10^{-4}
.....
(1)

- (c) Work out the value of $(2.3 \times 10^{12}) \div (4.6 \times 10^3)$
Give your answer in standard form.

$$\begin{aligned} \frac{2.3 \times 10^{12}}{4.6 \times 10^3} &= 0.5 \times 10^9 \\ &= 5 \times 10^8 \end{aligned}$$

5×10^8
.....
(2)

(4 marks)

3) Standard Form: Harder

Worded Standard Form

1) The world's smallest snail travels 4×10^{-3} m a month.

How many months would it take for the snail to travel?

2×10^{-1} m?

$$\frac{2 \times 10^{-1}}{4 \times 10^{-3}} = \frac{2}{4} \times 10^2$$

-1 - -3 = 2
↓

$$= 0.5 \times 10^2$$

$$= 5 \times 10^3$$

2)

The time taken for light to reach Earth from the edge of the known universe is 14 000 000 000 years.

Light travels at the speed of 9.46×10^{12} km/year.

Work out the distance, in kilometres, from the edge of the known universe to Earth.
Give your answer in standard form.

$$S = \frac{D}{T}$$

$$D = ST$$

$$D = 9.46 \times 10^{12} \times 1.4 \times 10^{10}$$

$$= 13.244 \times 10^{22}$$

$$= 1.3244 \times 10^{23}$$

4) Changing Ratios: Easier

Solution for Question 1:

a) Red : Blue = 8:12

Divide through by 4 to simplify: 2:3

b) Red : Blue = 8:10

Divide through by 2 to simplify: 4:5

Solution for Question 2:

a) Pen : Pencils = 2:3

Equivalent to 20:30

30 pencils in pencil case

b) Only pencils removed so still 20 pens, ratio 4:3 equivalent to 20:15 so removed 15 pencils

4) Changing Ratios: Medium

Solution for Question 3:

$$1:3:5$$

$$1:3+5 = 1:8$$

Solution for Question 4:

$$\text{Orange : Red} = 2:3$$

$$2:3 = 5$$

$$x:51 = y$$

$$\frac{51}{3} = 17$$

$$x = 2 \times 17 = 34$$

$$y = 5 \times 17 = 85$$

$$\text{Ratio of Orange to Red} = 34:51$$

Compare 2:3 to 10:17, achieving same number for red sweets

$$2:3 = 34:51$$

Multiply ratio 10:17 by 3

$$30:51$$

4 orange sweets were eaten by Solomon.

Solution for Question 5:

$$\text{HW : No HW} = 5:4$$

$$5:4 = 9$$

$$15:x = y$$

$$\frac{15}{5} = 3$$

$$x = 4 \times 3 = 12$$

$$y = 9 \times 3 = 27$$

$$\text{Ratio of HW done to HW not done} = 15:12$$

Compare 5:4 to 2:1

$$5:4 = 15:12$$

$$2:1 = ?:?$$

Same number of pupils in the class = 27

Multiply ratio 2:1 by 9 ($\frac{27}{3}$)

$$18:9$$

3 more pupils did do their homework, the teacher was correct.

4) Changing Ratios: Harder

Solution for Question 6:

Sedimentary : Metamorphic = 2:3

Metamorphic : Igneous = 9:10

Multiply ratio 2:3 by 3 = 6:9

Therefore, sedimentary to igneous = 6:10

Solution for Question 7:

Road bikes: Mountain bikes

3:5

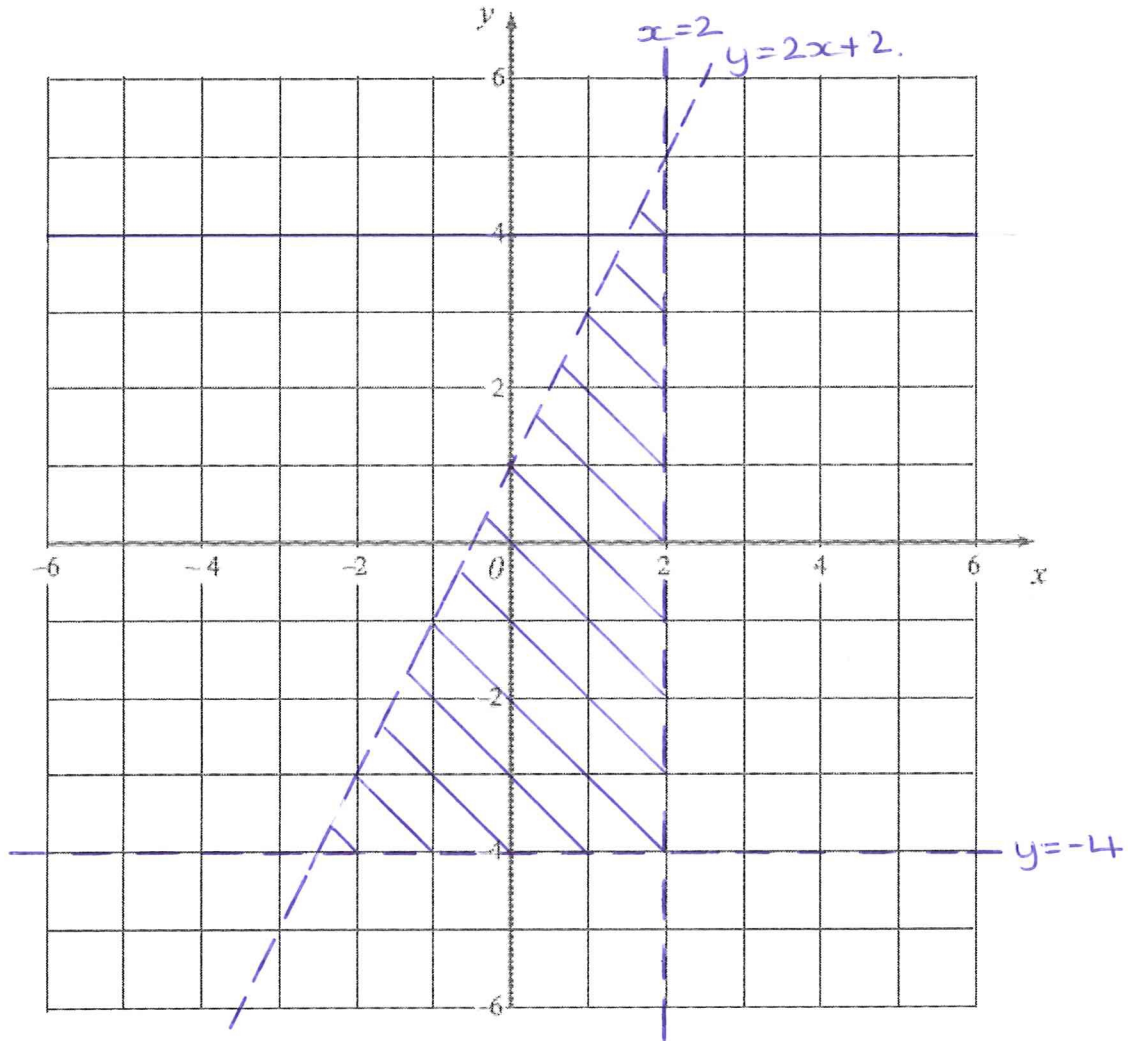
The minimum number of bikes sold is 3 road and 5 mountain, if the ratio changes to 2:1 but no more mountain bikes are sold then ratio is 10:5 so 7 more road bikes must have been sold.

It is not the only answer as there could have been many numbers of bikes sold, the ratio is 3:5 this could be 6:10 or any equivalent ratio. If it was 6 to 10 for example to change to 2:1 ratio must be 20:10 which would mean 14 more road bikes sold, so the number more road bikes sold is any multiple of 7

5) Inequalities Regions: Easier

1. On the grid, shade the region that satisfies all three of these inequalities

$$y > -4 \quad x < 2 \quad y < 2x + 1$$



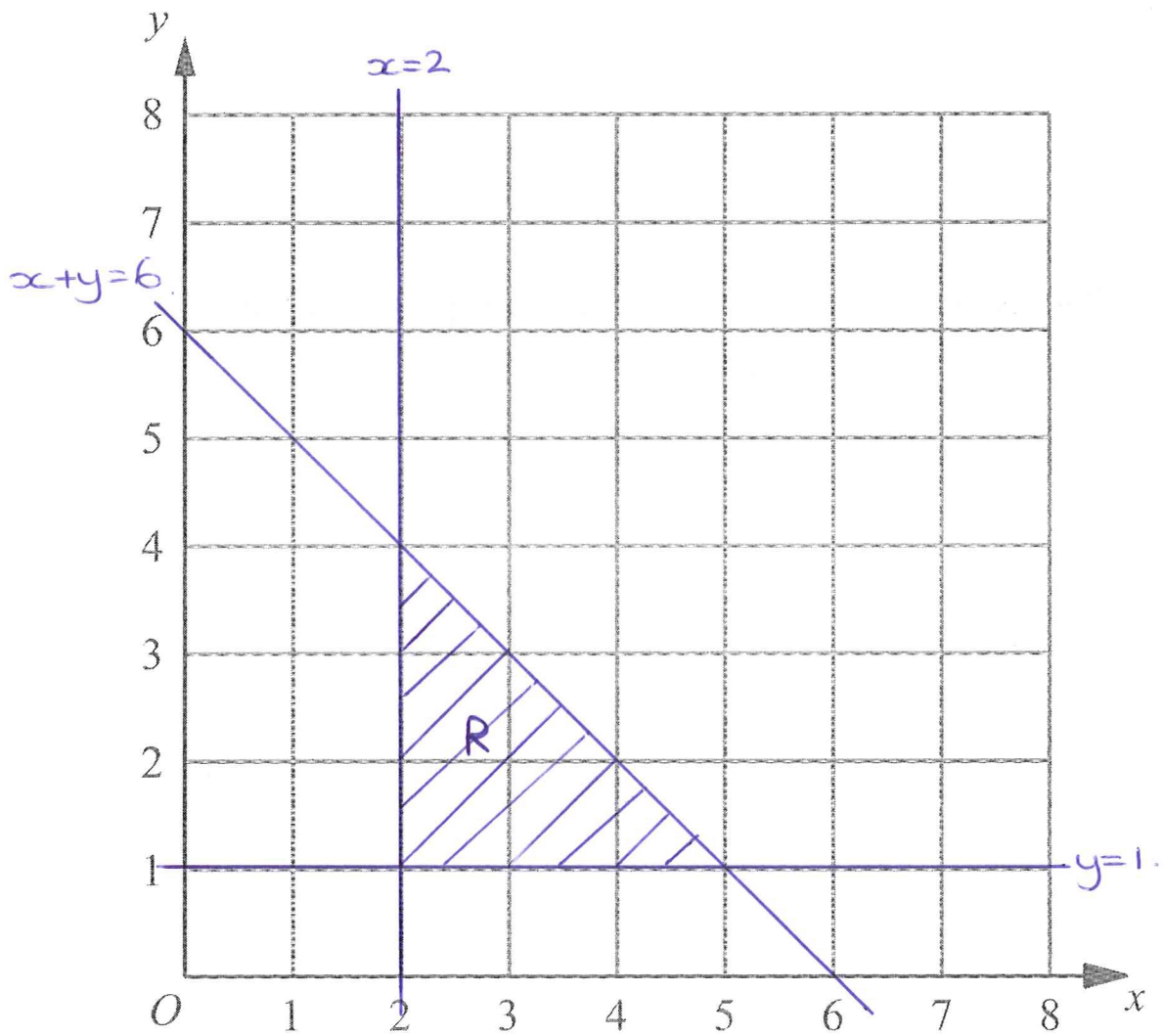
(Total for Question 19 = 4 marks)

5) Inequalities Regions: Medium

2. The region **R** satisfies the inequalities

$$x \geq 2, \quad y \geq 1, \quad x + y \leq 6$$

On the grid below, draw straight lines and use shading to show the region **R**.



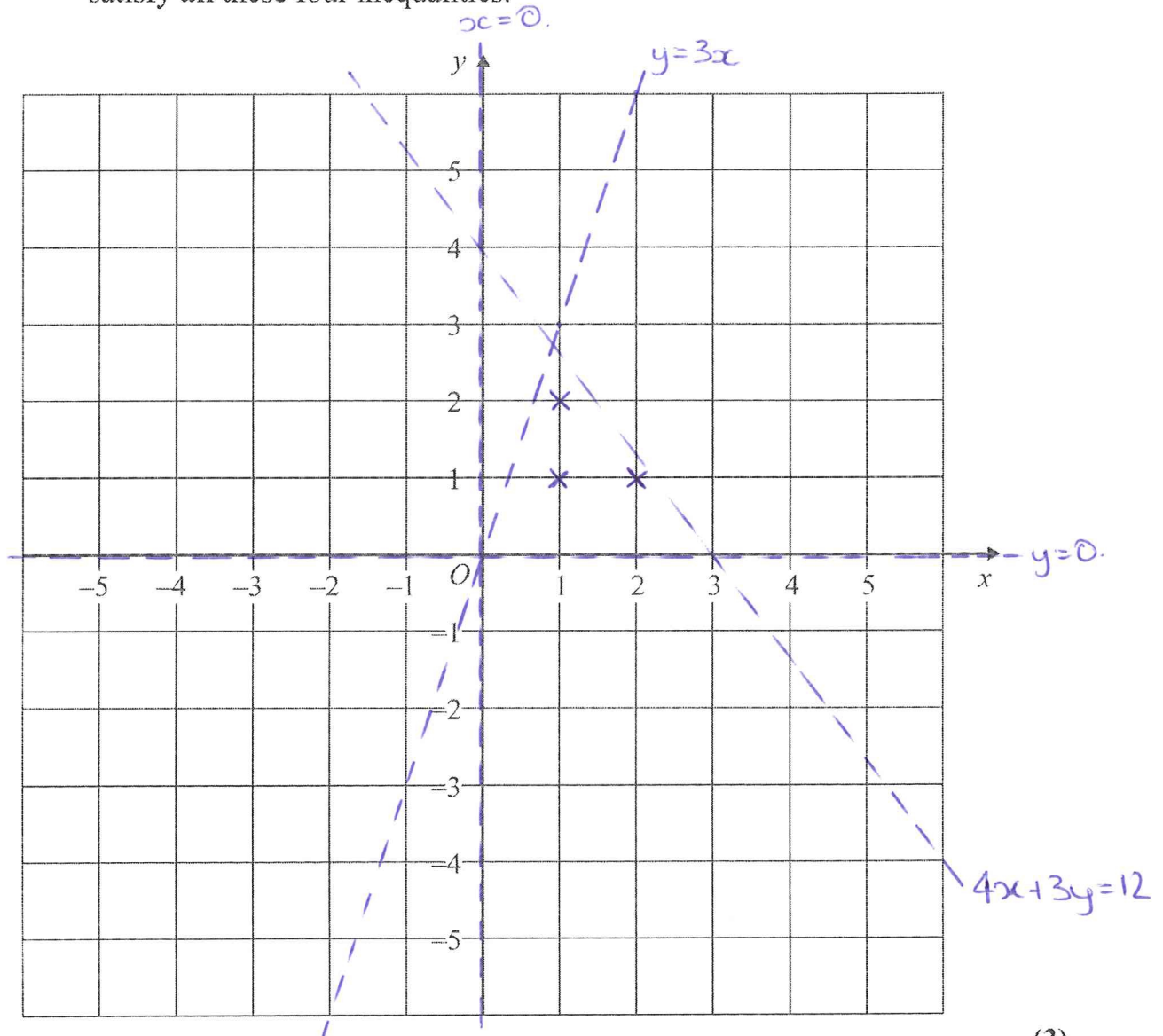
(Total 3 marks)

5) Inequalities Regions: Harder

7. $4x + 3y < 12$, $y < 3x$, $y > 0$, $x > 0$

x and y are both integers.

On the grid, mark with a cross (\times), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

GREGG Samuel

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Missing Mean Questions. Mathswatch Clip: NA

Topic 2: Inequalities Regions. Mathswatch Clip: 198

Topic 3: Proof. Mathswatch Clip: 193

Topic 4: Proof with vectors. Mathswatch Clip: 219

Topic 5: Extention1. Mathswatch Clip:

1) Missing Mean Questions: Easier

1) The mean of 8 and another number is 13.

What is the other number?

$$\text{Solution: } (8+x)/2 = 13 \quad \times 2$$

$$8 + x = 26 \quad - 8$$

$$x = 18$$

$$\underline{\hspace{2cm}} 18 \underline{\hspace{2cm}}$$

(3 Marks)

2) The mean of 2, 5, 8 and x is 4

Find x

$$\text{Solution: } (2 + 5 + 8 + x) / 4 = 4 \quad \times 4$$

$$15 + x = 16 \quad -15$$

$$x = 1$$

$$\underline{\hspace{2cm}} x = 1 \underline{\hspace{2cm}}$$

(3 Marks)

3) After measuring the heights of 7 people, they have an average height of 156cm. After measuring the heights of 8 people they have an average height of 158cm. How tall is the 8th person?

$$\text{Solution: } 7 \times 156 = 1092$$

$$8 \times 158 = 1264$$

$$1092 - 1264 = 172$$

(3 Marks)

$$\underline{\hspace{2cm}} 172 \underline{\hspace{2cm}}$$

1) Missing Mean Questions: Medium

4) The mean weight of a group of 7 girls is 58kg

a) Work out their total weight

Solution: $7 \times 58 = 406\text{kg}$

_____406_____Kg

When a 8th girl joins the group, the mean weight goes up to 59kg.

b) What is the weight of the 8th girl?

Solution: $59 \times 8 = 472$

$472 - 406 = 66 \text{ Kg}$

_____66_____Kg

(3 Marks)

5) The mean distance that Jack runs in his last 10 runs is 5.7 miles. Work out the distance that he would need to run to make this exactly 6 miles.

Solution: $10 \times 5.7 = 57$

$11 \times 6 = 66$

$66 - 57 = 9$

_____9 miles_____

(2 Marks)

1) Missing Mean Questions: Harder

- 6) Waitresses and kitchen staff in a restaurant decide to share their tips. There are 8 kitchen staff 10 waitresses. The kitchen staff receives a mean of £23 weekly and the waitresses receive a mean of £28 weekly.

Work out the mean of all 18 members of staff.

$$\begin{aligned} \text{Solution: } 23 \times 8 &= 184 \\ 28 \times 10 &= 280 \end{aligned}$$

$$\text{Total} = 184 + 280 = 464$$

$$\text{Mean} = 464/18 = 25.78$$

_____ £25.78 _____

(3 Marks)

- 7) The mean of a, a, b is 30

The mean of a, a, b, b, b is 20

Find the values of a and b

Solution:

$$(2a + b) / 3 = 30 \quad \times 3$$

$$(2a + 3b) / 5 = 20 \quad \times 5$$

$$2a + b = 90 \quad - \quad \text{solve simultaneously}$$

$$2a + 3b = 100$$

$$-2b = -10$$

$$b = 5$$

$$2a + 5 = 90$$

$$2a = 85$$

$$a = 42.5$$

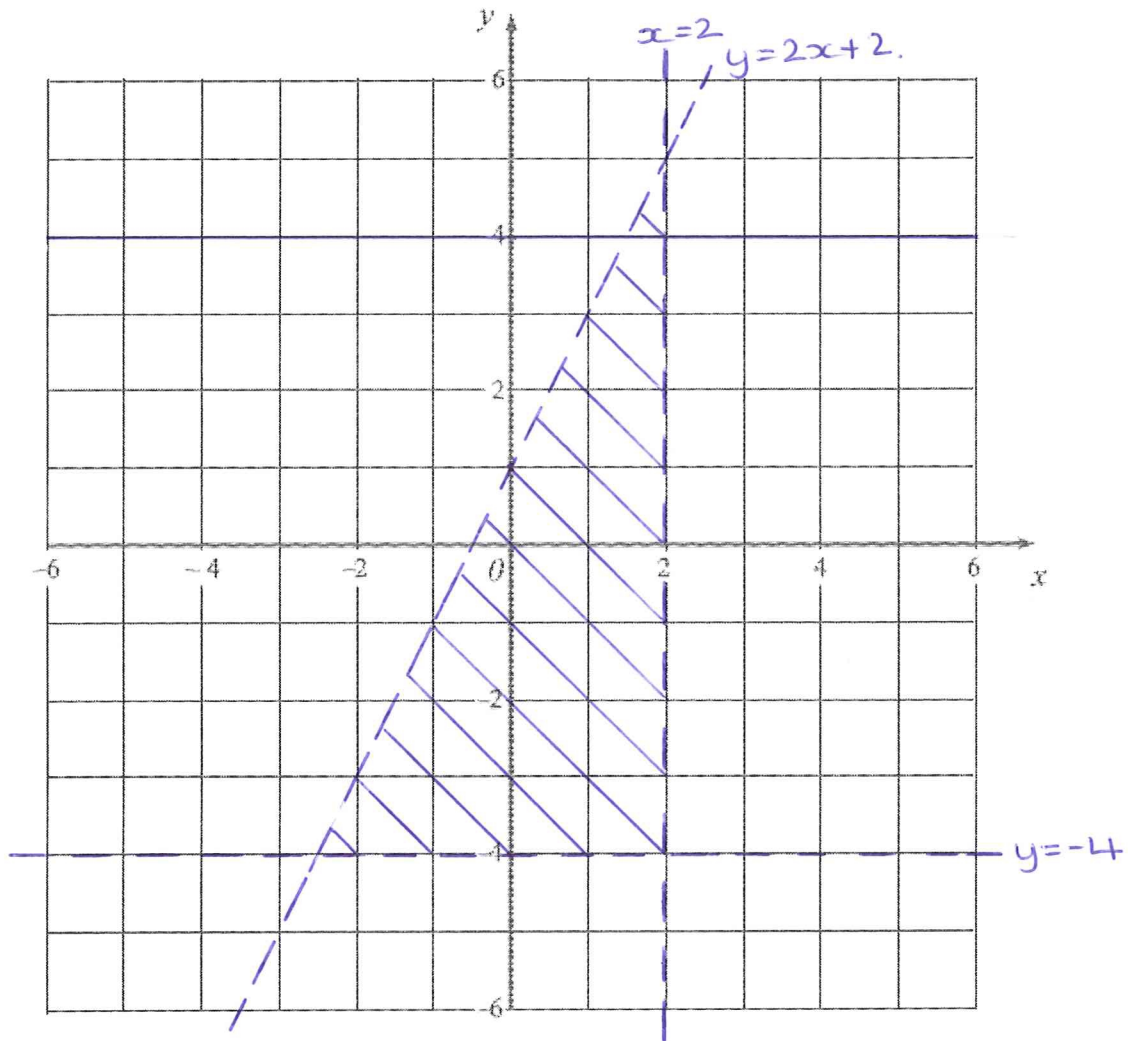
$a = 42.5 \quad b = 5$ _____

(5 Marks)

2) Inequalities Regions: Easier

1. On the grid, shade the region that satisfies all three of these inequalities

$$y > -4 \quad x < 2 \quad y < 2x + 1$$



(Total for Question 19 = 4 marks)

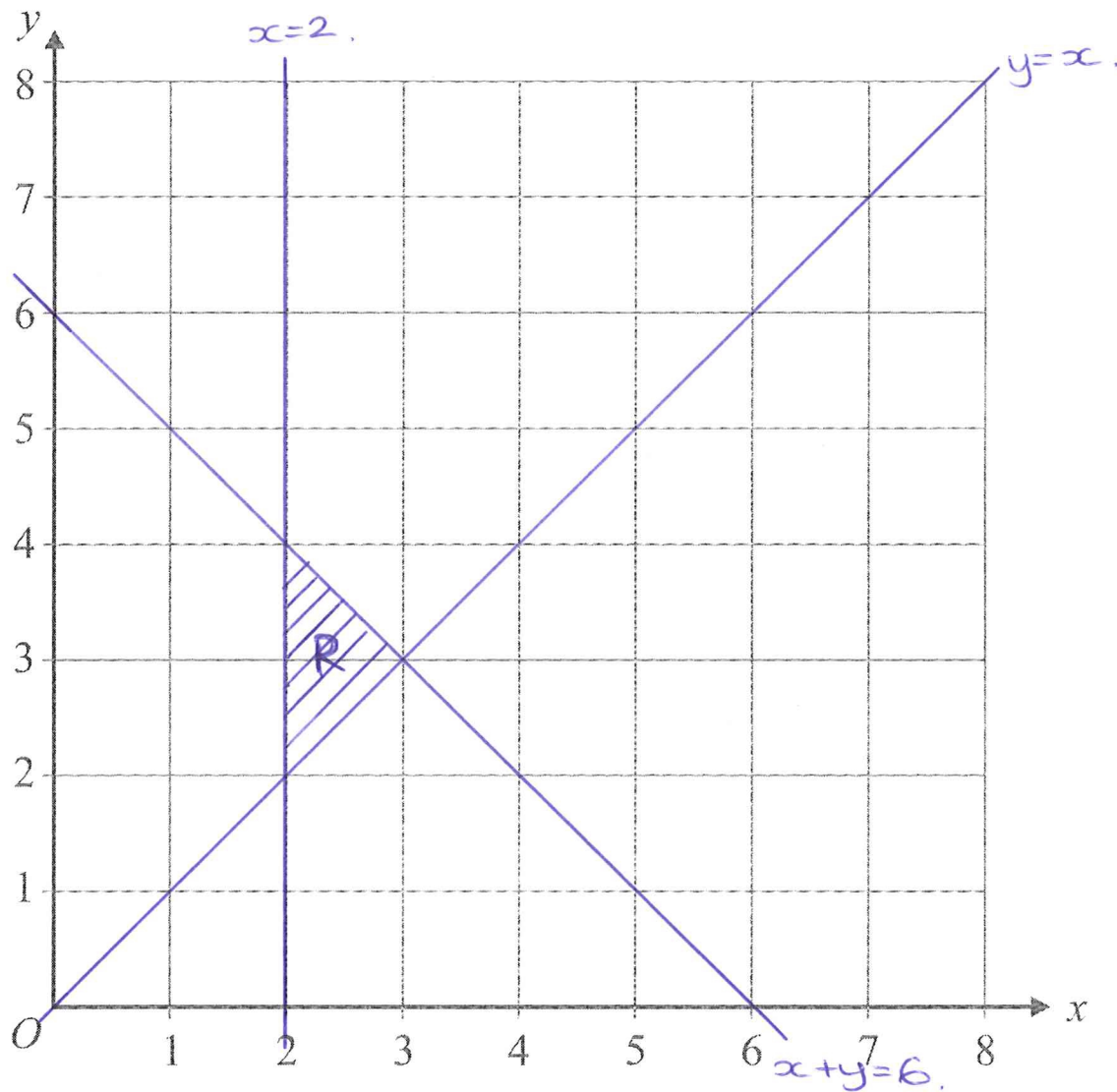
2) Inequalities Regions: Medium

6. (a) On the grid below, draw straight lines and use shading to show the region **R** that satisfies the inequalities

$$x \geq 2$$

$$y \geq x$$

$$x + y \leq 6$$



(3)

The point P with coordinates (x, y) lies inside the region **R**.
 x and y are **integers**.

- (b) Write down the coordinates of **all** the points of **R** whose coordinates are both integers.

$(2, 2)$ $(2, 3)$ $(2, 4)$ $(3, 3)$

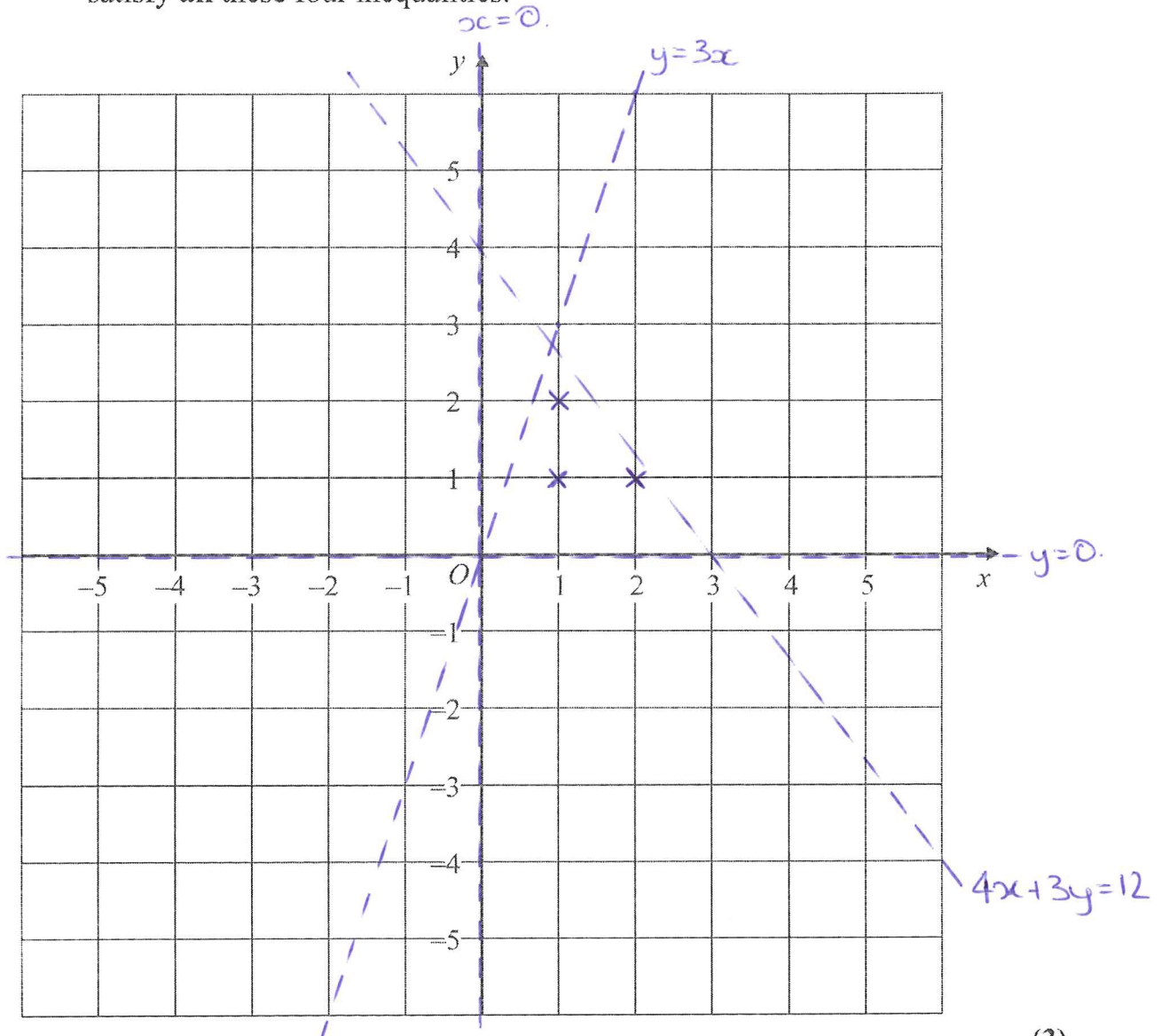
(2)

2) Inequalities Regions: Harder

7. $4x + 3y < 12$, $y < 3x$, $y > 0$, $x > 0$

x and y are both integers.

On the grid, mark with a cross (\times), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

3) Proof: Easier

1. The n th even number is $2n$.

The next even number after $2n$ is $2n + 2$

- (a) Explain why.

Every alternate integer is even. As $2n$ is even
 $2n + 1$ will be odd and so $2n + 2$ is even.

(1)

- (b) Write down an expression, in terms of n , for the next even number after $2n + 2$

$$2n + 2 + 2 = 2n + 4$$

$$\dots\dots\dots 2n + 4 \dots\dots\dots$$

(1)

- (c) Show algebraically that the sum of any 3 consecutive even numbers is always a multiple of 6

$$\begin{aligned}
 & 2n + 2n + 2 + 2n + 4 \\
 = & 6n + 6 \\
 = & 6(n + 1) \\
 & \uparrow \\
 & \text{a multiple of 6.}
 \end{aligned}$$

(3)

(5 marks)

3) Proof: Medium

8. Prove that

$(n+1)^2 - (n-1)^2 + 1$ is always odd for all positive integer values of n .

$$(n+1)^2 = n^2 + 2n + 1$$

$$(n-1)^2 = n^2 - 2n + 1$$

$$\begin{aligned}(n+1)^2 - (n-1)^2 + 1 &= (n^2 + 2n + 1) - (n^2 - 2n + 1) + 1 \\ &= n^2 + 2n + 1 - n^2 + 2n - 1 + 1 \\ &= 4n + 1\end{aligned}$$

$4n$ is a multiple of 4 so it must be even which means $4n+1$ is odd.

3) Proof: Harder

9. Prove algebraically that the sum of the squares of any two consecutive numbers always leaves a remainder of 1 when divided by 4.

consecutive numbers are n and $n+1$

$$\begin{aligned} & n^2 + (n+1)^2 \\ &= n^2 + n^2 + 2n + 1 \\ &= 2n^2 + 2n + 1 \\ &= 2n(n+1) + 1 \end{aligned}$$

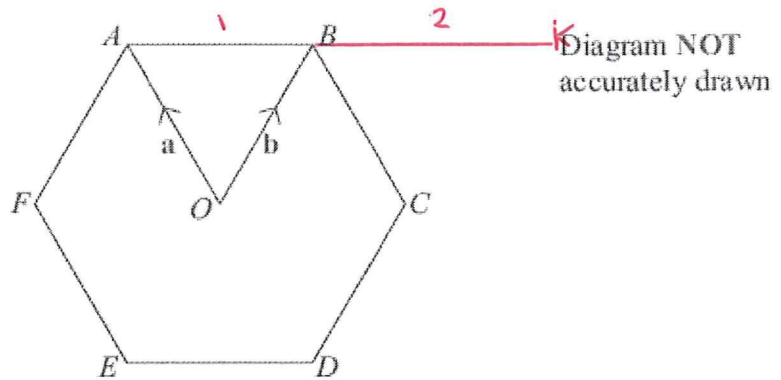
$n(n+1)$ is the product of 2 consecutive numbers. As one of them is even the product must be even.

$2n(n+1)$ is $2 \times$ an even number which has to be a multiple of 4

So $2n(n+1) + 1$ is a multiple of 4 plus 1 and will leave a remainder of 1 when divided by 4

4) Proof with vectors: Easier

1.



$ABCDEF$ is a regular hexagon, with centre O .

$$\overrightarrow{OA} = \mathbf{a}, \overrightarrow{OB} = \mathbf{b}.$$

(a) Write the vector \overrightarrow{AB} in terms of \mathbf{a} and \mathbf{b} .

$$\underline{\underline{-\mathbf{a} + \mathbf{b}}}$$

(1)

The line AB is extended to the point K so that $AB : BK = 1 : 2$

(b) Write the vector \overrightarrow{CK} in terms of \mathbf{a} and \mathbf{b} .
Give your answer in its simplest form.

$$\overrightarrow{AB} = -\mathbf{a} + \mathbf{b}$$

$$\overrightarrow{BK} = -2\mathbf{a} + 2\mathbf{b}$$

$$\overrightarrow{CK} = -\mathbf{a} + 2\mathbf{b}$$

$$\underline{\underline{-\mathbf{a} + 2\mathbf{b}}}$$

(3)

(4 marks)

4) Proof with vectors: Medium

6.

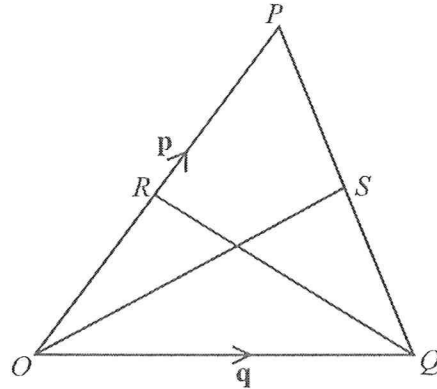


Diagram NOT
accurately drawn

OPQ is a triangle.

R is the midpoint of OP .

S is the midpoint of OQ .

$\vec{OP} = p$ and $\vec{OQ} = q$

$$\vec{PQ} = -p + q$$

$$\vec{PS} = -\frac{1}{2}p + \frac{1}{2}q$$

(i) Find \vec{OS} in terms of p and q .

$$\vec{OS} = p - \frac{1}{2}p + \frac{1}{2}q$$

$$= \frac{1}{2}p + \frac{1}{2}q$$

$$\vec{OS} = \dots \frac{1}{2}(p+q)$$

(ii) Show that RS is parallel to OQ .

$$\vec{RP} = \frac{1}{2}p$$

$$\vec{RS} = \frac{1}{2}p - \frac{1}{2}p + \frac{1}{2}q$$

$$= \frac{1}{2}q$$

\therefore As $\vec{OQ} = q$, \vec{RS} is parallel

(5 marks)

4) Proof with vectors: Harder

6.

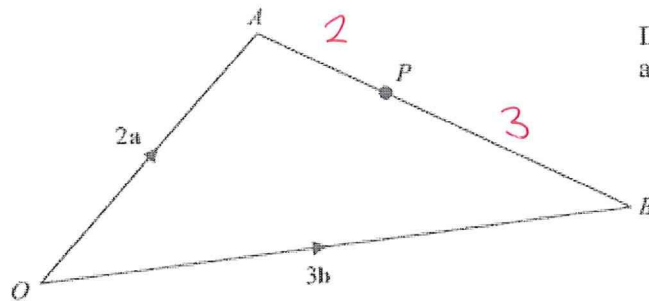


Diagram NOT accurately drawn

OAB is a triangle.

$$\overrightarrow{OA} = 2\mathbf{a}$$

$$\overrightarrow{OB} = 3\mathbf{b}$$

(a) Find AB in terms of \mathbf{a} and \mathbf{b} .

$$\overrightarrow{AB} = \frac{-2\mathbf{a} + 3\mathbf{b}}{\quad\quad\quad} \quad (1)$$

P is the point on AB such that $AP : PB = 2 : 3$

(b) Show that \overrightarrow{OP} is parallel to the vector $\mathbf{a} + \mathbf{b}$.

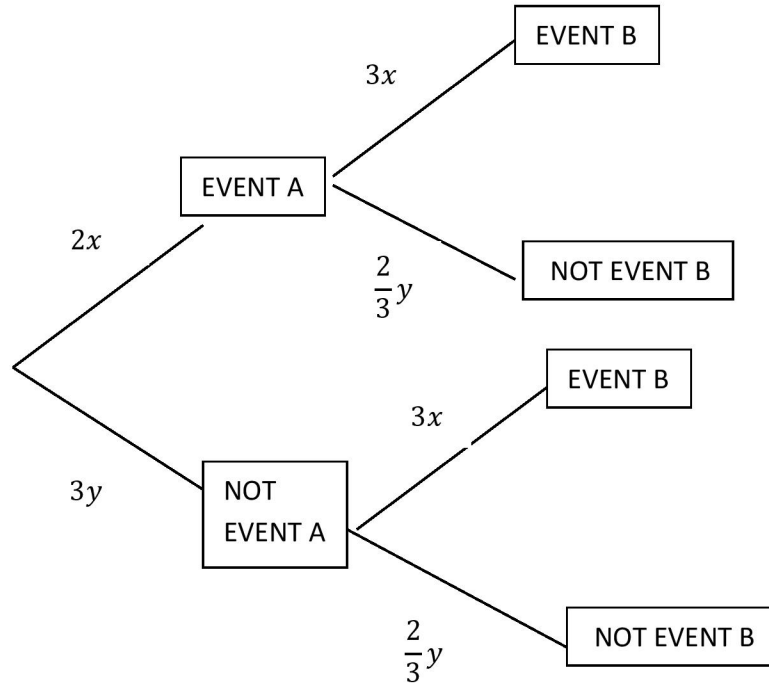
$$\begin{aligned} \overrightarrow{AP} &= \frac{2}{5}(-2\mathbf{a} + 3\mathbf{b}) \\ &= -\frac{4}{5}\mathbf{a} + \frac{6}{5}\mathbf{b} \\ \overrightarrow{OP} &= 2\mathbf{a} - \frac{4}{5}\mathbf{a} + \frac{6}{5}\mathbf{b} \\ &= \frac{6}{5}\mathbf{a} + \frac{6}{5}\mathbf{b} \\ &= \frac{6}{5}(\mathbf{a} + \mathbf{b}) \end{aligned} \quad (3)$$

(4 marks)

Therefore \overrightarrow{OP} is parallel as it has been

5) Extention1: Easier

1. The figure below shows a probability tree diagram for two events. What is the value of x and y ?



From tree diagram (branches sum to one)

$$2x + 3y = 1$$

$$3x + \frac{2}{3}y = 1$$

Multiplying equations to eliminate x

$$6x + 9y = 3$$

$$6x + \frac{4}{3}y = 2$$

$$\frac{23}{3}y = 1$$

$$y = \frac{3}{23}$$

$$2x + \frac{9}{23} = 1$$

$$x = \frac{7}{23}$$

5) Extention1: Medium

2. Given that $x^a = \frac{1}{x^b}$, What is the value of $2a + 2b$?

$$x^a = x^{-b}$$

$$a = -b$$

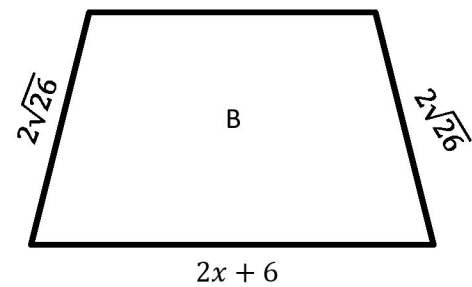
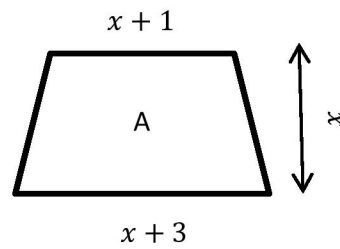
$$a + b = 0$$

$$2(a + b) = 0$$

$$2a + 2b = 0$$

5) Extention 1: Harder

3. The two trapezia below are similar. The area of trapezium A is 35cm^2 . Find the perimeter of trapezium B.



The area of trapezium A is given by $\frac{1}{2}(x + 1 + x + 3) \times x$

$$\frac{1}{2}(2x + 4) \times x = 35\text{cm}^2$$

$$x^2 + 2x = 35\text{cm}^2$$

$$x^2 + 2x - 35 = 0$$

$$(x - 5)(x + 7) = 0$$

$$x = 5\text{cm}, \quad (\text{as } x > 0)$$

The perimeter of Trapezium A is

$$2x + 6 + 2x + 2 + 4\sqrt{26}$$

When $x = 5$

$$4(5) + 8 + 4\sqrt{26}$$

$$= 18 + 4\sqrt{26}$$

GRIFFIN Joshua

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Bearings. Mathswatch Clip: 124

Topic 2: Solving Quadratics Using the Formula. MW: 191

Topic 3: Venn diagrams.. Mathswatch Clip: 127

Topic 4: Inequalities Regions. Mathswatch Clip: 198

Topic 5: More Difficult Rearranging Formulae. MW: 190

1) Bearings: Easier

1.

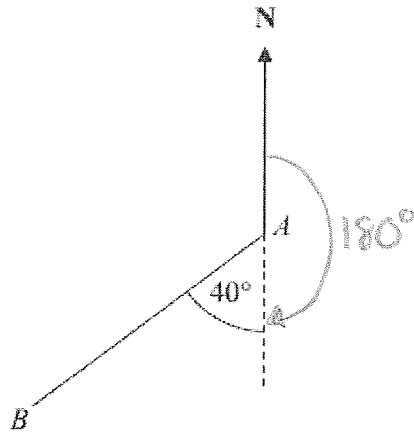


Diagram NOT accurately drawn

$180 + 40$

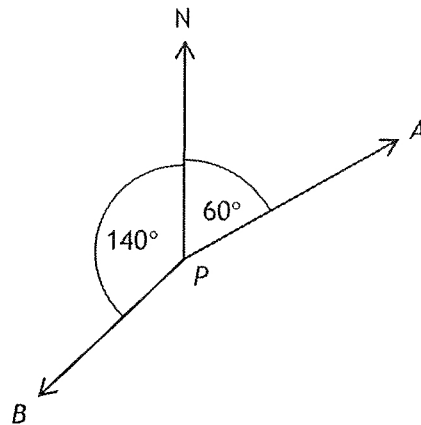
Work out the bearing of B from A.

START POINT

.....220.....°

(2 marks)

2.



(a) Write down the bearing of A from P.

Bearings are always 3 digits

.....060.....°

(b) Work out the bearing of B from P.

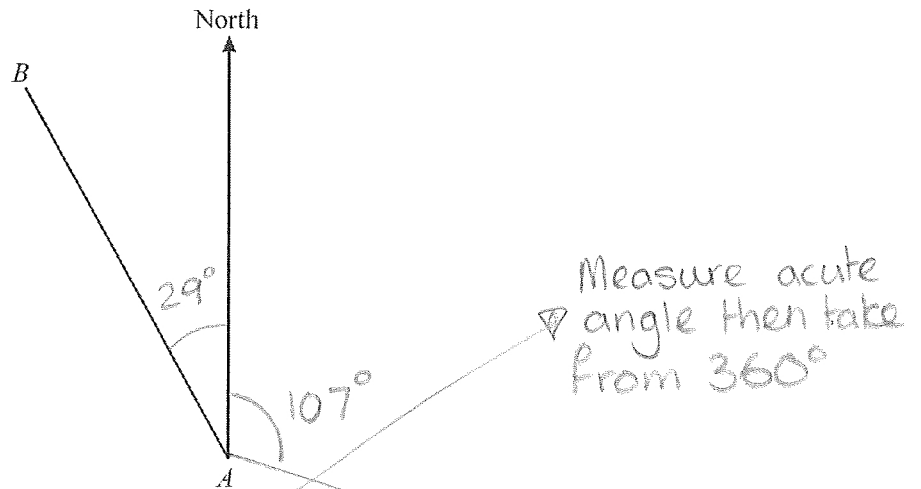
$360 - 140$

.....220.....°

(3 marks)

1) Bearings: Medium

3.



(a) Measure and write down the bearing of B from A.

$$360 - 29$$

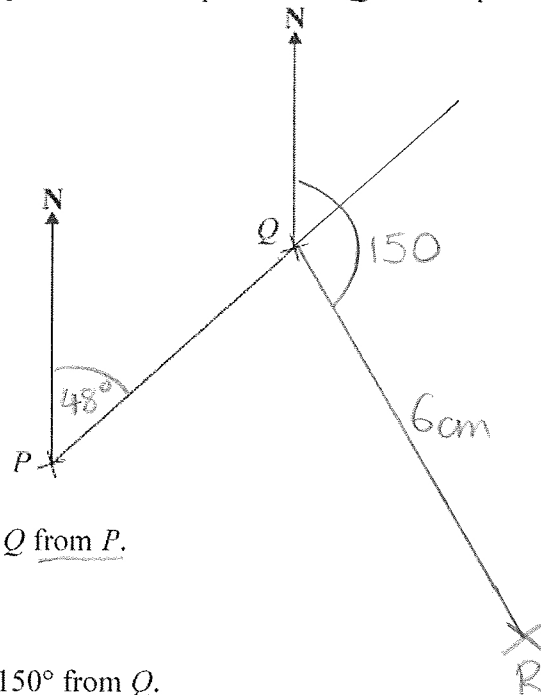
Measure acute angle then take from 360°
 331 $^\circ$
 (1)

(b) On the diagram, draw a line on a bearing of 107° from A.

clockwise

(1)
 (2 marks)

4. The diagram shows the position of two ports P and Q on a map.



(a) Measure the bearing of Q from P.

048 $^\circ$
 (1)

A rock R is on a bearing of 150° from Q.
 On the map R is 6 cm from Q.

(b) Mark the position of R with a cross (x) and label it R.

(2)

1) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

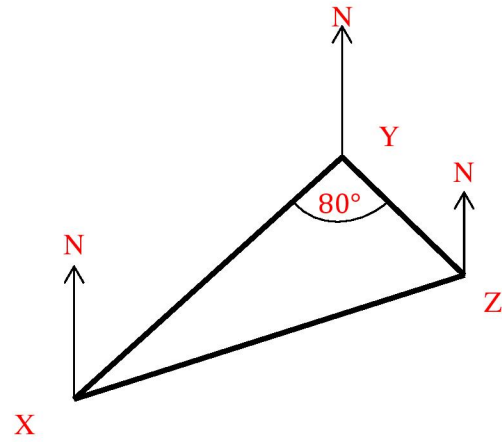
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

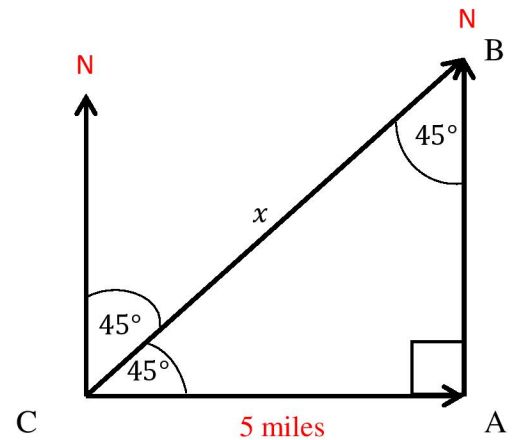
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



2) Solving Quadratics Using the Formula: Easier

1. Solve $3x^2 + 7x - 13 = 0$
Give your solutions correct to 2 decimal places.

$$a = 3 \quad b = 7 \quad c = -13$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-7 \pm \sqrt{7^2 - 4 \times 3 \times -13}}{2 \times 3} = \frac{-7 \pm \sqrt{205}}{6}$$

$$= 1.219636844 \quad \text{or} \quad -3.552970177$$

$$x = \underline{1.22} \dots \dots \dots \text{or } x = \underline{-3.55} \dots \dots \dots$$

(3 marks)

2. Solve the equation

$$2x^2 + 6x - 95 = 0$$

Give your solutions correct to 3 significant figures.

$$a = 2 \quad b = 6 \quad c = -95$$

$$x = \frac{-6 \pm \sqrt{36 - (4 \times 2 \times -95)}}{4}$$

$$= \frac{-6 \pm \sqrt{796}}{4}$$

$$= 5.55336799 \quad \text{or} \quad -8.55336799$$

$$x = \underline{5.55} \dots \dots \dots \text{or } x = \underline{-8.55} \dots \dots \dots$$

(3 marks)

2) Solving Quadratics Using the Formula: Medium

3. Solve $x^2 + 3x - 5 = 0$
Give your solutions correct to 4 significant figures.

$$a = 1 \quad b = 3 \quad c = -5$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-3 \pm \sqrt{9 - (4 \times 1 \times -5)}}{2}$$

$$= \frac{-3 \pm \sqrt{29}}{2}$$

$$x = 1.192582404 \text{ or } -4.192582404$$

$$x = 1.193 \text{ or } -4.193$$

(3 marks)

4. Solve this quadratic equation.

$$x^2 - 5x - 8 = 0$$

Give your answers correct to 3 significant figures.

$$a = 1 \quad b = -5 \quad c = -8$$

$$x = \frac{5 \pm \sqrt{25 - (4 \times 1 \times -8)}}{2}$$

$$= \frac{5 \pm \sqrt{57}}{2}$$

$$x = 6.274917218 \text{ or } -1.274917218$$

$$x = 6.27 \text{ or } -1.27$$

(3 marks)

2) Solving Quadratics Using the Formula: Harder

9. The diagram shows a 6-sided shape.
All the corners are right angles.
All the measurements are given in centimetres.

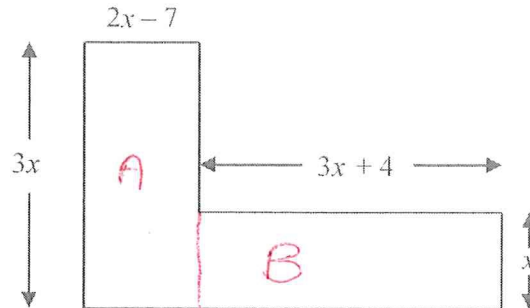


Diagram NOT accurately drawn

The area of the shape is 85 cm^2 .

- (a) Show that $9x^2 - 17x - 85 = 0$

$$A = 3x(2x-7) \quad B = x(3x+4)$$

$$= 6x^2 - 21x \quad = 3x^2 + 4x$$

$$6x^2 - 21x + 3x^2 + 4x = 85$$

$$9x^2 - 17x - 85 = 0$$

(3)

- (b) (i) Solve $9x^2 - 17x - 85 = 0$

Give your solutions correct to 3 significant figures.

$$a=9 \quad b=-17 \quad c=-85$$

$$x = \frac{17 \pm \sqrt{17^2 - 4(9)(-85)}}{18}$$

$$x = 4.159474732 \quad \text{or} \quad x = -2.270585844$$

$$x = 4.16 \dots \quad \text{or} \quad x = -2.27 \dots$$

- (ii) Hence, work out the length of the shortest side of the 6-sided shape.

$$2x-7$$

$$\dots 1.38 \dots \text{ cm}$$

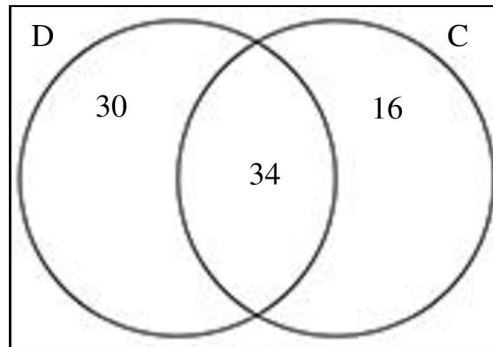
(4)

3) Venn diagrams.: Easier

Solution for Question 1:

Number of people that owned dogs only: $64 - 34 = 30$

Number of people that owned cats only: $80 - 34 - 30 = 16$



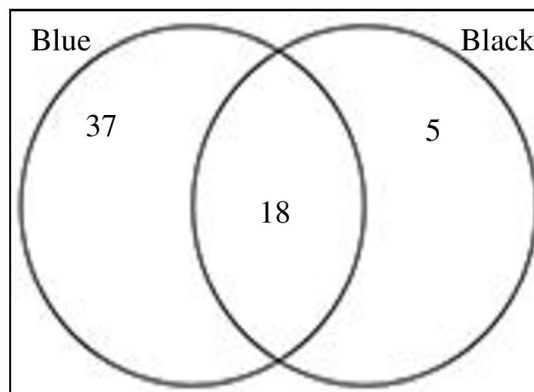
Solution for Question 2:

a) Number of people that only had a black pen:

$$60 - 37 - 18 = 5$$

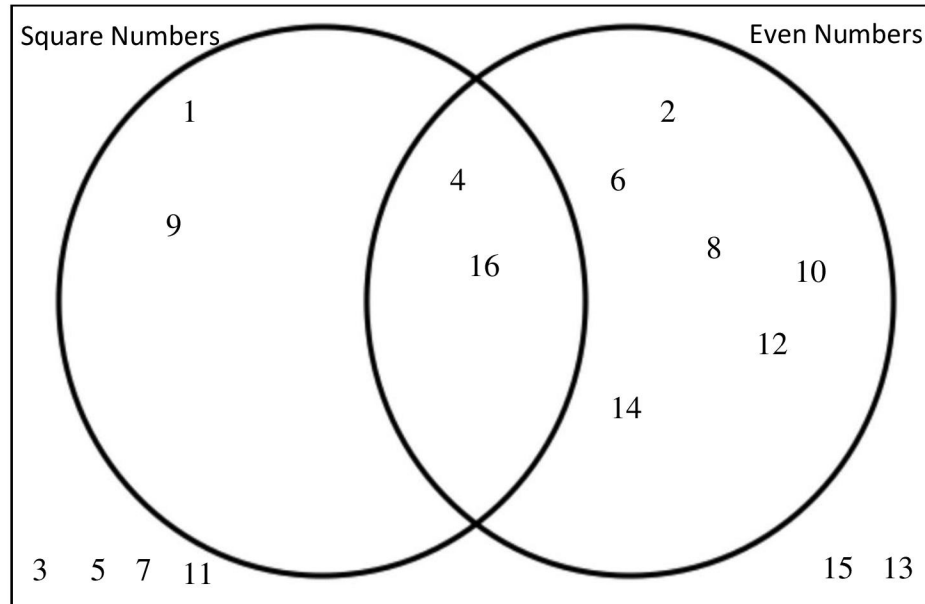
b) Probability of a person owning both types of pen:

$$\frac{18}{60} = \frac{3}{10}$$



3) Venn diagrams.: Medium

Solution for Question 3:



Solution for Question 4:

- a) Tea: $6 + 12 = 18$
 Coffee: $9 + 12 = 21$
 Therefore, False
- b) False
- c) False

Solution for Question 5:

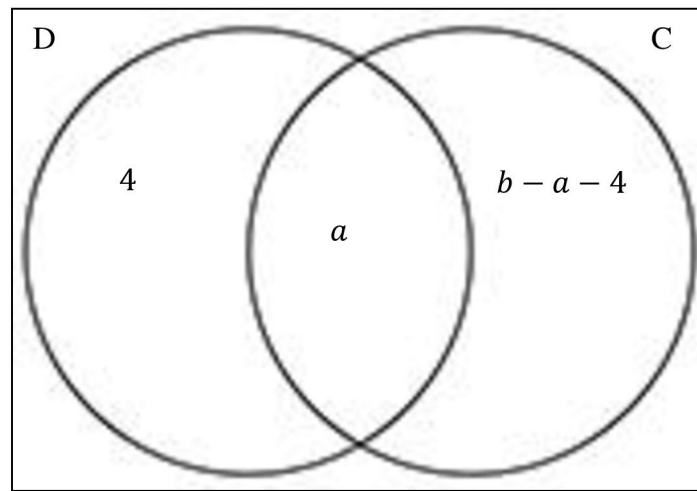
- a)
- i) $A \cap B = A$ and $B = \{9, 15\}$
- ii) $A \cup B = A$ or $B = \{3, 5, 6, 12, 18\}$

3) Venn diagrams.: Harder

Solution for Question 6:

Number of people who replied with cats only:

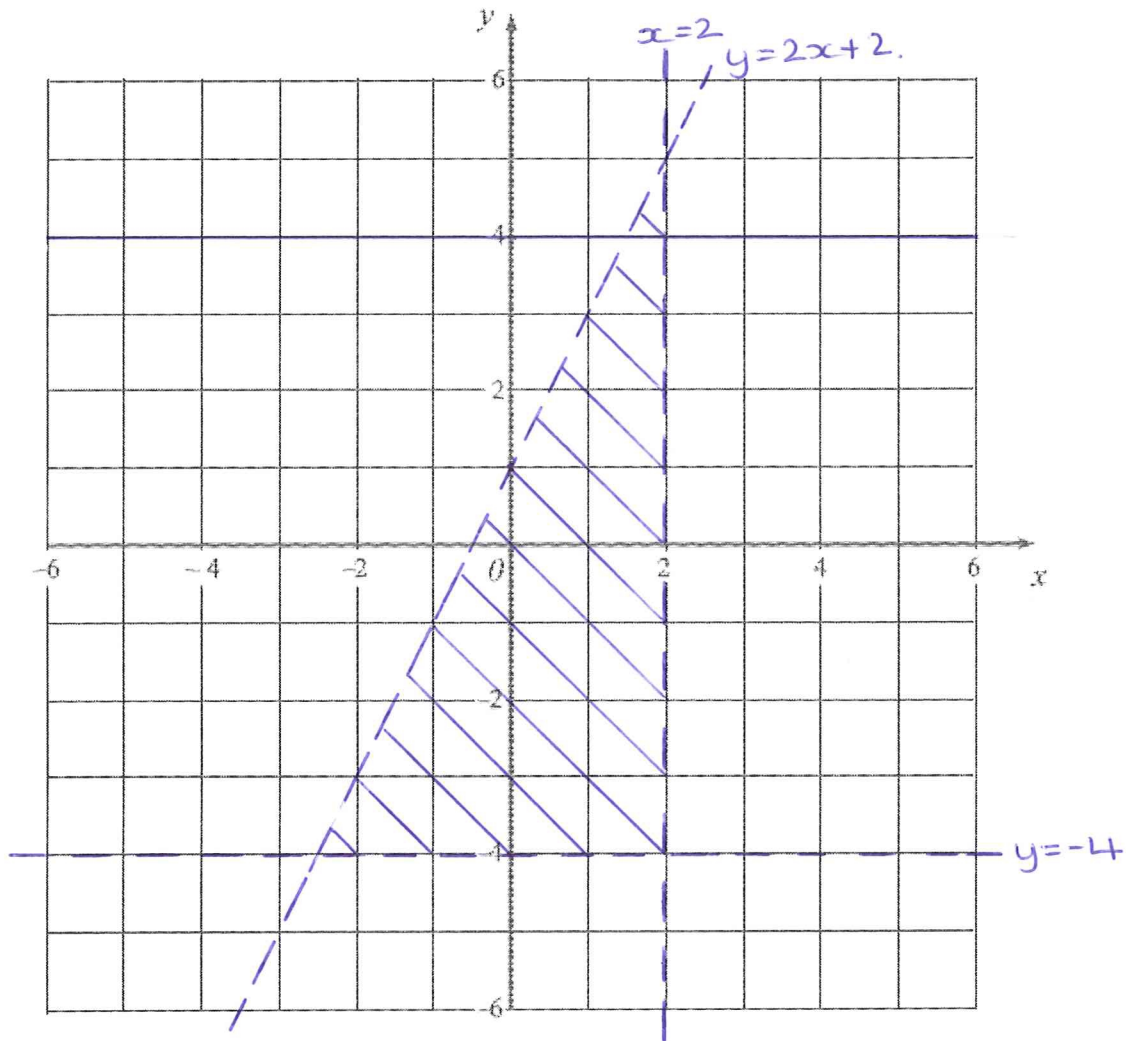
$$b - a - 4$$



4) Inequalities Regions: Easier

1. On the grid, shade the region that satisfies all three of these inequalities

$$y > -4 \quad x < 2 \quad y < 2x + 1$$



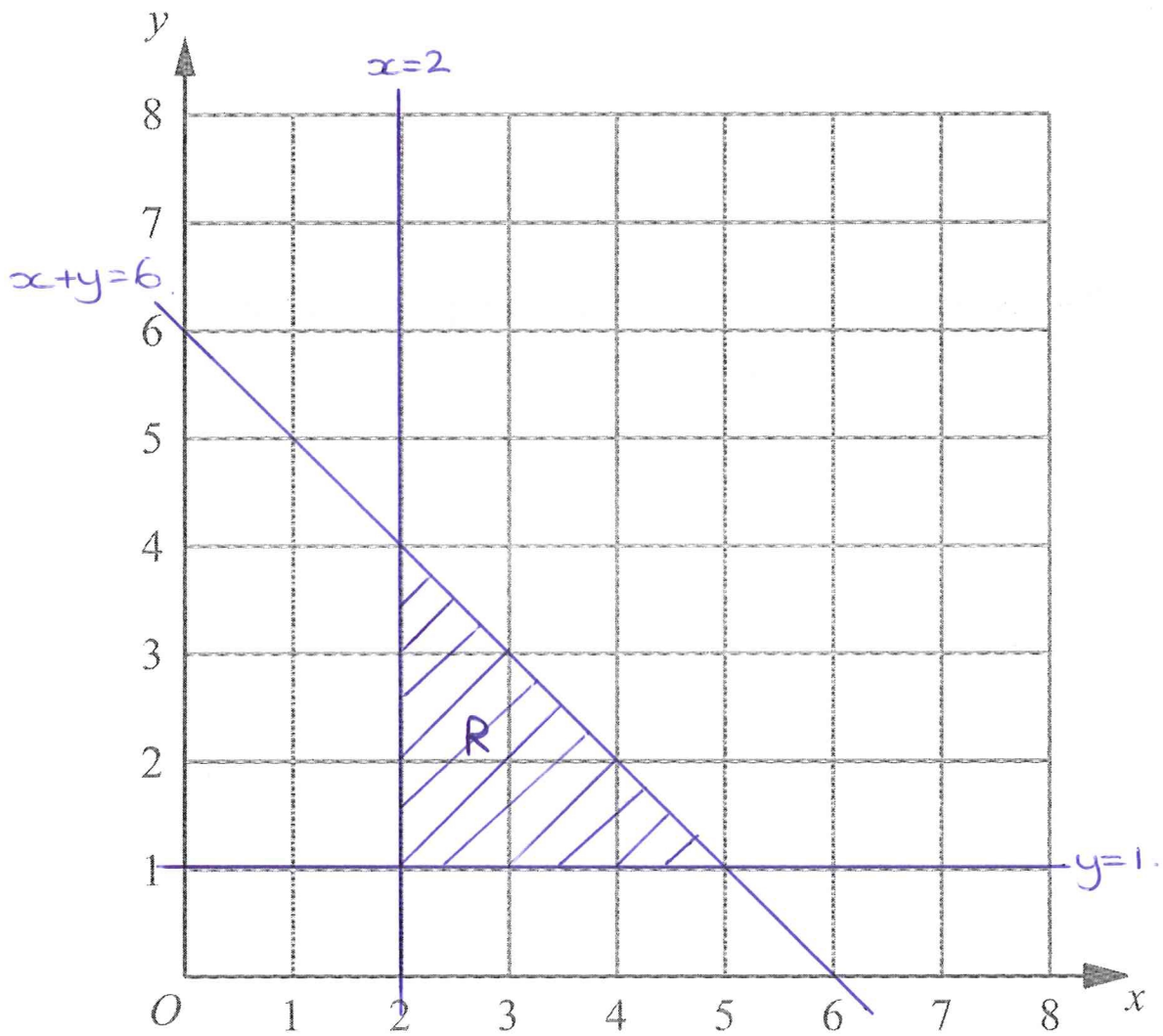
(Total for Question 19 = 4 marks)

4) Inequalities Regions: Medium

2. The region **R** satisfies the inequalities

$$x \geq 2, \quad y \geq 1, \quad x + y \leq 6$$

On the grid below, draw straight lines and use shading to show the region **R**.



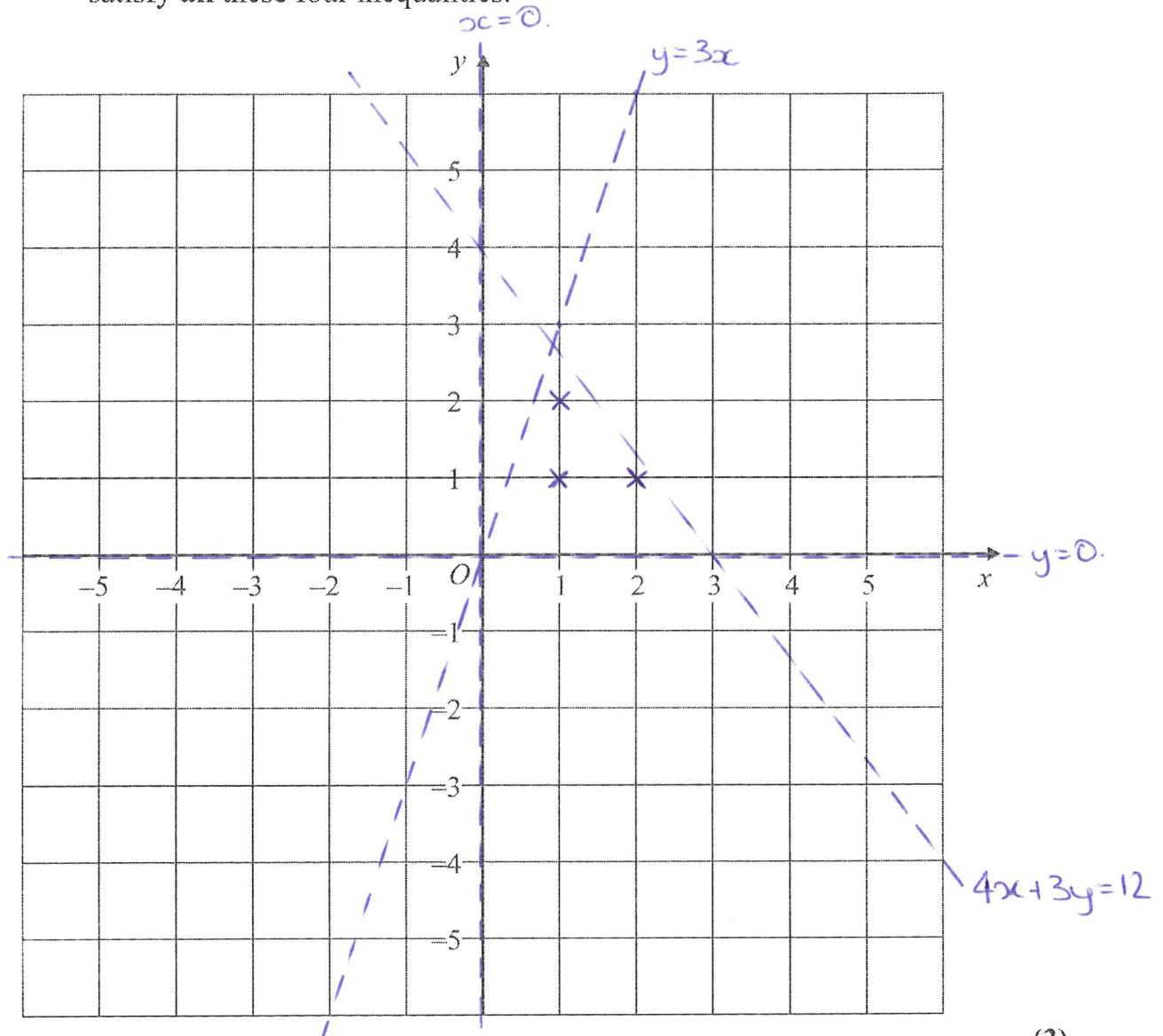
(Total 3 marks)

4) Inequalities Regions: Harder

7. $4x + 3y < 12$, $y < 3x$, $y > 0$, $x > 0$

x and y are both integers.

On the grid, mark with a cross (\times), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

5) More Difficult Rearranging Formulae: Easier

1. Rearrange $a(q - c) = d$ to make q the subject.

$$aq - ac = d$$

$$aq = d + ac$$

$$q = \frac{d + ac}{a}$$

$$q = \frac{d + ac}{a} \dots\dots\dots (3)$$

(Total 5 marks)

2. (a) Make n the subject of the formula $m = 5n - 21$

$$m + 21 = 5n$$

$$n = \frac{m + 21}{5}$$

5) More Difficult Rearranging Formulae: Medium

(b) Make p the subject of the formula $4(p - 2q) = 3p + 2$

$$4p - 8q = 3p + 2$$

$$p = 2 + 8q$$

$$p = \dots\dots\dots$$

(3)

(Total 5 marks)

3.

$$P = \pi r + 2r + 2a$$

Make r the subject of the formula

$$P - 2a = r(\pi + 2)$$

$$r = \frac{P - 2a}{\pi + 2}$$

(Total 3 marks)

5) More Difficult Rearranging Formulae: Harder

12. Rearrange $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

to make u the subject of the formula.

Give your answer in its simplest form.

$$fv + fu = uv$$

$$fu - uv = fv$$

$$u(f - v) = fv$$

$$u = \frac{fv}{f - v}$$

GROCH Anna

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Bearings. Mathswatch Clip: 124

Topic 2: Solving Quadratics Using the Formula. MW: 191

Topic 3: Inequalities Regions. Mathswatch Clip: 198

Topic 4: Pythagoras. Mathswatch Clip: 150

Topic 5: Proof. Mathswatch Clip: 193

1) Bearings: Easier

1.

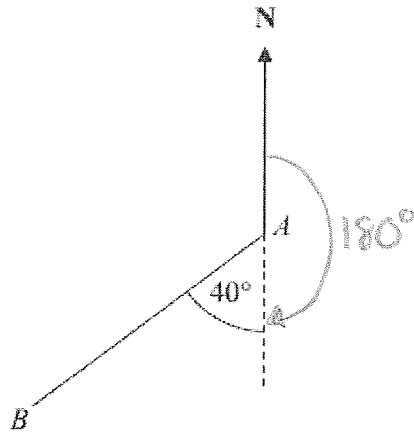


Diagram NOT accurately drawn

$180 + 40$

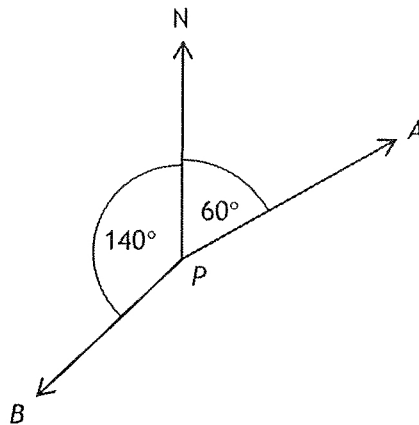
Work out the bearing of B from A.

START POINT

.....220.....°

(2 marks)

2.



(a) Write down the bearing of A from P.

Bearings are always 3 digits

.....060.....°

(b) Work out the bearing of B from P.

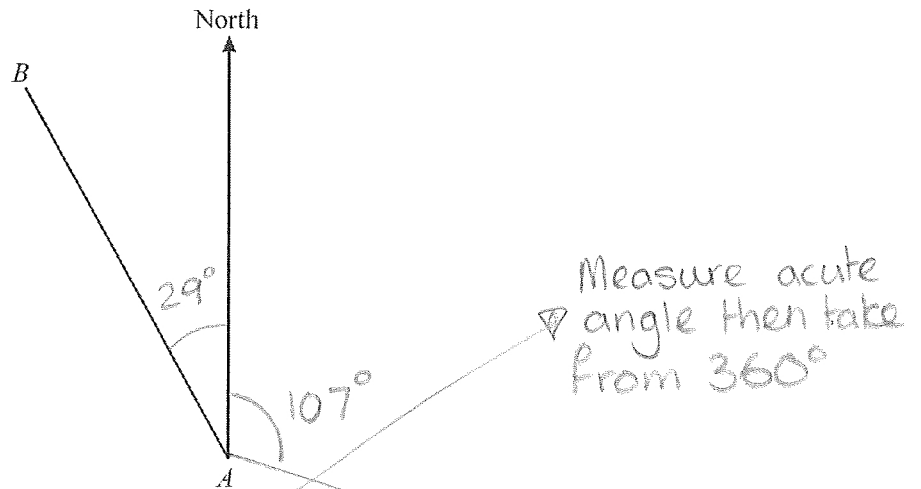
$360 - 140$

.....220.....°

(3 marks)

1) Bearings: Medium

3.



(a) Measure and write down the bearing of B from A.

$$360 - 29$$

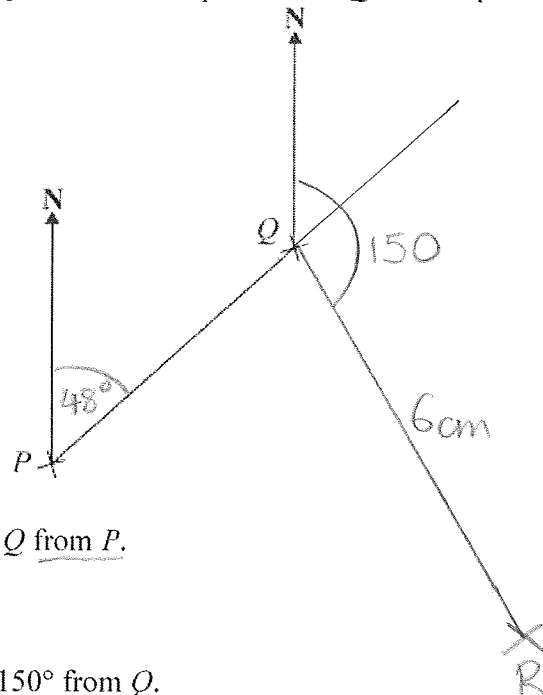
.....
331°
(1)

(b) On the diagram, draw a line on a bearing of 107° from A.

clockwise

(1)
(2 marks)

4. The diagram shows the position of two ports P and Q on a map.



(a) Measure the bearing of Q from P.

.....
048°
(1)

A rock R is on a bearing of 150° from Q.
On the map R is 6 cm from Q.

(b) Mark the position of R with a cross (x) and label it R.

(2)

1) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

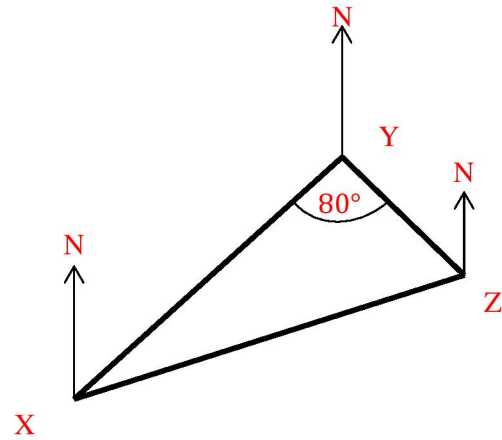
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

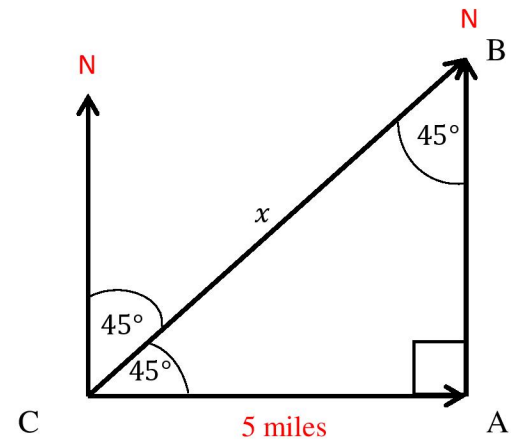
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



2) Solving Quadratics Using the Formula: Easier

1. Solve $3x^2 + 7x - 13 = 0$
Give your solutions correct to 2 decimal places.

$$a = 3 \quad b = 7 \quad c = -13$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-7 \pm \sqrt{7^2 - 4 \times 3 \times -13}}{2 \times 3} = \frac{-7 \pm \sqrt{205}}{6}$$

$$= 1.219636844 \quad \text{or} \quad -3.552970177$$

$$x = \underline{1.22} \dots \dots \dots \text{or } x = \underline{-3.55} \dots \dots \dots$$

(3 marks)

2. Solve the equation

$$2x^2 + 6x - 95 = 0$$

Give your solutions correct to 3 significant figures.

$$a = 2 \quad b = 6 \quad c = -95$$

$$x = \frac{-6 \pm \sqrt{36 - (4 \times 2 \times -95)}}{4}$$

$$= \frac{-6 \pm \sqrt{796}}{4}$$

$$= 5.55336799 \quad \text{or} \quad -8.55336799$$

$$x = \underline{5.55} \dots \dots \dots \text{or } x = \underline{-8.55} \dots \dots \dots$$

(3 marks)

2) Solving Quadratics Using the Formula: Medium

3. Solve $x^2 + 3x - 5 = 0$
Give your solutions correct to 4 significant figures.

$$a = 1 \quad b = 3 \quad c = -5$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-3 \pm \sqrt{9 - (4 \times 1 \times -5)}}{2}$$

$$= \frac{-3 \pm \sqrt{29}}{2}$$

$$x = 1.192582404 \text{ or } -4.192582404$$

$$x = 1.193 \text{ or } -4.193$$

(3 marks)

4. Solve this quadratic equation.

$$x^2 - 5x - 8 = 0$$

Give your answers correct to 3 significant figures.

$$a = 1 \quad b = -5 \quad c = -8$$

$$x = \frac{5 \pm \sqrt{25 - (4 \times 1 \times -8)}}{2}$$

$$= \frac{5 \pm \sqrt{57}}{2}$$

$$x = 6.274917218 \text{ or } -1.274917218$$

$$x = 6.27 \text{ or } -1.27$$

(3 marks)

2) Solving Quadratics Using the Formula: Harder

9. The diagram shows a 6-sided shape.
All the corners are right angles.
All the measurements are given in centimetres.

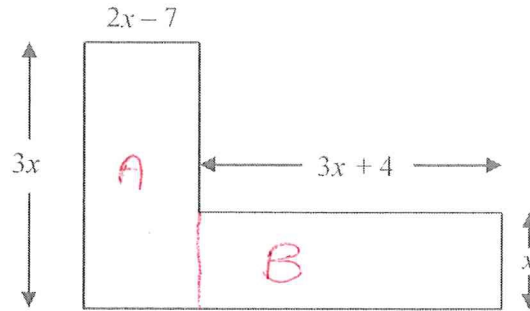


Diagram NOT accurately drawn

The area of the shape is 85 cm^2 .

- (a) Show that $9x^2 - 17x - 85 = 0$

$$A = 3x(2x-7) \quad B = x(3x+4)$$

$$= 6x^2 - 21x \quad = 3x^2 + 4x$$

$$6x^2 - 21x + 3x^2 + 4x = 85$$

$$9x^2 - 17x - 85 = 0 \quad (3)$$

- (b) (i) Solve $9x^2 - 17x - 85 = 0$

Give your solutions correct to 3 significant figures.

$$a=9 \quad b=-17 \quad c=-85$$

$$x = \frac{17 \pm \sqrt{17^2 - 4(9)(-85)}}{18}$$

$$x = 4.159474732 \quad \text{or} \quad x = -2.270585844$$

$$x = 4.16 \dots \quad \text{or} \quad x = -2.27 \dots$$

- (ii) Hence, work out the length of the shortest side of the 6-sided shape.

$$2x-7$$

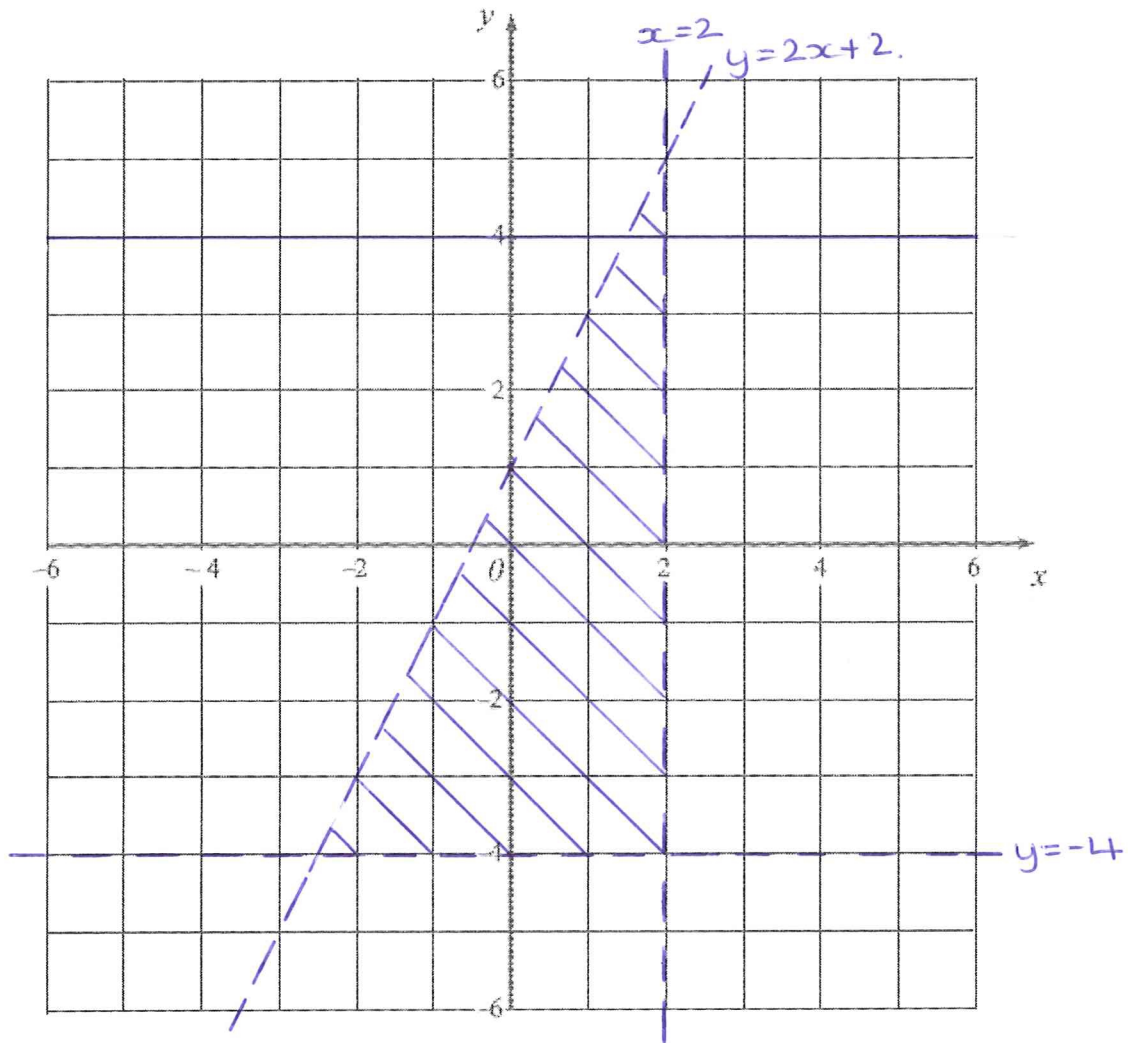
$$\dots 1.38 \dots \text{ cm}$$

(4)

3) Inequalities Regions: Easier

1. On the grid, shade the region that satisfies all three of these inequalities

$$y > -4 \quad x < 2 \quad y < 2x + 1$$



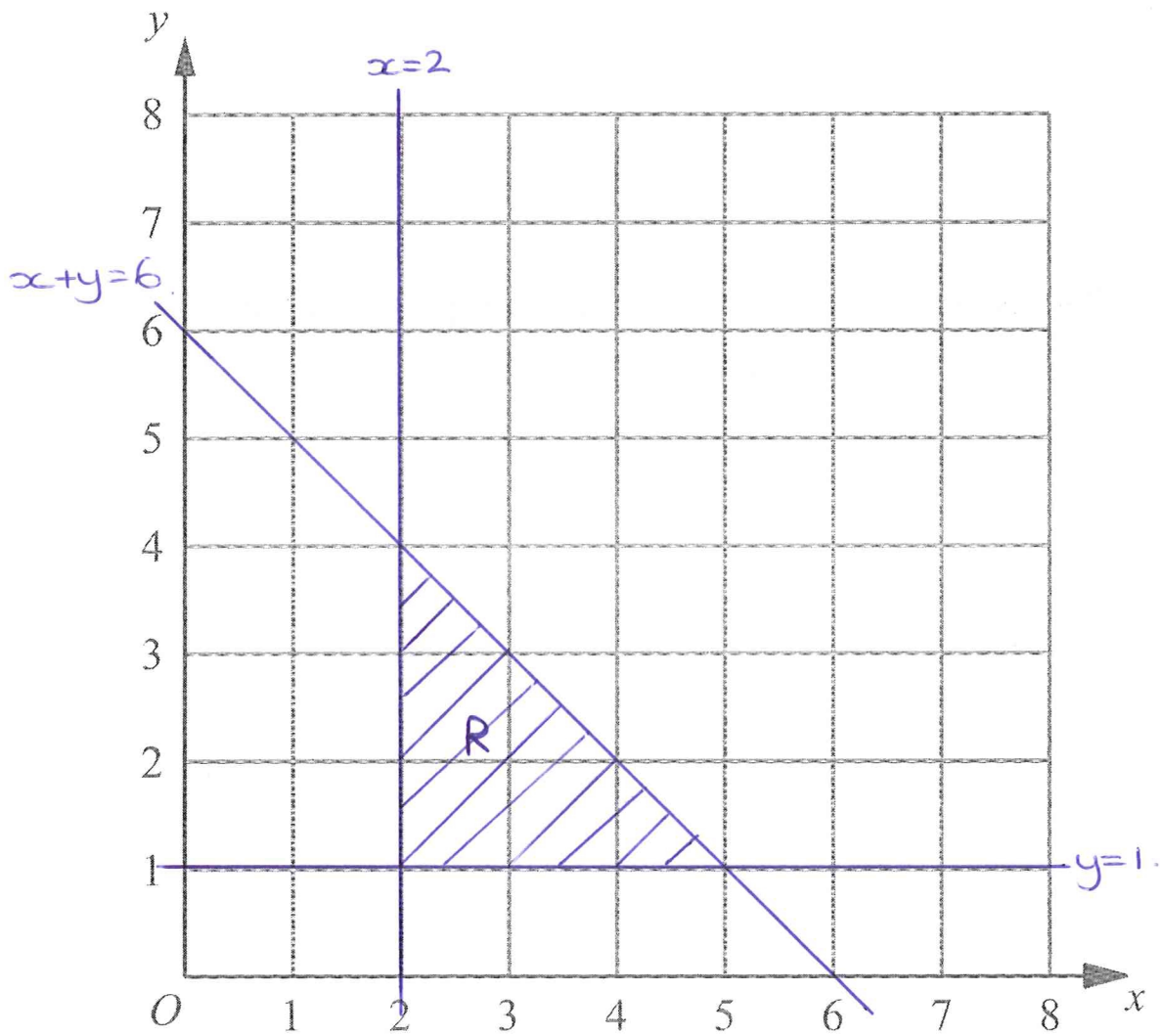
(Total for Question 19 = 4 marks)

3) Inequalities Regions: Medium

2. The region **R** satisfies the inequalities

$$x \geq 2, \quad y \geq 1, \quad x + y \leq 6$$

On the grid below, draw straight lines and use shading to show the region **R**.



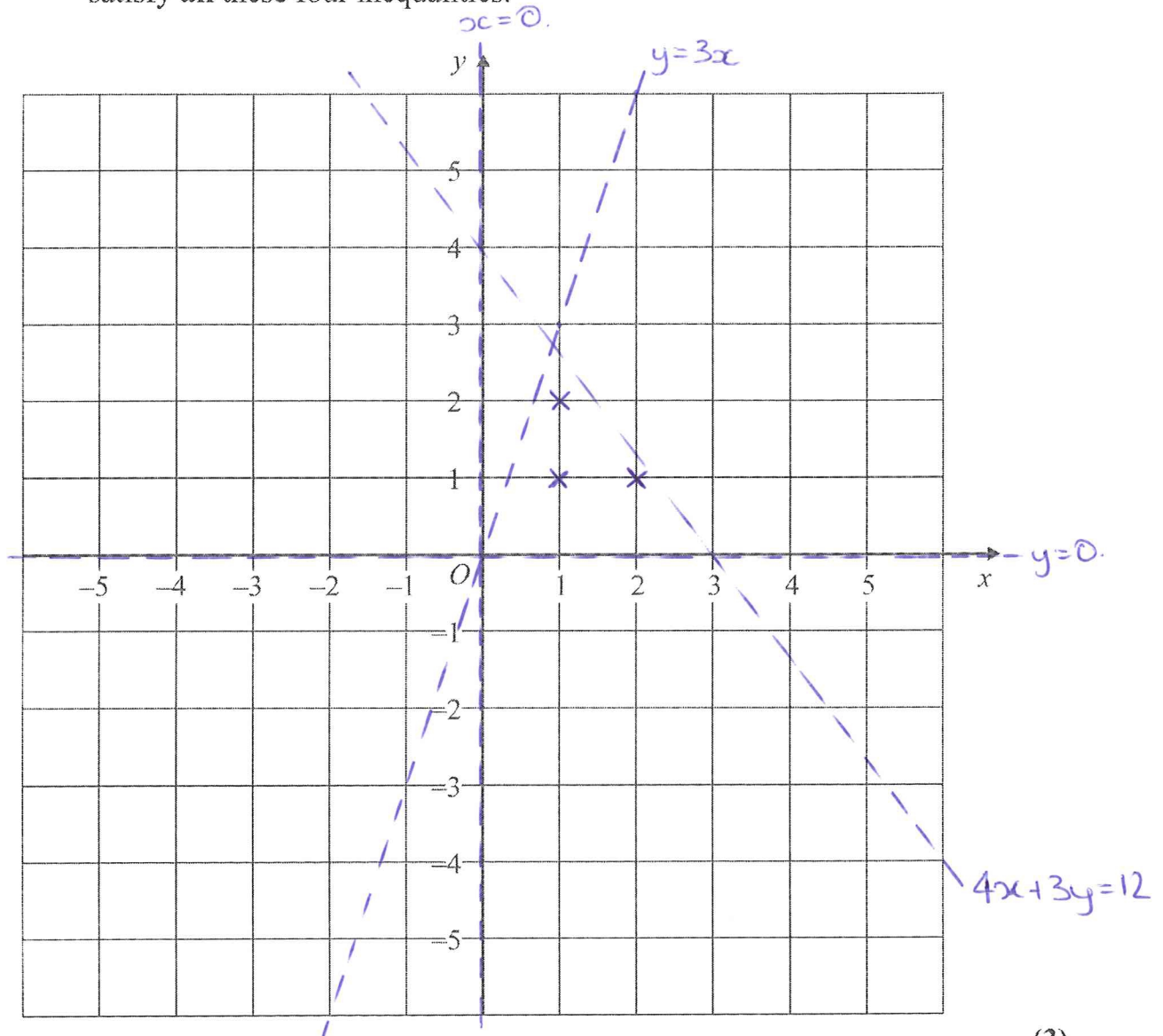
(Total 3 marks)

3) Inequalities Regions: Harder

7. $4x + 3y < 12$, $y < 3x$, $y > 0$, $x > 0$

x and y are both integers.

On the grid, mark with a cross (\times), each of the **three** points which satisfy **all** these four inequalities.

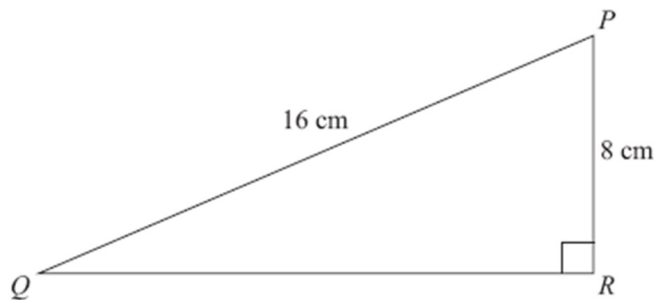


(3)
(Total 5 marks)

4) Pythagoras: Easier

1.

Diagram NOT
accurately drawn



PQR is a right-angled triangle.
 $PQ = 16$ cm.
 $PR = 8$ cm.

Calculate the length of QR .
 Give your answer correct to 2 decimal places.

$$QR^2 = 16^2 - 8^2 = 192$$

$$QR = \sqrt{192} = 13.86 \text{ cm}$$

..... **13.86** cm

(3 marks)

2.

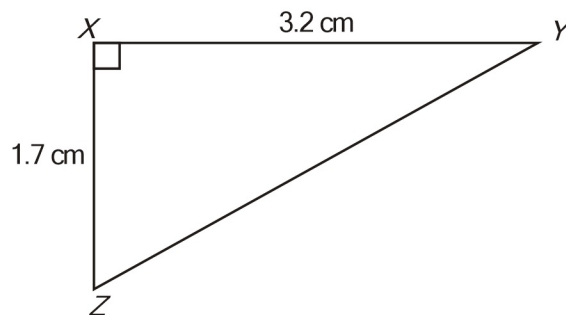


Diagram NOT
accurately drawn

XYZ is a right-angled triangle.
 $XY = 3.2$ cm.
 $XZ = 1.7$ cm.

Calculate the length of YZ .

Give your answer correct to 3 significant figures.

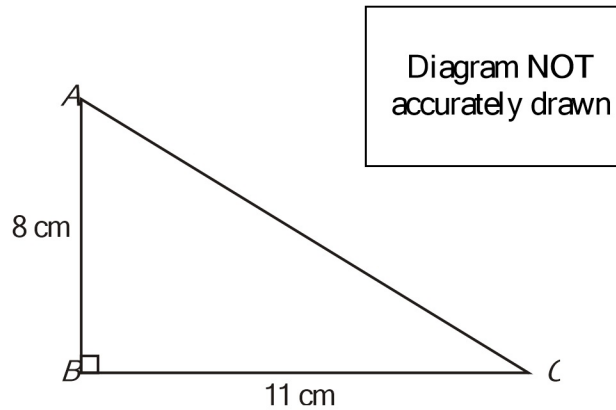
$$YZ^2 = 3.2^2 + 1.7^2 = 13.13$$

$$YZ = \sqrt{13.13} = 3.62 \text{ cm}$$

..... **3.62** cm

4) Pythagoras: Medium

3.



ABC is a right-angled triangle.

$AB = 8$ cm,
 $BC = 11$ cm.

Calculate the length of AC .
Give your answer correct to 3 significant figures.

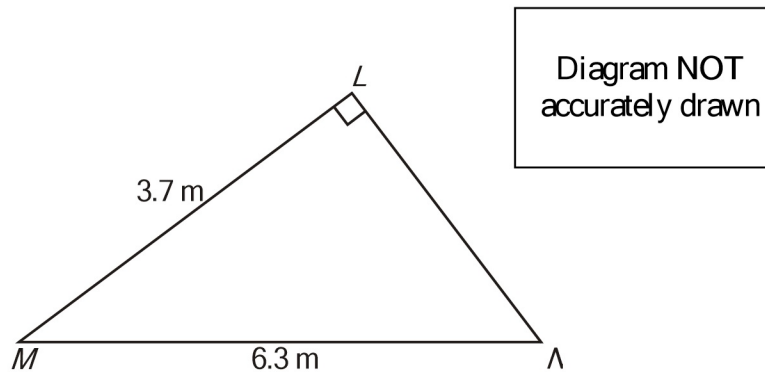
$$AC^2 = 8^2 + 11^2 = 185$$

$$AC = \sqrt{185} = 13.6 \text{ cm}$$

..... 13.6 cm

(3 marks)

4.



Angle $MLN = 90^\circ$.

$LM = 3.7$ m.

$MN = 6.3$ m.

Work out the length of LN .
Give your answer correct to 3 significant figures.

$$LN^2 = 6.3^2 - 3.7^2 = 26$$

$$LN = \sqrt{26} = 5.10 \text{ m}$$

$LN =$ 5.10 m

4) Pythagoras: Harder

13. $ABCD$ is a trapezium.

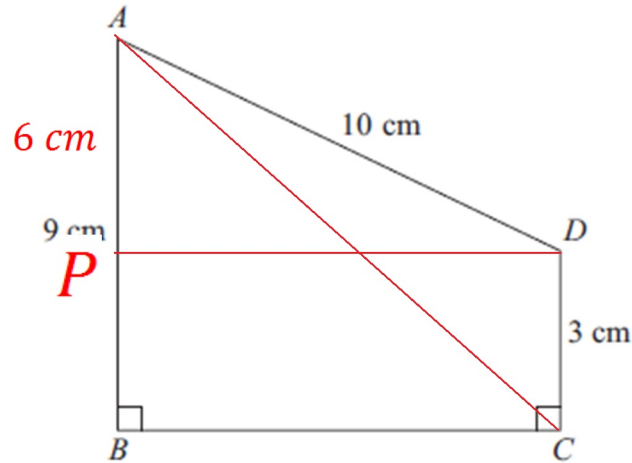


Diagram **NOT** accurately drawn

$AD = 10$ cm
 $AB = 9$ cm
 $DC = 3$ cm
 Angle $ABC =$ angle $BCD = 90^\circ$

Calculate the length of AC .
 Give your answer correct to 3 significant figures.

$$AP = 9 - 3 = 6 \text{ cm}$$

$$PD^2 = 10^2 - 6^2 = 64$$

$$BC = PD = \sqrt{64} = 8 \text{ cm}$$

$$AC^2 = 9^2 + 8^2 = 145$$

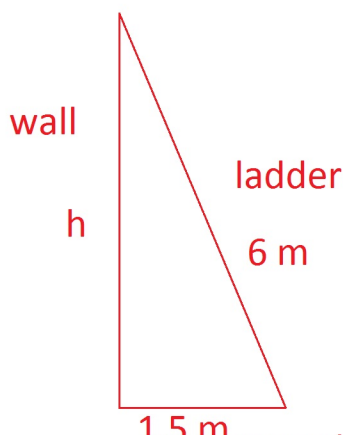
$$AC = \sqrt{145} = 12.0 \dots\dots\dots \text{ cm}$$

(5 marks)

14. A ladder is 6 m long.
 The ladder is placed on horizontal ground, resting against a vertical wall.

The instructions for using the ladder say that the bottom of the ladder must not be closer than 1.5 m from the bottom of the wall.

How far up the wall can the ladder reach?
 Give your answer correct to 1 decimal place.



$$h^2 = 6^2 - 1.5^2 = 33.75$$

$$h = \sqrt{33.75} = 5.8 \text{ m}$$

5) Proof: Easier

1. The n th even number is $2n$.

The next even number after $2n$ is $2n + 2$

- (a) Explain why.

Every alternate integer is even. As $2n$ is even
 $2n + 1$ will be odd and so $2n + 2$ is even.

(1)

- (b) Write down an expression, in terms of n , for the next even number after $2n + 2$

$$2n + 2 + 2 = 2n + 4$$

$$\dots\dots\dots 2n + 4 \dots\dots\dots$$

(1)

- (c) Show algebraically that the sum of any 3 consecutive even numbers is always a multiple of 6

$$\begin{aligned}
 & 2n + 2n + 2 + 2n + 4 \\
 = & 6n + 6 \\
 = & 6(n + 1) \\
 & \uparrow \\
 & \text{a multiple of 6.}
 \end{aligned}$$

(3)

(5 marks)

5) Proof: Medium

2. Prove that $(3n + 1)^2 - (3n - 1)^2$ is a multiple of 4, for all positive integer values of n .

$$(3n+1)^2 - (3n-1)^2$$

$$\begin{aligned} (3n+1)^2 &= (3n+1)(3n+1) \\ &= 9n^2 + 6n + 1 \end{aligned}$$

$$\begin{aligned} (3n-1)^2 &= (3n-1)(3n-1) \\ &= 9n^2 - 6n + 1 \end{aligned}$$

$$\begin{aligned} (3n+1)^2 - (3n-1)^2 &= (9n^2 + 6n + 1) - (9n^2 - 6n + 1) \\ &= 9n^2 + 6n + 1 - 9n^2 + 6n - 1 \\ &= 12n \\ &= 4(3n) \end{aligned}$$

↑
which is a multiple of 4

(3 marks)

5) Proof: Harder

9. Prove algebraically that the sum of the squares of any two consecutive numbers always leaves a remainder of 1 when divided by 4.

consecutive numbers are n and $n+1$

$$\begin{aligned} & n^2 + (n+1)^2 \\ &= n^2 + n^2 + 2n + 1 \\ &= 2n^2 + 2n + 1 \\ &= 2n(n+1) + 1 \end{aligned}$$

$n(n+1)$ is the product of 2 consecutive numbers. As one of them is even the product must be even.

$2n(n+1)$ is $2 \times$ an even number which has to be a multiple of 4

So $2n(n+1) + 1$ is a multiple of 4 plus 1 and will leave a remainder of 1 when divided by 4

HATCHELL Charlie

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Changing Ratios. Mathswatch Clip: NA

Topic 2: Solving Quadratics Using the Formula. MW: 191

Topic 3: Venn diagrams.. Mathswatch Clip: 127

Topic 4: More Difficult Rearranging Formulae. MW: 190

Topic 5: Pythagoras. Mathswatch Clip: 150

1) Changing Ratios: Easier

Solution for Question 1:

a) Red : Blue = 8:12

Divide through by 4 to simplify: 2:3

b) Red : Blue = 8:10

Divide through by 2 to simplify: 4:5

Solution for Question 2:

a) Pen : Pencils = 2:3

Equivalent to 20:30

30 pencils in pencil case

b) Only pencils removed so still 20 pens, ratio 4:3 equivalent to 20:15 so removed 15 pencils

1) Changing Ratios: Medium

Solution for Question 3:

$$1:3:5$$

$$1:3+5 = 1:8$$

Solution for Question 4:

$$\text{Orange : Red} = 2:3$$

$$2:3 = 5$$

$$x:51 = y$$

$$\frac{51}{3} = 17$$

$$x = 2 \times 17 = 34$$

$$y = 5 \times 17 = 85$$

$$\text{Ratio of Orange to Red} = 34:51$$

Compare 2:3 to 10:17, achieving same number for red sweets

$$2:3 = 34:51$$

Multiply ratio 10:17 by 3

$$30:51$$

4 orange sweets were eaten by Solomon.

Solution for Question 5:

$$\text{HW : No HW} = 5:4$$

$$5:4 = 9$$

$$15:x = y$$

$$\frac{15}{5} = 3$$

$$x = 4 \times 3 = 12$$

$$y = 9 \times 3 = 27$$

$$\text{Ratio of HW done to HW not done} = 15:12$$

Compare 5:4 to 2:1

$$5:4 = 15:12$$

$$2:1 = ??:?$$

Same number of pupils in the class = 27

Multiply ratio 2:1 by 9 ($\frac{27}{3}$)

$$18:9$$

3 more pupils did do their homework, the teacher was correct.

1) Changing Ratios: Harder

Solution for Question 6:

Sedimentary : Metamorphic = 2:3

Metamorphic : Igneous = 9:10

Multiply ratio 2:3 by 3 = 6:9

Therefore, sedimentary to igneous = 6:10

Solution for Question 7:

Road bikes: Mountain bikes

3:5

The minimum number of bikes sold is 3 road and 5 mountain, if the ratio changes to 2:1 but no more mountain bikes are sold then ratio is 10:5 so 7 more road bikes must have been sold.

It is not the only answer as there could have been many numbers of bikes sold, the ratio is 3:5 this could be 6:10 or any equivalent ratio. If it was 6 to 10 for example to change to 2:1 ratio must be 20:10 which would mean 14 more road bikes sold, so the number more road bikes sold is any multiple of 7

2) Solving Quadratics Using the Formula: Easier

1. Solve $3x^2 + 7x - 13 = 0$
Give your solutions correct to 2 decimal places.

$$a = 3 \quad b = 7 \quad c = -13$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-7 \pm \sqrt{7^2 - 4 \times 3 \times -13}}{2 \times 3} = \frac{-7 \pm \sqrt{205}}{6}$$

$$= 1.219636844 \quad \text{or} \quad -3.552970177$$

$$x = \underline{1.22} \dots \dots \dots \text{or } x = \underline{-3.55} \dots \dots \dots$$

(3 marks)

2. Solve the equation

$$2x^2 + 6x - 95 = 0$$

Give your solutions correct to 3 significant figures.

$$a = 2 \quad b = 6 \quad c = -95$$

$$x = \frac{-6 \pm \sqrt{36 - (4 \times 2 \times -95)}}{4}$$

$$= \frac{-6 \pm \sqrt{796}}{4}$$

$$= 5.55336799 \quad \text{or} \quad -8.55336799$$

$$x = \underline{5.55} \dots \dots \dots \text{or } x = \underline{-8.55} \dots \dots \dots$$

(3 marks)

2) Solving Quadratics Using the Formula: Medium

3. Solve $x^2 + 3x - 5 = 0$
Give your solutions correct to 4 significant figures.

$$a = 1 \quad b = 3 \quad c = -5$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-3 \pm \sqrt{9 - (4 \times 1 \times -5)}}{2}$$

$$= \frac{-3 \pm \sqrt{29}}{2}$$

$$x = 1.192582404 \text{ or } -4.192582404$$

$$x = 1.193 \text{ or } -4.193$$

(3 marks)

4. Solve this quadratic equation.

$$x^2 - 5x - 8 = 0$$

Give your answers correct to 3 significant figures.

$$a = 1 \quad b = -5 \quad c = -8$$

$$x = \frac{5 \pm \sqrt{25 - (4 \times 1 \times -8)}}{2}$$

$$= \frac{5 \pm \sqrt{57}}{2}$$

$$x = 6.274917218 \text{ or } -1.274917218$$

$$x = 6.27 \text{ or } -1.27$$

(3 marks)

2) Solving Quadratics Using the Formula: Harder

9. The diagram shows a 6-sided shape.
All the corners are right angles.
All the measurements are given in centimetres.

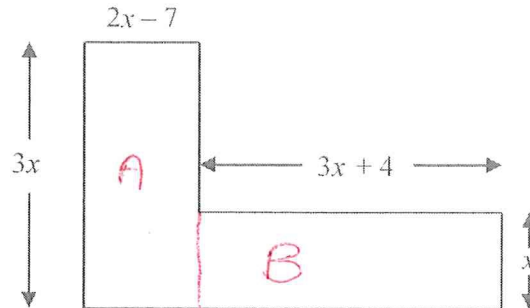


Diagram NOT accurately drawn

The area of the shape is 85 cm^2 .

- (a) Show that $9x^2 - 17x - 85 = 0$

$$A = 3x(2x-7) \quad B = x(3x+4)$$

$$= 6x^2 - 21x \quad = 3x^2 + 4x$$

$$6x^2 - 21x + 3x^2 + 4x = 85$$

$$9x^2 - 17x - 85 = 0 \quad (3)$$

- (b) (i) Solve $9x^2 - 17x - 85 = 0$

Give your solutions correct to 3 significant figures.

$$a=9 \quad b=-17 \quad c=-85$$

$$x = \frac{17 \pm \sqrt{17^2 - 4(9)(-85)}}{18}$$

$$x = 4.159474732 \quad \text{or} \quad x = -2.270585844$$

$$x = 4.16 \dots \quad \text{or} \quad x = -2.27 \dots$$

- (ii) Hence, work out the length of the shortest side of the 6-sided shape.

$$2x-7$$

$$\dots 1.38 \dots \text{ cm}$$

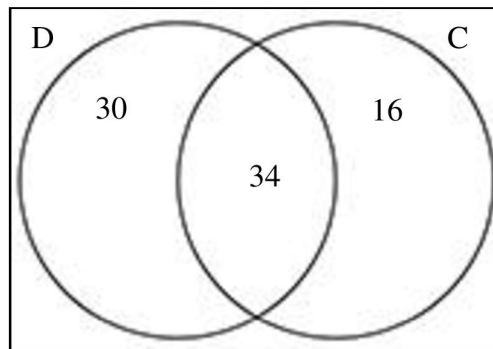
(4)

3) Venn diagrams.: Easier

Solution for Question 1:

Number of people that owned dogs only: $64 - 34 = 30$

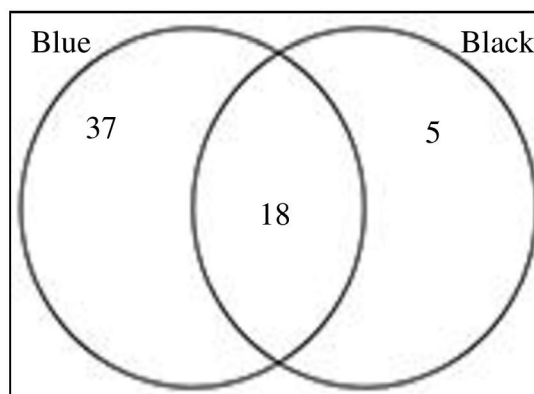
Number of people that owned cats only: $80 - 34 - 30 = 16$



Solution for Question 2:

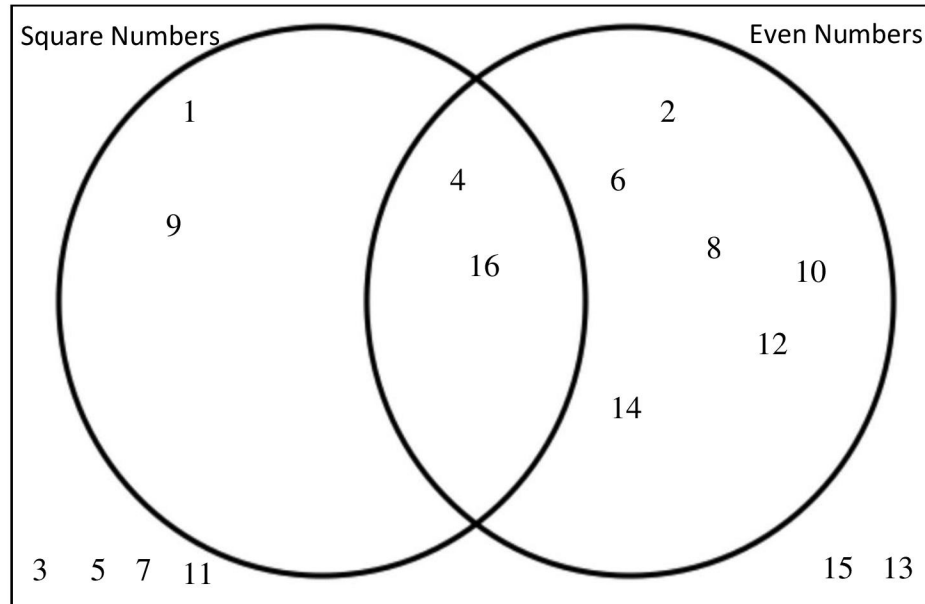
a) Number of people that only had a black pen:
 $60 - 37 - 18 = 5$

b) Probability of a person owning both types of pen:
 $\frac{18}{60} = \frac{3}{10}$



3) Venn diagrams.: Medium

Solution for Question 3:



Solution for Question 4:

- a) Tea: $6 + 12 = 18$
 Coffee: $9 + 12 = 21$
 Therefore, False
- b) False
- c) False

Solution for Question 5:

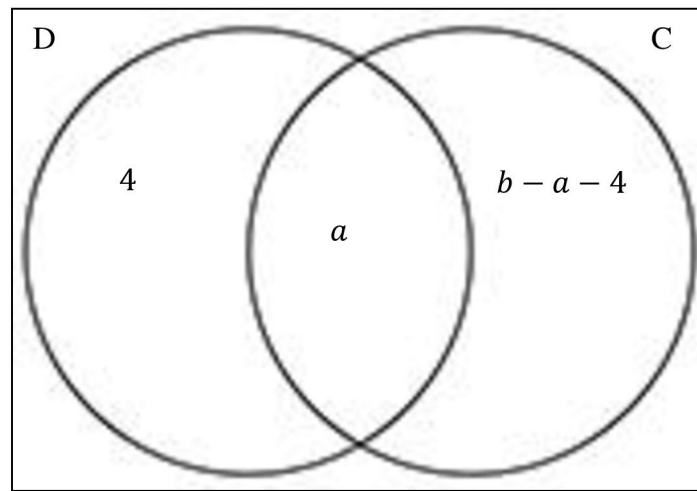
- a)
- i) $A \cap B = A$ and $B = \{9,15\}$
- ii) $A \cup B = A$ or $B = \{3,5,6,12,18\}$

3) Venn diagrams.: Harder

Solution for Question 6:

Number of people who replied with cats only:

$$b - a - 4$$



4) More Difficult Rearranging Formulae: Easier

1. Rearrange $a(q - c) = d$ to make q the subject.

$$aq - ac = d$$

$$aq = d + ac$$

$$q = \frac{d + ac}{a}$$

$$q = \frac{d + ac}{a} \dots\dots\dots (3)$$

(Total 5 marks)

2. (a) Make n the subject of the formula $m = 5n - 21$

$$m + 21 = 5n$$

$$n = \frac{m + 21}{5}$$

4) More Difficult Rearranging Formulae: Medium

(b) Make p the subject of the formula $4(p - 2q) = 3p + 2$

$$4p - 8q = 3p + 2$$

$$p = 2 + 8q$$

$$p = \dots\dots\dots$$

(3)

(Total 5 marks)

3.

$$P = \pi r + 2r + 2a$$

Make r the subject of the formula

$$P - 2a = r(\pi + 2)$$

$$r = \frac{P - 2a}{\pi + 2}$$

(Total 3 marks)

4) More Difficult Rearranging Formulae: Harder

12. Rearrange $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

to make u the subject of the formula.

Give your answer in its simplest form.

$$fv + fu = uv$$

$$fu - uv = fv$$

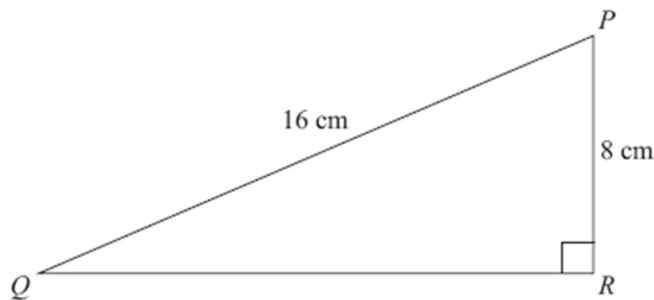
$$u(f-v) = fv$$

$$u = \frac{fv}{f-v}$$

5) Pythagoras: Easier

1.

Diagram NOT
accurately drawn



PQR is a right-angled triangle.
 $PQ = 16$ cm.
 $PR = 8$ cm.

Calculate the length of QR .
 Give your answer correct to 2 decimal places.

$$QR^2 = 16^2 - 8^2 = 192$$

$$QR = \sqrt{192} = 13.86 \text{ cm}$$

..... **13.86** cm

(3 marks)

2.

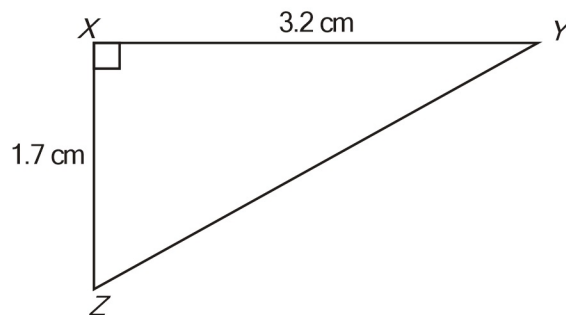


Diagram NOT
accurately drawn

XYZ is a right-angled triangle.
 $XY = 3.2$ cm.
 $XZ = 1.7$ cm.

Calculate the length of YZ .

Give your answer correct to 3 significant figures.

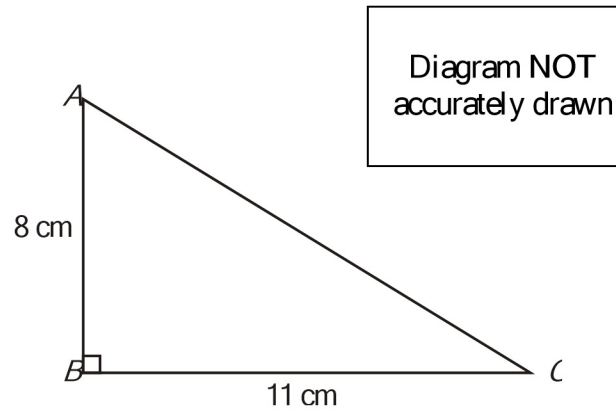
$$YZ^2 = 3.2^2 + 1.7^2 = 13.13$$

$$YZ = \sqrt{13.13} = 3.62 \text{ cm}$$

..... **3.62** cm

5) Pythagoras: Medium

3.



ABC is a right-angled triangle.

$AB = 8$ cm,
 $BC = 11$ cm.

Calculate the length of AC .
Give your answer correct to 3 significant figures.

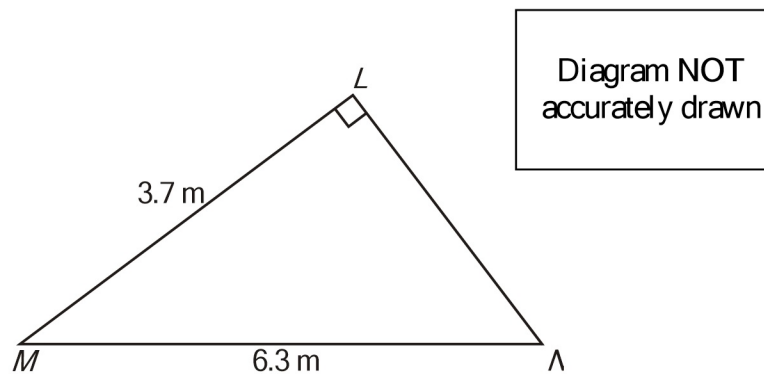
$$AC^2 = 8^2 + 11^2 = 185$$

$$AC = \sqrt{185} = 13.6 \text{ cm}$$

..... 13.6 cm

(3 marks)

4.



Angle $MLN = 90^\circ$.
 $LM = 3.7$ m.
 $MN = 6.3$ m.

Work out the length of LN .
Give your answer correct to 3 significant figures.

$$LN^2 = 6.3^2 - 3.7^2 = 26$$

$$LN = \sqrt{26} = 5.10 \text{ m}$$

$LN =$ 5.10 m

5) Pythagoras: Harder

13. $ABCD$ is a trapezium.

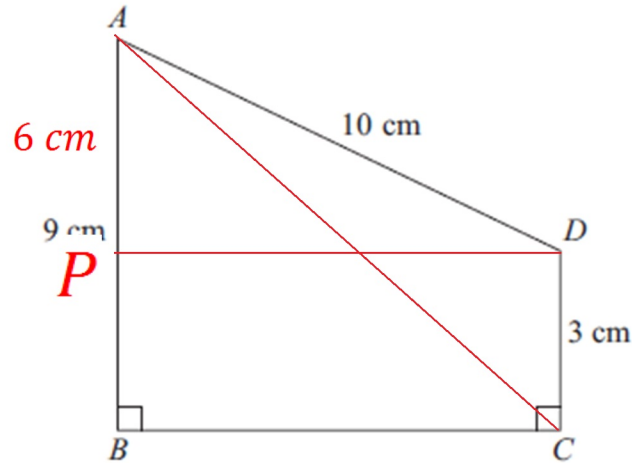


Diagram **NOT** accurately drawn

$AD = 10$ cm
 $AB = 9$ cm
 $DC = 3$ cm
 Angle $ABC =$ angle $BCD = 90^\circ$

Calculate the length of AC .
 Give your answer correct to 3 significant figures.

$$AP = 9 - 3 = 6 \text{ cm}$$

$$PD^2 = 10^2 - 6^2 = 64$$

$$BC = PD = \sqrt{64} = 8 \text{ cm}$$

$$AC^2 = 9^2 + 8^2 = 145$$

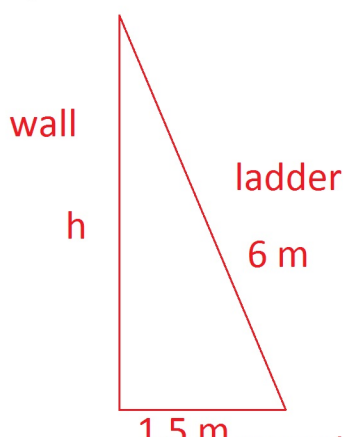
$$AC = \sqrt{145} = 12.0 \dots\dots\dots \text{ cm}$$

(5 marks)

14. A ladder is 6 m long.
 The ladder is placed on horizontal ground, resting against a vertical wall.

The instructions for using the ladder say that the bottom of the ladder must not be closer than 1.5 m from the bottom of the wall.

How far up the wall can the ladder reach?
 Give your answer correct to 1 decimal place.



$$h^2 = 6^2 - 1.5^2 = 33.75$$

$$h = \sqrt{33.75} = 5.8 \text{ m}$$

HAYES Benjamin

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Bearings. Mathswatch Clip: 124

Topic 2: Missing Mean Questions. Mathswatch Clip: NA

Topic 3: Changing Ratios. Mathswatch Clip: NA

Topic 4: Inequalities Regions. Mathswatch Clip: 198

Topic 5: More Difficult Rearranging Formulae. MW: 190

1) Bearings: Easier

1.

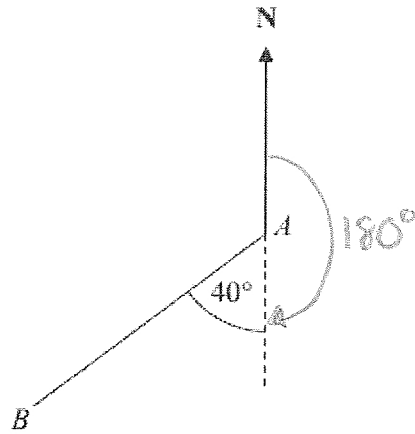


Diagram NOT accurately drawn

$180 + 40$

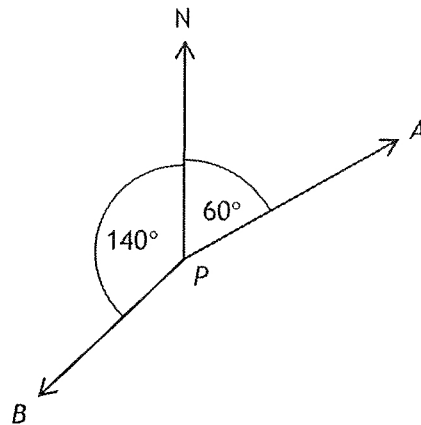
Work out the bearing of B from A.

START POINT

.....220.....°

(2 marks)

2.



(a) Write down the bearing of A from P.

Bearings are always 3 digits

.....060.....°

(b) Work out the bearing of B from P.

$360 - 140$

.....220.....°

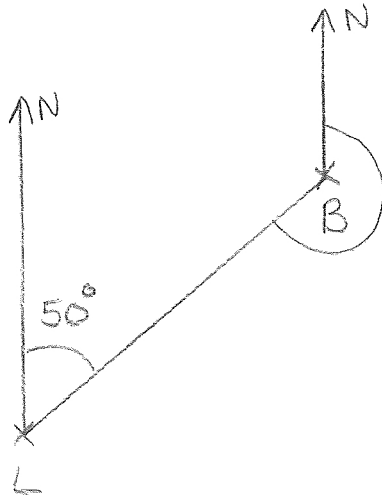
(3 marks)

1) Bearings: Medium

9. The bearing of a ship from a lighthouse is 050°

Work out the bearing of the lighthouse from the ship.

DRAW A SKETCH!
If accurate, you can measure the bearing



.....
230.....°

(2 marks)

1) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

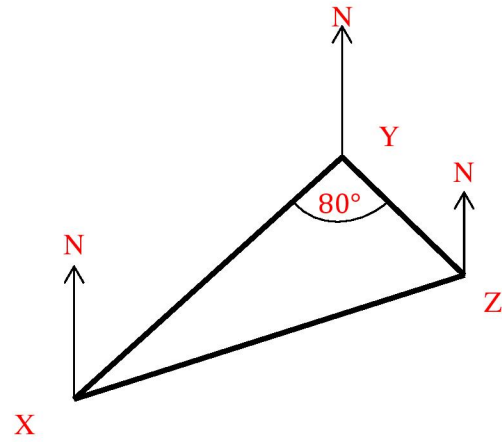
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

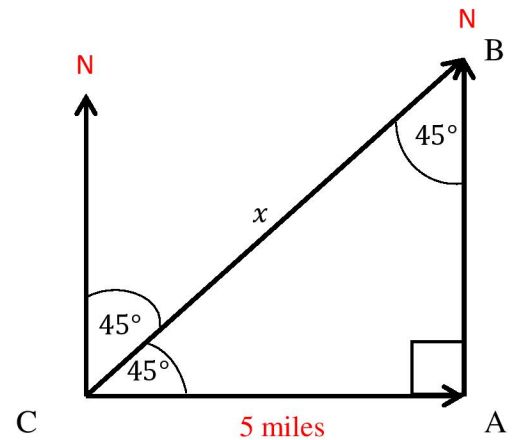
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



2) Missing Mean Questions: Easier

1) The mean of 8 and another number is 13.

What is the other number?

$$\text{Solution: } (8+x)/2 = 13 \quad \times 2$$

$$8 + x = 26 \quad - 8$$

$$x = 18$$

$$\underline{\hspace{2cm}} 18 \underline{\hspace{2cm}}$$

(3 Marks)

2) The mean of 2, 5, 8 and x is 4

Find x

$$\text{Solution: } (2 + 5 + 8 + x) / 4 = 4 \quad \times 4$$

$$15 + x = 16 \quad -15$$

$$x = 1$$

$$\underline{\hspace{2cm}} x = 1 \underline{\hspace{2cm}}$$

(3 Marks)

3) After measuring the heights of 7 people, they have an average height of 156cm. After measuring the heights of 8 people they have an average height of 158cm. How tall is the 8th person?

$$\text{Solution: } 7 \times 156 = 1092$$

$$8 \times 158 = 1264$$

$$1092 - 1264 = 172$$

(3 Marks)

$$\underline{\hspace{2cm}} 172 \underline{\hspace{2cm}}$$

2) Missing Mean Questions: Medium

4) The mean weight of a group of 7 girls is 58kg

a) Work out their total weight

Solution: $7 \times 58 = 406\text{kg}$

_____406_____Kg

When a 8th girl joins the group, the mean weight goes up to 59kg.

b) What is the weight of the 8th girl?

Solution: $59 \times 8 = 472$

$472 - 406 = 66 \text{ Kg}$

_____66_____Kg

(3 Marks)

5) The mean distance that Jack runs in his last 10 runs is 5.7 miles. Work out the distance that he would need to run to make this exactly 6 miles.

Solution: $10 \times 5.7 = 57$

$11 \times 6 = 66$

$66 - 57 = 9$

_____9 miles_____

(2 Marks)

2) Missing Mean Questions: Harder

- 6) Waitresses and kitchen staff in a restaurant decide to share their tips. There are 8 kitchen staff 10 waitresses. The kitchen staff receives a mean of £23 weekly and the waitresses receive a mean of £28 weekly.

Work out the mean of all 18 members of staff.

$$\begin{aligned} \text{Solution: } 23 \times 8 &= 184 \\ 28 \times 10 &= 280 \end{aligned}$$

$$\text{Total} = 184 + 280 = 464$$

$$\text{Mean} = 464/18 = 25.78$$

_____ £25.78 _____

(3 Marks)

- 7) The mean of a, a, b is 30

The mean of a, a, b, b, b is 20

Find the values of a and b

Solution:

$$(2a + b) / 3 = 30 \quad \times 3$$

$$(2a + 3b) / 5 = 20 \quad \times 5$$

$$2a + b = 90 \quad - \quad \text{solve simultaneously}$$

$$2a + 3b = 100$$

$$-2b = -10$$

$$b = 5$$

$$2a + 5 = 90$$

$$2a = 85$$

$$a = 42.5$$

$a = 42.5$ $b = 5$ _____

(5 Marks)

3) Changing Ratios: Easier

Solution for Question 1:

a) Red : Blue = 8:12

Divide through by 4 to simplify: 2:3

b) Red : Blue = 8:10

Divide through by 2 to simplify: 4:5

Solution for Question 2:

a) Pen : Pencils = 2:3

Equivalent to 20:30

30 pencils in pencil case

b) Only pencils removed so still 20 pens, ratio 4:3 equivalent to 20:15 so removed 15 pencils

3) Changing Ratios: Medium

Solution for Question 3:

$$1:3:5$$

$$1:3+5 = 1:8$$

Solution for Question 4:

$$\text{Orange : Red} = 2:3$$

$$2:3 = 5$$

$$x:51 = y$$

$$\frac{51}{3} = 17$$

$$x = 2 \times 17 = 34$$

$$y = 5 \times 17 = 85$$

$$\text{Ratio of Orange to Red} = 34:51$$

Compare 2:3 to 10:17, achieving same number for red sweets

$$2:3 = 34:51$$

Multiply ratio 10:17 by 3

$$30:51$$

4 orange sweets were eaten by Solomon.

Solution for Question 5:

$$\text{HW : No HW} = 5:4$$

$$5:4 = 9$$

$$15:x = y$$

$$\frac{15}{5} = 3$$

$$x = 4 \times 3 = 12$$

$$y = 9 \times 3 = 27$$

$$\text{Ratio of HW done to HW not done} = 15:12$$

Compare 5:4 to 2:1

$$5:4 = 15:12$$

$$2:1 = ?:?$$

Same number of pupils in the class = 27

Multiply ratio 2:1 by 9 ($\frac{27}{3}$)

$$18:9$$

3 more pupils did do their homework, the teacher was correct.

3) Changing Ratios: Harder

Solution for Question 6:

Sedimentary : Metamorphic = 2:3

Metamorphic : Igneous = 9:10

Multiply ratio 2:3 by 3 = 6:9

Therefore, sedimentary to igneous = 6:10

Solution for Question 7:

Road bikes: Mountain bikes

3:5

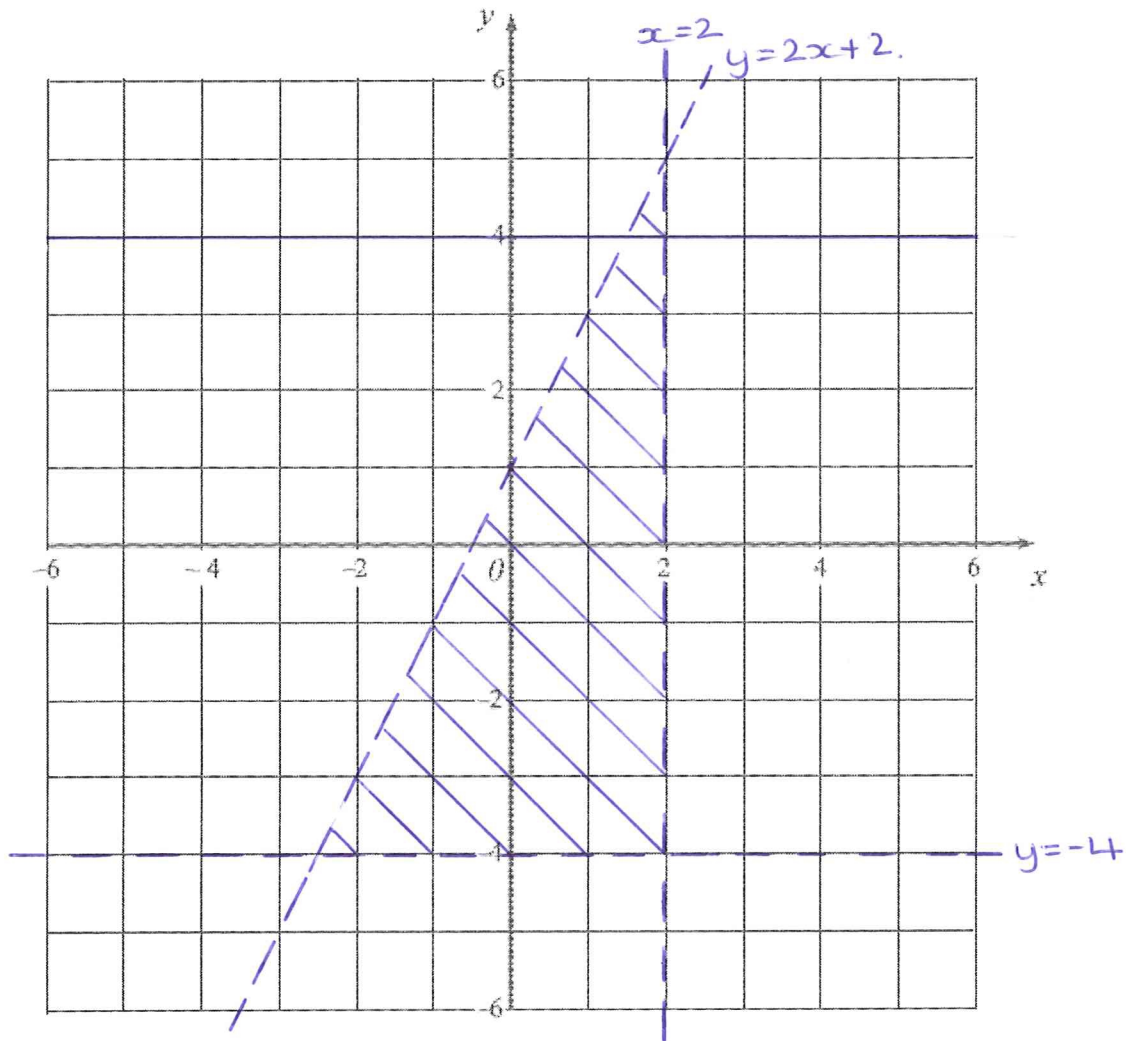
The minimum number of bikes sold is 3 road and 5 mountain, if the ratio changes to 2:1 but no more mountain bikes are sold then ratio is 10:5 so 7 more road bikes must have been sold.

It is not the only answer as there could have been many numbers of bikes sold, the ratio is 3:5 this could be 6:10 or any equivalent ratio. If it was 6 to 10 for example to change to 2:1 ratio must be 20:10 which would mean 14 more road bikes sold, so the number more road bikes sold is any multiple of 7

4) Inequalities Regions: Easier

1. On the grid, shade the region that satisfies all three of these inequalities

$$y > -4 \quad x < 2 \quad y < 2x + 1$$



(Total for Question 19 = 4 marks)

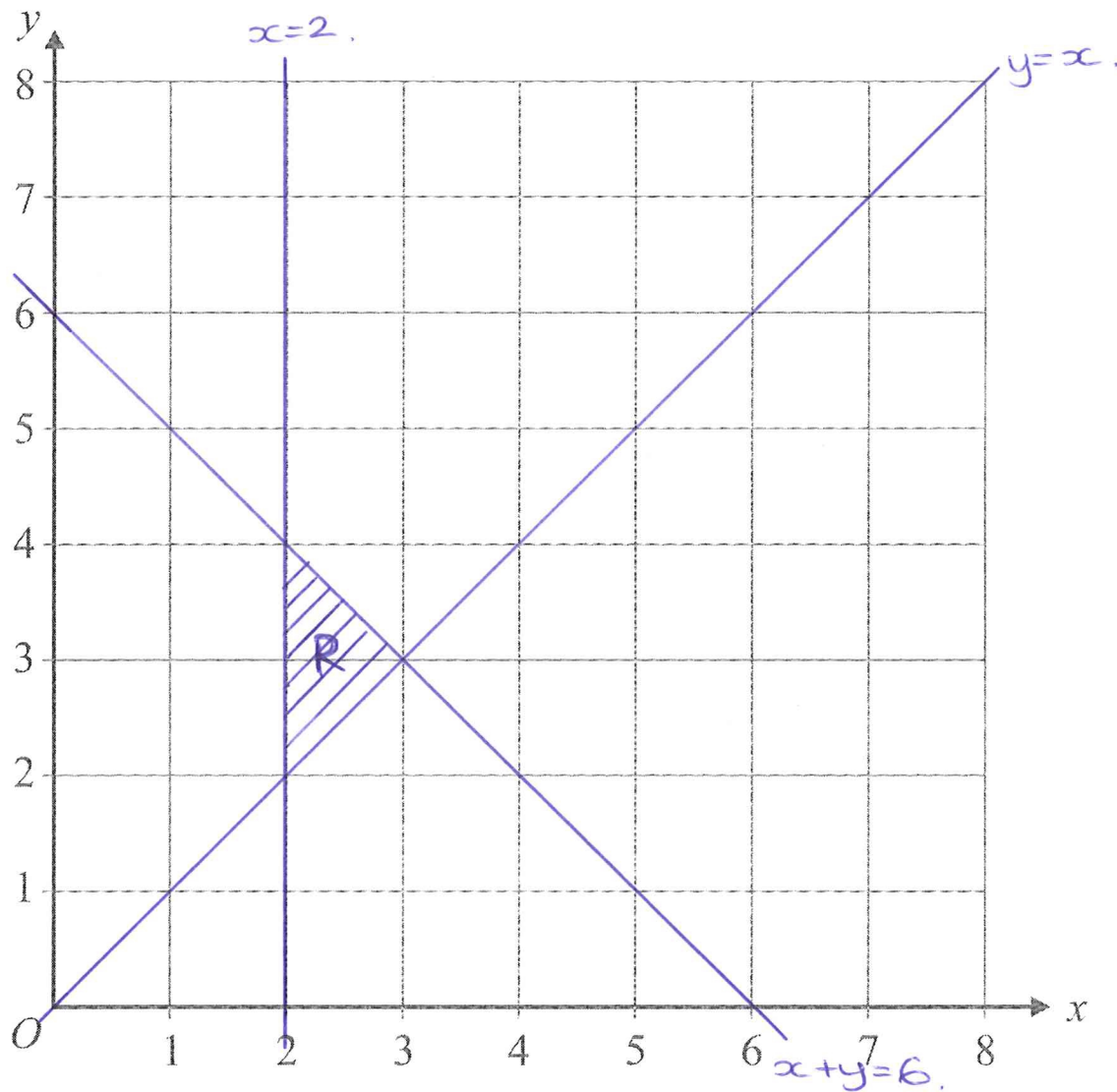
4) Inequalities Regions: Medium

6. (a) On the grid below, draw straight lines and use shading to show the region **R** that satisfies the inequalities

$$x \geq 2$$

$$y \geq x$$

$$x + y \leq 6$$



(3)

The point P with coordinates (x, y) lies inside the region **R**.
 x and y are **integers**.

- (b) Write down the coordinates of **all** the points of **R** whose coordinates are both integers.

$(2, 2)$ $(2, 3)$ $(2, 4)$ $(3, 3)$

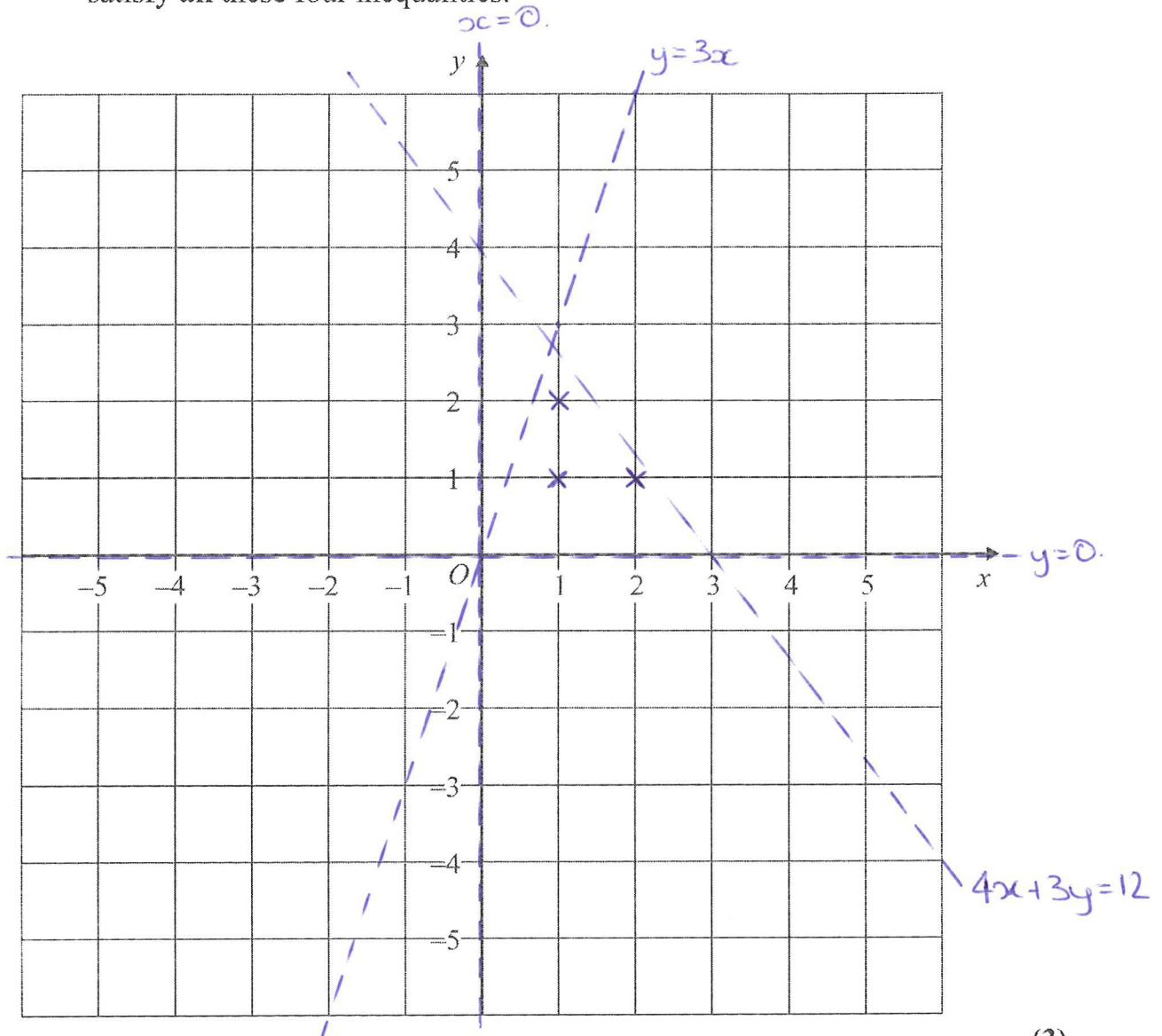
(2)

4) Inequalities Regions: Harder

7. $4x + 3y < 12$, $y < 3x$, $y > 0$, $x > 0$

x and y are both integers.

On the grid, mark with a cross (\times), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

5) More Difficult Rearranging Formulae: Easier

1. Rearrange $a(q - c) = d$ to make q the subject.

$$aq - ac = d$$

$$aq = d + ac$$

$$q = \frac{d + ac}{a}$$

$$q = \frac{d + ac}{a} \dots\dots\dots (3)$$

(Total 5 marks)

2. (a) Make n the subject of the formula $m = 5n - 21$

$$m + 21 = 5n$$

$$n = \frac{m + 21}{5}$$

5) More Difficult Rearranging Formulae: Medium

10. $P = \frac{n^2 + a}{n + a}$

Rearrange the formula to make a the subject.

$$p(n+a) = n^2 + a$$

$$pn + pa = n^2 + a$$

$$pa - a = n^2$$

$$a(p-1) = n^2$$

$$a = \frac{n^2}{p-1}$$

$$a = \dots\dots\dots$$

(Total 4 marks)

11. $\frac{x}{x+c} = \frac{p}{q}$

Make x the subject of the formula.

$$xq = p(x+c)$$

$$xq = px + cp$$

$$x(q-p) = cp$$

$$x = \frac{cp}{q-p}$$

$$x = \dots\dots\dots$$

(Total 4 marks)

5) More Difficult Rearranging Formulae: Harder

12. Rearrange $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

to make u the subject of the formula.

Give your answer in its simplest form.

$$fv + fu = uv$$

$$fu - uv = fv$$

$$u(f - v) = fv$$

$$u = \frac{fv}{f - v}$$

HOWELL Zulekha

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Bearings. Mathswatch Clip: 124

Topic 2: Solving Quadratics Using the Formula. MW: 191

Topic 3: Inequalities Regions. Mathswatch Clip: 198

Topic 4: More Difficult Rearranging Formulae. MW: 190

Topic 5: Pythagoras. Mathswatch Clip: 150

1) Bearings: Easier

1.

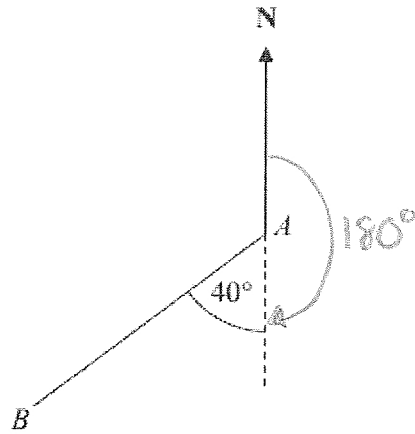


Diagram NOT accurately drawn

$180 + 40$

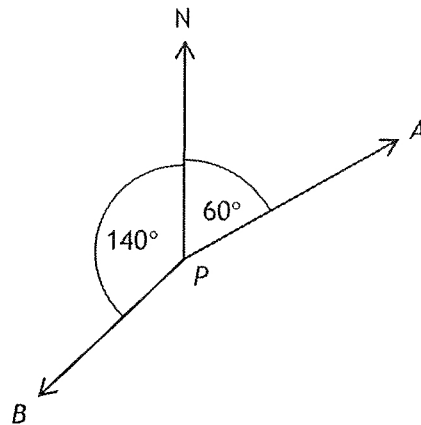
Work out the bearing of B from A.

START POINT

.....220.....°

(2 marks)

2.



(a) Write down the bearing of A from P.

Bearings are always 3 digits

.....060.....°

(b) Work out the bearing of B from P.

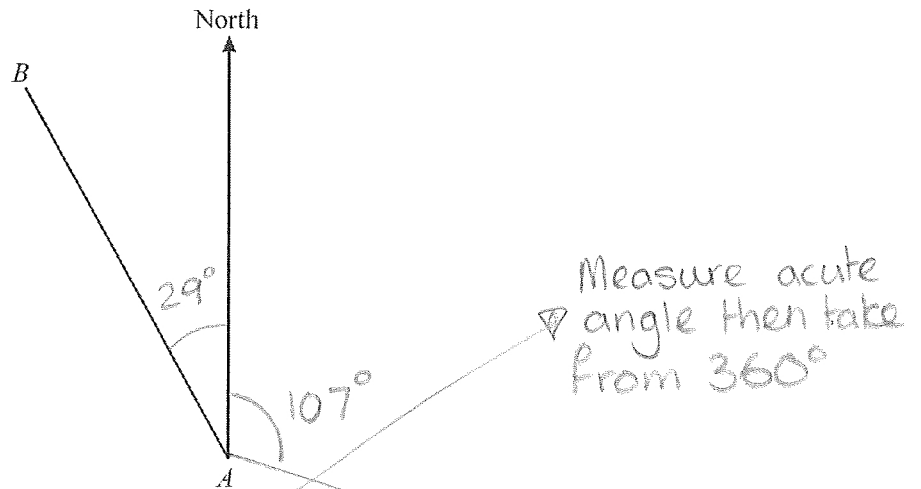
$360 - 140$

.....220.....°

(3 marks)

1) Bearings: Medium

3.



(a) Measure and write down the bearing of B from A.

$$360 - 29$$

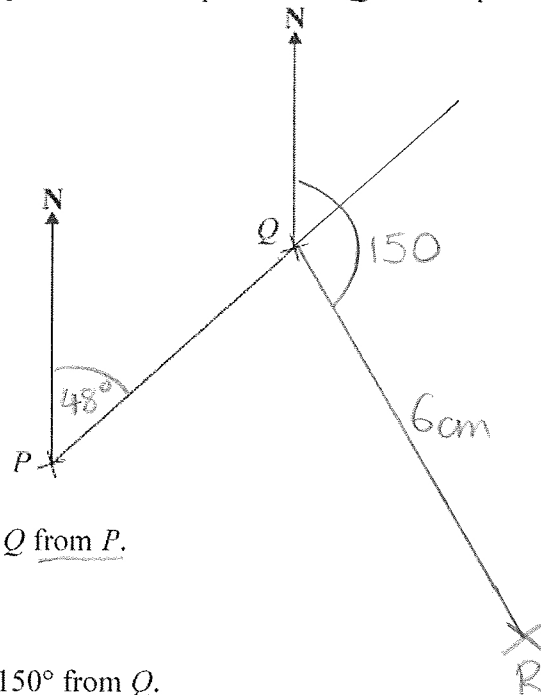
.....
331°
(1)

(b) On the diagram, draw a line on a bearing of 107° from A.

clockwise

(1)
(2 marks)

4. The diagram shows the position of two ports P and Q on a map.



(a) Measure the bearing of Q from P.

.....
048°
(1)

A rock R is on a bearing of 150° from Q.
On the map R is 6 cm from Q.

(b) Mark the position of R with a cross (x) and label it R.

(2)

1) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

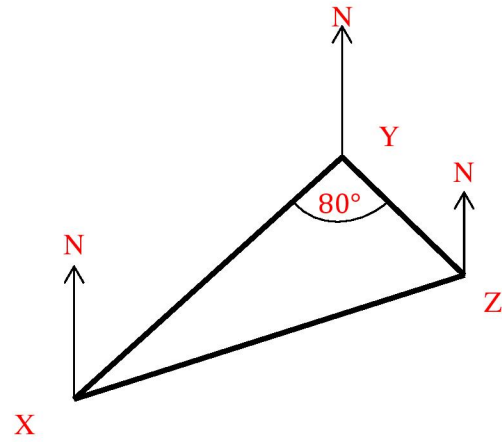
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

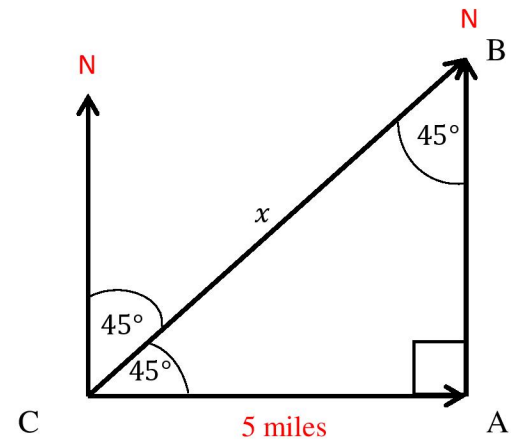
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



2) Solving Quadratics Using the Formula: Easier

1. Solve $3x^2 + 7x - 13 = 0$
Give your solutions correct to 2 decimal places.

$$a = 3 \quad b = 7 \quad c = -13$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-7 \pm \sqrt{7^2 - 4 \times 3 \times -13}}{2 \times 3} = \frac{-7 \pm \sqrt{205}}{6}$$

$$= 1.219636844 \quad \text{or} \quad -3.552970177$$

$$x = \underline{1.22} \dots \dots \dots \text{ or } x = \underline{-3.55} \dots \dots \dots$$

(3 marks)

2. Solve the equation

$$2x^2 + 6x - 95 = 0$$

Give your solutions correct to 3 significant figures.

$$a = 2 \quad b = 6 \quad c = -95$$

$$x = \frac{-6 \pm \sqrt{36 - (4 \times 2 \times -95)}}{4}$$

$$= \frac{-6 \pm \sqrt{796}}{4}$$

$$= 5.55336799 \quad \text{or} \quad -8.55336799$$

$$x = \underline{5.55} \dots \dots \dots \text{ or } x = \underline{-8.55} \dots \dots \dots$$

(3 marks)

2) Solving Quadratics Using the Formula: Medium

3. Solve $x^2 + 3x - 5 = 0$
Give your solutions correct to 4 significant figures.

$$a = 1 \quad b = 3 \quad c = -5$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-3 \pm \sqrt{9 - (4 \times 1 \times -5)}}{2}$$

$$= \frac{-3 \pm \sqrt{29}}{2}$$

$$x = 1.192582404 \text{ or } -4.192582404$$

$$x = 1.193 \text{ or } -4.193$$

(3 marks)

4. Solve this quadratic equation.

$$x^2 - 5x - 8 = 0$$

Give your answers correct to 3 significant figures.

$$a = 1 \quad b = -5 \quad c = -8$$

$$x = \frac{5 \pm \sqrt{25 - (4 \times 1 \times -8)}}{2}$$

$$= \frac{5 \pm \sqrt{57}}{2}$$

$$x = 6.274917218 \text{ or } -1.274917218$$

$$x = 6.27 \text{ or } -1.27$$

(3 marks)

2) Solving Quadratics Using the Formula: Harder

9. The diagram shows a 6-sided shape.
All the corners are right angles.
All the measurements are given in centimetres.

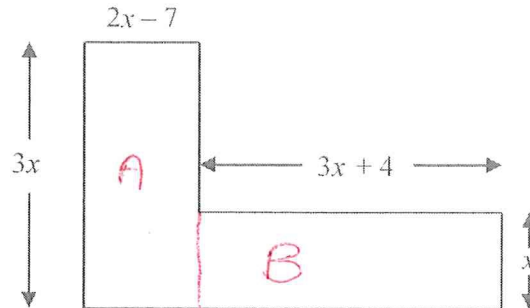


Diagram NOT accurately drawn

The area of the shape is 85 cm^2 .

- (a) Show that $9x^2 - 17x - 85 = 0$

$$A = 3x(2x-7) \\ = 6x^2 - 21x$$

$$B = x(3x+4) \\ = 3x^2 + 4x$$

$$6x^2 - 21x + 3x^2 + 4x = 85 \\ 9x^2 - 17x - 85 = 0$$

(3)

- (b) (i) Solve $9x^2 - 17x - 85 = 0$

Give your solutions correct to 3 significant figures.

$$a = 9 \quad b = -17 \quad c = -85$$

$$x = \frac{17 \pm \sqrt{17^2 - 4(9)(-85)}}{18}$$

$$x = 4.159474732 \quad \text{or} \quad x = -2.270585844$$

$$x = 4.16 \dots \quad \text{or} \quad x = -2.27 \dots$$

- (ii) Hence, work out the length of the shortest side of the 6-sided shape.

$$2x-7$$

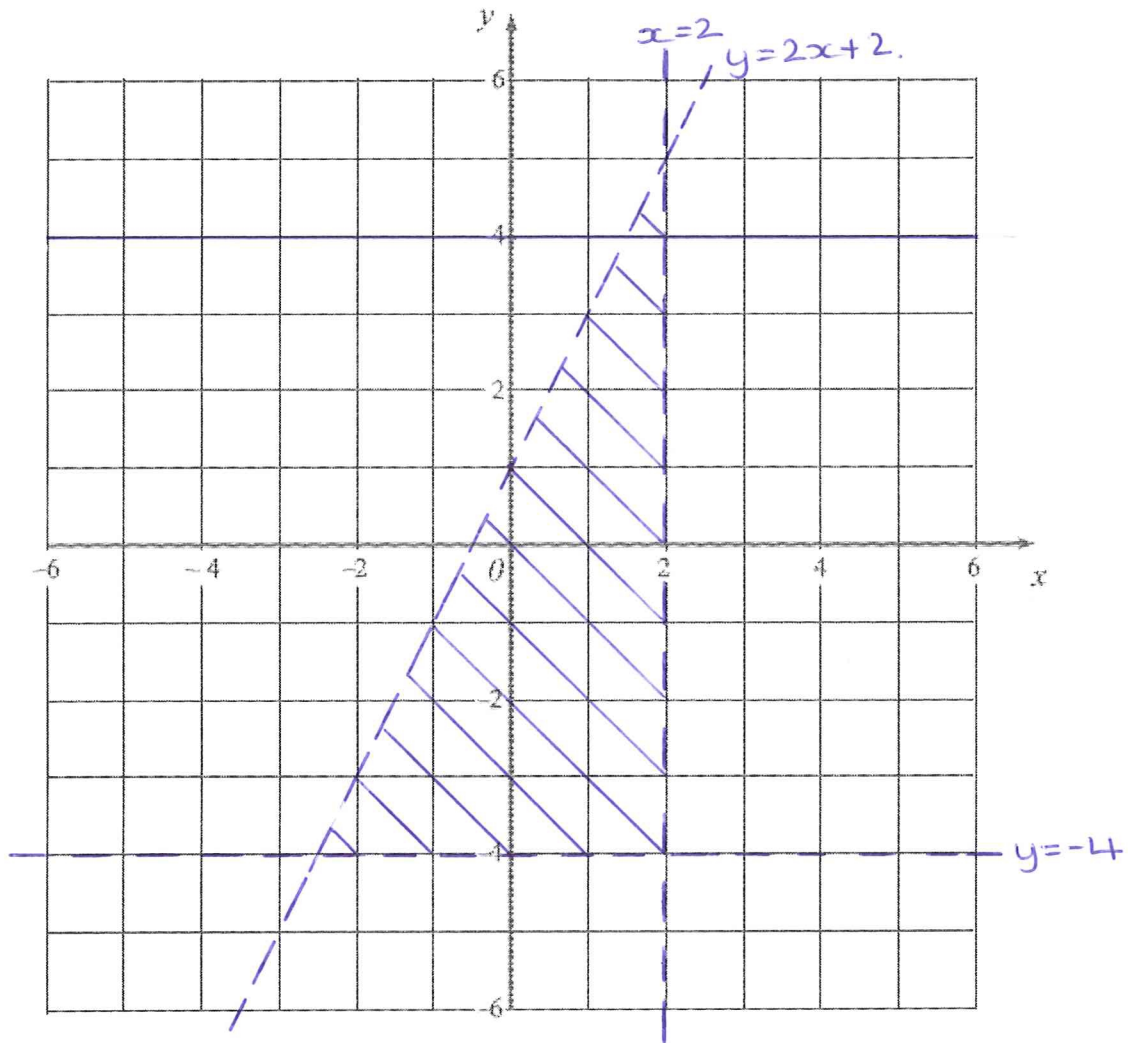
$$\dots 1.38 \dots \text{ cm}$$

(4)

3) Inequalities Regions: Easier

1. On the grid, shade the region that satisfies all three of these inequalities

$$y > -4 \quad x < 2 \quad y < 2x + 1$$



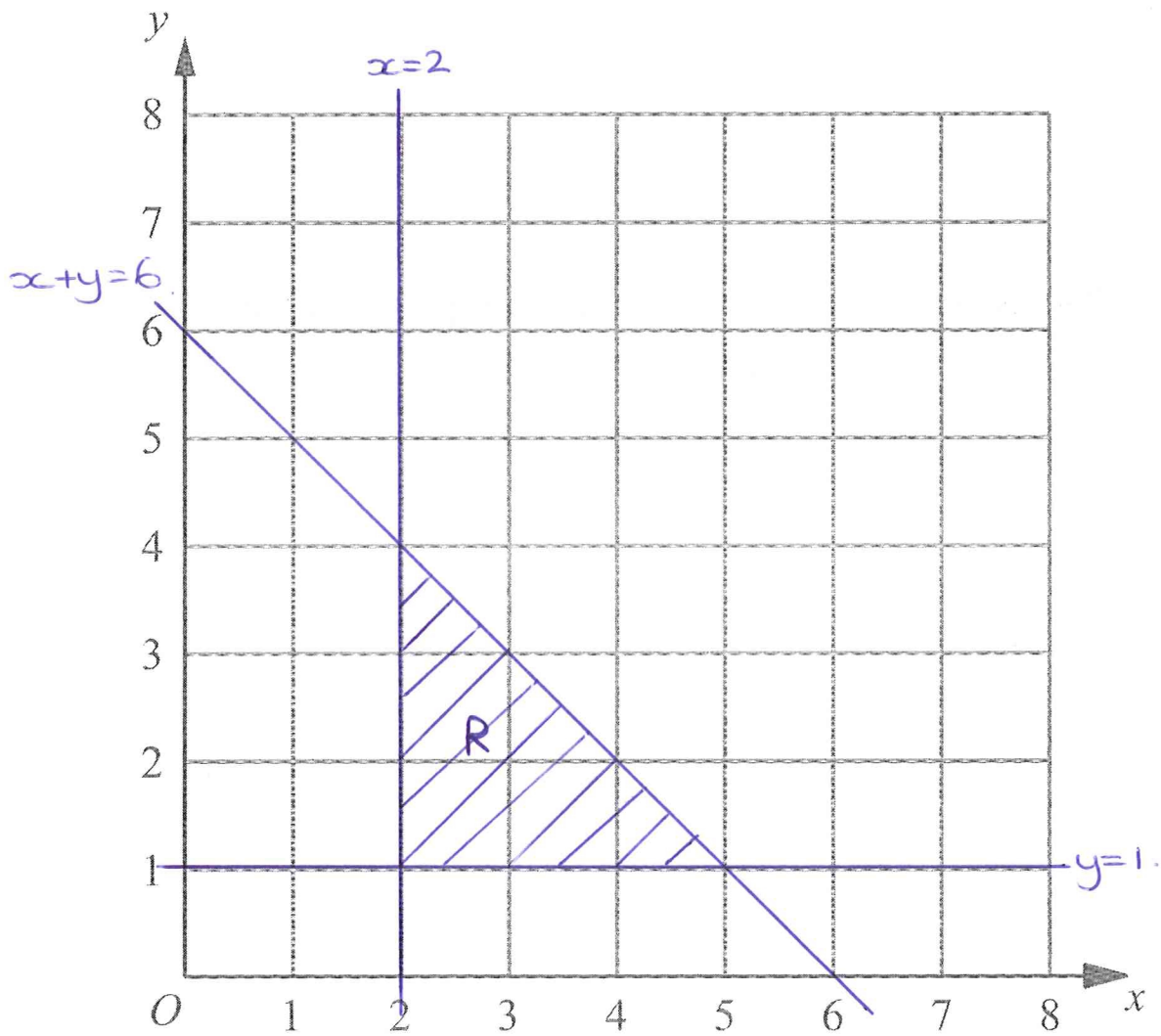
(Total for Question 19 = 4 marks)

3) Inequalities Regions: Medium

2. The region **R** satisfies the inequalities

$$x \geq 2, \quad y \geq 1, \quad x + y \leq 6$$

On the grid below, draw straight lines and use shading to show the region **R**.



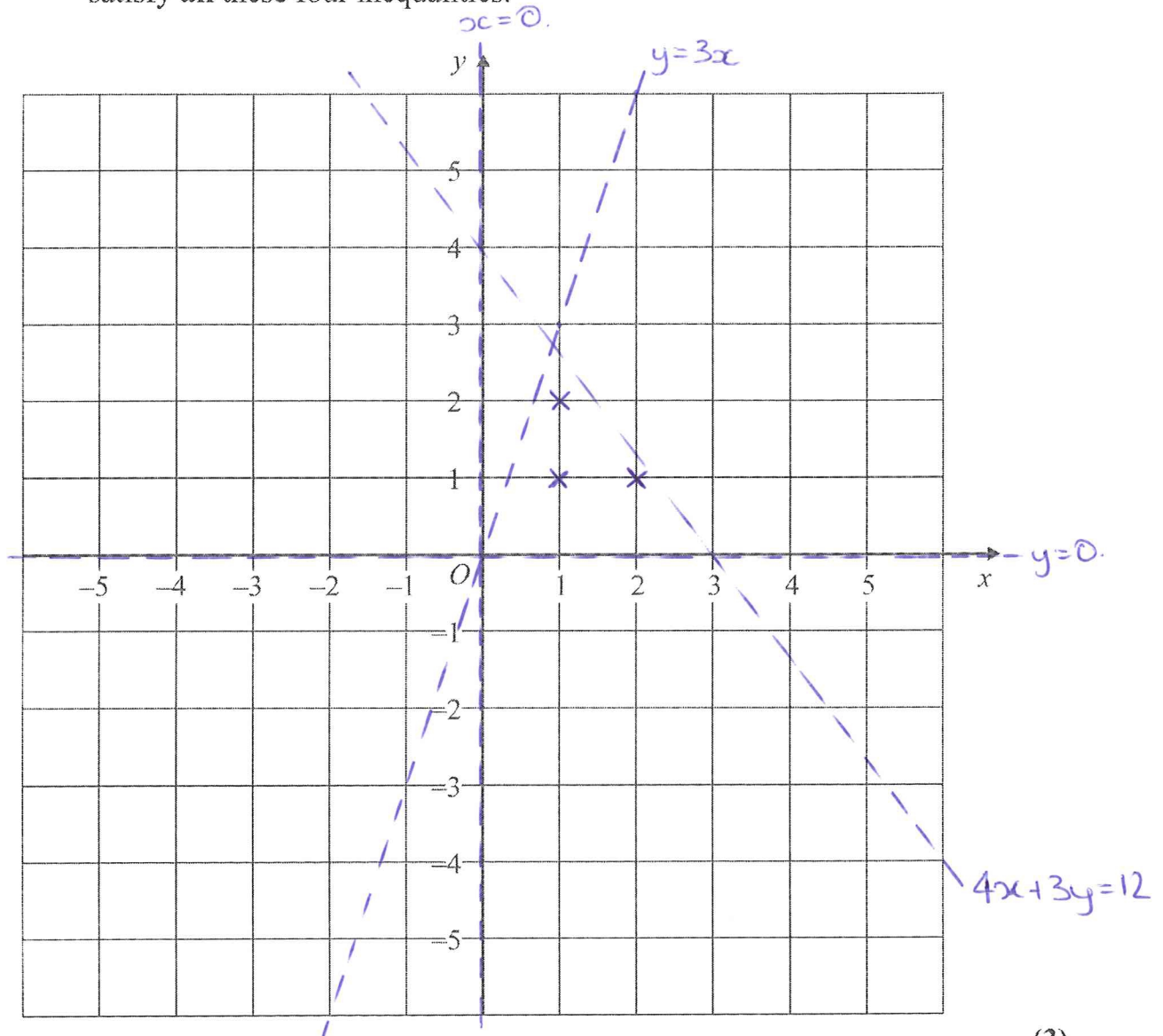
(Total 3 marks)

3) Inequalities Regions: Harder

7. $4x + 3y < 12$, $y < 3x$, $y > 0$, $x > 0$

x and y are both integers.

On the grid, mark with a cross (\times), each of the **three** points which satisfy **all** these four inequalities.



(3)
(Total 5 marks)

4) More Difficult Rearranging Formulae: Easier

1. Rearrange $a(q - c) = d$ to make q the subject.

$$aq - ac = d$$

$$aq = d + ac$$

$$q = \frac{d + ac}{a}$$

$$q = \frac{d + ac}{a} \dots \dots \dots (3)$$

(Total 5 marks)

2. (a) Make n the subject of the formula $m = 5n - 21$

$$m + 21 = 5n$$

$$n = \frac{m + 21}{5}$$

4) More Difficult Rearranging Formulae: Medium

(b) Make p the subject of the formula $4(p - 2q) = 3p + 2$

$$4p - 8q = 3p + 2$$

$$p = 2 + 8q$$

$$p = \dots\dots\dots$$

(3)

(Total 5 marks)

3.

$$P = \pi r + 2r + 2a$$

Make r the subject of the formula

$$P - 2a = r(\pi + 2)$$

$$r = \frac{P - 2a}{\pi + 2}$$

(Total 3 marks)

4) More Difficult Rearranging Formulae: Harder

12. Rearrange $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

to make u the subject of the formula.

Give your answer in its simplest form.

$$fv + fu = uv$$

$$fu - uv = fv$$

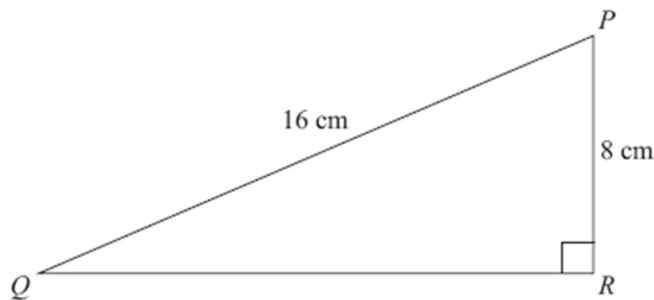
$$u(f - v) = fv$$

$$u = \frac{fv}{f - v}$$

5) Pythagoras: Easier

1.

Diagram NOT
accurately drawn



PQR is a right-angled triangle.

$PQ = 16$ cm.

$PR = 8$ cm.

Calculate the length of QR .

Give your answer correct to 2 decimal places.

$$QR^2 = 16^2 - 8^2 = 192$$

$$QR = \sqrt{192} = 13.86 \text{ cm}$$

..... **13.86** cm

(3 marks)

2.

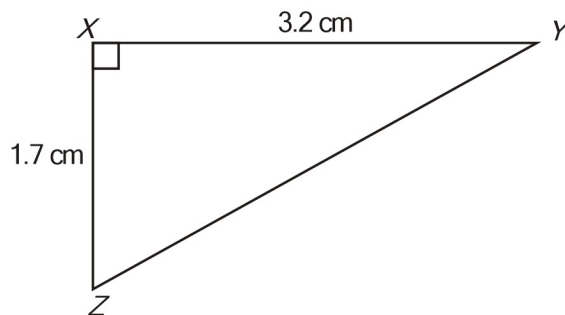


Diagram NOT
accurately drawn

XYZ is a right-angled triangle.

$XY = 3.2$ cm.

$XZ = 1.7$ cm.

Calculate the length of YZ .

Give your answer correct to 3 significant figures.

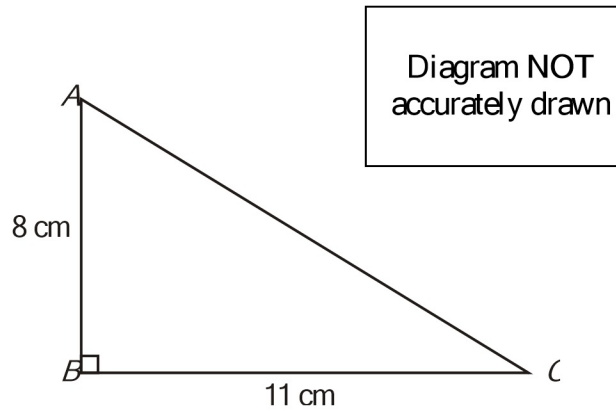
$$YZ^2 = 3.2^2 + 1.7^2 = 13.13$$

$$YZ = \sqrt{13.13} = 3.62 \text{ cm}$$

..... **3.62** cm

5) Pythagoras: Medium

3.



ABC is a right-angled triangle.

$AB = 8$ cm,
 $BC = 11$ cm.

Calculate the length of AC .
Give your answer correct to 3 significant figures.

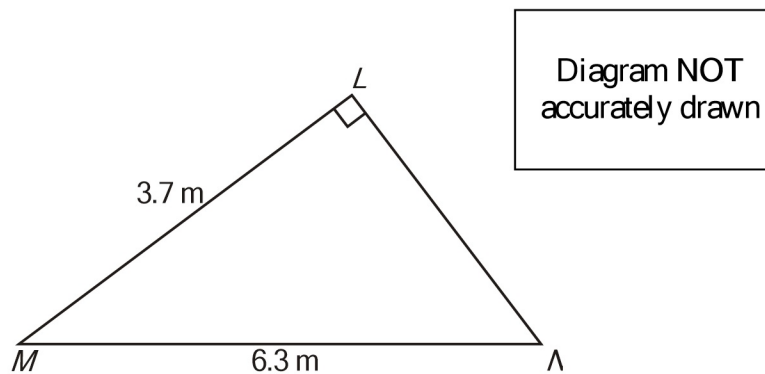
$$AC^2 = 8^2 + 11^2 = 185$$

$$AC = \sqrt{185} = 13.6 \text{ cm}$$

..... 13.6 cm

(3 marks)

4.



Angle $MLN = 90^\circ$.

$LM = 3.7$ m.

$MN = 6.3$ m.

Work out the length of LN .
Give your answer correct to 3 significant figures.

$$LN^2 = 6.3^2 - 3.7^2 = 26$$

$$LN = \sqrt{26} = 5.10 \text{ m}$$

$LN =$ 5.10 m

5) Pythagoras: Harder

13. $ABCD$ is a trapezium.

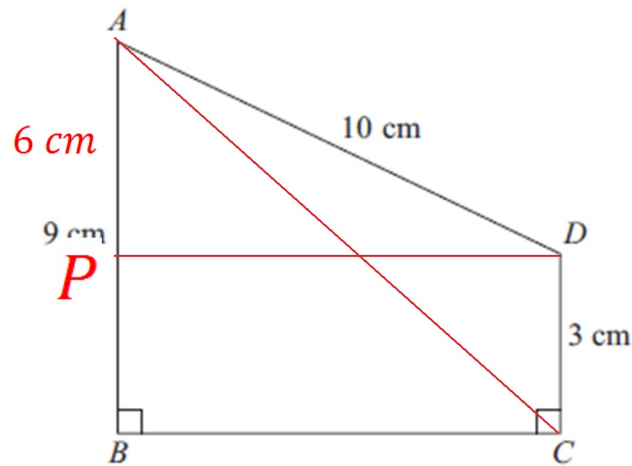


Diagram **NOT** accurately drawn

$AD = 10$ cm
 $AB = 9$ cm
 $DC = 3$ cm
 Angle $ABC =$ angle $BCD = 90^\circ$

Calculate the length of AC .
 Give your answer correct to 3 significant figures.

$$AP = 9 - 3 = 6 \text{ cm}$$

$$PD^2 = 10^2 - 6^2 = 64$$

$$BC = PD = \sqrt{64} = 8 \text{ cm}$$

$$AC^2 = 9^2 + 8^2 = 145$$

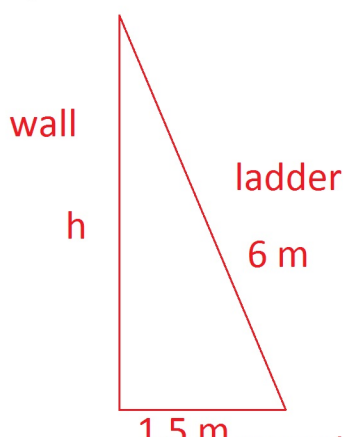
$$AC = \sqrt{145} = 12.0 \dots\dots\dots \text{ cm}$$

(5 marks)

14. A ladder is 6 m long.
 The ladder is placed on horizontal ground, resting against a vertical wall.

The instructions for using the ladder say that the bottom of the ladder must not be closer than 1.5 m from the bottom of the wall.

How far up the wall can the ladder reach?
 Give your answer correct to 1 decimal place.



$$h^2 = 6^2 - 1.5^2 = 33.75$$

$$h = \sqrt{33.75} = 5.8 \text{ m}$$

HUGHES Mia

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Missing Mean Questions. Mathswatch Clip: NA

Topic 2: More Difficult Rearranging Formulae. MW: 190

Topic 3: Pythagoras. Mathswatch Clip: 150

Topic 4: Proof. Mathswatch Clip: 193

Topic 5: Proof with vectors. Mathswatch Clip: 219

1) Missing Mean Questions: Easier

1) The mean of 8 and another number is 13.

What is the other number?

$$\begin{aligned} \text{Solution: } (8+x)/2 &= 13 && \times 2 \\ 8 + x &= 26 && - 8 \\ x &= 18 \end{aligned}$$

_____18_____

(3 Marks)

2) The mean of 2, 5, 8 and x is 4

Find x

$$\begin{aligned} \text{Solution: } (2 + 5 + 8 + x) / 4 &= 4 && \times 4 \\ 15 + x &= 16 && -15 \\ x &= 1 \end{aligned}$$

_____x = 1_____

(3 Marks)

3) After measuring the heights of 7 people, they have an average height of 156cm. After measuring the heights of 8 people they have an average height of 158cm. How tall is the 8th person?

$$\begin{aligned} \text{Solution: } 7 \times 156 &= 1092 \\ 8 \times 158 &= 1264 \\ 1092 - 1264 &= 172 \end{aligned}$$

(3 Marks)

_____172_____

1) Missing Mean Questions: Medium

4) The mean weight of a group of 7 girls is 58kg

a) Work out their total weight

Solution: $7 \times 58 = 406\text{kg}$

_____406_____Kg

When a 8th girl joins the group, the mean weight goes up to 59kg.

b) What is the weight of the 8th girl?

Solution: $59 \times 8 = 472$

$472 - 406 = 66 \text{ Kg}$

_____66_____Kg

(3 Marks)

5) The mean distance that Jack runs in his last 10 runs is 5.7 miles. Work out the distance that he would need to run to make this exactly 6 miles.

Solution: $10 \times 5.7 = 57$

$11 \times 6 = 66$

$66 - 57 = 9$

_____9 miles_____

(2 Marks)

1) Missing Mean Questions: Harder

- 6) Waitresses and kitchen staff in a restaurant decide to share their tips. There are 8 kitchen staff 10 waitresses. The kitchen staff receives a mean of £23 weekly and the waitresses receive a mean of £28 weekly.
Work out the mean of all 18 members of staff.

$$\begin{aligned} \text{Solution: } 23 \times 8 &= 184 \\ 28 \times 10 &= 280 \end{aligned}$$

$$\text{Total} = 184 + 280 = 464$$

$$\text{Mean} = 464/18 = 25.78$$

_____ £25.78 _____

(3 Marks)

- 7) The mean of a, a, b is 30

The mean of a, a, b, b, b is 20

Find the values of a and b

Solution:

$$(2a + b) / 3 = 30 \quad \times 3$$

$$(2a + 3b) / 5 = 20 \quad \times 5$$

$$2a + b = 90 \quad - \quad \text{solve simultaneously}$$

$$2a + 3b = 100$$

$$-2b = -10$$

$$b = 5$$

$$2a + 5 = 90$$

$$2a = 85$$

$$a = 42.5$$

$a = 42.5 \quad b = 5$ _____

2) More Difficult Rearranging Formulae: Easier

1. Rearrange $a(q - c) = d$ to make q the subject.

$$aq - ac = d$$

$$aq = d + ac$$

$$q = \frac{d + ac}{a}$$

$$q = \frac{d + ac}{a} \dots \dots \dots (3)$$

(Total 5 marks)

2. (a) Make n the subject of the formula $m = 5n - 21$

$$m + 21 = 5n$$

$$n = \frac{m + 21}{5}$$

2) More Difficult Rearranging Formulae: Medium

10. $P = \frac{n^2 + a}{n + a}$

Rearrange the formula to make a the subject.

$$p(n+a) = n^2 + a$$

$$pn + pa = n^2 + a$$

$$pa - a = n^2$$

$$a(p-1) = n^2$$

$$a = \frac{n^2}{p-1}$$

$$a = \dots\dots\dots$$

(Total 4 marks)

11. $\frac{x}{x+c} = \frac{p}{q}$

Make x the subject of the formula.

$$xq = p(x+c)$$

$$xq = px + cp$$

$$x(q-p) = cp$$

$$x = \frac{cp}{q-p}$$

$$x = \dots\dots\dots$$

(Total 4 marks)

2) More Difficult Rearranging Formulae: Harder

12. Rearrange $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

to make u the subject of the formula.

Give your answer in its simplest form.

$$fv + fu = uv$$

$$fu - uv = fv$$

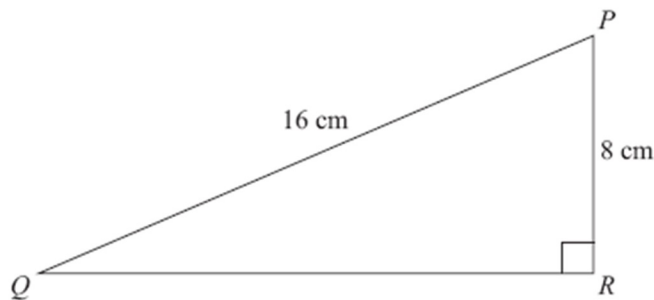
$$u(f-v) = fv$$

$$u = \frac{fv}{f-v}$$

3) Pythagoras: Easier

1.

Diagram NOT accurately drawn



PQR is a right-angled triangle.
 $PQ = 16$ cm.
 $PR = 8$ cm.

Calculate the length of QR .
 Give your answer correct to 2 decimal places.

$$QR^2 = 16^2 - 8^2 = 192$$

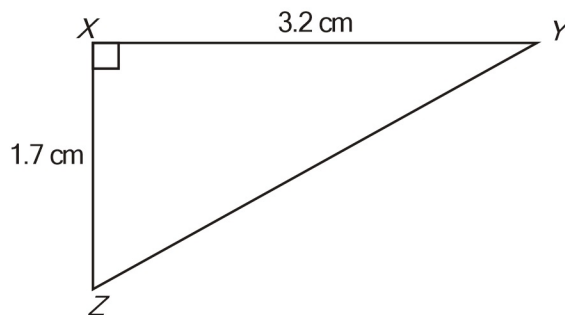
$$QR = \sqrt{192} = 13.86 \text{ cm}$$

..... **13.86** cm

(3 marks)

2.

Diagram NOT accurately drawn



XYZ is a right-angled triangle.
 $XY = 3.2$ cm.
 $XZ = 1.7$ cm.

Calculate the length of YZ .
 Give your answer correct to 3 significant figures.

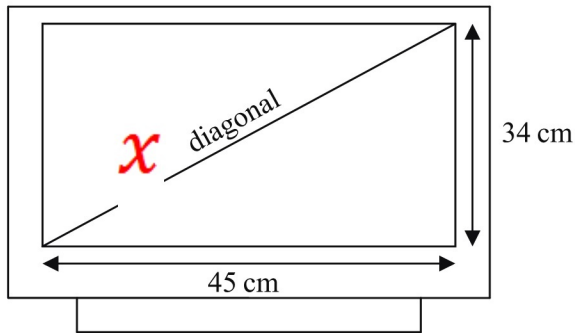
$$YZ^2 = 3.2^2 + 1.7^2 = 13.13$$

$$YZ = \sqrt{13.13} = 3.62 \text{ cm}$$

..... **3.62** cm

3) Pythagoras: Medium

7.



old version answers:

Q11 22.4 cm

Q12 11.9cm

Diagram NOT accurately drawn

A rectangular television screen has a width of 45 cm and a height of 34 cm.

Work out the length of the diagonal of the screen.
Give your answer correct to the nearest centimetre.

$$x^2 = 45^2 + 34^2 = 3181$$

$$x = \sqrt{3181} = 56 \text{ cm}$$

..... 56 cm
(4 marks)

8.

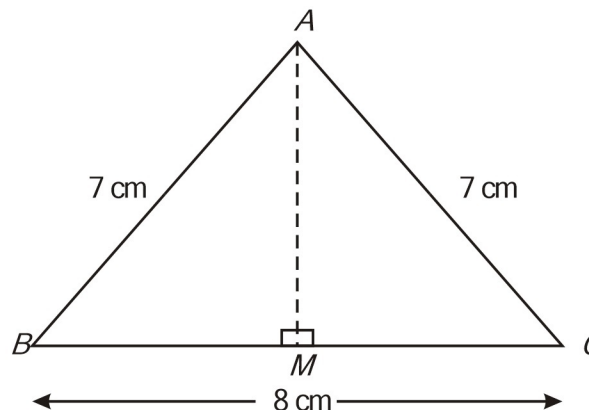


Diagram NOT accurately drawn

Work out the length, in centimetres, of AM .
Give your answer correct to 2 decimal places.

$$BM = \frac{1}{2} BC = 4 \text{ cm}$$

$$AM^2 = 7^2 - 4^2 = 33$$

$$AM = \sqrt{33} = 5.74$$

..... 5.74 cm
(3 marks)

3) Pythagoras: Harder

13. $ABCD$ is a trapezium.

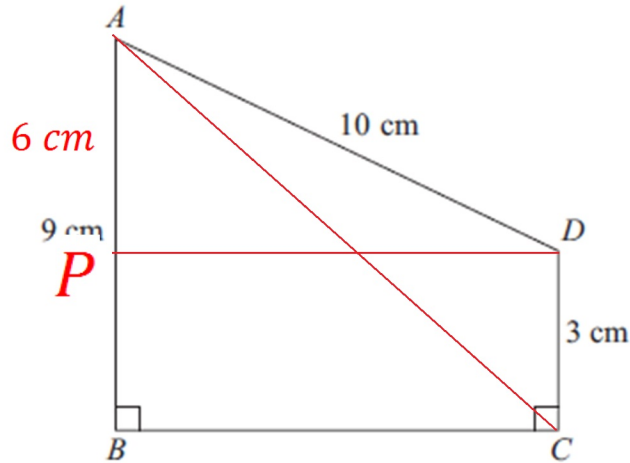


Diagram NOT accurately drawn

$AD = 10$ cm
 $AB = 9$ cm
 $DC = 3$ cm
 Angle $ABC =$ angle $BCD = 90^\circ$

Calculate the length of AC .
 Give your answer correct to 3 significant figures.

$$AP = 9 - 3 = 6 \text{ cm}$$

$$PD^2 = 10^2 - 6^2 = 64$$

$$BC = PD = \sqrt{64} = 8 \text{ cm}$$

$$AC^2 = 9^2 + 8^2 = 145$$

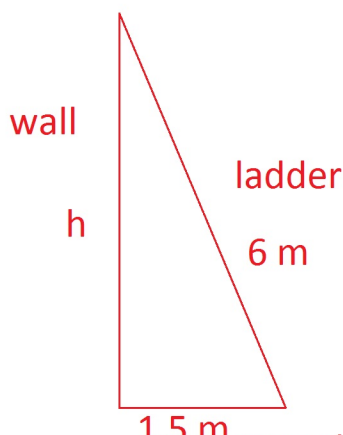
$$AC = \sqrt{145} = 12.0 \dots\dots\dots \text{ cm}$$

(5 marks)

14. A ladder is 6 m long.
 The ladder is placed on horizontal ground, resting against a vertical wall.

The instructions for using the ladder say that the bottom of the ladder must not be closer than 1.5 m from the bottom of the wall.

How far up the wall can the ladder reach?
 Give your answer correct to 1 decimal place.



$$h^2 = 6^2 - 1.5^2 = 33.75$$

$$h = \sqrt{33.75} = 5.8 \text{ m}$$

4) Proof: Easier

1. The n th even number is $2n$.

The next even number after $2n$ is $2n + 2$

- (a) Explain why.

Every alternate integer is even. As $2n$ is even
 $2n + 1$ will be odd and so $2n + 2$ is even.

(1)

- (b) Write down an expression, in terms of n , for the next even number after $2n + 2$

$$2n + 2 + 2 = 2n + 4$$

$$\underline{\underline{2n + 4}}$$

(1)

- (c) Show algebraically that the sum of any 3 consecutive even numbers is always a multiple of 6

$$\begin{aligned} & 2n + 2n + 2 + 2n + 4 \\ = & 6n + 6 \\ = & 6(n + 1) \end{aligned}$$

↑ a multiple of 6.

(3)

(5 marks)

4) Proof: Medium

8. Prove that

$(n+1)^2 - (n-1)^2 + 1$ is always odd for all positive integer values of n .

$$(n+1)^2 = n^2 + 2n + 1$$

$$(n-1)^2 = n^2 - 2n + 1$$

$$\begin{aligned}(n+1)^2 - (n-1)^2 + 1 &= (n^2 + 2n + 1) - (n^2 - 2n + 1) + 1 \\ &= n^2 + 2n + 1 - n^2 + 2n - 1 + 1 \\ &= 4n + 1\end{aligned}$$

$4n$ is a multiple of 4 so it must be even which means $4n+1$ is odd.

4) Proof: Harder

9. Prove algebraically that the sum of the squares of any two consecutive numbers always leaves a remainder of 1 when divided by 4.

consecutive numbers are n and $n+1$

$$\begin{aligned} & n^2 + (n+1)^2 \\ &= n^2 + n^2 + 2n + 1 \\ &= 2n^2 + 2n + 1 \\ &= 2n(n+1) + 1 \end{aligned}$$

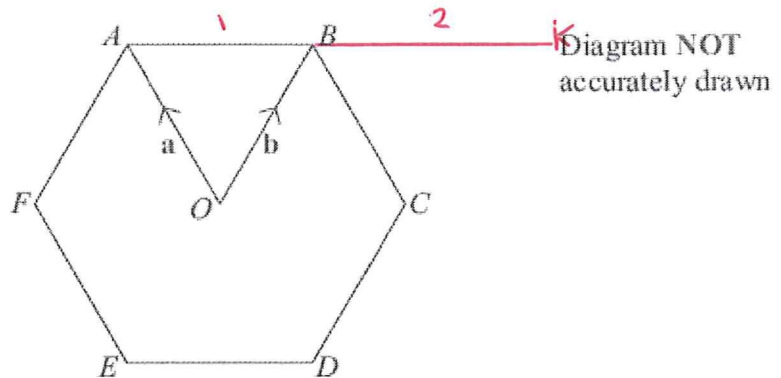
$n(n+1)$ is the product of 2 consecutive numbers. As one of them is even the product must be even.

$2n(n+1)$ is $2 \times$ an even number which has to be a multiple of 4

So $2n(n+1) + 1$ is a multiple of 4 plus 1 and will leave a remainder of 1 when divided by 4

5) Proof with vectors: Easier

1.



$ABCDEF$ is a regular hexagon, with centre O .

$$\vec{OA} = \mathbf{a}, \vec{OB} = \mathbf{b}.$$

(a) Write the vector \vec{AB} in terms of \mathbf{a} and \mathbf{b} .

$$\underline{\underline{-a+b}} \quad (1)$$

The line AB is extended to the point K so that $AB : BK = 1 : 2$

(b) Write the vector \vec{CK} in terms of \mathbf{a} and \mathbf{b} .
Give your answer in its simplest form.

$$\vec{AB} = -a + b$$

$$\vec{BK} = -2a + 2b$$

$$\vec{CK} = -a + 2b$$

$$\underline{\underline{-a+2b}} \quad (3)$$

(4 marks)

5) Proof with vectors: Medium

6.

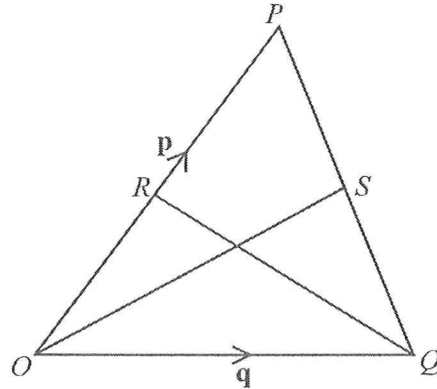


Diagram NOT accurately drawn

OPQ is a triangle.

R is the midpoint of OP .

S is the midpoint of OQ .

$\vec{OP} = p$ and $\vec{OQ} = q$

$$\vec{PQ} = -p + q$$

$$\vec{PS} = -\frac{1}{2}p + \frac{1}{2}q$$

(i) Find \vec{OS} in terms of p and q .

$$\vec{OS} = p - \frac{1}{2}p + \frac{1}{2}q$$

$$= \frac{1}{2}p + \frac{1}{2}q$$

$$\vec{OS} = \dots \frac{1}{2}(p+q)$$

(ii) Show that RS is parallel to OQ .

$$\vec{RP} = \frac{1}{2}p$$

$$\vec{RS} = \frac{1}{2}p - \frac{1}{2}p + \frac{1}{2}q$$

$$= \frac{1}{2}q$$

\therefore As $\vec{OQ} = q$, \vec{RS} is parallel

(5 marks)

5) Proof with vectors: Harder

6.

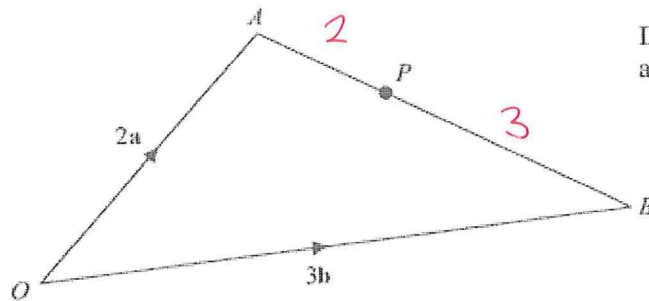


Diagram NOT accurately drawn

OAB is a triangle.

$$\overrightarrow{OA} = 2\mathbf{a}$$

$$\overrightarrow{OB} = 3\mathbf{b}$$

(a) Find AB in terms of \mathbf{a} and \mathbf{b} .

$$\overrightarrow{AB} = \frac{-2\mathbf{a} + 3\mathbf{b}}{(1)}$$

P is the point on AB such that $AP : PB = 2 : 3$

(b) Show that \overrightarrow{OP} is parallel to the vector $\mathbf{a} + \mathbf{b}$.

$$\begin{aligned} \overrightarrow{AP} &= \frac{2}{5}(-2\mathbf{a} + 3\mathbf{b}) \\ &= -\frac{4}{5}\mathbf{a} + \frac{6}{5}\mathbf{b} \\ \overrightarrow{OP} &= 2\mathbf{a} - \frac{4}{5}\mathbf{a} + \frac{6}{5}\mathbf{b} \\ &= \frac{6}{5}\mathbf{a} + \frac{6}{5}\mathbf{b} \\ &= \frac{6}{5}(\mathbf{a} + \mathbf{b}) \end{aligned} \tag{3}$$

(4 marks)

Therefore \overrightarrow{OP} is parallel as it has been

JAMES-KEEP India

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Angles in Polygons. Mathswatch Clip: 123

Topic 2: Bearings. Mathswatch Clip: 124

Topic 3: Simple Bounds. Mathswatch Clip: 132

Topic 4: Standard Form. Mathswatch Clip: 83

Topic 5: More Difficult Rearranging Formulae. MW: 190

1) Angles in Polygons: Easier

1. Each exterior angle of a regular polygon is 30° .

Work out the number of sides of the polygon.

$$360 \div 30 = 12$$

..... 12

(2 marks)

- 2.

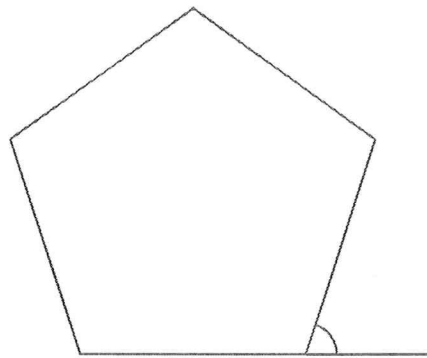


Diagram NOT accurately drawn

Work out the size of an exterior angle of a regular pentagon.

$$360 \div 5 = 72$$

..... 72^o

(2 marks)

- 3.

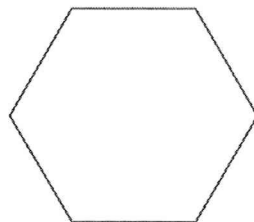


Diagram NOT accurately drawn

Calculate the size of the exterior angle of a regular hexagon.

$$360 \div 6 = 60$$

..... 60^o

(2 marks)

1) Angles in Polygons: Medium

4. The size of each exterior angle of a regular polygon is 40° .

Work out the number of sides of the regular polygon.

$$360 \div 40 = 9$$

..... 9

(2 marks)

5. The size of each interior angle of a regular polygon is 156° .

Work out the number of sides of the polygon.

$$180 - 156 = 24 \text{ (Exterior angle)}$$

$$360 \div 24 = 15$$

..... 15

(3 marks)

6. Here is a regular polygon with 9 sides.

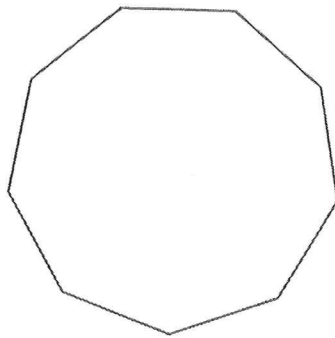


Diagram **NOT** accurately drawn

Work out the size of an exterior angle.

$$360 \div 9 = 40$$

..... 40

(2 marks)

1) Angles in Polygons: Harder

11.

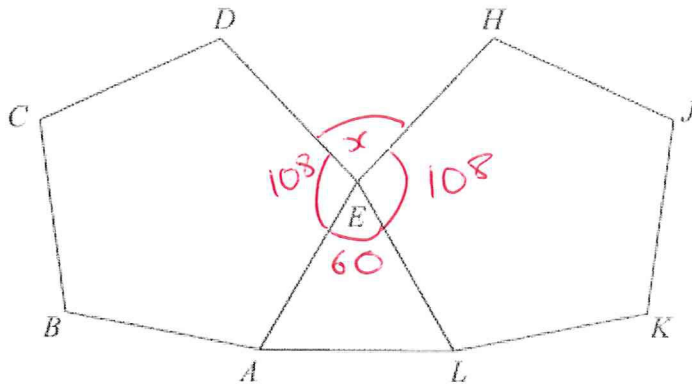


Diagram NOT accurately drawn

ABCDE and *EHJKL* are regular pentagons.
AEL is an equilateral triangle.

Work out the size of angle *DEH*.

$$\begin{aligned} \text{Pentagon} &= \frac{180 \times (n-2)}{n} \\ &= \frac{180 \times 3}{5} = \frac{540}{5} = 108 \end{aligned}$$

$$360 - 108 - 108 - 60 = 84$$

84

.....°
 (4 marks)

2) Bearings: Easier

1.

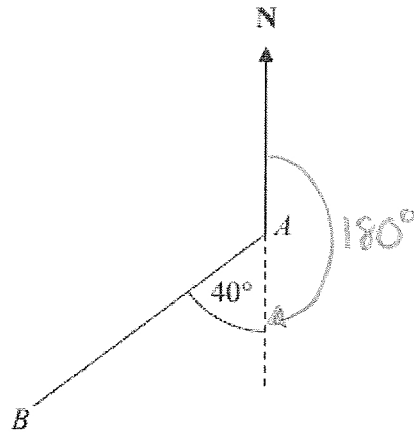


Diagram NOT accurately drawn

$$180 + 40$$

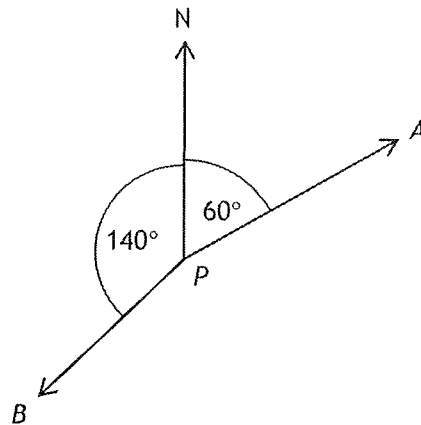
Work out the bearing of B from A .

START POINT

..... 220 °

(2 marks)

2.



(a) Write down the bearing of A from P .

Bearings are always 3 digits

..... 060 °

(b) Work out the bearing of B from P .

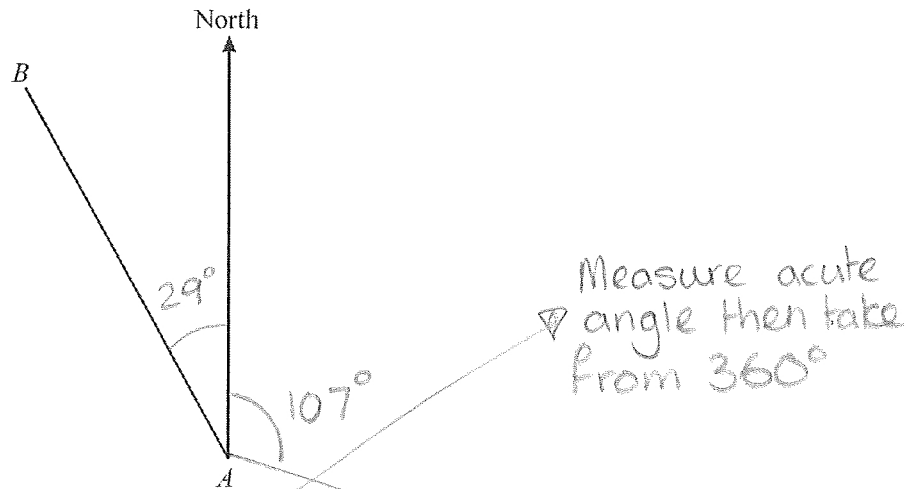
$$360 - 140$$

..... 220 °

(3 marks)

2) Bearings: Medium

3.



(a) Measure and write down the bearing of B from A.

$$360 - 29$$

.....
331.....^o

(1)

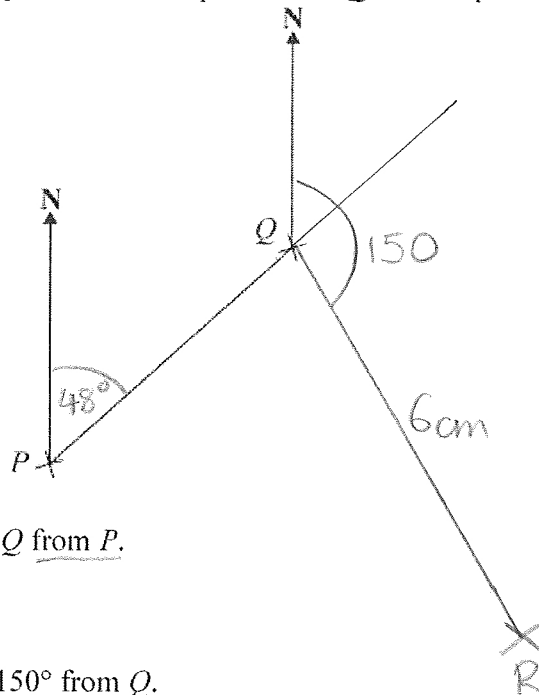
(b) On the diagram, draw a line on a bearing of 107° from A.

clockwise

(1)

(2 marks)

4. The diagram shows the position of two ports P and Q on a map.



(a) Measure the bearing of Q from P.

.....
048.....^o

(1)

A rock R is on a bearing of 150° from Q.
On the map R is 6 cm from Q.

(b) Mark the position of R with a cross (x) and label it R.

(2)

2) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

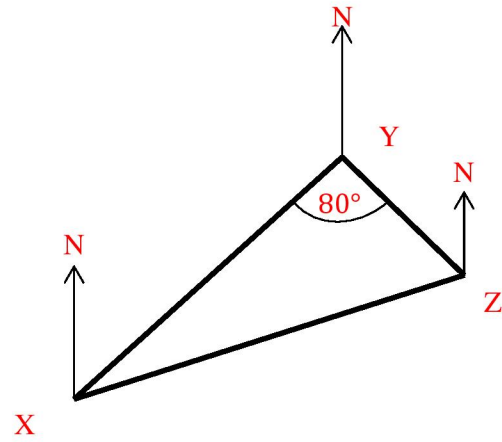
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

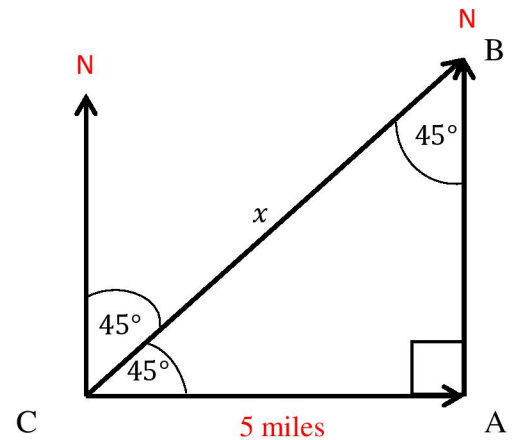
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



3) Simple Bounds: Easier

1. A piece of string has a length of 55 mm to the nearest mm.

(a) Write down the shortest possible length of the piece of string.

_____ 54.5 _____ mm (1)

(b) Write down the greatest possible length of the piece of string.

_____ 55.5 _____ mm (1)
(2 marks)

2. Chelsea's height is 158 cm to the nearest cm.

(a) Write down Chelsea's minimum possible height.

_____ 157.5 _____ cm (1)

(b) Write down Chelsea's maximum possible height.

_____ 158.5 _____ cm (1)
(2 marks)

3) Simple Bounds: Medium

3. A is 4.2 correct to the nearest decimal place.
B is 13 correct to the nearest whole number.

a) What is the error interval for A?

$$4.15 \leq A < 4.25$$

_____ cm

(1)

b) What is the lower bound of B?

$$12.5$$

_____ cm

(1)

c) What is the error interval of A + B?

$$\text{Lower bound } A+B \quad 4.15 + 12.5 = 16.65$$

$$\text{Upper bound } A+B \quad 4.25 + 13.5 = 17.75$$

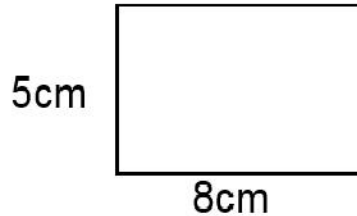
$$16.65 \leq A + B < 17.75$$

_____ cm

(1)

3) Simple Bounds: Harder

4.



The sides of the rectangle above are measured to the nearest cm.

a) Work out a lower bound for the perimeter.

Lower bounds for the sides are 4.5cm and 7.5cm

So lower bounds for perimeter is $2 \times 4.5 + 2 \times 7.5 = 9 + 15 = 24\text{cm}$

24cm

b) Work out the upper bound for the perimeter.

Upper bounds for the sides are 5.5cm and 8.5cm

So lower bounds for perimeter is $2 \times 5.5 + 2 \times 8.5 = 11 + 17 = 28\text{cm}$

28cm

(4 marks)

5. Tom has 100 identical pens.

Each of these pen weighs 5 grams to the nearest gram.

Work out the greatest possible total weight of all 100 pens.

Give your answer in kilograms.

Upper bound for weight of one pen: 5.5 g

So for 100 pens upper bound is $100 \times 5.5 = 550\text{g}$

One kilogram = 1000 grams so

$$550\text{g} = 0.55\text{kg}$$

0.55 kg

(3 marks)

4) Standard Form: Easier

1. (a) Write the number 0.00037 in standard form.

(1)

$$3.7 \times 10^4$$

- (b) Write 8.25×10^3 as an ordinary number.

(1)

$$8250$$

- (c) Work out $(2.1 \times 10^8) \times (6 \times 10^{-5})$.
Write your answer in standard form.

$$\begin{aligned} 2.1 \times 10^8 \times 6 \times 10^{-5} \\ = 12.6 \times 10^3 \\ = 1.26 \times 10^4 \end{aligned}$$

(2)

$$1.26 \times 10^4$$

(4 marks)

2. (a) Write 6.43×10^5 as an ordinary number.

$$643000$$

(1)

- (b) Work out the value of $2 \times 10^7 \times 8 \times 10^{-12}$.
Give your answer in standard form.

$$\begin{aligned} 2 \times 10^7 \times 8 \times 10^{-12} \\ = 16 \times 10^{-5} \\ = 1.6 \times 10^{-4} \end{aligned}$$

$$1.6 \times 10^{-4}$$

(2)

(3 marks)

4) Standard Form: Medium

3. (a) Write down the value of 10^0

.....|
.....

(1)

- (b) Write 6.7×10^{-5} as an ordinary number.

.....0.000067
.....

(1)

- (c) Work out the value of $(3 \times 10^7) \times (9 \times 10^6)$
Give your answer in standard form.

$$\begin{aligned} 3 \times 10^7 \times 9 \times 10^6 \\ = 27 \times 10^{13} \\ = 2.7 \times 10^{14} \end{aligned}$$

..... 2.7×10^{14}
.....

(2)

(4 marks)

4. (a) Write 8.2×10^5 as an ordinary number.

.....820000
.....

(1)

- (b) Write 0.000 376 in standard form.

..... 3.76×10^{-4}
.....

(1)

- (c) Work out the value of $(2.3 \times 10^{12}) \div (4.6 \times 10^3)$
Give your answer in standard form.

$$\begin{aligned} \frac{2.3 \times 10^{12}}{4.6 \times 10^3} &= 0.5 \times 10^9 \\ &= 5 \times 10^8 \end{aligned}$$

..... 5×10^8
.....

(2)

(4 marks)

4) Standard Form: Harder

Worded Standard Form

1) The world's smallest snail travels 4×10^{-3} m a month.

How many months would it take for the snail to travel?

2×10^{-1} m?

$$\frac{2 \times 10^{-1}}{4 \times 10^{-3}} = \frac{2}{4} \times 10^2$$

$$= 0.5 \times 10^2$$

$$= 5 \times 10^3$$

-1 - -3 = 2
↙

2)

The time taken for light to reach Earth from the edge of the known universe is 14 000 000 000 years.

Light travels at the speed of 9.46×10^{12} km/year.

Work out the distance, in kilometres, from the edge of the known universe to Earth.
Give your answer in standard form.

$$S = \frac{D}{T}$$

$$D = ST$$

$$D = 9.46 \times 10^{12} \times 1.4 \times 10^{10}$$

$$= 13.244 \times 10^{22}$$

$$= 1.3244 \times 10^{23}$$

5) More Difficult Rearranging Formulae: Easier

1. Rearrange $a(q - c) = d$ to make q the subject.

$$aq - ac = d$$

$$aq = d + ac$$

$$q = \frac{d + ac}{a}$$

$$q = \frac{d + ac}{a} \dots\dots\dots (3)$$

(Total 5 marks)

2. (a) Make n the subject of the formula $m = 5n - 21$

$$m + 21 = 5n$$

$$n = \frac{m + 21}{5}$$

5) More Difficult Rearranging Formulae: Medium

(b) Make p the subject of the formula $4(p - 2q) = 3p + 2$

$$4p - 8q = 3p + 2$$

$$p = 2 + 8q$$

$$p = \dots\dots\dots$$

(3)

(Total 5 marks)

3.

$$P = \pi r + 2r + 2a$$

Make r the subject of the formula

$$P - 2a = r(\pi + 2)$$

$$r = \frac{P - 2a}{\pi + 2}$$

(Total 3 marks)

5) More Difficult Rearranging Formulae: Harder

12. Rearrange $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

to make u the subject of the formula.

Give your answer in its simplest form.

$$fv + fu = uv$$

$$fu - uv = fv$$

$$u(f - v) = fv$$

$$u = \frac{fv}{f - v}$$

JANSON Eleanor

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Simultaneous Equations. Mathswatch Clip: 162

Topic 2: Changing Ratios. Mathswatch Clip: NA

Topic 3: Venn diagrams.. Mathswatch Clip: 127

Topic 4: Inequalities Regions. Mathswatch Clip: 198

Topic 5: Pythagoras. Mathswatch Clip: 150

1) Simultaneous Equations: Easier

1) Solve the simultaneous equations.

① $2x + 3y = 9$

② $5x + 3y = 18$

② - ①

$$5x + 3y = 18$$

$$2x + 3y = 9 \quad -$$

$$\frac{3x}{3} = \frac{9}{3}$$

$$x = 3$$

Sub $x = 3$ into ①

$$2x + 3y = 9$$

↓

$$6 + 3y = 9$$

$$3y = 3$$

$$y = 1$$

$$x = \underline{\quad 3 \quad}$$

$$y = \underline{\quad 1 \quad}$$

(3 Marks)

2) Solve the simultaneous equations.

① $4x + 2y = 9 \quad \times 2$

② $8x + 8y = 20$

③ $8x + 4y = 18$

② - ③

$$8x + 8y = 20$$

$$8x + 4y = 18 \quad -$$

$$\frac{4y}{4} = \frac{2}{4}$$

$$y = 0.5$$

Sub $y = 0.5$ into ①

$$4x + 1 = 9$$

$$\frac{4x}{4} = \frac{8}{4}$$

$$x = 2$$

$$x = \underline{\quad 2 \quad}$$

$$y = \underline{\quad 0.5 \quad}$$

(4 Marks)

1) Simultaneous Equations: Medium

7) Solve the simultaneous equations.

$$\textcircled{1} \quad 6x + 3y = 15 \quad \times 3$$

$$\textcircled{2} \quad 4x - 9y = -34$$

$$\textcircled{3} \quad 18x + 9y = 45$$

$\textcircled{2} + \textcircled{3}$

$$\begin{array}{r} 4x - 9y = -34 \\ 18x + 9y = 45 \\ \hline 22x = 11 \\ \hline 22 \quad x = 0.5 \end{array}$$

Sub $x = 0.5$ into $\textcircled{1}$

$$\begin{array}{r} 3 + 3y = 15 \\ -3 \quad -3 \\ \hline 3y = 12 \\ \hline y = 4 \end{array}$$

$$\begin{array}{l} x = \underline{0.5} \\ y = \underline{4} \end{array}$$

(4 Marks)

8) Solve the simultaneous equations.

$$\textcircled{1} \quad 5x + 2y = 29 \quad \times 3$$

$$\textcircled{2} \quad 8x - 6y = 51$$

$$\textcircled{3} \quad 15x + 6y = 87$$

$\textcircled{2} + \textcircled{3}$

$$\begin{array}{r} 8x - 6y = 51 \\ 15x + 6y = 87 \\ \hline 23x = 138 \\ \hline 23 \quad x = 6 \end{array}$$

Sub $x = 6$ into $\textcircled{1}$

$$\begin{array}{r} 30 + 2y = 29 \\ -30 \quad -30 \\ \hline 2y = -1 \\ \hline y = -0.5 \end{array}$$

$$\begin{array}{l} x = \underline{6} \\ y = \underline{-0.5} \end{array}$$

(4 Marks)

1) Simultaneous Equations: Harder

9) Bill goes into a chip shop and buys **3 fish** and **2 portions of chips**, it cost him £5.20

Jenny also goes into the same chip shop. She buys **5 fish** and **6 portions of chips**, it cost her £10.80

What is the cost of a portion of fish and chips?

$$\begin{array}{l}
 \textcircled{1} \quad 3f + 2p = 5.20 \quad \times 3 \\
 \textcircled{2} \quad 5f + 6p = 10.80 \\
 \textcircled{3} \quad 9f + 6p = 15.60 \\
 \textcircled{3} - \textcircled{2} \\
 \hline
 9f + 6p = 15.60 \\
 5f + 6p = 10.80 \\
 \hline
 4f = 4.8 \\
 \hline
 f = 1.20
 \end{array}$$

$$\begin{array}{r}
 4f = 4.80 \\
 \underline{4} \quad \quad 4 \\
 f = 1.20 \\
 \text{Sub into } \textcircled{1} \\
 3.60 + 2p = 5.20 \\
 \underline{-3.60} \quad \quad \underline{-3.60} \\
 2p = 1.60 \\
 p = 0.80
 \end{array}$$

$$p + f = \pounds 2$$

(5 Marks)

10) There are some ducks and some sheep on a farm. Altogether they have 35 heads and 94 feet.

How many ducks and sheep are there?

$$\begin{array}{l}
 \textcircled{1} \quad d + s = 35 \text{ (heads)} \quad \times 2 \\
 \textcircled{2} \quad 2d + 4s = 94 \text{ (feet)} \\
 \textcircled{3} \quad 2d + 2s = 70 \\
 \textcircled{2} - \textcircled{3} \\
 \hline
 2d + 4s = 94 \\
 2d + 2s = 70 \quad - \\
 \hline
 2s = 24 \\
 s = 12
 \end{array}$$

$$\begin{array}{l}
 \text{Sub } s = 12 \text{ into } \textcircled{1} \\
 d + 12 = 35 \\
 \underline{-12} \quad \quad \underline{-12} \\
 d = 23
 \end{array}$$

Ducks = 23
Sheep = 12

(5 Marks)

2) Changing Ratios: Easier

Solution for Question 1:

a) Red : Blue = 8:12

Divide through by 4 to simplify: 2:3

b) Red : Blue = 8:10

Divide through by 2 to simplify: 4:5

Solution for Question 2:

a) Pen : Pencils = 2:3

Equivalent to 20:30

30 pencils in pencil case

b) Only pencils removed so still 20 pens, ratio 4:3 equivalent to 20:15 so removed 15 pencils

2) Changing Ratios: Medium

Solution for Question 3:

$$1:3:5$$

$$1:3+5 = 1:8$$

Solution for Question 4:

$$\text{Orange : Red} = 2:3$$

$$2:3 = 5$$

$$x:51 = y$$

$$\frac{51}{3} = 17$$

$$x = 2 \times 17 = 34$$

$$y = 5 \times 17 = 85$$

$$\text{Ratio of Orange to Red} = 34:51$$

Compare 2:3 to 10:17, achieving same number for red sweets

$$2:3 = 34:51$$

Multiply ratio 10:17 by 3

$$30:51$$

4 orange sweets were eaten by Solomon.

Solution for Question 5:

$$\text{HW : No HW} = 5:4$$

$$5:4 = 9$$

$$15:x = y$$

$$\frac{15}{5} = 3$$

$$x = 4 \times 3 = 12$$

$$y = 9 \times 3 = 27$$

$$\text{Ratio of HW done to HW not done} = 15:12$$

Compare 5:4 to 2:1

$$5:4 = 15:12$$

$$2:1 = ??:?$$

Same number of pupils in the class = 27

Multiply ratio 2:1 by 9 ($\frac{27}{3}$)

$$18:9$$

3 more pupils did do their homework, the teacher was correct.

2) Changing Ratios: Harder

Solution for Question 6:

Sedimentary : Metamorphic = 2:3

Metamorphic : Igneous = 9:10

Multiply ratio 2:3 by 3 = 6:9

Therefore, sedimentary to igneous = 6:10

Solution for Question 7:

Road bikes: Mountain bikes

3:5

The minimum number of bikes sold is 3 road and 5 mountain, if the ratio changes to 2:1 but no more mountain bikes are sold then ratio is 10:5 so 7 more road bikes must have been sold.

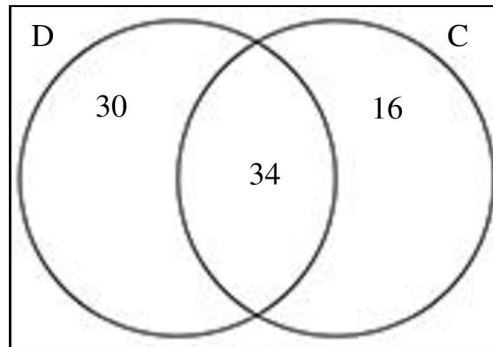
It is not the only answer as there could have been many numbers of bikes sold, the ratio is 3:5 this could be 6:10 or any equivalent ratio. If it was 6 to 10 for example to change to 2:1 ratio must be 20:10 which would mean 14 more road bikes sold, so the number more road bikes sold is any multiple of 7

3) Venn diagrams.: Easier

Solution for Question 1:

Number of people that owned dogs only: $64 - 34 = 30$

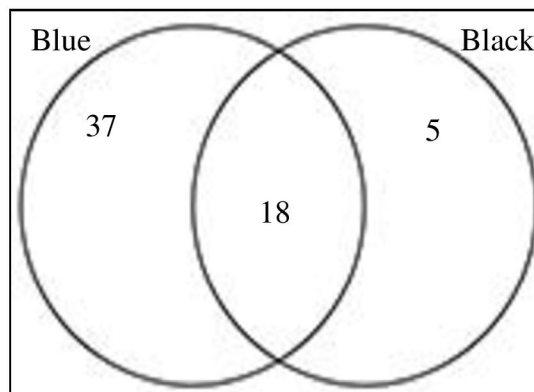
Number of people that owned cats only: $80 - 34 - 30 = 16$



Solution for Question 2:

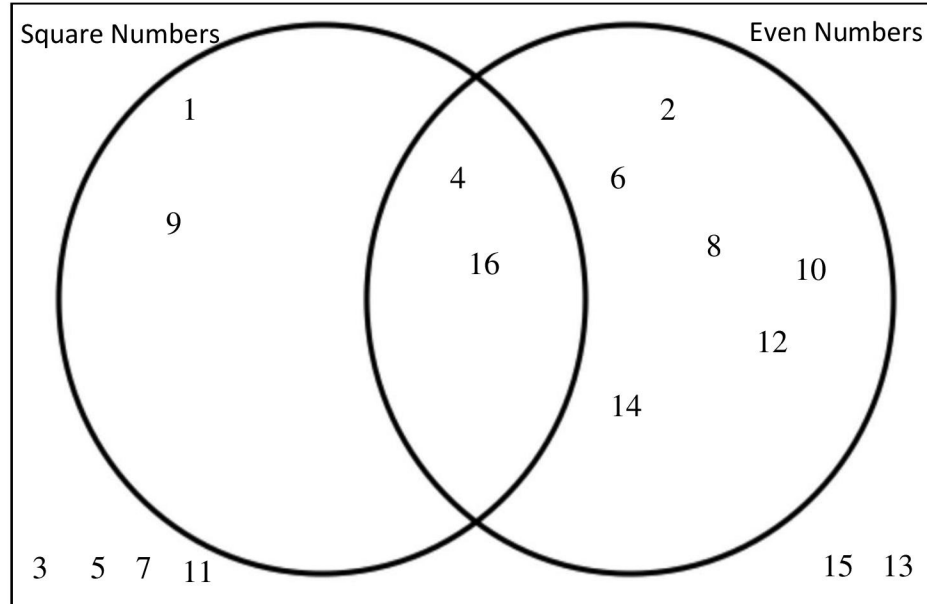
a) Number of people that only had a black pen:
 $60 - 37 - 18 = 5$

b) Probability of a person owning both types of pen:
 $\frac{18}{60} = \frac{3}{10}$



3) Venn diagrams.: Medium

Solution for Question 3:



Solution for Question 4:

- a) Tea: $6 + 12 = 18$
 Coffee: $9 + 12 = 21$
 Therefore, False
- b) False
- c) False

Solution for Question 5:

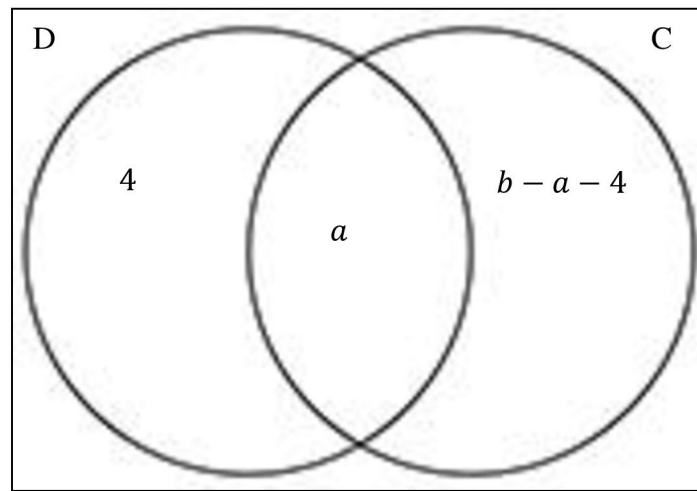
- a)
- i) $A \cap B = A$ and $B = \{9,15\}$
- ii) $A \cup B = A$ or $B = \{3,5,6,12,18\}$

3) Venn diagrams.: Harder

Solution for Question 6:

Number of people who replied with cats only:

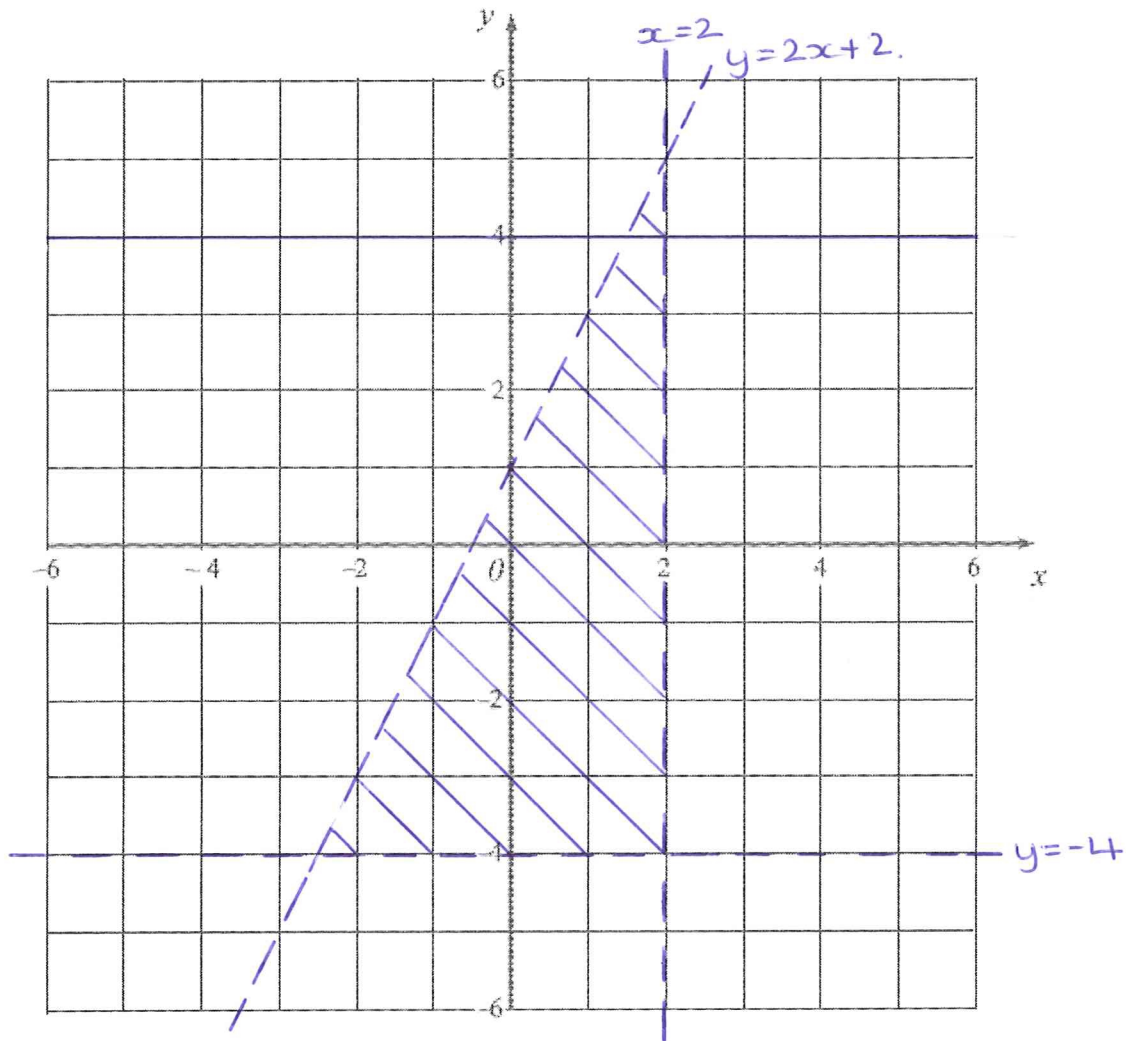
$$b - a - 4$$



4) Inequalities Regions: Easier

1. On the grid, shade the region that satisfies all three of these inequalities

$$y > -4 \quad x < 2 \quad y < 2x + 1$$



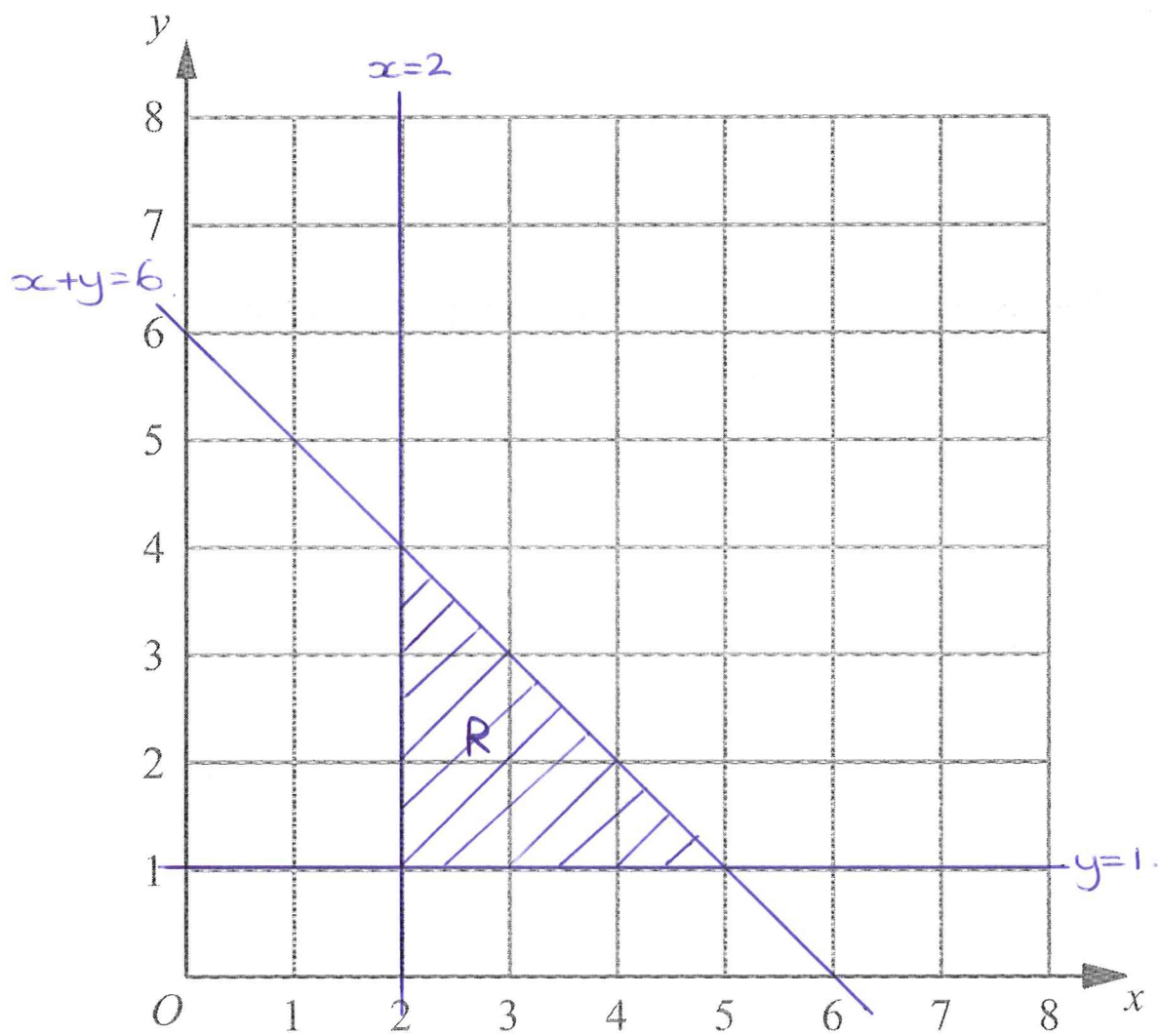
(Total for Question 19 = 4 marks)

4) Inequalities Regions: Medium

2. The region **R** satisfies the inequalities

$$x \geq 2, \quad y \geq 1, \quad x + y \leq 6$$

On the grid below, draw straight lines and use shading to show the region **R**.



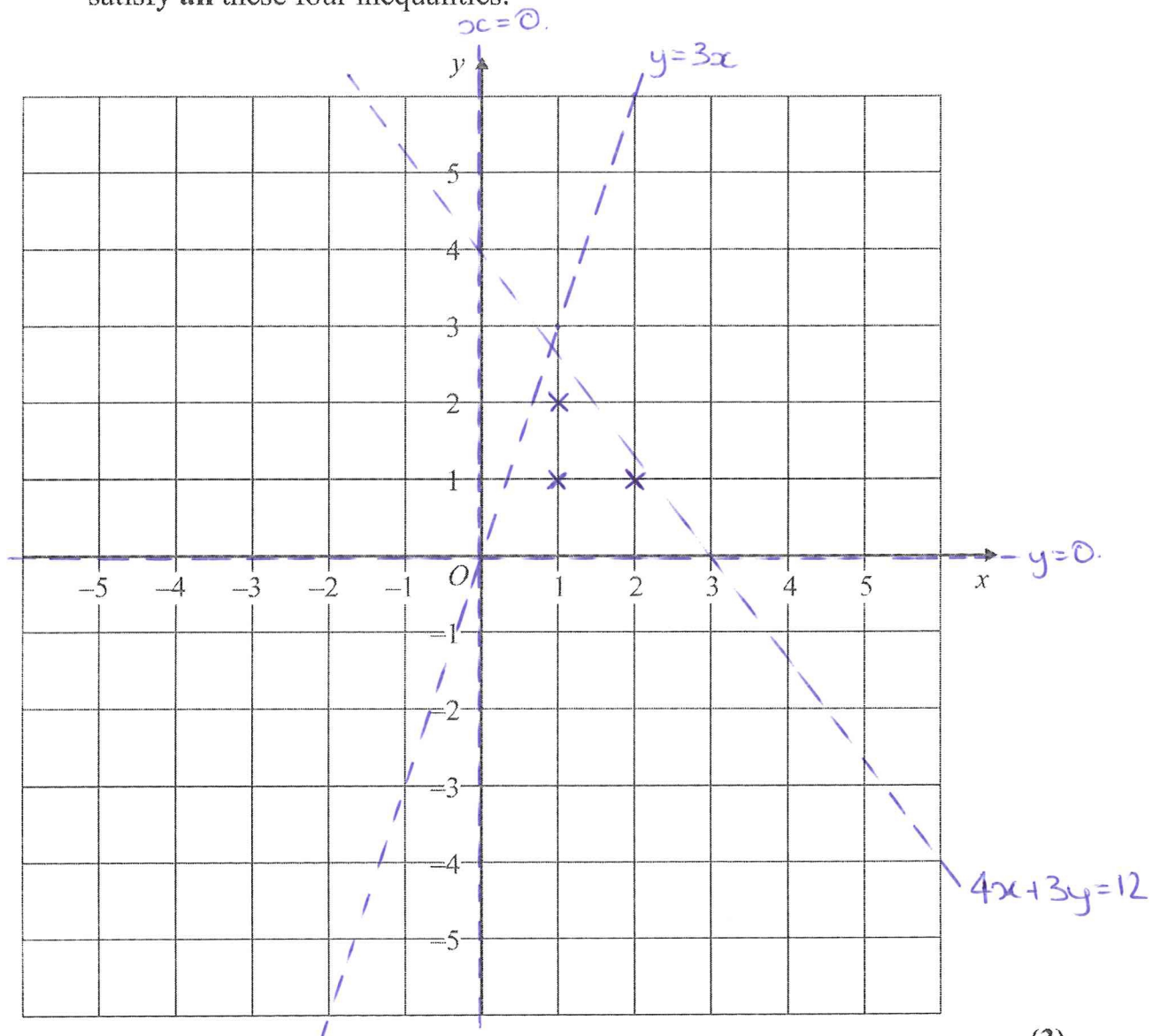
(Total 3 marks)

4) Inequalities Regions: Harder

7. $4x + 3y < 12$, $y < 3x$, $y > 0$, $x > 0$

x and y are both integers.

On the grid, mark with a cross (\times), each of the **three** points which satisfy **all** these four inequalities.



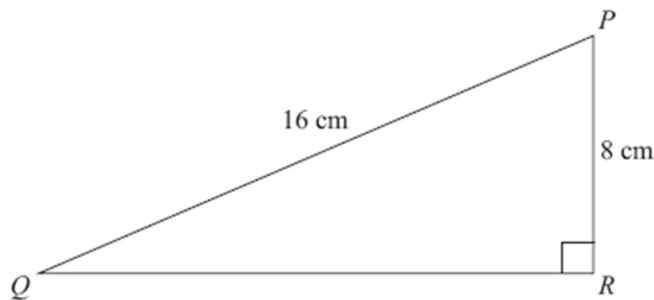
(3)

(Total 5 marks)

5) Pythagoras: Easier

1.

Diagram NOT
accurately drawn



PQR is a right-angled triangle.

$PQ = 16$ cm.

$PR = 8$ cm.

Calculate the length of QR .

Give your answer correct to 2 decimal places.

$$QR^2 = 16^2 - 8^2 = 192$$

$$QR = \sqrt{192} = 13.86 \text{ cm}$$

..... **13.86** cm

(3 marks)

2.

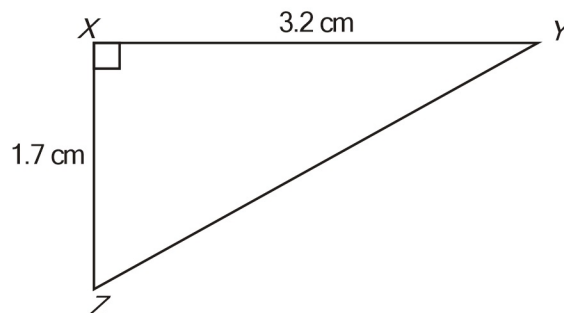


Diagram NOT
accurately drawn

XYZ is a right-angled triangle.

$XY = 3.2$ cm.

$XZ = 1.7$ cm.

Calculate the length of YZ .

Give your answer correct to 3 significant figures.

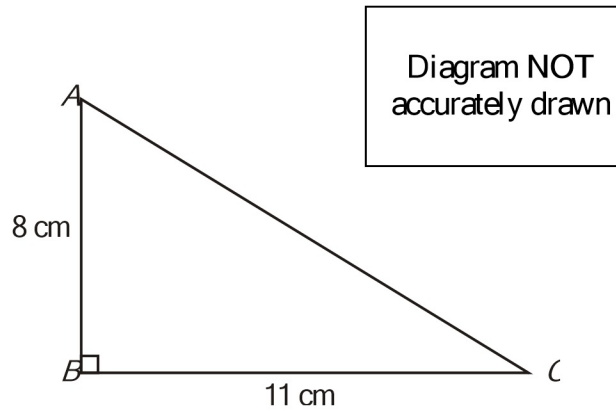
$$YZ^2 = 3.2^2 + 1.7^2 = 13.13$$

$$YZ = \sqrt{13.13} = 3.62 \text{ cm}$$

..... **3.62** cm

5) Pythagoras: Medium

3.



ABC is a right-angled triangle.

$AB = 8$ cm,
 $BC = 11$ cm.

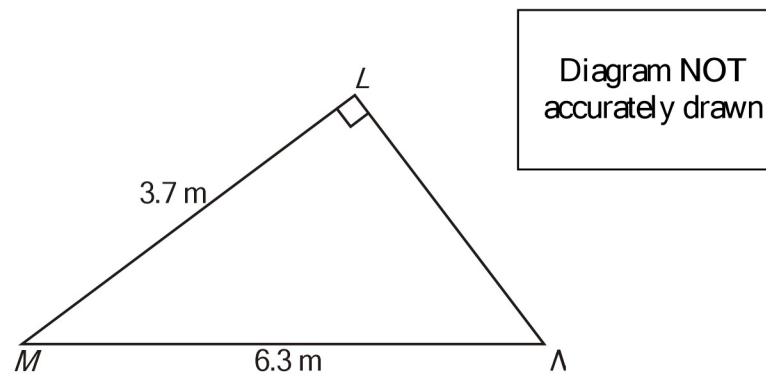
Calculate the length of AC .
Give your answer correct to 3 significant figures.

$$AC^2 = 8^2 + 11^2 = 185$$

$$AC = \sqrt{185} = 13.6 \text{ cm}$$

..... 13.6 cm
(3 marks)

4.



Angle $MLN = 90^\circ$.
 $LM = 3.7$ m.
 $MN = 6.3$ m.

Work out the length of LN .
Give your answer correct to 3 significant figures.

$$LN^2 = 6.3^2 - 3.7^2 = 26$$

$$LN = \sqrt{26} = 5.10 \text{ m}$$

$LN =$ 5.10 m

5) Pythagoras: Harder

13. $ABCD$ is a trapezium.

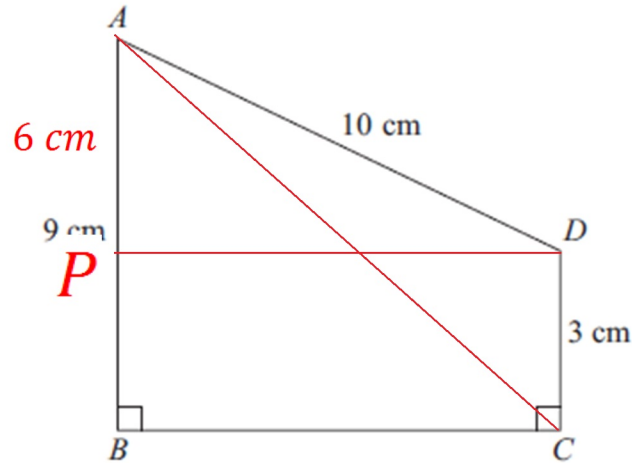


Diagram **NOT** accurately drawn

$AD = 10$ cm
 $AB = 9$ cm
 $DC = 3$ cm
 Angle $ABC =$ angle $BCD = 90^\circ$

Calculate the length of AC .
 Give your answer correct to 3 significant figures.

$$AP = 9 - 3 = 6 \text{ cm}$$

$$PD^2 = 10^2 - 6^2 = 64$$

$$BC = PD = \sqrt{64} = 8 \text{ cm}$$

$$AC^2 = 9^2 + 8^2 = 145$$

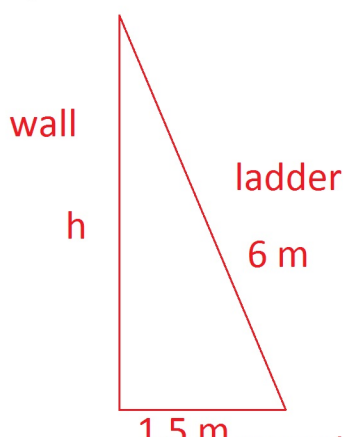
$$AC = \sqrt{145} = 12.0 \dots\dots\dots \text{ cm}$$

(5 marks)

14. A ladder is 6 m long.
 The ladder is placed on horizontal ground, resting against a vertical wall.

The instructions for using the ladder say that the bottom of the ladder must not be closer than 1.5 m from the bottom of the wall.

How far up the wall can the ladder reach?
 Give your answer correct to 1 decimal place.



$$h^2 = 6^2 - 1.5^2 = 33.75$$

$$h = \sqrt{33.75} = 5.8 \text{ m}$$

KANE Emily

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Simultaneous Equations. Mathswatch Clip: 162

Topic 2: Changing Ratios. Mathswatch Clip: NA

Topic 3: Solving Quadratics Using the Formula. MW: 191

Topic 4: Venn diagrams.. Mathswatch Clip: 127

Topic 5: Inequalities Regions. Mathswatch Clip: 198

1) Simultaneous Equations: Easier

1) Solve the simultaneous equations.

① $2x + 3y = 9$

② $5x + 3y = 18$

② - ①

$$5x + 3y = 18$$

$$2x + 3y = 9 \quad -$$

$$\frac{3x}{3} = \frac{9}{3}$$

$$x = 3$$

Sub $x = 3$ into ①

$$2x + 3y = 9$$

↓

$$6 + 3y = 9$$

$$3y = 3$$

$$y = 1$$

$$x = \underline{\quad 3 \quad}$$

$$y = \underline{\quad 1 \quad}$$

(3 Marks)

2) Solve the simultaneous equations.

① $4x + 2y = 9 \quad \times 2$

② $8x + 8y = 20$

③ $8x + 4y = 18$

② - ③

$$8x + 8y = 20$$

$$8x + 4y = 18 \quad -$$

$$\frac{4y}{4} = \frac{2}{4}$$

$$y = 0.5$$

Sub $y = 0.5$ into ①

$$4x + 1 = 9$$

$$\frac{4x}{4} = \frac{8}{4}$$

$$x = 2$$

$$x = \underline{\quad 2 \quad}$$

$$y = \underline{\quad 0.5 \quad}$$

(4 Marks)

1) Simultaneous Equations: Medium

7) Solve the simultaneous equations.

$$\textcircled{1} \quad 6x + 3y = 15 \quad \times 3$$

$$\textcircled{2} \quad 4x - 9y = -34$$

$$\textcircled{3} \quad 18x + 9y = 45$$

$\textcircled{2} + \textcircled{3}$

$$\begin{array}{r} 4x - 9y = -34 \\ 18x + 9y = 45 \quad + \\ \hline 22x = 11 \end{array}$$

$$\frac{22x}{22} = \frac{11}{22}$$

$$x = 0.5$$

Sub $x = 0.5$ into $\textcircled{1}$

$$\begin{array}{r} 3 + 3y = 15 \\ -3 \quad -3 \end{array}$$

$$\frac{3y}{3} = \frac{12}{3}$$

$$y = 4$$

$$x = \underline{0.5}$$

$$y = \underline{4}$$

(4 Marks)

8) Solve the simultaneous equations.

$$\textcircled{1} \quad 5x + 2y = 29 \quad \times 3$$

$$\textcircled{2} \quad 8x - 6y = 51$$

$$\textcircled{3} \quad 15x + 6y = 87$$

$\textcircled{2} + \textcircled{3}$

$$\begin{array}{r} 8x - 6y = 51 \\ 15x + 6y = 87 \quad + \\ \hline 23x = 138 \end{array}$$

$$\frac{23x}{23} = \frac{138}{23}$$

$$x = 6$$

Sub $x = 6$ into $\textcircled{1}$

$$\begin{array}{r} 30 + 2y = 29 \\ -30 \quad -30 \end{array}$$

$$\frac{2y}{2} = \frac{-1}{2}$$

$$y = -0.5$$

$$x = \underline{6}$$

$$y = \underline{-0.5}$$

(4 Marks)

1) Simultaneous Equations: Harder

9) Bill goes into a chip shop and buys **3 fish** and **2 portions of chips**, it cost him £5.20

Jenny also goes into the same chip shop. She buys **5 fish** and **6 portions of chips**, it cost her £10.80

What is the cost of a portion of fish and chips?

$$\begin{array}{l}
 \textcircled{1} \quad 3f + 2p = 5.20 \quad \times 3 \\
 \textcircled{2} \quad 5f + 6p = 10.80 \\
 \textcircled{3} \quad 9f + 6p = 15.60 \\
 \textcircled{3} - \textcircled{2} \\
 \hline
 9f + 6p = 15.60 \\
 5f + 6p = 10.80 \\
 \hline
 4f = 4.8
 \end{array}$$

$$\begin{array}{r}
 4f = 4.80 \\
 \underline{4} \quad \quad 4 \\
 f = 1.20 \\
 \text{Sub into } \textcircled{1} \\
 3.60 + 2p = 5.20 \\
 \underline{-3.60} \quad \quad \underline{-3.60} \\
 2p = 1.60 \\
 p = 0.80
 \end{array}$$

$$p + f = \pounds 2$$

(5 Marks)

10) There are some ducks and some sheep on a farm. Altogether they have 35 heads and 94 feet.

How many ducks and sheep are there?

$$\begin{array}{l}
 \textcircled{1} \quad d + s = 35 \text{ (heads)} \quad \times 2 \\
 \textcircled{2} \quad 2d + 4s = 94 \text{ (feet)} \\
 \textcircled{3} \quad 2d + 2s = 70 \\
 \textcircled{2} - \textcircled{3} \\
 \hline
 2d + 4s = 94 \\
 2d + 2s = 70 \quad - \\
 \hline
 2s = 24
 \end{array}$$

$$\begin{array}{r}
 \text{Sub } s = 12 \text{ into } \textcircled{1} \\
 d + 12 = 35 \\
 \underline{-12} \quad \quad \underline{-12} \\
 d = 23
 \end{array}$$

$$\begin{array}{l}
 \text{Ducks} = \underline{23} \\
 \text{Sheep} = \underline{12}
 \end{array}$$

(5 Marks)

2) Changing Ratios: Easier

Solution for Question 1:

a) Red : Blue = 8:12

Divide through by 4 to simplify: 2:3

b) Red : Blue = 8:10

Divide through by 2 to simplify: 4:5

Solution for Question 2:

a) Pen : Pencils = 2:3

Equivalent to 20:30

30 pencils in pencil case

b) Only pencils removed so still 20 pens, ratio 4:3 equivalent to 20:15 so removed 15 pencils

2) Changing Ratios: Medium

Solution for Question 3:

$$1:3:5$$

$$1:3+5 = 1:8$$

Solution for Question 4:

$$\text{Orange : Red} = 2:3$$

$$2:3 = 5$$

$$x:51 = y$$

$$\frac{51}{3} = 17$$

$$x = 2 \times 17 = 34$$

$$y = 5 \times 17 = 85$$

$$\text{Ratio of Orange to Red} = 34:51$$

Compare 2:3 to 10:17, achieving same number for red sweets

$$2:3 = 34:51$$

Multiply ratio 10:17 by 3

$$30:51$$

4 orange sweets were eaten by Solomon.

Solution for Question 5:

$$\text{HW : No HW} = 5:4$$

$$5:4 = 9$$

$$15:x = y$$

$$\frac{15}{5} = 3$$

$$x = 4 \times 3 = 12$$

$$y = 9 \times 3 = 27$$

$$\text{Ratio of HW done to HW not done} = 15:12$$

Compare 5:4 to 2:1

$$5:4 = 15:12$$

$$2:1 = ?:?$$

Same number of pupils in the class = 27

Multiply ratio 2:1 by 9 ($\frac{27}{3}$)

$$18:9$$

3 more pupils did do their homework, the teacher was correct.

2) Changing Ratios: Harder

Solution for Question 6:

Sedimentary : Metamorphic = 2:3

Metamorphic : Igneous = 9:10

Multiply ratio 2:3 by 3 = 6:9

Therefore, sedimentary to igneous = 6:10

Solution for Question 7:

Road bikes: Mountain bikes

3:5

The minimum number of bikes sold is 3 road and 5 mountain, if the ratio changes to 2:1 but no more mountain bikes are sold then ratio is 10:5 so 7 more road bikes must have been sold.

It is not the only answer as there could have been many numbers of bikes sold, the ratio is 3:5 this could be 6:10 or any equivalent ratio. If it was 6 to 10 for example to change to 2:1 ratio must be 20:10 which would mean 14 more road bikes sold, so the number more road bikes sold is any multiple of 7

3) Solving Quadratics Using the Formula: Easier

1. Solve $3x^2 + 7x - 13 = 0$
Give your solutions correct to 2 decimal places.

$$a = 3 \quad b = 7 \quad c = -13$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-7 \pm \sqrt{7^2 - 4 \times 3 \times -13}}{2 \times 3} = \frac{-7 \pm \sqrt{205}}{6}$$

$$= 1.219636844 \quad \text{or} \quad -3.552970177$$

$$x = \underline{1.22} \dots \dots \dots \text{or } x = \underline{-3.55} \dots \dots \dots$$

(3 marks)

2. Solve the equation

$$2x^2 + 6x - 95 = 0$$

Give your solutions correct to 3 significant figures.

$$a = 2 \quad b = 6 \quad c = -95$$

$$x = \frac{-6 \pm \sqrt{36 - (4 \times 2 \times -95)}}{4}$$

$$= \frac{-6 \pm \sqrt{796}}{4}$$

$$= 5.55336799 \quad \text{or} \quad -8.55336799$$

$$x = \underline{5.55} \dots \dots \dots \text{or } x = \underline{-8.55} \dots \dots \dots$$

(3 marks)

3) Solving Quadratics Using the Formula: Medium

3. Solve $x^2 + 3x - 5 = 0$
Give your solutions correct to 4 significant figures.

$$a = 1 \quad b = 3 \quad c = -5$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-3 \pm \sqrt{9 - (4 \times 1 \times -5)}}{2}$$

$$= \frac{-3 \pm \sqrt{29}}{2}$$

$$x = 1.192582404 \text{ or } -4.192582404$$

$$x = 1.193 \text{ or } -4.193$$

(3 marks)

4. Solve this quadratic equation.

$$x^2 - 5x - 8 = 0$$

Give your answers correct to 3 significant figures.

$$a = 1 \quad b = -5 \quad c = -8$$

$$x = \frac{5 \pm \sqrt{25 - (4 \times 1 \times -8)}}{2}$$

$$= \frac{5 \pm \sqrt{57}}{2}$$

$$x = 6.274917218 \text{ or } -1.274917218$$

$$x = 6.27 \text{ or } -1.27$$

(3 marks)

3) Solving Quadratics Using the Formula: Harder

9. The diagram shows a 6-sided shape.
All the corners are right angles.
All the measurements are given in centimetres.

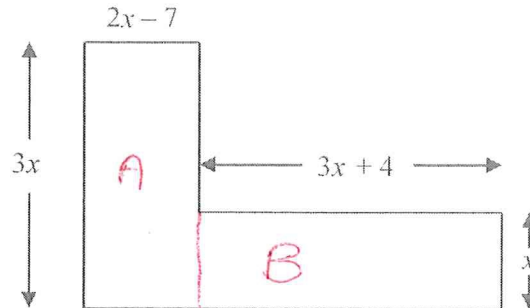


Diagram NOT accurately drawn

The area of the shape is 85 cm^2 .

- (a) Show that $9x^2 - 17x - 85 = 0$

$$A = 3x(2x-7) \quad B = x(3x+4)$$

$$= 6x^2 - 21x \quad = 3x^2 + 4x$$

$$6x^2 - 21x + 3x^2 + 4x = 85$$

$$9x^2 - 17x - 85 = 0 \quad (3)$$

- (b) (i) Solve $9x^2 - 17x - 85 = 0$

Give your solutions correct to 3 significant figures.

$$a=9 \quad b=-17 \quad c=-85$$

$$x = \frac{17 \pm \sqrt{17^2 - 4(9)(-85)}}{18}$$

$$x = 4.159474732 \quad \text{or} \quad x = -2.270585844$$

$$x = 4.16 \dots \quad \text{or} \quad x = -2.27 \dots$$

- (ii) Hence, work out the length of the shortest side of the 6-sided shape.

$$2x-7$$

$$\dots 1.38 \dots \text{ cm}$$

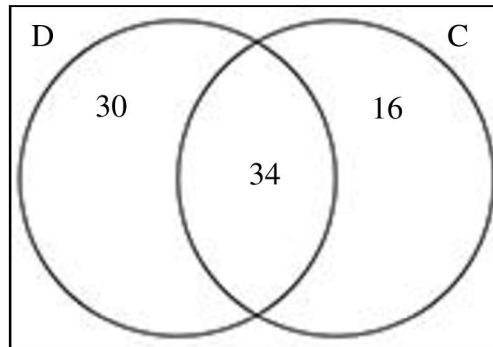
(4)

4) Venn diagrams.: Easier

Solution for Question 1:

Number of people that owned dogs only: $64 - 34 = 30$

Number of people that owned cats only: $80 - 34 - 30 = 16$



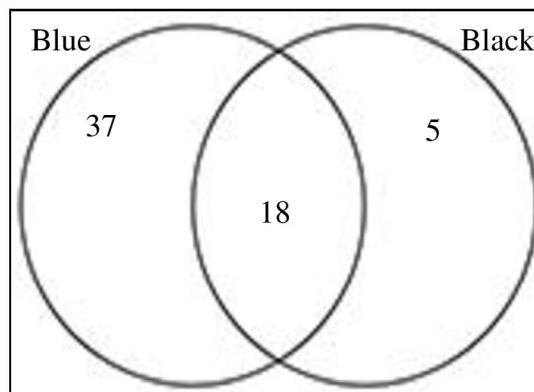
Solution for Question 2:

a) Number of people that only had a black pen:

$$60 - 37 - 18 = 5$$

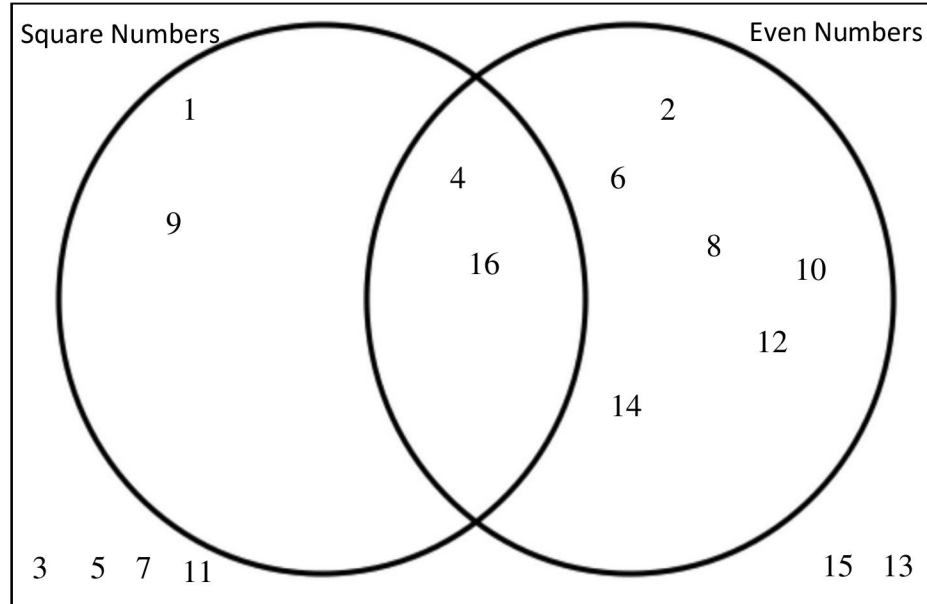
b) Probability of a person owning both types of pen:

$$\frac{18}{60} = \frac{3}{10}$$



4) Venn diagrams.: Medium

Solution for Question 3:



Solution for Question 4:

- a) Tea: $6 + 12 = 18$
 Coffee: $9 + 12 = 21$
 Therefore, False
- b) False
- c) False

Solution for Question 5:

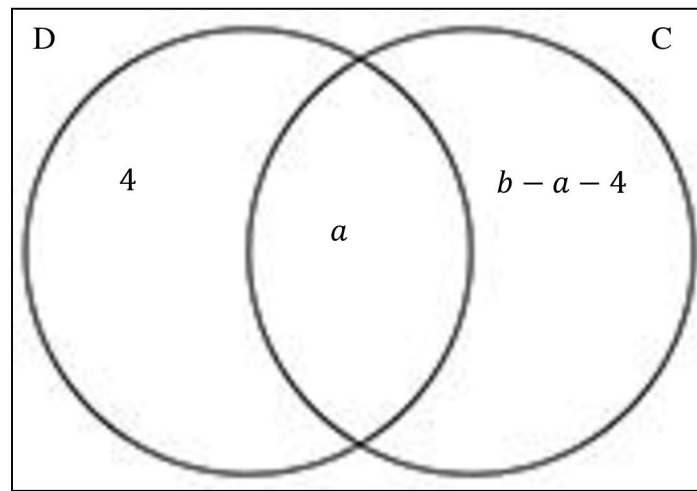
- a)
- i) $A \cap B = A$ and $B = \{9, 15\}$
- ii) $A \cup B = A$ or $B = \{3, 5, 6, 12, 18\}$

4) Venn diagrams.: Harder

Solution for Question 6:

Number of people who replied with cats only:

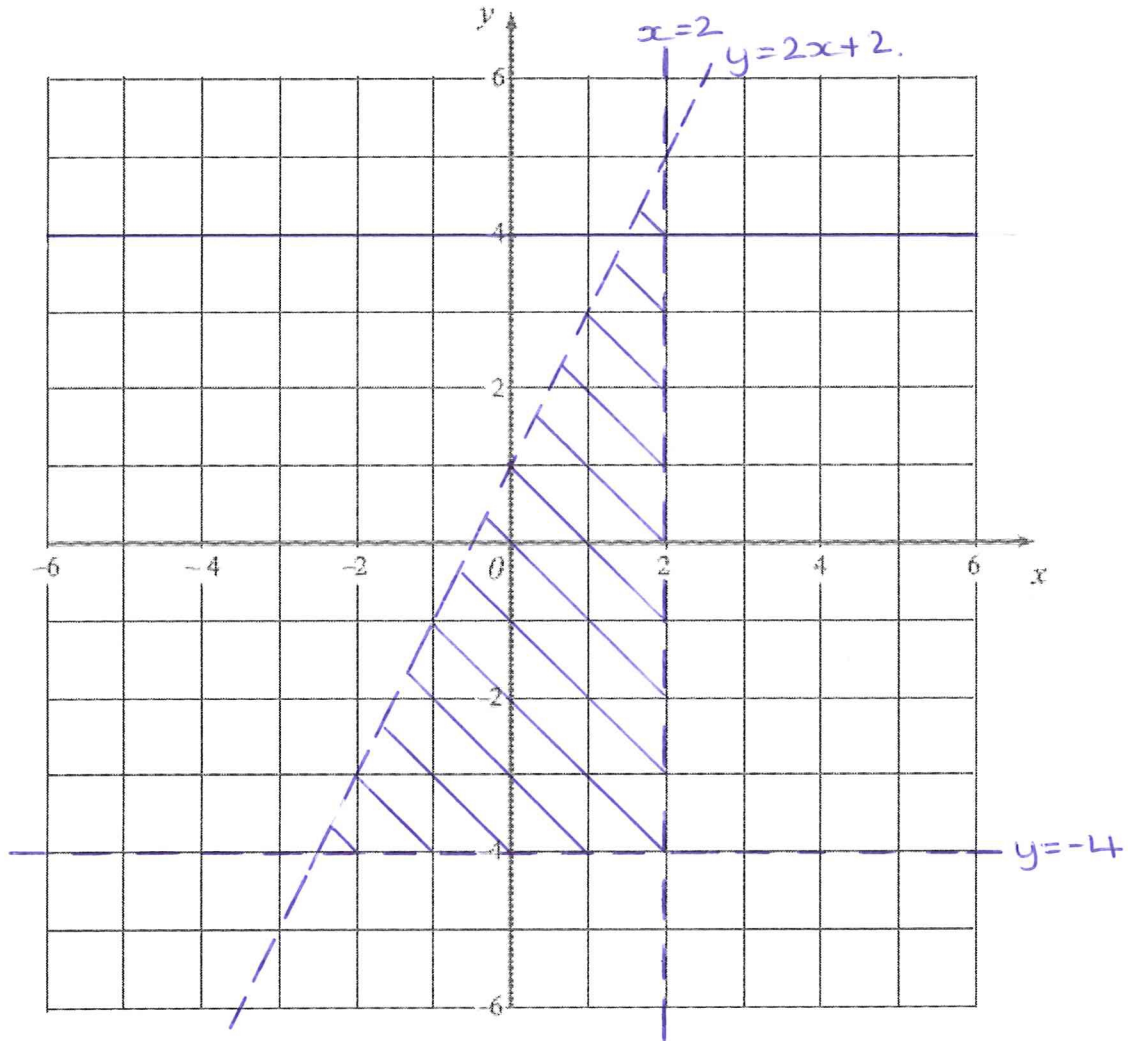
$$b - a - 4$$



5) Inequalities Regions: Easier

1. On the grid, shade the region that satisfies all three of these inequalities

$$y > -4 \quad x < 2 \quad y < 2x + 1$$



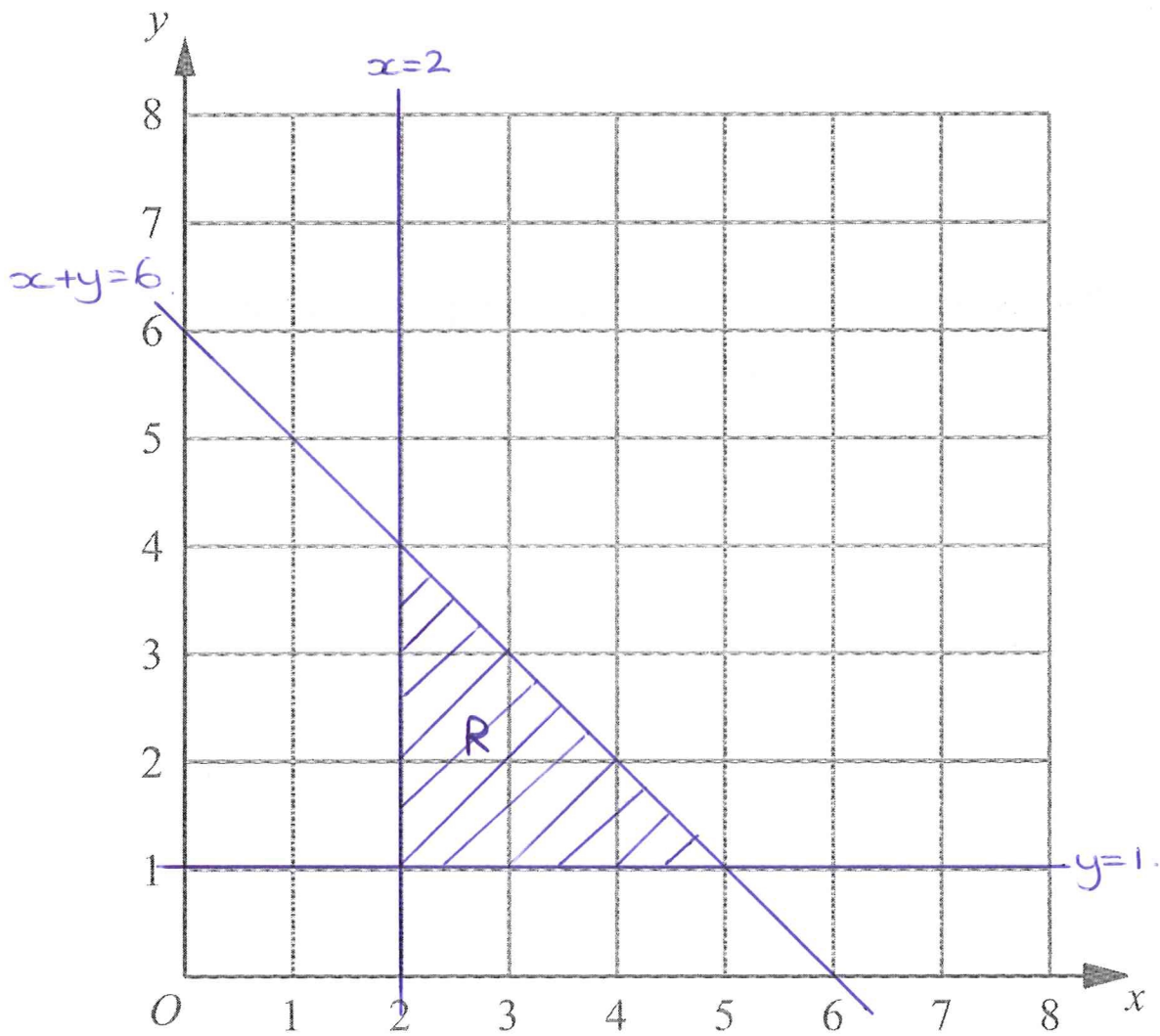
(Total for Question 19 = 4 marks)

5) Inequalities Regions: Medium

2. The region **R** satisfies the inequalities

$$x \geq 2, \quad y \geq 1, \quad x + y \leq 6$$

On the grid below, draw straight lines and use shading to show the region **R**.



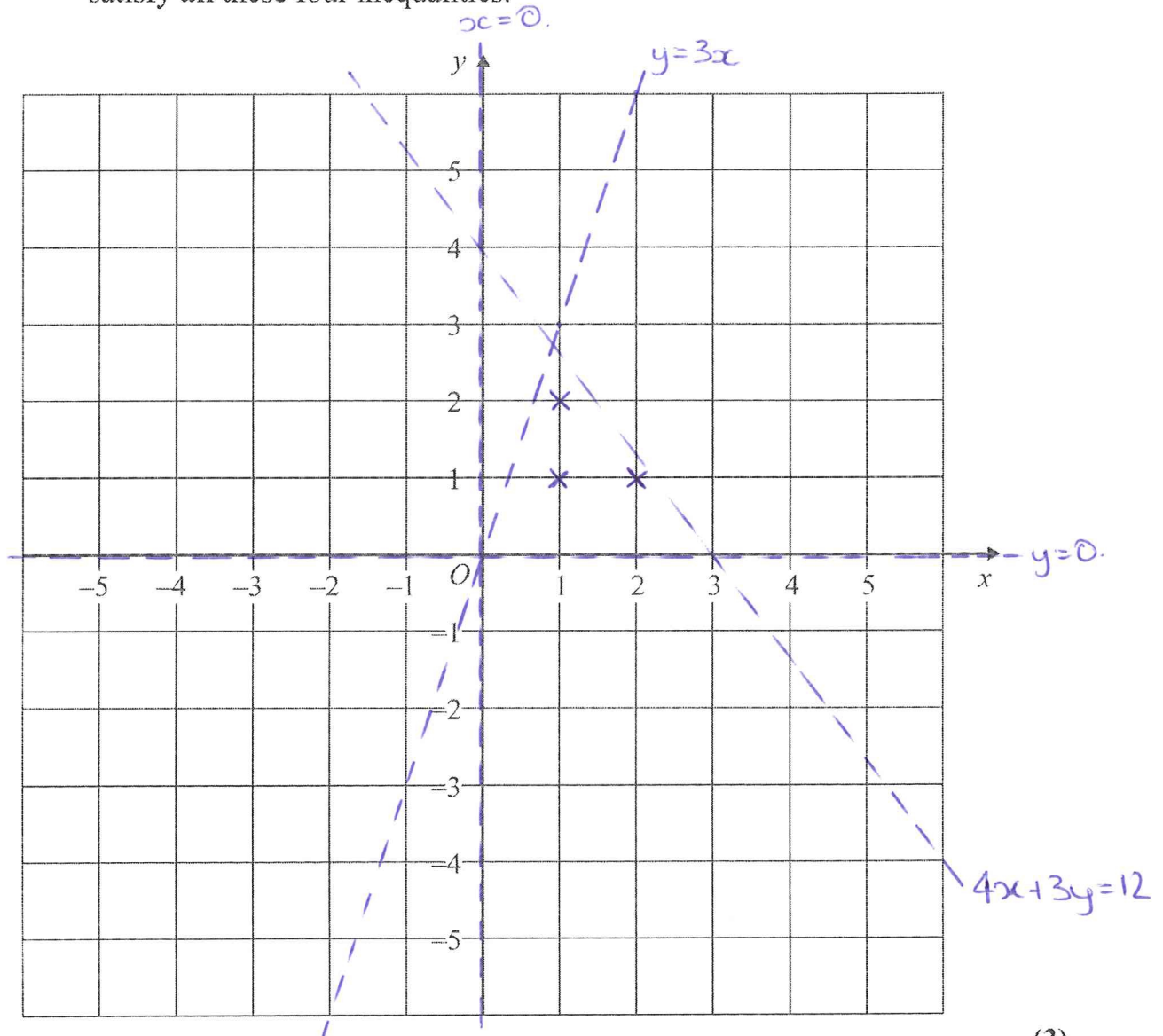
(Total 3 marks)

5) Inequalities Regions: Harder

7. $4x + 3y < 12$, $y < 3x$, $y > 0$, $x > 0$

x and y are both integers.

On the grid, mark with a cross (\times), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

LEE Yasmin

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Missing Mean Questions. Mathswatch Clip: NA

Topic 2: Changing Ratios. Mathswatch Clip: NA

Topic 3: Inequalities Regions. Mathswatch Clip: 198

Topic 4: More Difficult Rearranging Formulae. MW: 190

Topic 5: Pythagoras. Mathswatch Clip: 150

1) Missing Mean Questions: Easier

1) The mean of 8 and another number is 13.

What is the other number?

$$\begin{aligned} \text{Solution: } (8+x)/2 &= 13 && \times 2 \\ 8 + x &= 26 && - 8 \\ x &= 18 \end{aligned}$$

_____18_____

(3 Marks)

2) The mean of 2, 5, 8 and x is 4

Find x

$$\begin{aligned} \text{Solution: } (2 + 5 + 8 + x) / 4 &= 4 && \times 4 \\ 15 + x &= 16 && -15 \\ x &= 1 \end{aligned}$$

_____x = 1_____

(3 Marks)

3) After measuring the heights of 7 people, they have an average height of 156cm. After measuring the heights of 8 people they have an average height of 158cm. How tall is the 8th person?

$$\begin{aligned} \text{Solution: } 7 \times 156 &= 1092 \\ 8 \times 158 &= 1264 \\ 1092 - 1264 &= 172 \end{aligned}$$

(3 Marks)

_____172_____

1) Missing Mean Questions: Medium

4) The mean weight of a group of 7 girls is 58kg

a) Work out their total weight

Solution: $7 \times 58 = 406\text{kg}$

_____406_____Kg

When a 8th girl joins the group, the mean weight goes up to 59kg.

b) What is the weight of the 8th girl?

Solution: $59 \times 8 = 472$

$472 - 406 = 66 \text{ Kg}$

_____66_____Kg

(3 Marks)

5) The mean distance that Jack runs in his last 10 runs is 5.7 miles. Work out the distance that he would need to run to make this exactly 6 miles.

Solution: $10 \times 5.7 = 57$

$11 \times 6 = 66$

$66 - 57 = 9$

_____9 miles_____

(2 Marks)

1) Missing Mean Questions: Harder

- 6) Waitresses and kitchen staff in a restaurant decide to share their tips. There are 8 kitchen staff 10 waitresses. The kitchen staff receives a mean of £23 weekly and the waitresses receive a mean of £28 weekly.

Work out the mean of all 18 members of staff.

$$\begin{aligned} \text{Solution: } 23 \times 8 &= 184 \\ 28 \times 10 &= 280 \end{aligned}$$

$$\text{Total} = 184 + 280 = 464$$

$$\text{Mean} = 464/18 = 25.78$$

_____ £25.78 _____

(3 Marks)

- 7) The mean of a, a, b is 30

The mean of a, a, b, b, b is 20

Find the values of a and b

Solution:

$$(2a + b) / 3 = 30 \quad \times 3$$

$$(2a + 3b) / 5 = 20 \quad \times 5$$

$$2a + b = 90 \quad - \quad \text{solve simultaneously}$$

$$2a + 3b = 100$$

$$-2b = -10$$

$$b = 5$$

$$2a + 5 = 90$$

$$2a = 85$$

$$a = 42.5$$

$a = 42.5$ $b = 5$ _____

(5 Marks)

2) Changing Ratios: Easier

Solution for Question 1:

a) Red : Blue = 8:12

Divide through by 4 to simplify: 2:3

b) Red : Blue = 8:10

Divide through by 2 to simplify: 4:5

Solution for Question 2:

a) Pen : Pencils = 2:3

Equivalent to 20:30

30 pencils in pencil case

b) Only pencils removed so still 20 pens, ratio 4:3 equivalent to 20:15 so removed 15 pencils

2) Changing Ratios: Medium

Solution for Question 3:

$$1:3:5$$

$$1:3+5 = 1:8$$

Solution for Question 4:

$$\text{Orange : Red} = 2:3$$

$$2:3 = 5$$

$$x:51 = y$$

$$\frac{51}{3} = 17$$

$$x = 2 \times 17 = 34$$

$$y = 5 \times 17 = 85$$

$$\text{Ratio of Orange to Red} = 34:51$$

Compare 2:3 to 10:17, achieving same number for red sweets

$$2:3 = 34:51$$

Multiply ratio 10:17 by 3

$$30:51$$

4 orange sweets were eaten by Solomon.

Solution for Question 5:

$$\text{HW : No HW} = 5:4$$

$$5:4 = 9$$

$$15:x = y$$

$$\frac{15}{5} = 3$$

$$x = 4 \times 3 = 12$$

$$y = 9 \times 3 = 27$$

$$\text{Ratio of HW done to HW not done} = 15:12$$

Compare 5:4 to 2:1

$$5:4 = 15:12$$

$$2:1 = ??:?$$

Same number of pupils in the class = 27

Multiply ratio 2:1 by 9 ($\frac{27}{3}$)

$$18:9$$

3 more pupils did do their homework, the teacher was correct.

2) Changing Ratios: Harder

Solution for Question 6:

Sedimentary : Metamorphic = 2:3

Metamorphic : Igneous = 9:10

Multiply ratio 2:3 by 3 = 6:9

Therefore, sedimentary to igneous = 6:10

Solution for Question 7:

Road bikes: Mountain bikes

3:5

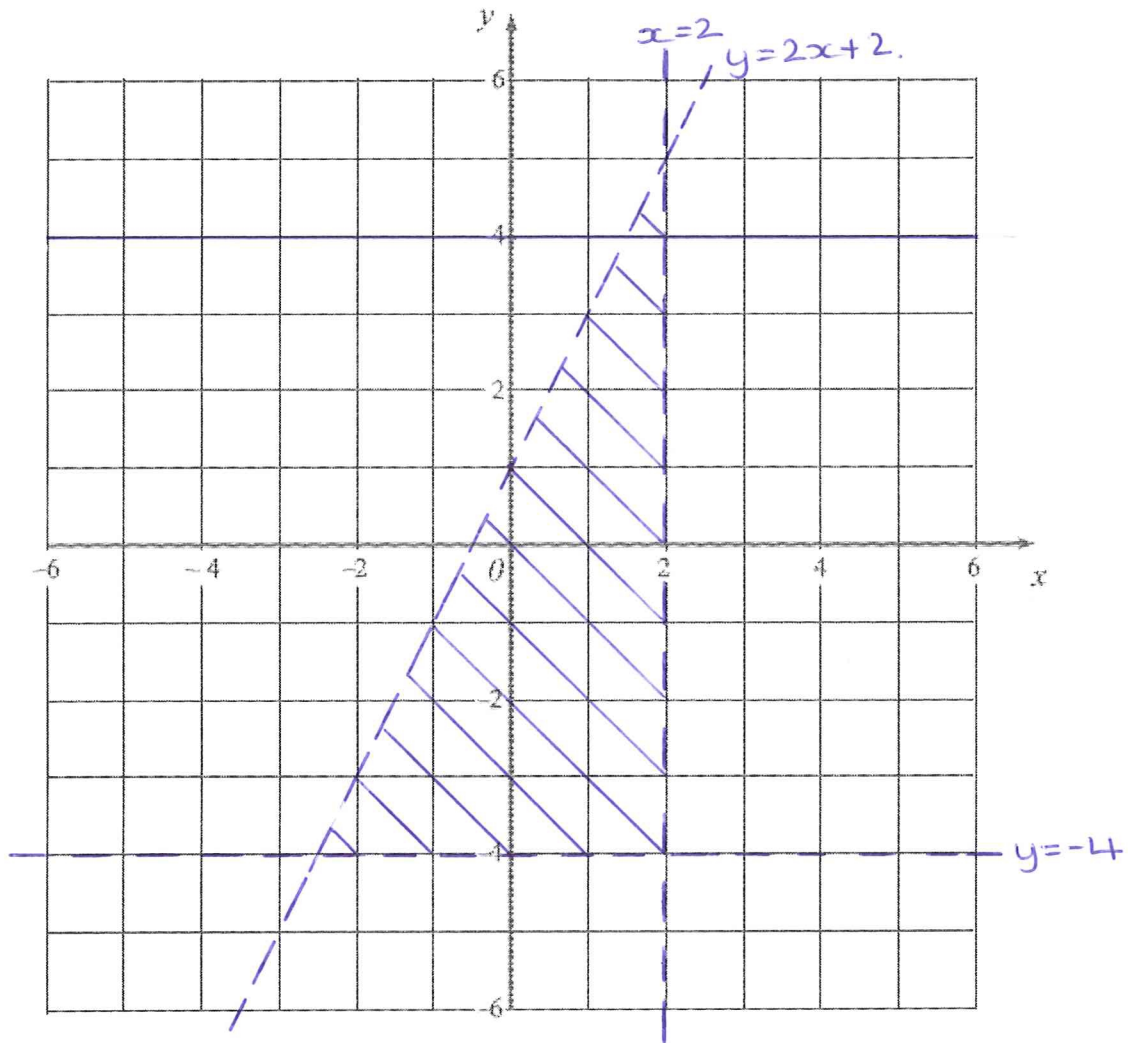
The minimum number of bikes sold is 3 road and 5 mountain, if the ratio changes to 2:1 but no more mountain bikes are sold then ratio is 10:5 so 7 more road bikes must have been sold.

It is not the only answer as there could have been many numbers of bikes sold, the ratio is 3:5 this could be 6:10 or any equivalent ratio. If it was 6 to 10 for example to change to 2:1 ratio must be 20:10 which would mean 14 more road bikes sold, so the number more road bikes sold is any multiple of 7

3) Inequalities Regions: Easier

1. On the grid, shade the region that satisfies all three of these inequalities

$$y > -4 \quad x < 2 \quad y < 2x + 1$$



(Total for Question 19 = 4 marks)

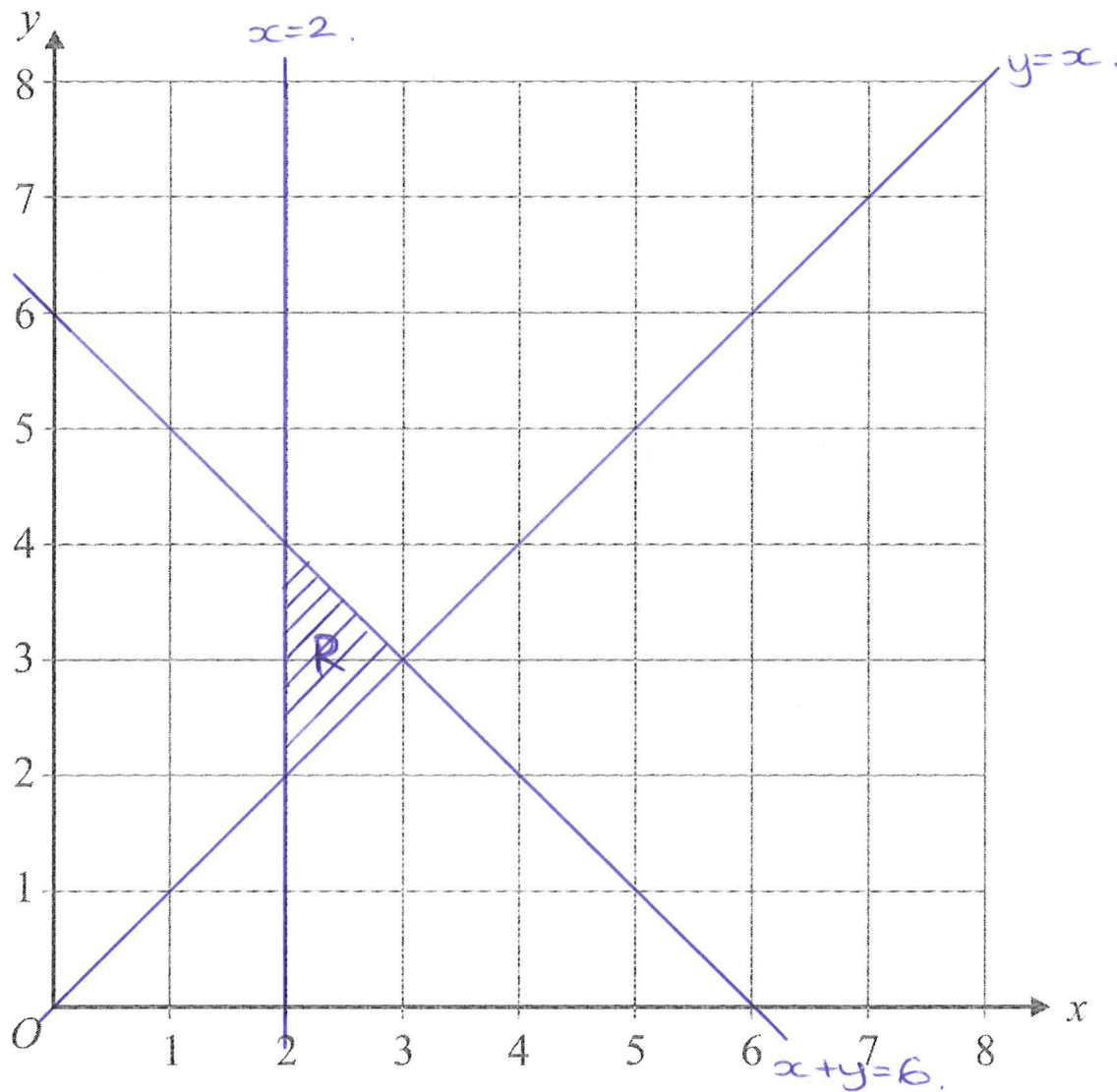
3) Inequalities Regions: Medium

6. (a) On the grid below, draw straight lines and use shading to show the region **R** that satisfies the inequalities

$$x \geq 2$$

$$y \geq x$$

$$x + y \leq 6$$



(3)

The point P with coordinates (x, y) lies inside the region **R**.
 x and y are **integers**.

- (b) Write down the coordinates of **all** the points of **R** whose coordinates are both integers.

$(2, 2)$ $(2, 3)$ $(2, 4)$ $(3, 3)$

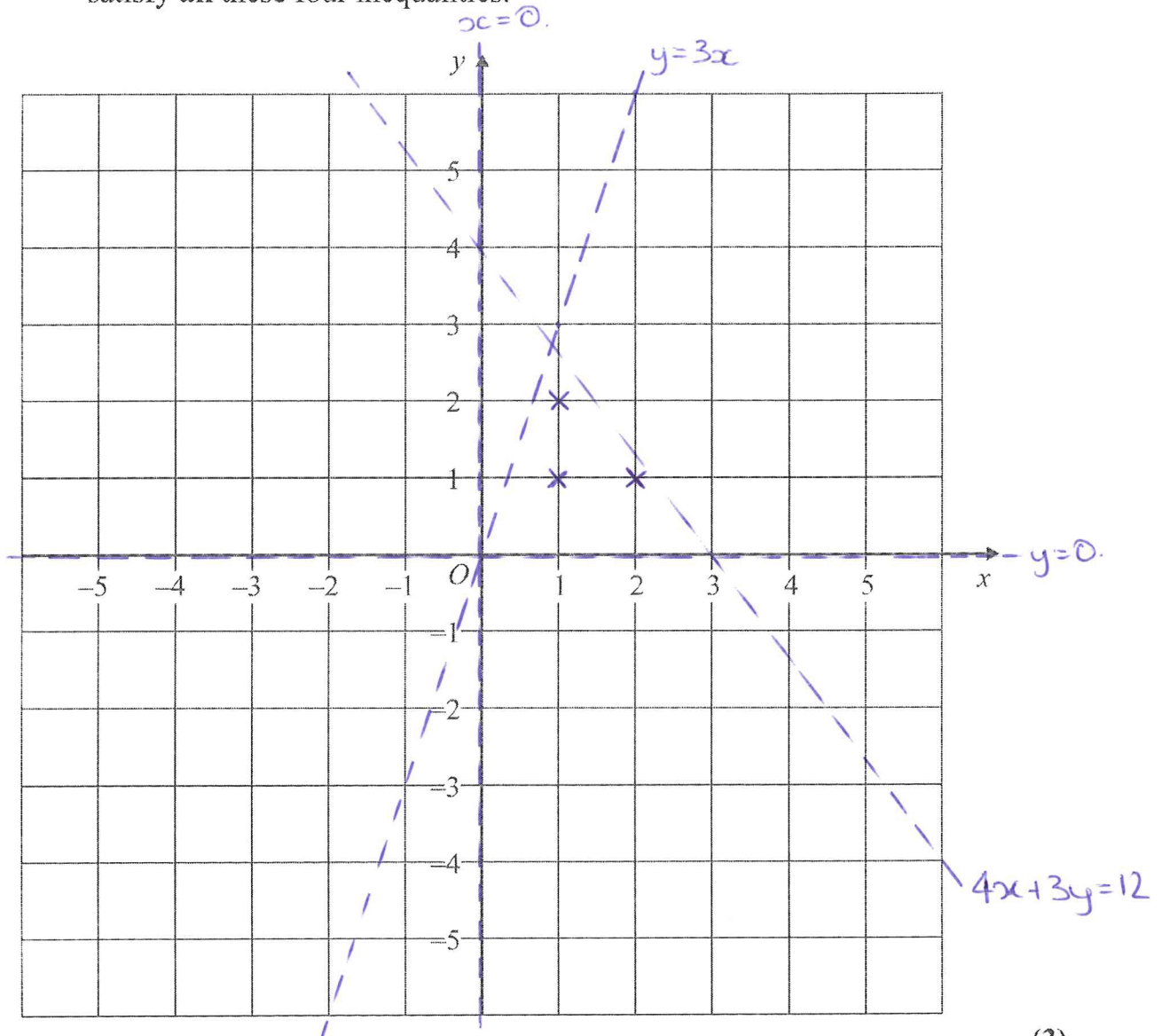
(2)

3) Inequalities Regions: Harder

7. $4x + 3y < 12$, $y < 3x$, $y > 0$, $x > 0$

x and y are both integers.

On the grid, mark with a cross (\times), each of the **three** points which satisfy **all** these four inequalities.



(3)
(Total 5 marks)

4) More Difficult Rearranging Formulae: Easier

1. Rearrange $a(q - c) = d$ to make q the subject.

$$aq - ac = d$$

$$aq = d + ac$$

$$q = \frac{d + ac}{a}$$

$$q = \frac{d + ac}{a} \dots\dots\dots (3)$$

(Total 5 marks)

2. (a) Make n the subject of the formula $m = 5n - 21$

$$m + 21 = 5n$$

$$n = \frac{m + 21}{5}$$

4) More Difficult Rearranging Formulae: Medium

10. $P = \frac{n^2 + a}{n + a}$

Rearrange the formula to make a the subject.

$$p(n+a) = n^2 + a$$

$$pn + pa = n^2 + a$$

$$pa - a = n^2$$

$$a(p-1) = n^2$$

$$a = \frac{n^2}{p-1}$$

$$a = \dots\dots\dots$$

(Total 4 marks)

11. $\frac{x}{x+c} = \frac{p}{q}$

Make x the subject of the formula.

$$xq = p(x+c)$$

$$xq = px + cp$$

$$x(q-p) = cp$$

$$x = \frac{cp}{q-p}$$

$$x = \dots\dots\dots$$

(Total 4 marks)

4) More Difficult Rearranging Formulae: Harder

12. Rearrange $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

to make u the subject of the formula.

Give your answer in its simplest form.

$$fv + fu = uv$$

$$fu - uv = fv$$

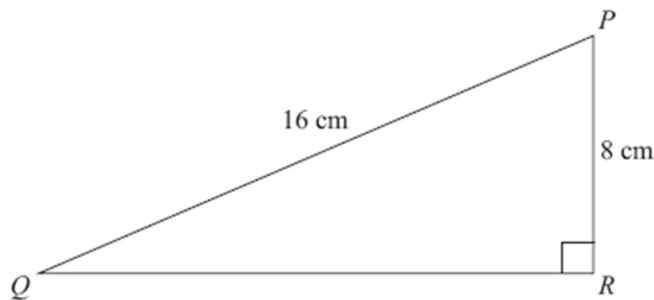
$$u(f-v) = fv$$

$$u = \frac{fv}{f-v}$$

5) Pythagoras: Easier

1.

Diagram NOT
accurately drawn



PQR is a right-angled triangle.
 $PQ = 16$ cm.
 $PR = 8$ cm.

Calculate the length of QR .
 Give your answer correct to 2 decimal places.

$$QR^2 = 16^2 - 8^2 = 192$$

$$QR = \sqrt{192} = 13.86 \text{ cm}$$

..... **13.86** cm

(3 marks)

2.

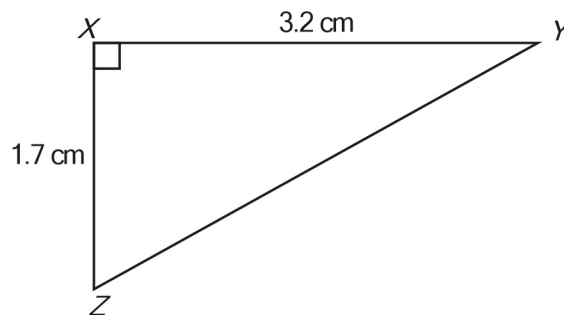


Diagram NOT
accurately drawn

XYZ is a right-angled triangle.
 $XY = 3.2$ cm.
 $XZ = 1.7$ cm.

Calculate the length of YZ .

Give your answer correct to 3 significant figures.

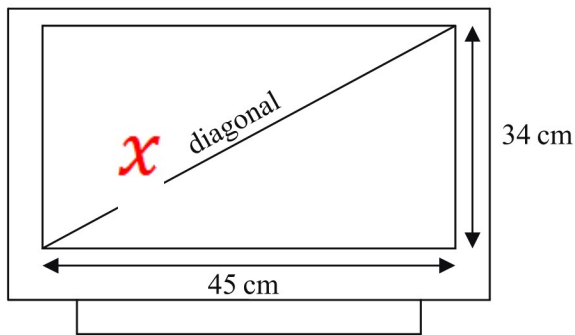
$$YZ^2 = 3.2^2 + 1.7^2 = 13.13$$

$$YZ = \sqrt{13.13} = 3.62 \text{ cm}$$

..... **3.62** cm

5) Pythagoras: Medium

7.



old version answers:

Q11 22.4 cm

Q12 11.9cm

Diagram NOT accurately drawn

A rectangular television screen has a width of 45 cm and a height of 34 cm.

Work out the length of the diagonal of the screen.
Give your answer correct to the nearest centimetre.

$$x^2 = 45^2 + 34^2 = 3181$$

$$x = \sqrt{3181} = 56 \text{ cm}$$

..... 56 cm
(4 marks)

8.

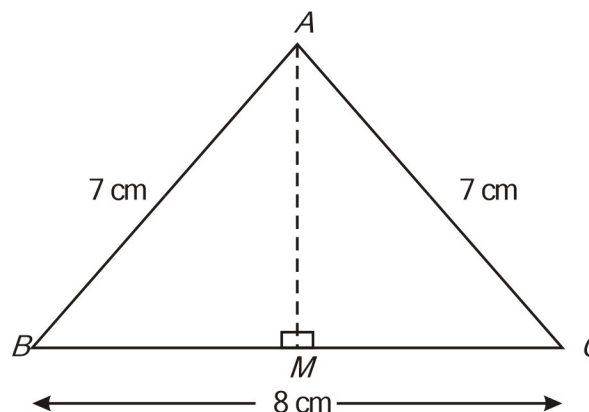


Diagram NOT accurately drawn

Work out the length, in centimetres, of AM .
Give your answer correct to 2 decimal places.

$$BM = \frac{1}{2} BC = 4 \text{ cm}$$

$$AM^2 = 7^2 - 4^2 = 33$$

$$AM = \sqrt{33} = 5.74$$

..... 5.74 cm
(3 marks)

5) Pythagoras: Harder

13. $ABCD$ is a trapezium.

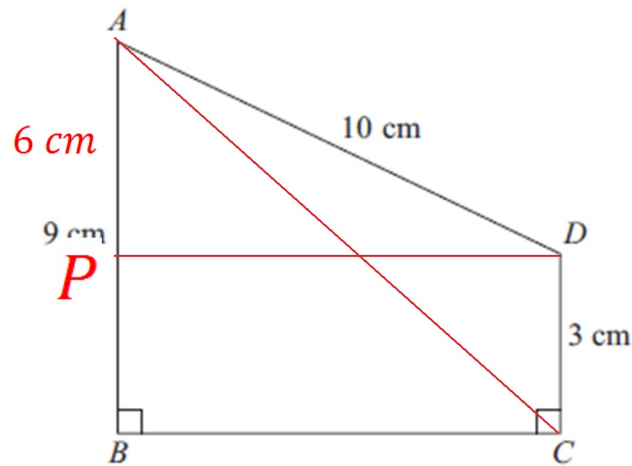


Diagram **NOT** accurately drawn

$AD = 10$ cm
 $AB = 9$ cm
 $DC = 3$ cm
 Angle $ABC =$ angle $BCD = 90^\circ$

Calculate the length of AC .
 Give your answer correct to 3 significant figures.

$$AP = 9 - 3 = 6 \text{ cm}$$

$$PD^2 = 10^2 - 6^2 = 64$$

$$BC = PD = \sqrt{64} = 8 \text{ cm}$$

$$AC^2 = 9^2 + 8^2 = 145$$

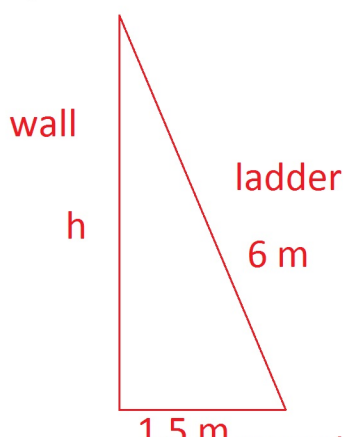
$$AC = \sqrt{145} = 12.0 \dots\dots\dots \text{ cm}$$

(5 marks)

14. A ladder is 6 m long.
 The ladder is placed on horizontal ground, resting against a vertical wall.

The instructions for using the ladder say that the bottom of the ladder must not be closer than 1.5 m from the bottom of the wall.

How far up the wall can the ladder reach?
 Give your answer correct to 1 decimal place.



$$h^2 = 6^2 - 1.5^2 = 33.75$$

$$h = \sqrt{33.75} = 5.8 \text{ m}$$

LEIGH-VALERO Nadia

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Bearings. Mathswatch Clip: 124

Topic 2: Simple Bounds. Mathswatch Clip: 132

Topic 3: Missing Mean Questions. Mathswatch Clip: NA

Topic 4: Standard Form. Mathswatch Clip: 83

Topic 5: Solving Quadratics Using the Formula. MW: 191

1) Bearings: Easier

1.

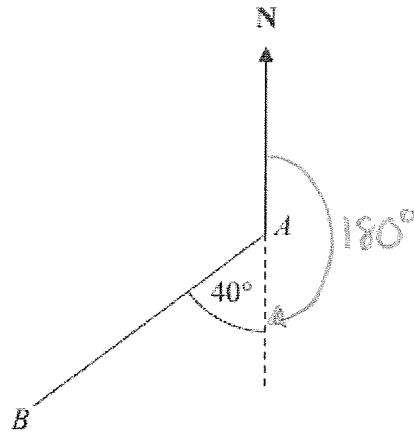


Diagram NOT accurately drawn

$180 + 40$

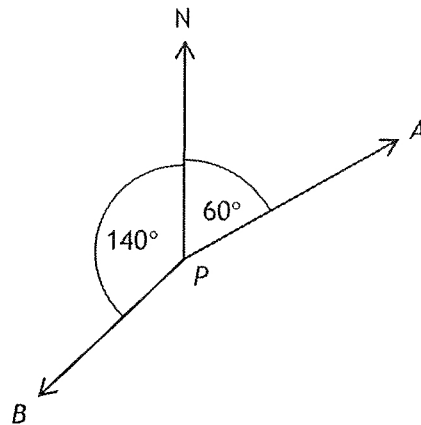
Work out the bearing of B from A.

START POINT

.....220.....°

(2 marks)

2.



(a) Write down the bearing of A from P.

Bearings are always 3 digits

.....060.....°

(b) Work out the bearing of B from P.

$360 - 140$

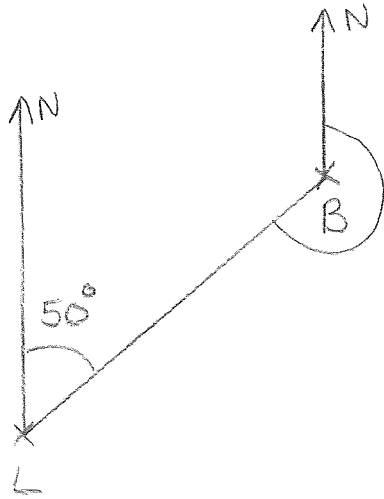
.....220.....°

(3 marks)

1) Bearings: Medium

9. The bearing of a ship from a lighthouse is 050°

Work out the bearing of the lighthouse from the ship.



DRAW A SKETCH!
If accurate, you can measure the bearing

.....
230.....°

(2 marks)

1) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

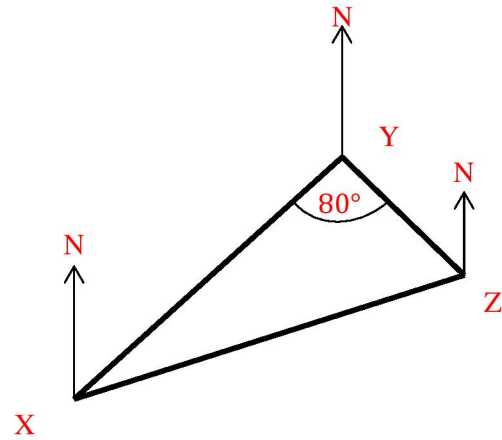
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

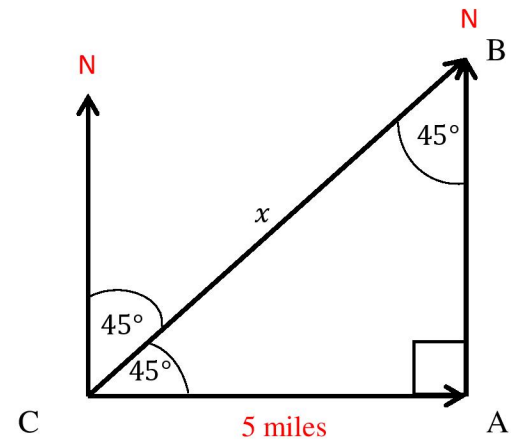
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



2) Simple Bounds: Easier

1. A piece of string has a length of 55 mm to the nearest mm.

(a) Write down the shortest possible length of the piece of string.

_____ 54.5 _____ mm
(1)

(b) Write down the greatest possible length of the piece of string.

_____ 55.5 _____ mm
(1)
(2 marks)

2. Chelsea's height is 158 cm to the nearest cm.

(a) Write down Chelsea's minimum possible height.

_____ 157.5 _____ cm
(1)

(b) Write down Chelsea's maximum possible height.

_____ 158.5 _____ cm
(1)
(2 marks)

2) Simple Bounds: Medium

3. A is 4.2 correct to the nearest decimal place.
B is 13 correct to the nearest whole number.

a) What is the error interval for A?

$$4.15 \leq A < 4.25$$

_____ cm

(1)

b) What is the lower bound of B?

$$12.5$$

_____ cm

(1)

c) What is the error interval of A + B?

$$\text{Lower bound } A+B \quad 4.15 + 12.5 = 16.65$$

$$\text{Upper bound } A+B \quad 4.25 + 13.5 = 17.75$$

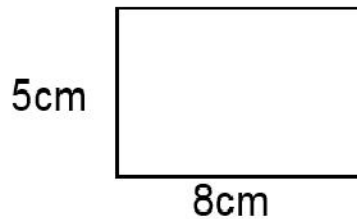
$$16.65 \leq A + B < 17.75$$

_____ cm

(1)

2) Simple Bounds: Harder

4.



The sides of the rectangle above are measured to the nearest cm.

a) Work out a lower bound for the perimeter.

Lower bounds for the sides are 4.5cm and 7.5cm

So lower bounds for perimeter is $2 \times 4.5 + 2 \times 7.5 = 9 + 15 = 24\text{cm}$

24cm

b) Work out the upper bound for the perimeter.

Upper bounds for the sides are 5.5cm and 8.5cm

So lower bounds for perimeter is $2 \times 5.5 + 2 \times 8.5 = 11 + 17 = 28\text{cm}$

28cm

(4 marks)

5. Tom has 100 identical pens.

Each of these pen weighs 5 grams to the nearest gram.

Work out the greatest possible total weight of all 100 pens.

Give your answer in kilograms.

Upper bound for weight of one pen: 5.5 g

So for 100 pens upper bound is $100 \times 5.5 = 550\text{g}$

One kilogram = 1000 grams so

$$550\text{g} = 0.55\text{kg}$$

0.55

kg

(3 marks)

3) Missing Mean Questions: Easier

1) The mean of 8 and another number is 13.

What is the other number?

$$\begin{aligned} \text{Solution: } (8+x)/2 &= 13 && \times 2 \\ 8 + x &= 26 && - 8 \\ x &= 18 \end{aligned}$$

_____18_____

(3 Marks)

2) The mean of 2, 5, 8 and x is 4

Find x

$$\begin{aligned} \text{Solution: } (2 + 5 + 8 + x) / 4 &= 4 && \times 4 \\ 15 + x &= 16 && -15 \\ x &= 1 \end{aligned}$$

_____x = 1_____

(3 Marks)

3) After measuring the heights of 7 people, they have an average height of 156cm. After measuring the heights of 8 people they have an average height of 158cm. How tall is the 8th person?

$$\begin{aligned} \text{Solution: } 7 \times 156 &= 1092 \\ 8 \times 158 &= 1264 \\ 1092 - 1264 &= 172 \end{aligned}$$

(3 Marks)

_____172_____

3) Missing Mean Questions: Medium

4) The mean weight of a group of 7 girls is 58kg

a) Work out their total weight

Solution: $7 \times 58 = 406\text{kg}$

_____406_____Kg

When a 8th girl joins the group, the mean weight goes up to 59kg.

b) What is the weight of the 8th girl?

Solution: $59 \times 8 = 472$

$472 - 406 = 66 \text{ Kg}$

_____66_____Kg

(3 Marks)

5) The mean distance that Jack runs in his last 10 runs is 5.7 miles. Work out the distance that he would need to run to make this exactly 6 miles.

Solution: $10 \times 5.7 = 57$

$11 \times 6 = 66$

$66 - 57 = 9$

_____9 miles_____

(2 Marks)

3) Missing Mean Questions: Harder

- 6) Waitresses and kitchen staff in a restaurant decide to share their tips. There are 8 kitchen staff 10 waitresses. The kitchen staff receives a mean of £23 weekly and the waitresses receive a mean of £28 weekly.

Work out the mean of all 18 members of staff.

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$$\text{Total} = 184 + 280 = 464$$

$$\text{Mean} = 464/18 = 25.78$$

_____ £25.78 _____

(3 Marks)

- 7) The mean of a, a, b is 30

The mean of a, a, b, b, b is 20

Find the values of a and b

Solution:

$$(2a + b) / 3 = 30 \quad \times 3$$

$$(2a + 3b) / 5 = 20 \quad \times 5$$

$$2a + b = 90 \quad - \quad \text{solve simultaneously}$$

$$2a + 3b = 100$$

$$-2b = -10$$

$$b = 5$$

$$2a + 5 = 90$$

$$2a = 85$$

$$a = 42.5$$

$a = 42.5 \quad b = 5$ _____

4) Standard Form: Easier

1. (a) Write the number 0.00037 in standard form.

(1)

$$3.7 \times 10^4$$

- (b) Write 8.25×10^3 as an ordinary number.

(1)

$$8250$$

- (c) Work out $(2.1 \times 10^8) \times (6 \times 10^{-5})$.
Write your answer in standard form.

$$\begin{aligned} 2.1 \times 10^8 \times 6 \times 10^{-5} \\ = 12.6 \times 10^3 \\ = 1.26 \times 10^4 \end{aligned}$$

(2)

$$1.26 \times 10^4$$

(4 marks)

2. (a) Write 6.43×10^5 as an ordinary number.

$$643000$$

(1)

- (b) Work out the value of $2 \times 10^7 \times 8 \times 10^{-12}$.
Give your answer in standard form.

$$\begin{aligned} 2 \times 10^7 \times 8 \times 10^{-12} \\ = 16 \times 10^{-5} \\ = 1.6 \times 10^{-4} \end{aligned}$$

$$1.6 \times 10^{-4}$$

(2)

(3 marks)

4) Standard Form: Medium

15.
$$p^2 = \frac{x-y}{xy}$$

$$x = 8.5 \times 10^9$$

$$y = 4 \times 10^8$$

Find the value of p .

Give your answer in standard form correct to 2 significant figures.

$$p^2 = \frac{8.5 \times 10^9 - 4 \times 10^8}{8.5 \times 10^9 \times 4 \times 10^8} = \frac{8.1 \times 10^9}{3.4 \times 10^{18}}$$

$$= 2.38235... \times 10^{-9}$$

$$= 2.4 \times 10^{-9} \text{ (2sf)}$$

$$p = \sqrt{2.38235... \times 10^{-9}}$$

$$= 4.880935... \times 10^{-5}$$

$$= 4.9 \times 10^{-5} \text{ (2sf)}$$

$$4.9 \times 10^{-5} \text{ (2sf)}$$

$$\underline{\underline{4.9 \times 10^{-5}}}$$

(4 marks)

16.
$$y^2 = \frac{ab}{a+b}$$

$$a = 3 \times 10^8$$

$$b = 2 \times 10^7$$

Find y .

Give your answer in standard form correct to 2 significant figures.

$$y^2 = \frac{3 \times 10^8 \times 2 \times 10^7}{3 \times 10^8 + 2 \times 10^7}$$

$$= \frac{6 \times 10^{15}}{3.2 \times 10^8}$$

$$= 18750000$$

$$y = \sqrt{18750000}$$

$$= 4330.127...$$

$$= 4300 \text{ (2sf)}$$

$$= 4.3 \times 10^3 \text{ (2sf)}$$

$$y = \underline{\underline{4.3 \times 10^3 \text{ (2sf)}}}$$

(4 marks)

4) Standard Form: Harder

Worded Standard Form

1) The world's smallest snail travels 4×10^{-3} m a month.

How many months would it take for the snail to travel?

2×10^{-1} m?

$$\frac{2 \times 10^{-1}}{4 \times 10^{-3}} = \frac{2}{4} \times 10^2$$

$$= 0.5 \times 10^2$$

$$= 5 \times 10^3$$

(-1 - -3 = 2)

2)

The time taken for light to reach Earth from the edge of the known universe is 14 000 000 000 years.

Light travels at the speed of 9.46×10^{12} km/year.

Work out the distance, in kilometres, from the edge of the known universe to Earth.
Give your answer in standard form.

$$S = \frac{D}{T}$$

$$D = ST$$

$$D = 9.46 \times 10^{12} \times 1.4 \times 10^{10}$$

$$= 13.244 \times 10^{22}$$

$$= 1.3244 \times 10^{23}$$

5) Solving Quadratics Using the Formula: Easier

1. Solve $3x^2 + 7x - 13 = 0$
Give your solutions correct to 2 decimal places.

$$a = 3 \quad b = 7 \quad c = -13$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-7 \pm \sqrt{7^2 - 4 \times 3 \times -13}}{2 \times 3} = \frac{-7 \pm \sqrt{205}}{6}$$

$$= 1.219636844 \quad \text{or} \quad -3.552970177$$

$$x = \underline{1.22} \dots \dots \dots \text{or } x = \underline{-3.55} \dots \dots \dots$$

(3 marks)

2. Solve the equation

$$2x^2 + 6x - 95 = 0$$

Give your solutions correct to 3 significant figures.

$$a = 2 \quad b = 6 \quad c = -95$$

$$x = \frac{-6 \pm \sqrt{36 - (4 \times 2 \times -95)}}{4}$$

$$= \frac{-6 \pm \sqrt{796}}{4}$$

$$= 5.55336799 \quad \text{or} \quad -8.55336799$$

$$x = \underline{5.55} \dots \dots \dots \text{or } x = \underline{-8.55} \dots \dots \dots$$

(3 marks)

5) Solving Quadratics Using the Formula: Medium

8. The diagram below shows a 6-sided shape.

All the corners are right angles.

All measurements are given in centimetres.

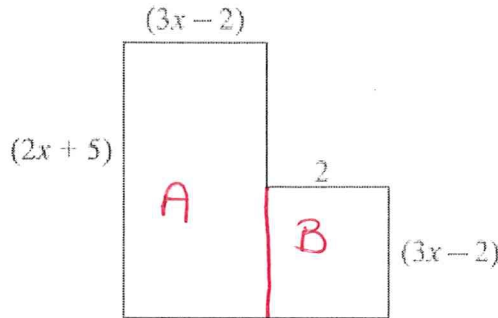


Diagram NOT accurately drawn

The area of the shape is 25 cm^2 .

(a) Show that $6x^2 + 17x - 39 = 0$

$$\begin{aligned} \text{Area A} &= (2x+5)(3x-2) \\ &= 6x^2 - 4x + 15x - 10 \\ &= 6x^2 + 11x - 10 \end{aligned}$$

$$\begin{aligned} \text{Area B} &= 2(3x-2) \\ &= 6x - 4 \end{aligned}$$

$$\begin{aligned} \text{TOTAL AREA} &= 6x^2 + 11x - 10 + 6x - 4 \\ &= 6x^2 + 17x - 14 \end{aligned}$$

$$\begin{aligned} \text{SO } 6x^2 + 17x - 14 &= 25 \\ 6x^2 + 17x - 39 &= 0 \end{aligned}$$

(b) (i) Solve the equation

$$6x^2 + 17x - 39 = 0$$

$$a = 6 \quad b = 17 \quad c = -39$$

$$x = \frac{-17 \pm \sqrt{17^2 - 4(6)(-39)}}{12}$$

$$x = 1.5 \quad \text{or} \quad x = -4.3$$

$x = \dots\dots\dots$ or $x = \dots\dots\dots$

(ii) Hence work out the length of the longest side of the shape.

$$(2 \times 1.5) + 5 = 8$$

$\dots\dots\dots 8 \dots\dots\dots \text{cm}$

(4)

5) Solving Quadratics Using the Formula: Harder

9. The diagram shows a 6-sided shape.
All the corners are right angles.
All the measurements are given in centimetres.

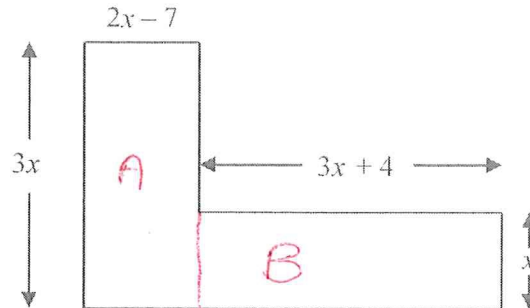


Diagram NOT accurately drawn

The area of the shape is 85 cm^2 .

- (a) Show that $9x^2 - 17x - 85 = 0$

$$A = 3x(2x-7) \quad B = x(3x+4)$$

$$= 6x^2 - 21x \quad = 3x^2 + 4x$$

$$6x^2 - 21x + 3x^2 + 4x = 85$$

$$9x^2 - 17x - 85 = 0 \quad (3)$$

- (b) (i) Solve $9x^2 - 17x - 85 = 0$

Give your solutions correct to 3 significant figures.

$$a=9 \quad b=-17 \quad c=-85$$

$$x = \frac{17 \pm \sqrt{17^2 - 4(9)(-85)}}{18}$$

$$x = 4.159474732 \quad \text{or} \quad x = -2.270585844$$

$$x = 4.16 \dots \quad \text{or} \quad x = -2.27 \dots$$

- (ii) Hence, work out the length of the shortest side of the 6-sided shape.

$$2x-7$$

$$\dots 1.38 \dots \text{ cm}$$

(4)

LEIGH-VALERO Tori

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Bearings. Mathswatch Clip: 124

Topic 2: Missing Mean Questions. Mathswatch Clip: NA

Topic 3: Solving Quadratics Using the Formula. MW: 191

Topic 4: Venn diagrams.. Mathswatch Clip: 127

Topic 5: Inequalities Regions. Mathswatch Clip: 198

1) Bearings: Easier

1.

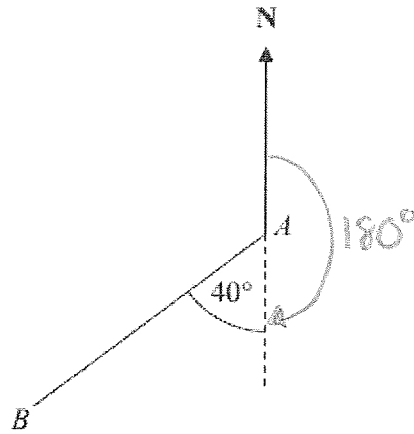


Diagram NOT accurately drawn

$180 + 40$

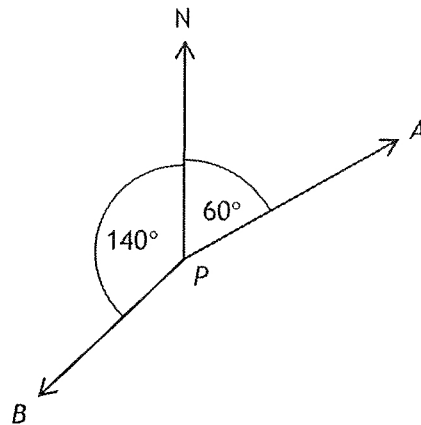
Work out the bearing of B from A.

START POINT

.....220.....°

(2 marks)

2.



(a) Write down the bearing of A from P.

Bearings are always 3 digits

.....060.....°

(b) Work out the bearing of B from P.

$360 - 140$

.....220.....°

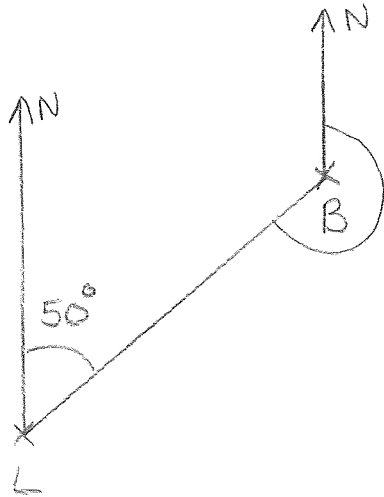
(3 marks)

1) Bearings: Medium

9. The bearing of a ship from a lighthouse is 050°

Work out the bearing of the lighthouse from the ship.

DRAW A SKETCH!
If accurate, you can measure the bearing



.....
230.....°

(2 marks)

1) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

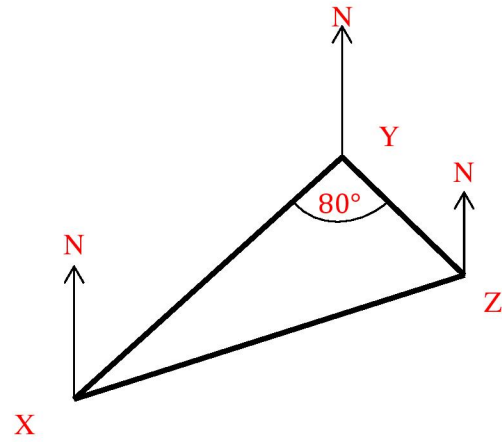
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

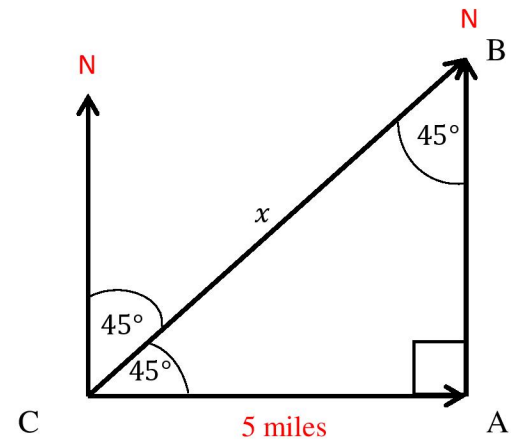
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



2) Missing Mean Questions: Easier

1) The mean of 8 and another number is 13.

What is the other number?

$$\begin{aligned} \text{Solution: } (8+x)/2 &= 13 && \times 2 \\ 8 + x &= 26 && - 8 \\ x &= 18 \end{aligned}$$

_____18_____

(3 Marks)

2) The mean of 2, 5, 8 and x is 4

Find x

$$\begin{aligned} \text{Solution: } (2 + 5 + 8 + x) / 4 &= 4 && \times 4 \\ 15 + x &= 16 && -15 \\ x &= 1 \end{aligned}$$

_____x = 1_____

(3 Marks)

3) After measuring the heights of 7 people, they have an average height of 156cm. After measuring the heights of 8 people they have an average height of 158cm. How tall is the 8th person?

$$\begin{aligned} \text{Solution: } 7 \times 156 &= 1092 \\ 8 \times 158 &= 1264 \\ 1092 - 1264 &= 172 \end{aligned}$$

(3 Marks)

_____172_____

2) Missing Mean Questions: Medium

4) The mean weight of a group of 7 girls is 58kg

a) Work out their total weight

Solution: $7 \times 58 = 406\text{kg}$

_____406_____Kg

When a 8th girl joins the group, the mean weight goes up to 59kg.

b) What is the weight of the 8th girl?

Solution: $59 \times 8 = 472$

$472 - 406 = 66 \text{ Kg}$

_____66_____Kg

(3 Marks)

5) The mean distance that Jack runs in his last 10 runs is 5.7 miles. Work out the distance that he would need to run to make this exactly 6 miles.

Solution: $10 \times 5.7 = 57$

$11 \times 6 = 66$

$66 - 57 = 9$

_____9 miles_____

(2 Marks)

2) Missing Mean Questions: Harder

- 6) Waitresses and kitchen staff in a restaurant decide to share their tips. There are 8 kitchen staff 10 waitresses. The kitchen staff receives a mean of £23 weekly and the waitresses receive a mean of £28 weekly.

Work out the mean of all 18 members of staff.

$$\begin{aligned} \text{Solution: } 23 \times 8 &= 184 \\ 28 \times 10 &= 280 \end{aligned}$$

$$\text{Total} = 184 + 280 = 464$$

$$\text{Mean} = 464/18 = 25.78$$

_____ £25.78 _____

(3 Marks)

- 7) The mean of a, a, b is 30

The mean of a, a, b, b, b is 20

Find the values of a and b

Solution:

$$(2a + b) / 3 = 30 \quad \times 3$$

$$(2a + 3b) / 5 = 20 \quad \times 5$$

$$2a + b = 90 \quad - \quad \text{solve simultaneously}$$

$$2a + 3b = 100$$

$$-2b = -10$$

$$b = 5$$

$$2a + 5 = 90$$

$$2a = 85$$

$$a = 42.5$$

$a = 42.5$ $b = 5$ _____

3) Solving Quadratics Using the Formula: Easier

1. Solve $3x^2 + 7x - 13 = 0$
Give your solutions correct to 2 decimal places.

$$a = 3 \quad b = 7 \quad c = -13$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-7 \pm \sqrt{7^2 - 4 \times 3 \times -13}}{2 \times 3} = \frac{-7 \pm \sqrt{205}}{6}$$

$$= 1.219636844 \quad \text{or} \quad -3.552970177$$

$$x = \underline{1.22} \dots \dots \dots \text{or } x = \underline{-3.55} \dots \dots \dots$$

(3 marks)

2. Solve the equation

$$2x^2 + 6x - 95 = 0$$

Give your solutions correct to 3 significant figures.

$$a = 2 \quad b = 6 \quad c = -95$$

$$x = \frac{-6 \pm \sqrt{36 - (4 \times 2 \times -95)}}{4}$$

$$= \frac{-6 \pm \sqrt{796}}{4}$$

$$= 5.55336799 \quad \text{or} \quad -8.55336799$$

$$x = \underline{5.55} \dots \dots \dots \text{or } x = \underline{-8.55} \dots \dots \dots$$

(3 marks)

3) Solving Quadratics Using the Formula: Medium

8. The diagram below shows a 6-sided shape.

All the corners are right angles.

All measurements are given in centimetres.

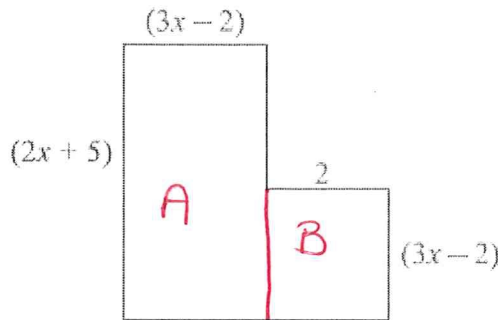


Diagram NOT accurately drawn

The area of the shape is 25 cm^2 .

(a) Show that $6x^2 + 17x - 39 = 0$

$$\begin{aligned} \text{Area A} &= (2x+5)(3x-2) \\ &= 6x^2 - 4x + 15x - 10 \\ &= 6x^2 + 11x - 10 \end{aligned}$$

$$\begin{aligned} \text{Area B} &= 2(3x-2) \\ &= 6x - 4 \end{aligned}$$

$$\begin{aligned} \text{TOTAL AREA} &= 6x^2 + 11x - 10 + 6x - 4 \\ &= 6x^2 + 17x - 14 \end{aligned}$$

$$\begin{aligned} \text{SO } 6x^2 + 17x - 14 &= 25 \\ 6x^2 + 17x - 39 &= 0 \end{aligned}$$

(b) (i) Solve the equation

$$6x^2 + 17x - 39 = 0$$

$$a = 6 \quad b = 17 \quad c = -39$$

$$x = \frac{-17 \pm \sqrt{17^2 - 4(6)(-39)}}{12}$$

$$x = 1.5 \quad \text{or} \quad x = -4.3$$

$x = \dots\dots\dots$ or $x = \dots\dots\dots$

(ii) Hence work out the length of the longest side of the shape.

$$(2 \times 1.5) + 5 = 8$$

$\dots\dots\dots 8 \dots\dots\dots \text{cm}$

(4)

3) Solving Quadratics Using the Formula: Harder

9. The diagram shows a 6-sided shape.
All the corners are right angles.
All the measurements are given in centimetres.

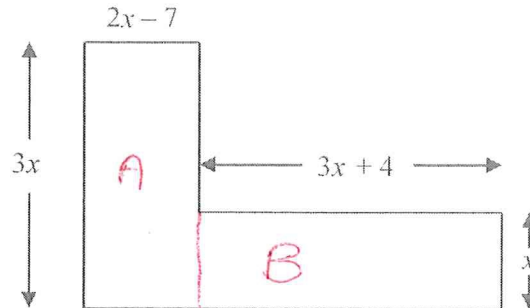


Diagram NOT accurately drawn

The area of the shape is 85 cm^2 .

- (a) Show that $9x^2 - 17x - 85 = 0$

$$A = 3x(2x-7) \quad B = x(3x+4)$$

$$= 6x^2 - 21x \quad = 3x^2 + 4x$$

$$6x^2 - 21x + 3x^2 + 4x = 85$$

$$9x^2 - 17x - 85 = 0 \quad (3)$$

- (b) (i) Solve $9x^2 - 17x - 85 = 0$

Give your solutions correct to 3 significant figures.

$$a=9 \quad b=-17 \quad c=-85$$

$$x = \frac{17 \pm \sqrt{17^2 - 4(9)(-85)}}{18}$$

$$x = 4.159474732 \quad \text{or} \quad x = -2.270585844$$

$$x = 4.16 \dots \quad \text{or} \quad x = -2.27 \dots$$

- (ii) Hence, work out the length of the shortest side of the 6-sided shape.

$$2x-7$$

$$\dots 1.38 \dots \text{ cm}$$

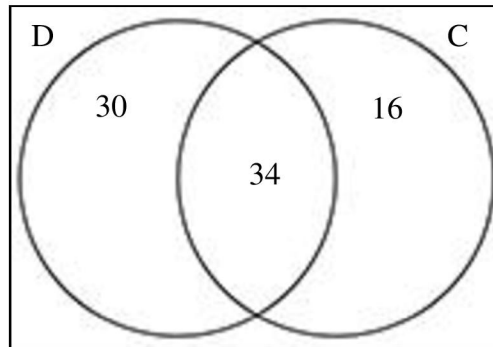
(4)

4) Venn diagrams.: Easier

Solution for Question 1:

Number of people that owned dogs only: $64 - 34 = 30$

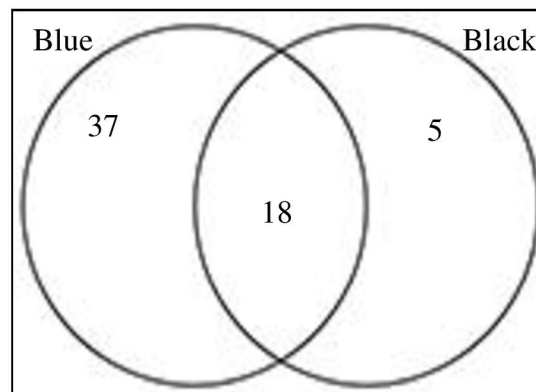
Number of people that owned cats only: $80 - 34 - 30 = 16$



Solution for Question 2:

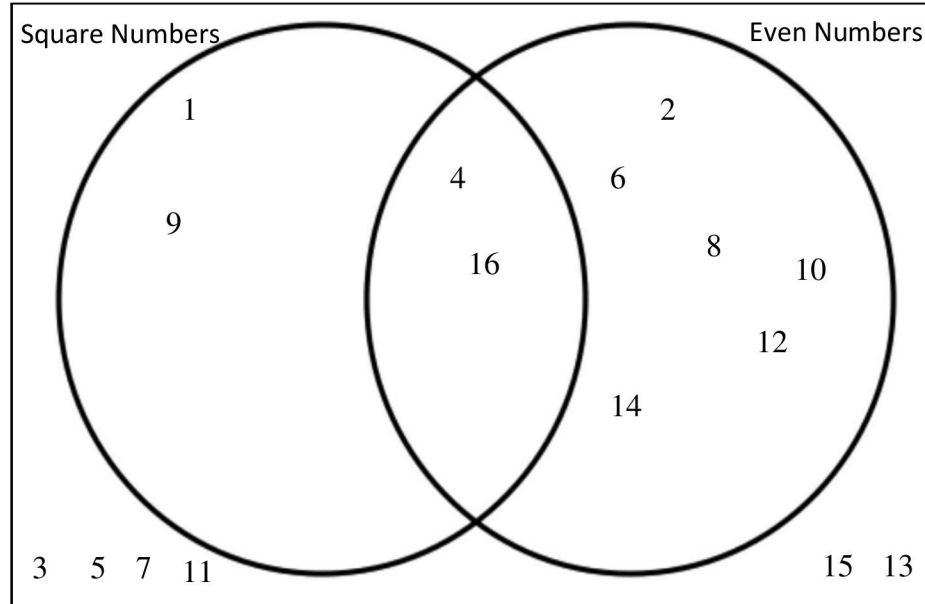
a) Number of people that only had a black pen:
 $60 - 37 - 18 = 5$

b) Probability of a person owning both types of pen:
 $\frac{18}{60} = \frac{3}{10}$



4) Venn diagrams.: Medium

Solution for Question 3:



Solution for Question 4:

- a) Tea: $6 + 12 = 18$
 Coffee: $9 + 12 = 21$
 Therefore, False
- b) False
- c) False

Solution for Question 5:

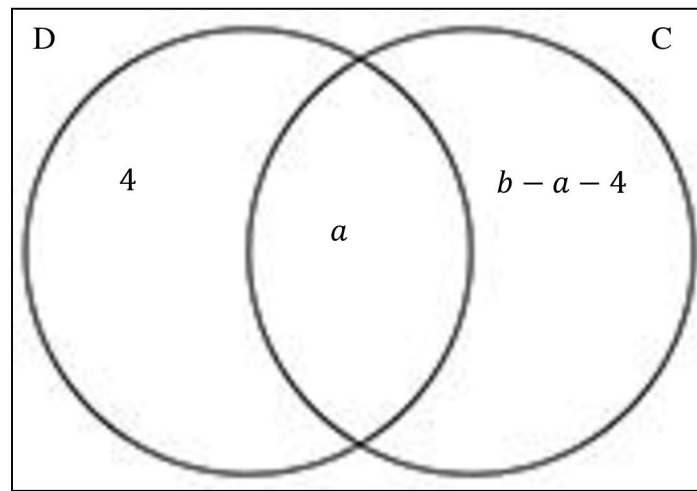
- a)
- i) $A \cap B = A$ and $B = \{9,15\}$
- ii) $A \cup B = A$ or $B = \{3,5,6,12,18\}$

4) Venn diagrams.: Harder

Solution for Question 6:

Number of people who replied with cats only:

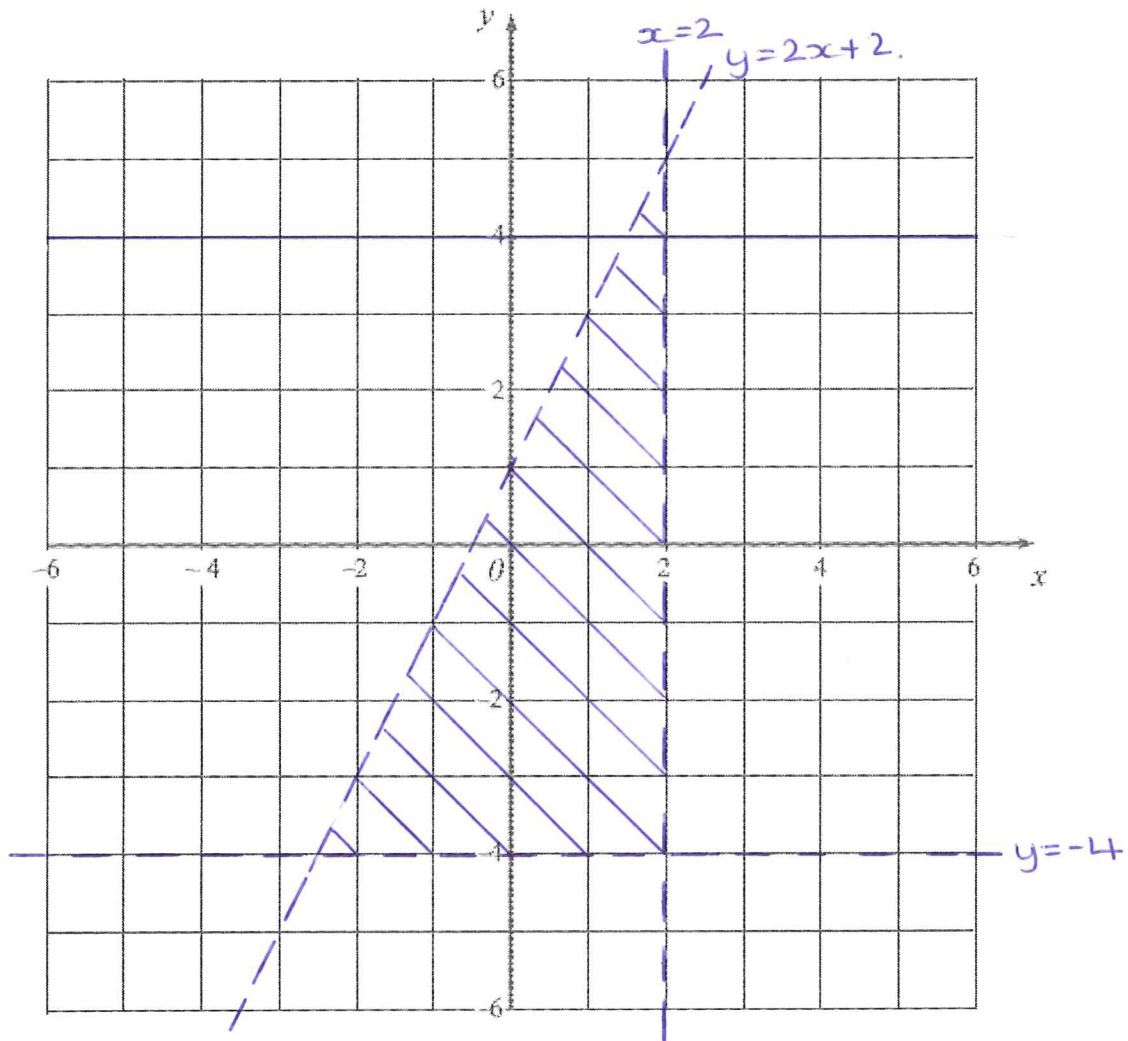
$$b - a - 4$$



5) Inequalities Regions: Easier

1. On the grid, shade the region that satisfies all three of these inequalities

$$y > -4 \quad x < 2 \quad y < 2x + 1$$



(Total for Question 19 = 4 marks)

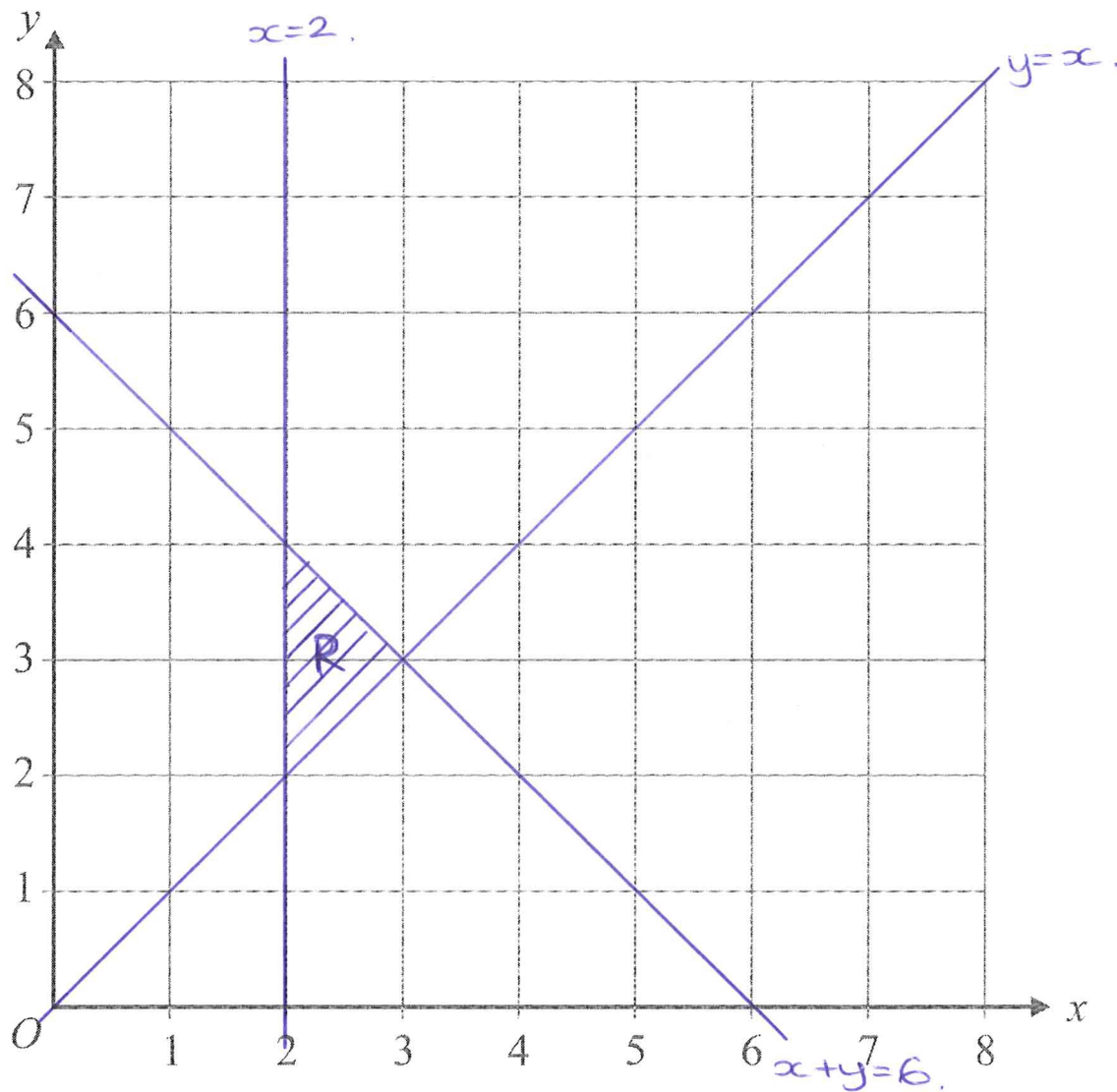
5) Inequalities Regions: Medium

6. (a) On the grid below, draw straight lines and use shading to show the region **R** that satisfies the inequalities

$$x \geq 2$$

$$y \geq x$$

$$x + y \leq 6$$



(3)

The point P with coordinates (x, y) lies inside the region **R**.
 x and y are **integers**.

- (b) Write down the coordinates of **all** the points of **R** whose coordinates are both integers.

$(2, 2)$ $(2, 3)$ $(2, 4)$ $(3, 3)$

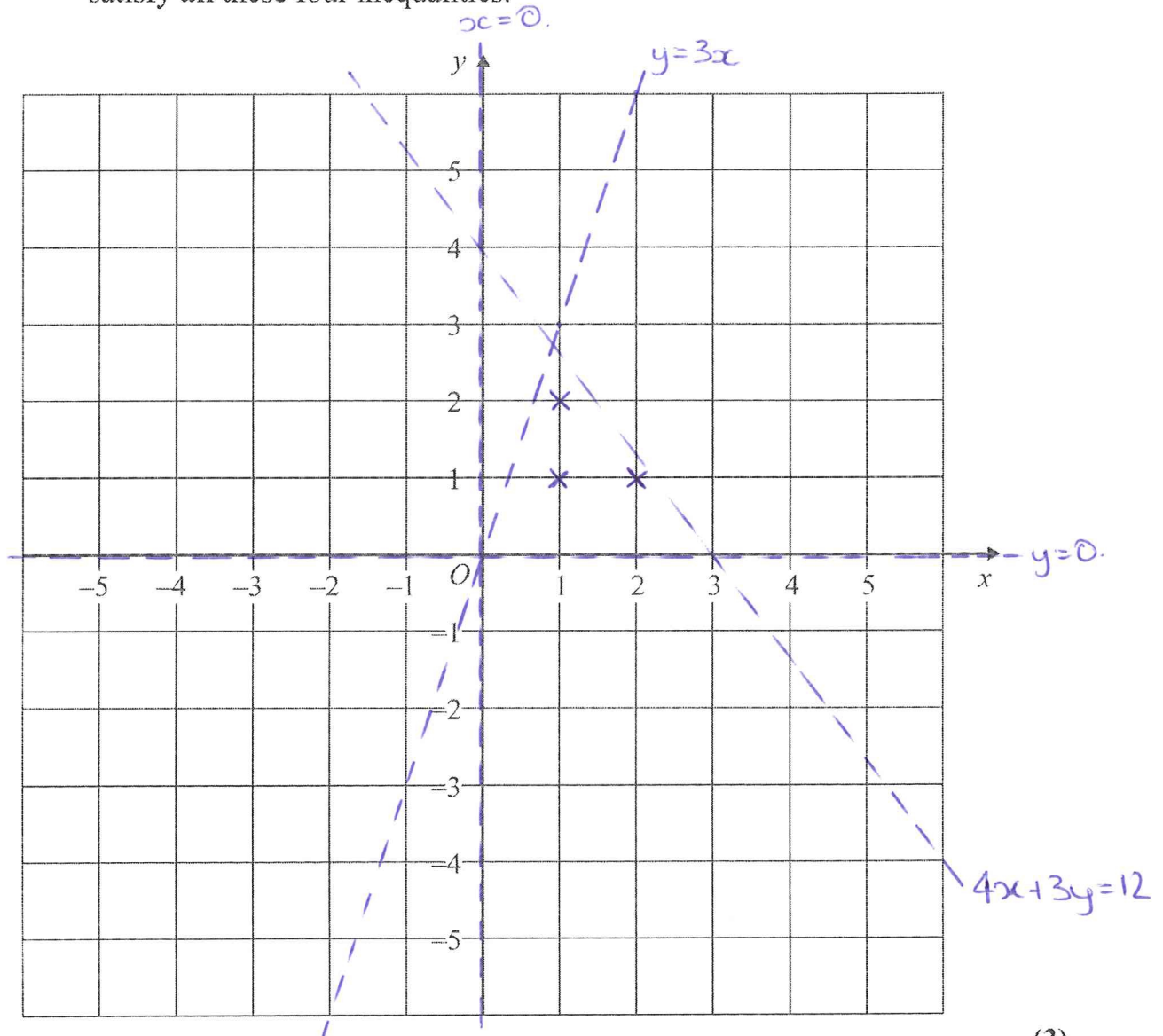
(2)

5) Inequalities Regions: Harder

7. $4x + 3y < 12$, $y < 3x$, $y > 0$, $x > 0$

x and y are both integers.

On the grid, mark with a cross (\times), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

LUNT Aoife

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Bearings. Mathswatch Clip: 124

Topic 2: Missing Mean Questions. Mathswatch Clip: NA

Topic 3: Inequalities Regions. Mathswatch Clip: 198

Topic 4: More Difficult Rearranging Formulae. MW: 190

Topic 5: Pythagoras. Mathswatch Clip: 150

1) Bearings: Easier

1.

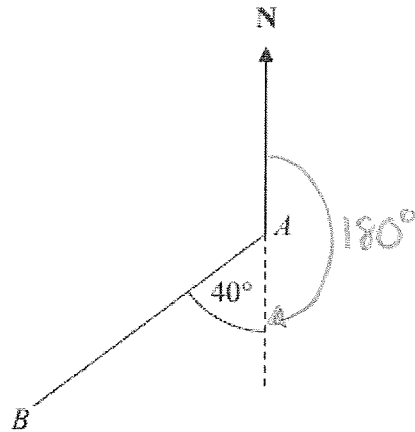


Diagram NOT accurately drawn

$180 + 40$

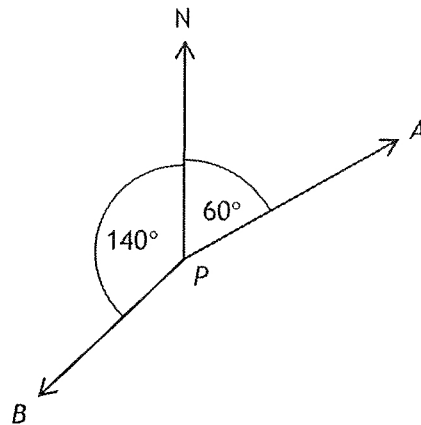
Work out the bearing of B from A.

START POINT

.....220.....°

(2 marks)

2.



(a) Write down the bearing of A from P.

Bearings are always 3 digits

.....060.....°

(b) Work out the bearing of B from P.

$360 - 140$

.....220.....°

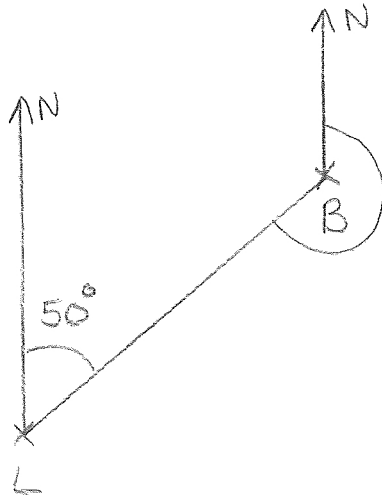
(3 marks)

1) Bearings: Medium

9. The bearing of a ship from a lighthouse is 050°

Work out the bearing of the lighthouse from the ship.

DRAW A SKETCH!
If accurate, you can measure the bearing



.....
230.....°

(2 marks)

1) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

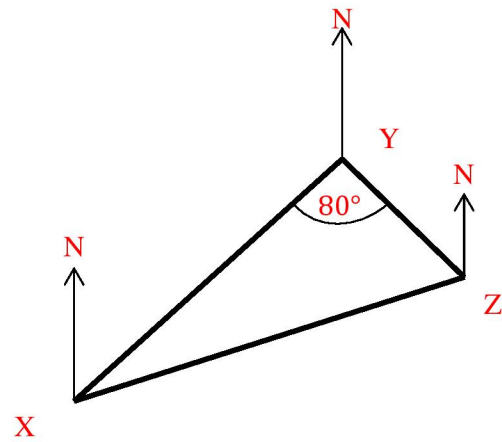
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

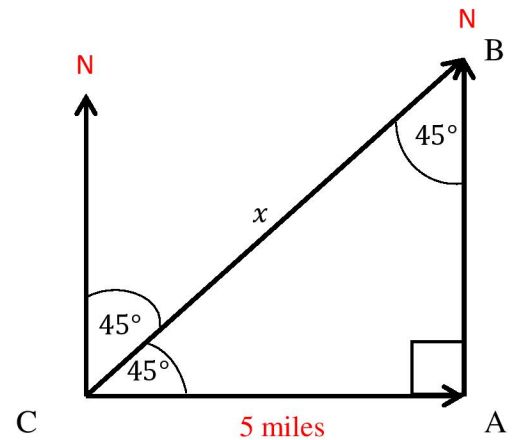
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



2) Missing Mean Questions: Easier

1) The mean of 8 and another number is 13.

What is the other number?

$$\text{Solution: } (8+x)/2 = 13 \quad \times 2$$

$$8 + x = 26 \quad - 8$$

$$x = 18$$

$$\underline{\hspace{2cm}} 18 \underline{\hspace{2cm}}$$

(3 Marks)

2) The mean of 2, 5, 8 and x is 4

Find x

$$\text{Solution: } (2 + 5 + 8 + x) / 4 = 4 \quad \times 4$$

$$15 + x = 16 \quad -15$$

$$x = 1$$

$$\underline{\hspace{2cm}} x = 1 \underline{\hspace{2cm}}$$

(3 Marks)

3) After measuring the heights of 7 people, they have an average height of 156cm. After measuring the heights of 8 people they have an average height of 158cm. How tall is the 8th person?

$$\text{Solution: } 7 \times 156 = 1092$$

$$8 \times 158 = 1264$$

$$1092 - 1264 = 172$$

(3 Marks)

$$\underline{\hspace{2cm}} 172 \underline{\hspace{2cm}}$$

2) Missing Mean Questions: Medium

4) The mean weight of a group of 7 girls is 58kg

a) Work out their total weight

Solution: $7 \times 58 = 406\text{kg}$

_____406_____Kg

When a 8th girl joins the group, the mean weight goes up to 59kg.

b) What is the weight of the 8th girl?

Solution: $59 \times 8 = 472$

$472 - 406 = 66 \text{ Kg}$

_____66_____Kg

(3 Marks)

5) The mean distance that Jack runs in his last 10 runs is 5.7 miles. Work out the distance that he would need to run to make this exactly 6 miles.

Solution: $10 \times 5.7 = 57$

$11 \times 6 = 66$

$66 - 57 = 9$

_____9 miles_____

(2 Marks)

2) Missing Mean Questions: Harder

- 6) Waitresses and kitchen staff in a restaurant decide to share their tips. There are 8 kitchen staff 10 waitresses. The kitchen staff receives a mean of £23 weekly and the waitresses receive a mean of £28 weekly.

Work out the mean of all 18 members of staff.

$$\begin{aligned} \text{Solution: } 23 \times 8 &= 184 \\ 28 \times 10 &= 280 \end{aligned}$$

$$\text{Total} = 184 + 280 = 464$$

$$\text{Mean} = 464/18 = 25.78$$

_____ £25.78 _____

(3 Marks)

- 7) The mean of a, a, b is 30

The mean of a, a, b, b, b is 20

Find the values of a and b

Solution:

$$(2a + b) / 3 = 30 \quad \times 3$$

$$(2a + 3b) / 5 = 20 \quad \times 5$$

$$2a + b = 90 \quad - \quad \text{solve simultaneously}$$

$$2a + 3b = 100$$

$$-2b = -10$$

$$b = 5$$

$$2a + 5 = 90$$

$$2a = 85$$

$$a = 42.5$$

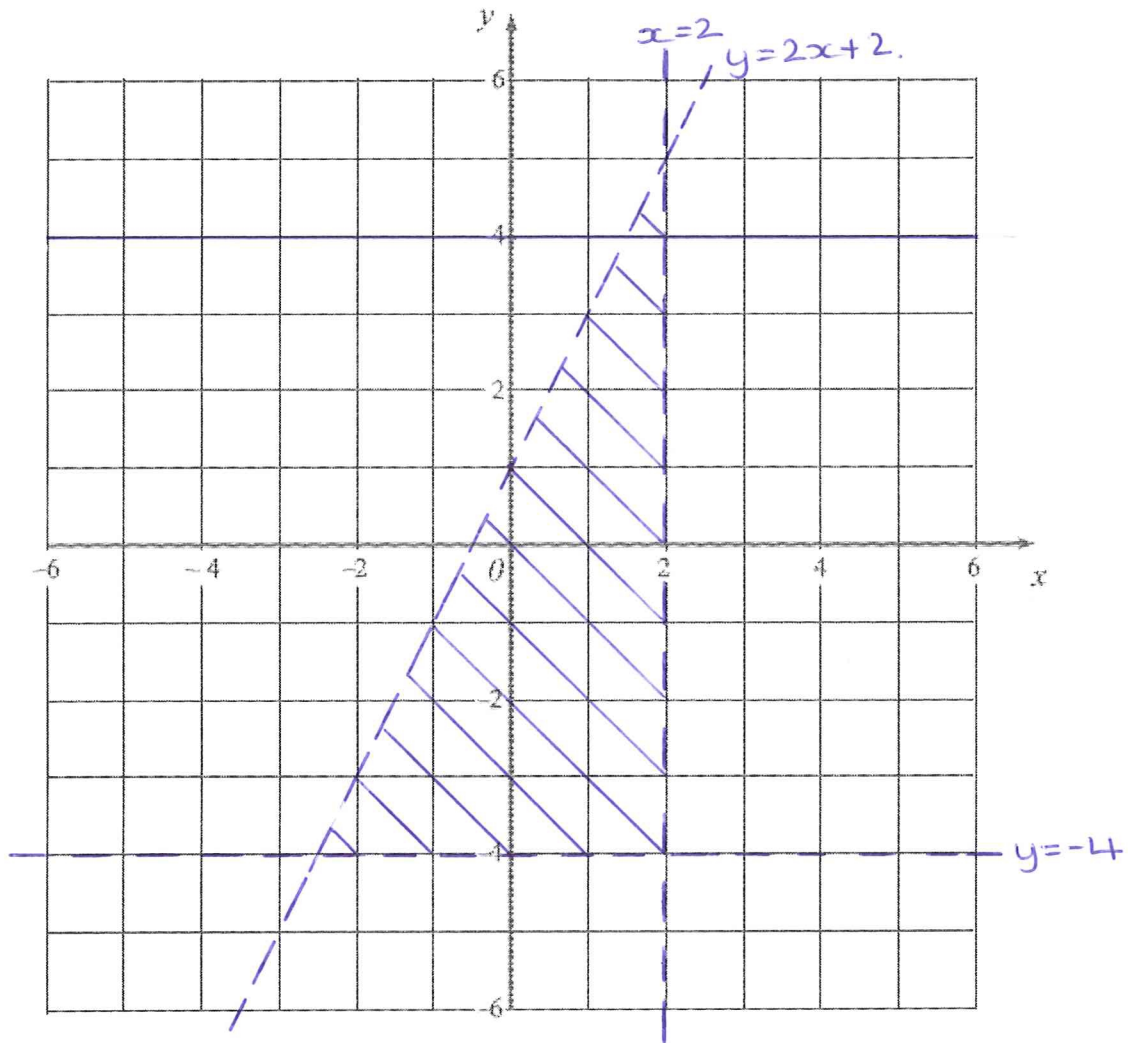
$a = 42.5$ $b = 5$ _____

(5 Marks)

3) Inequalities Regions: Easier

1. On the grid, shade the region that satisfies all three of these inequalities

$$y > -4 \quad x < 2 \quad y < 2x + 1$$



(Total for Question 19 = 4 marks)

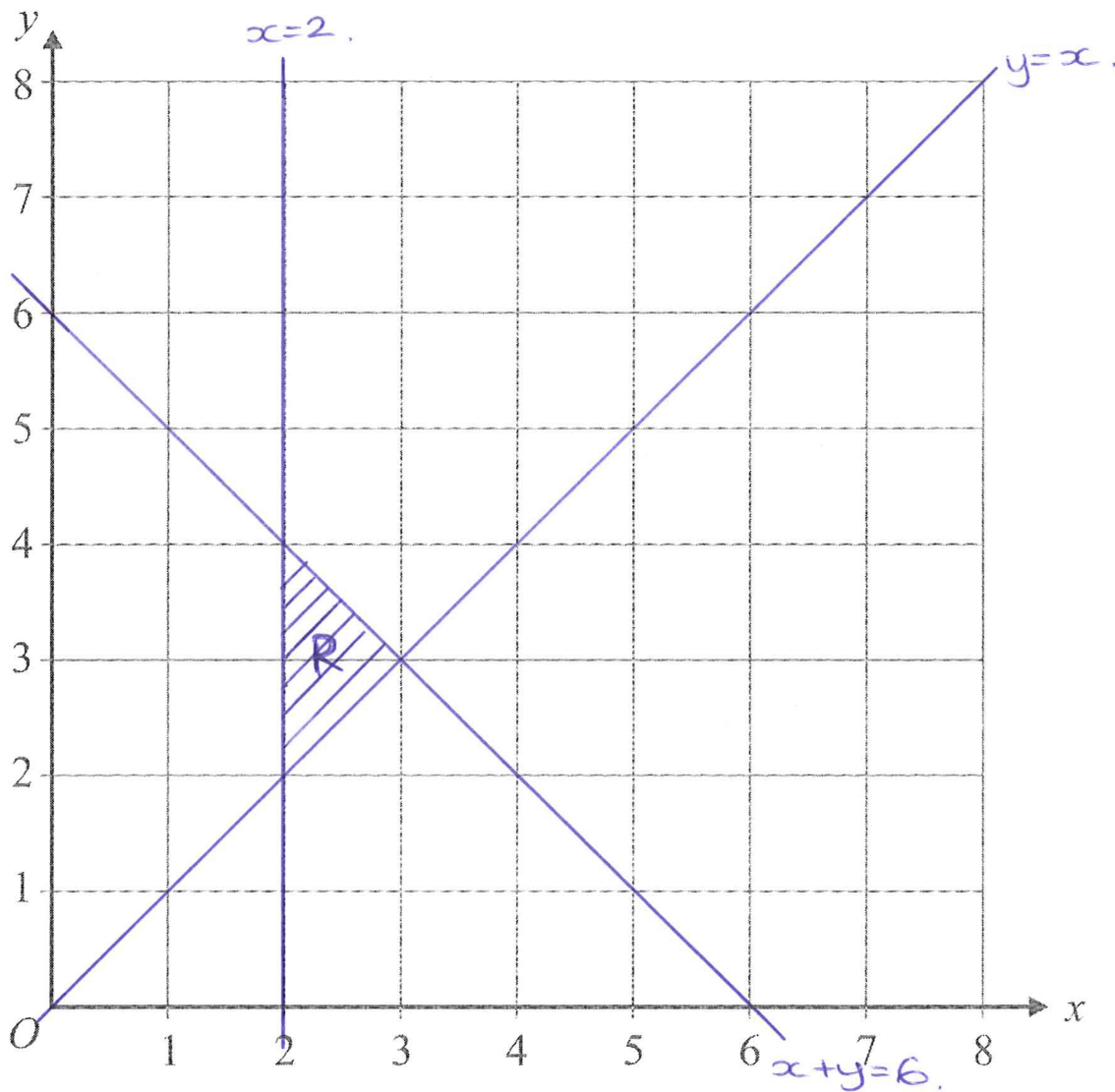
3) Inequalities Regions: Medium

6. (a) On the grid below, draw straight lines and use shading to show the region **R** that satisfies the inequalities

$$x \geq 2$$

$$y \geq x$$

$$x + y \leq 6$$



(3)

The point P with coordinates (x, y) lies inside the region **R**.
 x and y are **integers**.

- (b) Write down the coordinates of **all** the points of **R** whose coordinates are both integers.

$(2, 2)$ $(2, 3)$ $(2, 4)$ $(3, 3)$

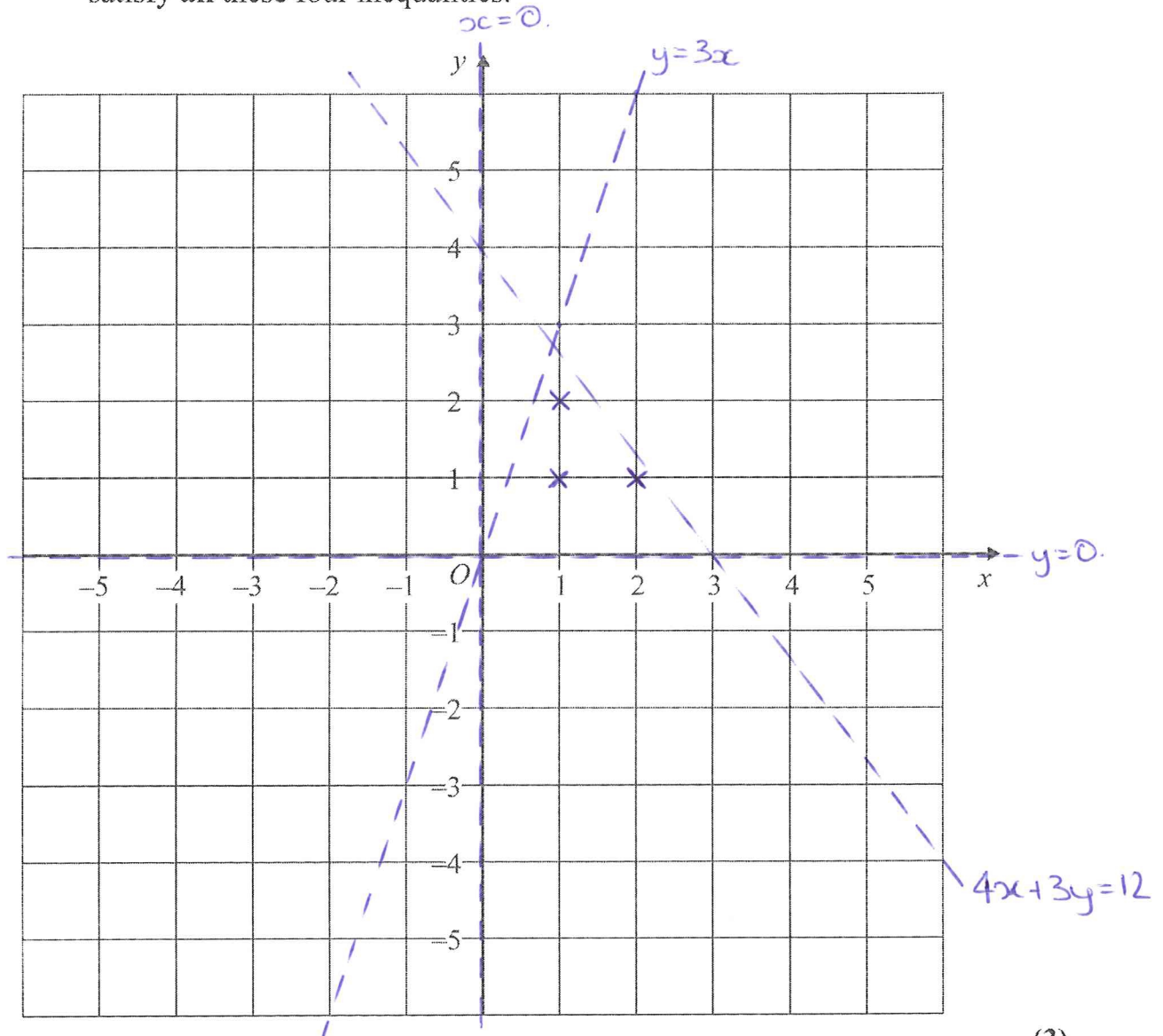
(2)

3) Inequalities Regions: Harder

7. $4x + 3y < 12$, $y < 3x$, $y > 0$, $x > 0$

x and y are both integers.

On the grid, mark with a cross (\times), each of the **three** points which satisfy **all** these four inequalities.



(3)
(Total 5 marks)

4) More Difficult Rearranging Formulae: Easier

1. Rearrange $a(q - c) = d$ to make q the subject.

$$aq - ac = d$$

$$aq = d + ac$$

$$q = \frac{d + ac}{a}$$

$$q = \frac{d + ac}{a} \dots\dots\dots (3)$$

(Total 5 marks)

2. (a) Make n the subject of the formula $m = 5n - 21$

$$m + 21 = 5n$$

$$n = \frac{m + 21}{5}$$

4) More Difficult Rearranging Formulae: Medium

10. $P = \frac{n^2 + a}{n + a}$

Rearrange the formula to make a the subject.

$$p(n+a) = n^2 + a$$

$$pn + pa = n^2 + a$$

$$pa - a = n^2$$

$$a(p-1) = n^2$$

$$a = \frac{n^2}{p-1}$$

$$a = \dots\dots\dots$$

(Total 4 marks)

11. $\frac{x}{x+c} = \frac{p}{q}$

Make x the subject of the formula.

$$xq = p(x+c)$$

$$xq = px + cp$$

$$x(q-p) = cp$$

$$x = \frac{cp}{q-p}$$

$$LUNT Aoife, Page 300 / 480 \quad x = \dots\dots\dots$$

(Total 4 marks)

4) More Difficult Rearranging Formulae: Harder

12. Rearrange $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

to make u the subject of the formula.

Give your answer in its simplest form.

$$fv + fu = uv$$

$$fu - uv = fv$$

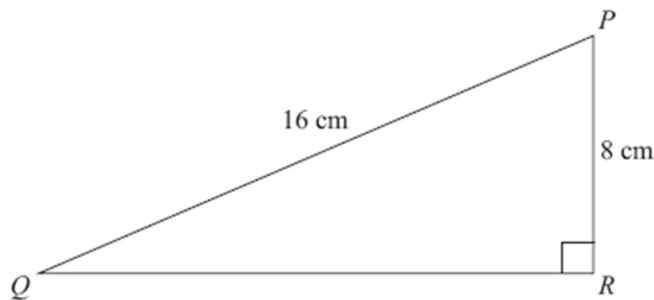
$$u(f-v) = fv$$

$$u = \frac{fv}{f-v}$$

5) Pythagoras: Easier

1.

Diagram NOT
accurately drawn



PQR is a right-angled triangle.
 $PQ = 16$ cm.
 $PR = 8$ cm.

Calculate the length of QR .
 Give your answer correct to 2 decimal places.

$$QR^2 = 16^2 - 8^2 = 192$$

$$QR = \sqrt{192} = 13.86 \text{ cm}$$

..... **13.86** cm

(3 marks)

2.

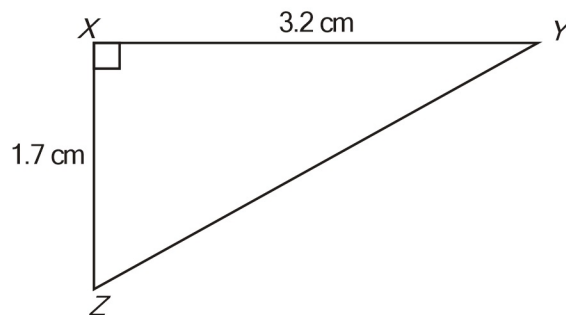


Diagram NOT
accurately drawn

XYZ is a right-angled triangle.
 $XY = 3.2$ cm.
 $XZ = 1.7$ cm.

Calculate the length of YZ .

Give your answer correct to 3 significant figures.

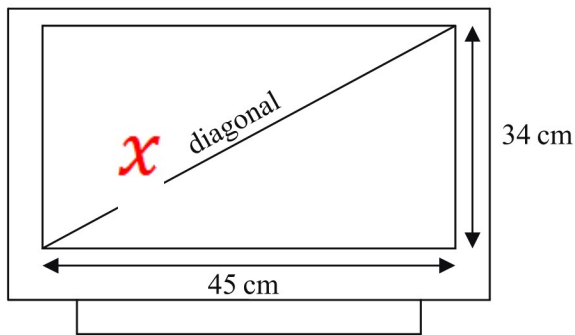
$$YZ^2 = 3.2^2 + 1.7^2 = 13.13$$

$$YZ = \sqrt{13.13} = 3.62 \text{ cm}$$

..... **3.62** cm

5) Pythagoras: Medium

7.



old version answers:

Q11 22.4 cm

Q12 11.9cm

Diagram NOT accurately drawn

A rectangular television screen has a width of 45 cm and a height of 34 cm.

Work out the length of the diagonal of the screen.
Give your answer correct to the nearest centimetre.

$$x^2 = 45^2 + 34^2 = 3181$$

$$x = \sqrt{3181} = 56 \text{ cm}$$

..... 56 cm
(4 marks)

8.

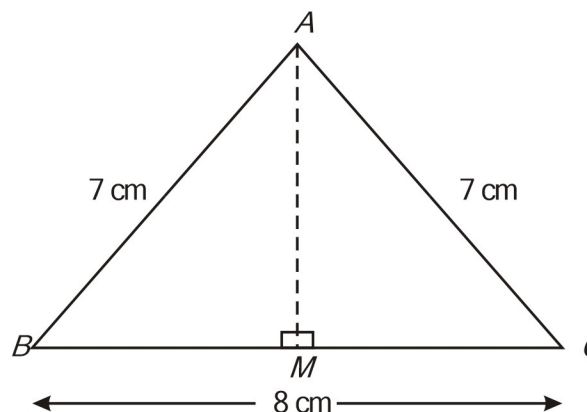


Diagram NOT accurately drawn

Work out the length, in centimetres, of AM .
Give your answer correct to 2 decimal places.

$$BM = \frac{1}{2} BC = 4 \text{ cm}$$

$$AM^2 = 7^2 - 4^2 = 33$$

$$AM = \sqrt{33} = 5.74$$

..... 5.74 cm
(3 marks)

5) Pythagoras: Harder

13. $ABCD$ is a trapezium.

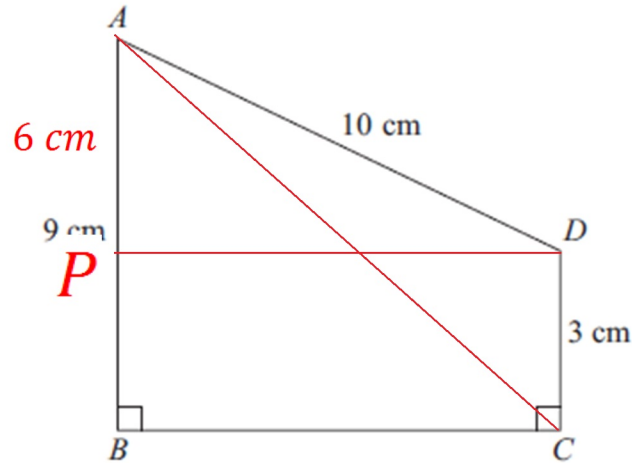


Diagram **NOT** accurately drawn

$AD = 10$ cm
 $AB = 9$ cm
 $DC = 3$ cm
 Angle $ABC =$ angle $BCD = 90^\circ$

Calculate the length of AC .
 Give your answer correct to 3 significant figures.

$$AP = 9 - 3 = 6 \text{ cm}$$

$$PD^2 = 10^2 - 6^2 = 64$$

$$BC = PD = \sqrt{64} = 8 \text{ cm}$$

$$AC^2 = 9^2 + 8^2 = 145$$

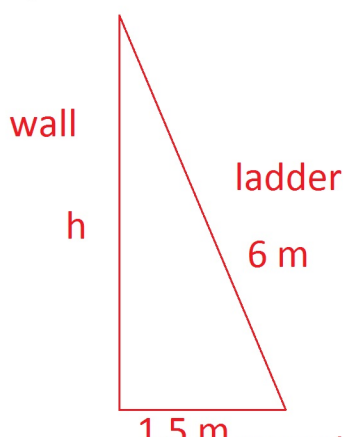
$$AC = \sqrt{145} = 12.0 \dots\dots\dots \text{ cm}$$

(5 marks)

14. A ladder is 6 m long.
 The ladder is placed on horizontal ground, resting against a vertical wall.

The instructions for using the ladder say that the bottom of the ladder must not be closer than 1.5 m from the bottom of the wall.

How far up the wall can the ladder reach?
 Give your answer correct to 1 decimal place.



$$h^2 = 6^2 - 1.5^2 = 33.75$$

$$h = \sqrt{33.75} = 5.8 \text{ m}$$

MACKENZIE Jed

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Bearings. Mathswatch Clip: 124

Topic 2: Missing Mean Questions. Mathswatch Clip: NA

Topic 3: Changing Ratios. Mathswatch Clip: NA

Topic 4: Solving Quadratics Using the Formula. MW: 191

Topic 5: More Difficult Rearranging Formulae. MW: 190

1) Bearings: Easier

1.

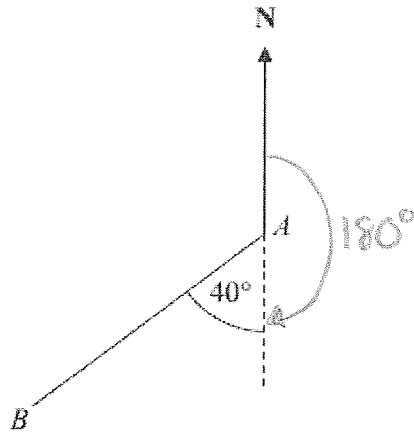


Diagram NOT accurately drawn

$180 + 40$

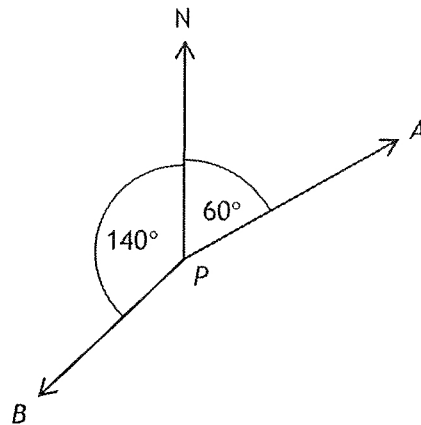
Work out the bearing of B from A.

START POINT

.....220.....°

(2 marks)

2.



(a) Write down the bearing of A from P.

Bearings are always 3 digits

.....060.....°

(b) Work out the bearing of B from P.

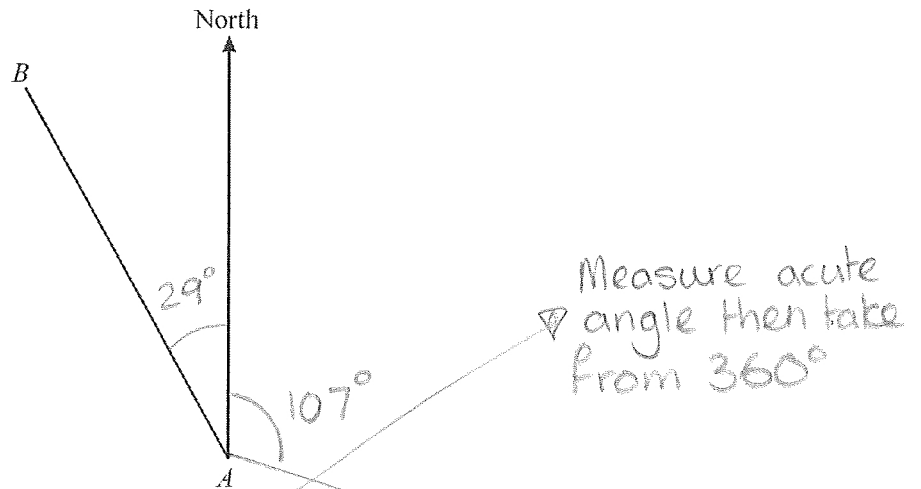
$360 - 140$

.....220.....°

(3 marks)

1) Bearings: Medium

3.



(a) Measure and write down the bearing of B from A.

$$360 - 29$$

.....
331.....^o

(1)

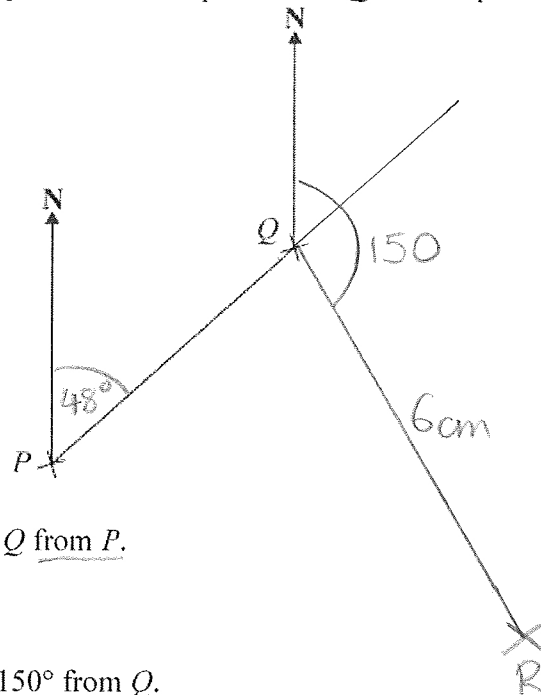
(b) On the diagram, draw a line on a bearing of 107° from A.

clockwise

(1)

(2 marks)

4. The diagram shows the position of two ports P and Q on a map.



(a) Measure the bearing of Q from P.

.....
048.....^o

(1)

A rock R is on a bearing of 150° from Q.
On the map R is 6 cm from Q.

(b) Mark the position of R with a cross (x) and label it R.

(2)

1) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

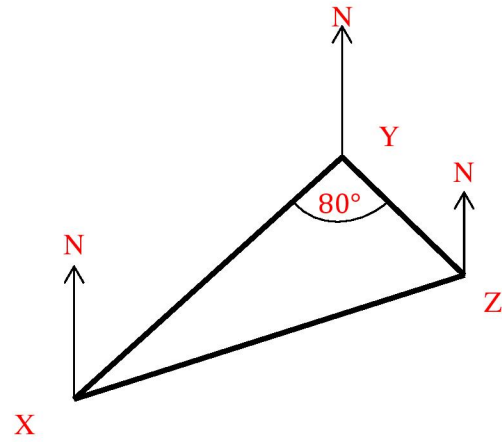
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

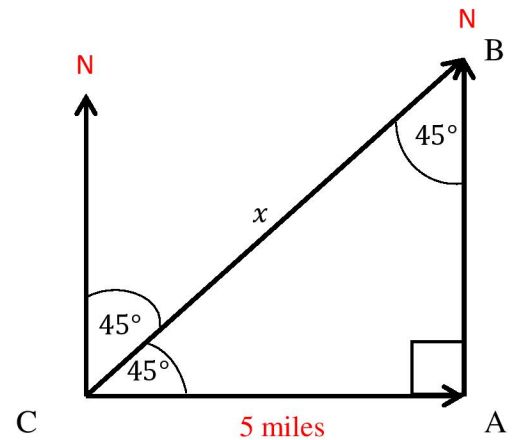
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



2) Missing Mean Questions: Easier

1) The mean of 8 and another number is 13.

What is the other number?

$$\begin{aligned} \text{Solution: } (8+x)/2 &= 13 && \times 2 \\ 8 + x &= 26 && - 8 \\ x &= 18 \end{aligned}$$

_____18_____

(3 Marks)

2) The mean of 2, 5, 8 and x is 4

Find x

$$\begin{aligned} \text{Solution: } (2 + 5 + 8 + x) / 4 &= 4 && \times 4 \\ 15 + x &= 16 && -15 \\ x &= 1 \end{aligned}$$

_____x = 1_____

(3 Marks)

3) After measuring the heights of 7 people, they have an average height of 156cm. After measuring the heights of 8 people they have an average height of 158cm. How tall is the 8th person?

$$\begin{aligned} \text{Solution: } 7 \times 156 &= 1092 \\ 8 \times 158 &= 1264 \\ 1092 - 1264 &= 172 \end{aligned}$$

(3 Marks)

_____172_____

2) Missing Mean Questions: Medium

4) The mean weight of a group of 7 girls is 58kg

a) Work out their total weight

Solution: $7 \times 58 = 406\text{kg}$

_____406_____Kg

When a 8th girl joins the group, the mean weight goes up to 59kg.

b) What is the weight of the 8th girl?

Solution: $59 \times 8 = 472$

$472 - 406 = 66 \text{ Kg}$

_____66_____Kg

(3 Marks)

5) The mean distance that Jack runs in his last 10 runs is 5.7 miles. Work out the distance that he would need to run to make this exactly 6 miles.

Solution: $10 \times 5.7 = 57$

$11 \times 6 = 66$

$66 - 57 = 9$

_____9 miles_____

(2 Marks)

2) Missing Mean Questions: Harder

- 6) Waitresses and kitchen staff in a restaurant decide to share their tips. There are 8 kitchen staff 10 waitresses. The kitchen staff receives a mean of £23 weekly and the waitresses receive a mean of £28 weekly.

Work out the mean of all 18 members of staff.

$$\begin{aligned} \text{Solution: } 23 \times 8 &= 184 \\ 28 \times 10 &= 280 \end{aligned}$$

$$\text{Total} = 184 + 280 = 464$$

$$\text{Mean} = 464/18 = 25.78$$

$$\underline{\quad \quad \quad \text{£}25.78 \quad \quad \quad \underline{\quad \quad \quad}}$$

(3 Marks)

- 7) The mean of a, a, b is 30

The mean of a, a, b, b, b is 20

Find the values of a and b

Solution:

$$(2a + b) / 3 = 30 \quad \times 3$$

$$(2a + 3b) / 5 = 20 \quad \times 5$$

$$2a + b = 90 \quad - \quad \text{solve simultaneously}$$

$$2a + 3b = 100$$

$$-2b = -10$$

$$b = 5$$

$$2a + 5 = 90$$

$$2a = 85$$

$$a = 42.5$$

$$a = 42.5 \quad b = 5 \underline{\quad \quad \quad}$$

(5 Marks)

3) Changing Ratios: Easier

Solution for Question 1:

a) Red : Blue = 8:12

Divide through by 4 to simplify: 2:3

b) Red : Blue = 8:10

Divide through by 2 to simplify: 4:5

Solution for Question 2:

a) Pen : Pencils = 2:3

Equivalent to 20:30

30 pencils in pencil case

b) Only pencils removed so still 20 pens, ratio 4:3 equivalent to 20:15 so removed 15 pencils

3) Changing Ratios: Medium

Solution for Question 3:

$$1:3:5$$

$$1:3+5 = 1:8$$

Solution for Question 4:

$$\text{Orange : Red} = 2:3$$

$$2:3 = 5$$

$$x:51 = y$$

$$\frac{51}{3} = 17$$

$$x = 2 \times 17 = 34$$

$$y = 5 \times 17 = 85$$

$$\text{Ratio of Orange to Red} = 34:51$$

Compare 2:3 to 10:17, achieving same number for red sweets

$$2:3 = 34:51$$

Multiply ratio 10:17 by 3

$$30:51$$

4 orange sweets were eaten by Solomon.

Solution for Question 5:

$$\text{HW : No HW} = 5:4$$

$$5:4 = 9$$

$$15:x = y$$

$$\frac{15}{5} = 3$$

$$x = 4 \times 3 = 12$$

$$y = 9 \times 3 = 27$$

$$\text{Ratio of HW done to HW not done} = 15:12$$

Compare 5:4 to 2:1

$$5:4 = 15:12$$

$$2:1 = ?:?$$

Same number of pupils in the class = 27

Multiply ratio 2:1 by 9 ($\frac{27}{3}$)

$$18:9$$

3 more pupils did do their homework, the teacher was correct.

3) Changing Ratios: Harder

Solution for Question 6:

Sedimentary : Metamorphic = 2:3

Metamorphic : Igneous = 9:10

Multiply ratio 2:3 by 3 = 6:9

Therefore, sedimentary to igneous = 6:10

Solution for Question 7:

Road bikes: Mountain bikes

3:5

The minimum number of bikes sold is 3 road and 5 mountain, if the ratio changes to 2:1 but no more mountain bikes are sold then ratio is 10:5 so 7 more road bikes must have been sold.

It is not the only answer as there could have been many numbers of bikes sold, the ratio is 3:5 this could be 6:10 or any equivalent ratio. If it was 6 to 10 for example to change to 2:1 ratio must be 20:10 which would mean 14 more road bikes sold, so the number more road bikes sold is any multiple of 7

4) Solving Quadratics Using the Formula: Easier

1. Solve $3x^2 + 7x - 13 = 0$
Give your solutions correct to 2 decimal places.

$$a = 3 \quad b = 7 \quad c = -13$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-7 \pm \sqrt{7^2 - 4 \times 3 \times -13}}{2 \times 3} = \frac{-7 \pm \sqrt{205}}{6}$$

$$= 1.219636844 \quad \text{or} \quad -3.552970177$$

$$x = \underline{1.22} \dots \dots \dots \text{or } x = \underline{-3.55} \dots \dots \dots$$

(3 marks)

2. Solve the equation

$$2x^2 + 6x - 95 = 0$$

Give your solutions correct to 3 significant figures.

$$a = 2 \quad b = 6 \quad c = -95$$

$$x = \frac{-6 \pm \sqrt{36 - (4 \times 2 \times -95)}}{4}$$

$$= \frac{-6 \pm \sqrt{796}}{4}$$

$$= 5.55336799 \quad \text{or} \quad -8.55336799$$

$$x = \underline{5.55} \dots \dots \dots \text{or } x = \underline{-8.55} \dots \dots \dots$$

(3 marks)

4) Solving Quadratics Using the Formula: Medium

3. Solve $x^2 + 3x - 5 = 0$
Give your solutions correct to 4 significant figures.

$$a = 1 \quad b = 3 \quad c = -5$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-3 \pm \sqrt{9 - (4 \times 1 \times -5)}}{2}$$

$$= \frac{-3 \pm \sqrt{29}}{2}$$

$$x = 1.192582404 \text{ or } -4.192582404$$

$$x = 1.193 \text{ or } -4.193$$

(3 marks)

4. Solve this quadratic equation.

$$x^2 - 5x - 8 = 0$$

Give your answers correct to 3 significant figures.

$$a = 1 \quad b = -5 \quad c = -8$$

$$x = \frac{5 \pm \sqrt{25 - (4 \times 1 \times -8)}}{2}$$

$$= \frac{5 \pm \sqrt{57}}{2}$$

$$x = 6.274917218 \text{ or } -1.274917218$$

$$x = 6.27 \text{ or } -1.27$$

(3 marks)

4) Solving Quadratics Using the Formula: Harder

9. The diagram shows a 6-sided shape.
All the corners are right angles.
All the measurements are given in centimetres.

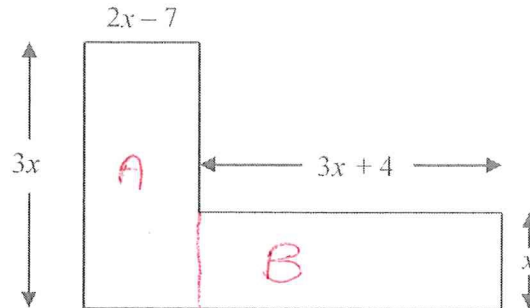


Diagram NOT accurately drawn

The area of the shape is 85 cm^2 .

- (a) Show that $9x^2 - 17x - 85 = 0$

$$A = 3x(2x-7) = 6x^2 - 21x$$

$$B = x(3x+4) = 3x^2 + 4x$$

$$6x^2 - 21x + 3x^2 + 4x = 85$$

$$9x^2 - 17x - 85 = 0$$

(3)

- (b) (i) Solve $9x^2 - 17x - 85 = 0$

Give your solutions correct to 3 significant figures.

$$a = 9 \quad b = -17 \quad c = -85$$

$$x = \frac{17 \pm \sqrt{17^2 - 4(9)(-85)}}{18}$$

$$x = 4.159474732 \quad \text{or} \quad x = -2.270585844$$

$$x = 4.16 \dots \quad \text{or} \quad x = -2.27 \dots$$

- (ii) Hence, work out the length of the shortest side of the 6-sided shape.

$$2x - 7$$

$$\dots 1.38 \dots \text{ cm}$$

(4)

5) More Difficult Rearranging Formulae: Easier

1. Rearrange $a(q - c) = d$ to make q the subject.

$$aq - ac = d$$

$$aq = d + ac$$

$$q = \frac{d + ac}{a}$$

$$q = \frac{d + ac}{a} \dots \dots \dots (3)$$

(Total 5 marks)

2. (a) Make n the subject of the formula $m = 5n - 21$

$$m + 21 = 5n$$

$$n = \frac{m + 21}{5}$$

5) More Difficult Rearranging Formulae: Medium

(b) Make p the subject of the formula $4(p - 2q) = 3p + 2$

$$4p - 8q = 3p + 2$$

$$p = 2 + 8q$$

$$p = \dots\dots\dots$$

(3)

(Total 5 marks)

3.

$$P = \pi r + 2r + 2a$$

Make r the subject of the formula

$$P - 2a = r(\pi + 2)$$

$$r = \frac{P - 2a}{\pi + 2}$$

(Total 3 marks)

5) More Difficult Rearranging Formulae: Harder

12. Rearrange $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

to make u the subject of the formula.

Give your answer in its simplest form.

$$fv + fu = uv$$

$$fu - uv = fv$$

$$u(f - v) = fv$$

$$u = \frac{fv}{f - v}$$

MCLAUGHLIN Laura

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Index Notation. Mathswatch Clip: 131

Topic 2: Angles in Polygons. Mathswatch Clip: 123

Topic 3: Bearings. Mathswatch Clip: 124

Topic 4: Writing one number as % of another. MW: 88

Topic 5: Changing Ratios. Mathswatch Clip: NA

1) Index Notation: Easier

1. (a) Simplify $m^3 \times m^6 = m^{3+6}$ m^9

 (1)

(b) Simplify $\frac{p^8}{p^2} p^{8-2}$ p^6

 (1)

(c) Simplify $(2n^3)^4 16n^{3 \times 4}$ $16n^{12}$

 (2)

(4 marks)

2. (a) Simplify $m^6 \times m^7 m^{6+7}$ m^{13}

 (1)

(b) Simplify x^0 1

 (1)

(c) Simplify $(16y^6)^{\frac{1}{2}}$ $4y^3$

 (2)

(4 marks)

3. (a) Simplify $m^5 \div m^3 m^{5-3}$ m^2

 (1)

(b) Simplify $5x^4y^3 \times x^2y 5x^{4+2}y^{3+1}$ $5x^6y^4$

 (2)

(3 marks)

1) Index Notation: Medium

4. (a) Simplify $a^4 \times a^5$ a^{4+5} a^9 (1)

(b) Simplify $\frac{45e^6 f^8}{5ef^2}$ $9e^{6-1} f^{8-2}$ $9e^5 f^6$ (2)

(c) Write down the value of $9^{\frac{1}{2}}$ $\sqrt{9}$ 3 (1)

(4 marks)

5. (a) Simplify $m^2 \times m^4$ m^{2+4} m^6 (1)

(b) Simplify $y^7 \div y^5$ y^{7-5} y^2 (1)

(c) Simplify $(m^3)^5$ $m^{3 \times 5}$ m^{15} (2)

(4 marks)

6. Simplify fully

(a) $p^2 \times p^7$ p^{2+7} p^9 (1)

(b) $\frac{3q^4 \times 2q^5}{q^3}$ $\frac{(3 \times 2)q^{4+5}}{q^3} = 6q^{9-3}$ $6q^6$ (2)

(c) $(2xy^3)^5$ $2^5 x^5 y^{3 \times 5}$ $32x^5 y^{15}$ (2)

(4 marks)

1) Index Notation: Harder

20. (a) Find the value of

(i) 64^0

1

(ii) $64^{\frac{1}{2}}$

$$\sqrt{64}$$

8

(iii) $64^{-\frac{2}{3}}$

$$= \frac{1}{64^{\frac{2}{3}}} = \frac{1}{(\sqrt[3]{64})^2} = \frac{1}{4^2}$$

$\frac{1}{16}$ or 0.0625

(4 marks)

2) Angles in Polygons: Easier

1. Each exterior angle of a regular polygon is 30° .

Work out the number of sides of the polygon.

$$360 \div 30 = 12$$

.....
12

(2 marks)

- 2.

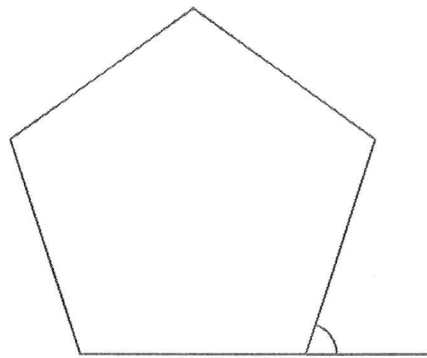


Diagram NOT
accurately drawn

Work out the size of an exterior angle of a regular pentagon.

$$360 \div 5 = 72$$

.....
72°

(2 marks)

- 3.

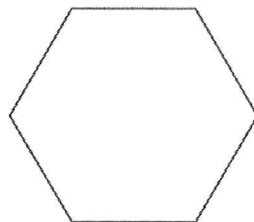


Diagram NOT
accurately drawn

Calculate the size of the exterior angle of a regular hexagon.

$$360 \div 6 = 60$$

.....
60°

(2 marks)

2) Angles in Polygons: Medium

4. The size of each exterior angle of a regular polygon is 40° .

Work out the number of sides of the regular polygon.

$$360 \div 40 = 9$$

..... 9

(2 marks)

5. The size of each interior angle of a regular polygon is 156° .

Work out the number of sides of the polygon.

$$180 - 156 = 24 \text{ (Exterior angle)}$$

$$360 \div 24 = 15$$

..... 15

(3 marks)

6. Here is a regular polygon with 9 sides.

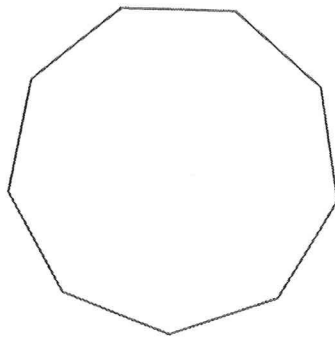


Diagram **NOT** accurately drawn

Work out the size of an exterior angle.

$$360 \div 9 = 40$$

..... 40^o

(2 marks)

2) Angles in Polygons: Harder

11.

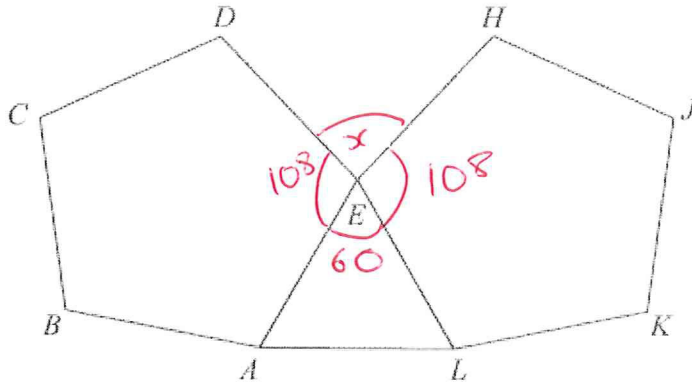


Diagram NOT accurately drawn

$ABCDE$ and $EHJKL$ are regular pentagons.
 AEL is an equilateral triangle.

Work out the size of angle DEH .

$$\begin{aligned} \text{Pentagon} &= \frac{180 \times (n-2)}{n} \\ &= \frac{180 \times 3}{5} = \frac{540}{5} = 108 \end{aligned}$$

$$360 - 108 - 108 - 60 = 84$$

84

.....°
 (4 marks)

3) Bearings: Easier

1.

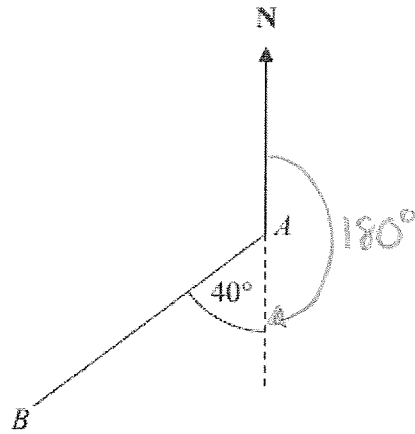


Diagram NOT accurately drawn

$180 + 40$

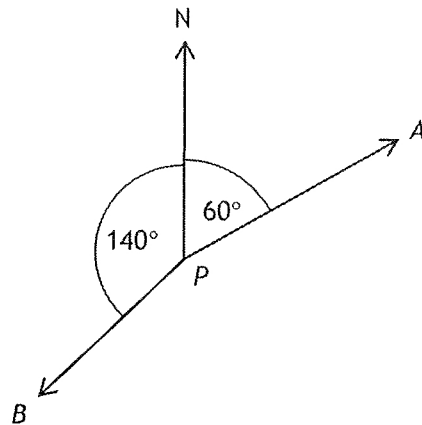
Work out the bearing of B from A.

START POINT

.....220.....°

(2 marks)

2.



(a) Write down the bearing of A from P.

Bearings are always 3 digits

.....060.....°

(b) Work out the bearing of B from P.

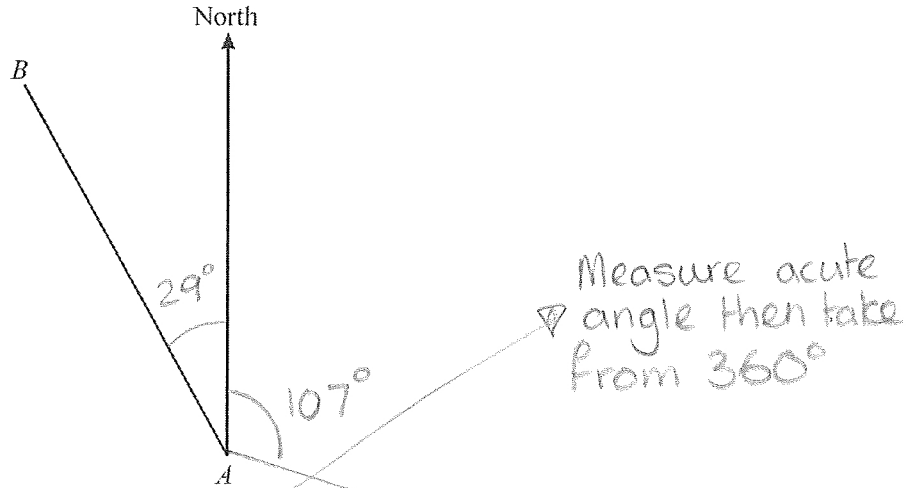
$360 - 140$

.....220.....°

(3 marks)

3) Bearings: Medium

3.



(a) Measure and write down the bearing of B from A.

$$360 - 29$$

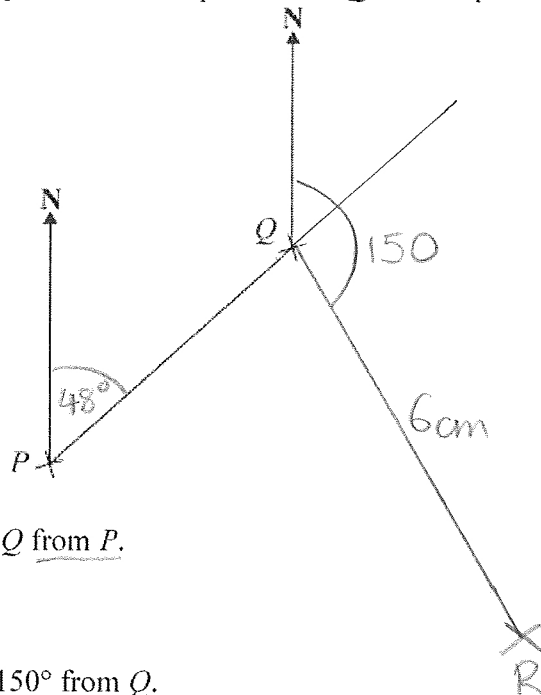
.....
331.....^o
(1)

(b) On the diagram, draw a line on a bearing of 107° from A.

clockwise

(1)
(2 marks)

4. The diagram shows the position of two ports P and Q on a map.



(a) Measure the bearing of Q from P.

.....
048.....^o
(1)

A rock R is on a bearing of 150° from Q.
On the map R is 6 cm from Q.

(b) Mark the position of R with a cross (x) and label it R.

(2)

3) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

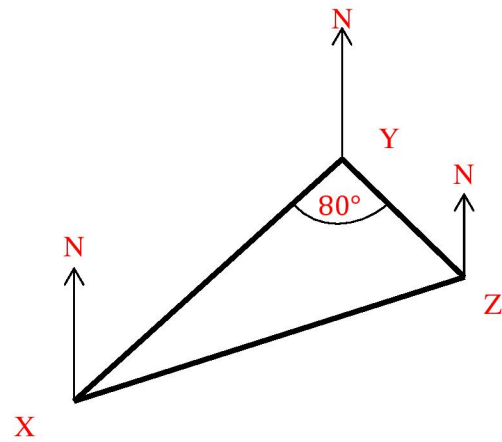
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

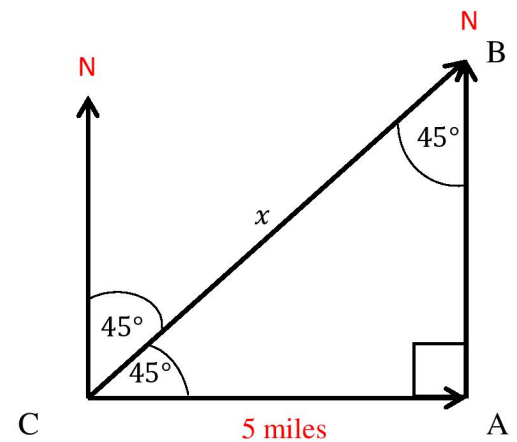
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



4) Writing one number as % of another: Easier

- 1) Write 24 as a percentage of 40

$$\frac{24}{40} \times 100 = 60\%$$

60%

.....

(1 Mark)

- 2) Write 62 as a percentage of 50

$$\frac{62}{50} \times 100 = 124\%$$

124%.....

(1 Mark)

- 3) Sally gets 32% in a test. Hawys got twenty seven out of the seventy marks available. Who did better on the test?

$$\frac{27}{70} \times 100 = 38.57\%$$

Hawys did better as she got 39% which is higher than 32%

.....

(1 Mark)

- 4) In 2001, 2050 attended a theatre in December. In 2002, 3501 attended the same theatre in December. Work out the percentage increase in theatre attendees. Give your answer to 3 significant figures.

$$\text{Percentage increase} = \frac{\text{actual increase}}{\text{original amount}} \times 100$$

$$\text{actual increase} = 3501 - 2050 = 1451$$

$$\text{Percentage increase} = \frac{1451}{2050} \times 100 = 70.8\%$$

70.8%

.....

(2 Marks)

4) Writing one number as % of another: Medium

- 5) In a sale a coat costs £240. Before the sale the coat was priced at £350. Work out the percentage reduction.

$$\text{Percentage reduction} = \frac{\text{actual reduction}}{\text{original amount}} \times 100$$

$$\text{actual reduction} = 350 - 240 = 110$$

$$\text{Percentage reduction} = \frac{110}{350} \times 100 = 31.4\%$$

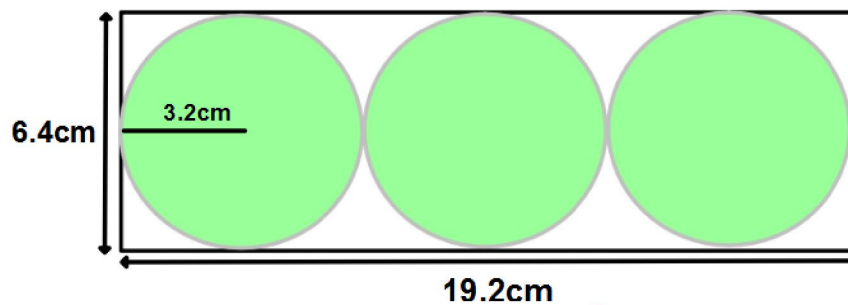
31.4%

.....

(2 Marks)

- 6) The diagram shows the side elevation of a cylinder container of tennis balls. Each tennis ball has a radius of 3.2cm. What percentage of the volume of the container is filled by tennis balls?

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$



$$\text{Volume of cylinder} = \pi r^2 h$$

$$\text{Volume of cylinder} = \pi(3.2)^2(19.2) = 617.7\text{cm}^3$$

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

$$\text{Volume of sphere} = \frac{4}{3}\pi(3.2)^3 = 137.258277\text{cm}^3$$

$$3 \text{ tennis balls so } 137.258277\text{cm}^3 \times 3 = 411.7748\text{cm}^3$$

$$\text{Percentage volume taken up by tennis balls} = \frac{411.77}{617.7} \times 100 = 66.7\%$$

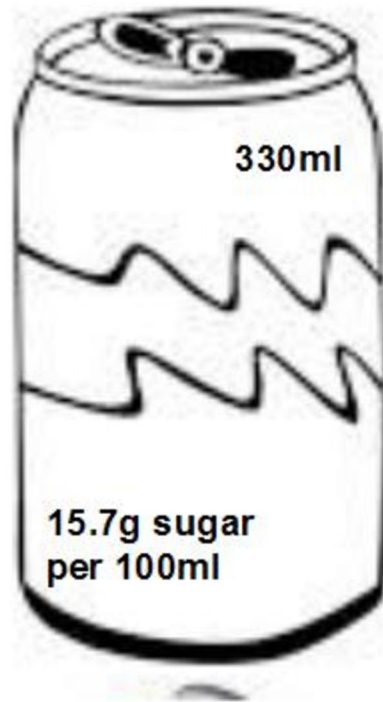
66.7%

.....

(5 Marks)

4) Writing one number as % of another: Harder

- 7) The average adult should have a maximum of 90g of sugar a day.



Tom buys this can of soft drink. His friend tells him that it is over 55% of his daily allowance. Is she correct? You **must** show your working.

$$1\text{ml contains } \frac{15.7}{100} = 0.157\text{g sugar}$$

$$330\text{ml contains } 0.157 \times 330 = 51.81\text{g sugar}$$

$$\frac{51.81}{90} \times 100 = 57.6\%$$

His friend is correct. The drink is 57.6% of his daily sugar allowance.

(4 Marks)

5) Changing Ratios: Easier

Solution for Question 1:

a) Red : Blue = 8:12

Divide through by 4 to simplify: 2:3

b) Red : Blue = 8:10

Divide through by 2 to simplify: 4:5

Solution for Question 2:

a) Pen : Pencils = 2:3

Equivalent to 20:30

30 pencils in pencil case

b) Only pencils removed so still 20 pens, ratio 4:3 equivalent to 20:15 so removed 15 pencils

5) Changing Ratios: Medium

Solution for Question 3:

$$1:3:5$$

$$1:3+5 = 1:8$$

Solution for Question 4:

$$\text{Orange : Red} = 2:3$$

$$2:3 = 5$$

$$x:51 = y$$

$$\frac{51}{3} = 17$$

$$x = 2 \times 17 = 34$$

$$y = 5 \times 17 = 85$$

$$\text{Ratio of Orange to Red} = 34:51$$

Compare 2:3 to 10:17, achieving same number for red sweets

$$2:3 = 34:51$$

Multiply ratio 10:17 by 3

$$30:51$$

4 orange sweets were eaten by Solomon.

Solution for Question 5:

$$\text{HW : No HW} = 5:4$$

$$5:4 = 9$$

$$15:x = y$$

$$\frac{15}{5} = 3$$

$$x = 4 \times 3 = 12$$

$$y = 9 \times 3 = 27$$

$$\text{Ratio of HW done to HW not done} = 15:12$$

Compare 5:4 to 2:1

$$5:4 = 15:12$$

$$2:1 = ?:?$$

Same number of pupils in the class = 27

Multiply ratio 2:1 by 9 ($\frac{27}{3}$)

$$18:9$$

3 more pupils did do their homework, the teacher was correct.

5) Changing Ratios: Harder

Solution for Question 6:

Sedimentary : Metamorphic = 2:3

Metamorphic : Igneous = 9:10

Multiply ratio 2:3 by 3 = 6:9

Therefore, sedimentary to igneous = 6:10

Solution for Question 7:

Road bikes: Mountain bikes

3:5

The minimum number of bikes sold is 3 road and 5 mountain, if the ratio changes to 2:1 but no more mountain bikes are sold then ratio is 10:5 so 7 more road bikes must have been sold.

It is not the only answer as there could have been many numbers of bikes sold, the ratio is 3:5 this could be 6:10 or any equivalent ratio. If it was 6 to 10 for example to change to 2:1 ratio must be 20:10 which would mean 14 more road bikes sold, so the number more road bikes sold is any multiple of 7

MELLISH Aaron

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Similar Shapes - linear scale factors only. MW: 144

Topic 2: Missing Mean Questions. Mathswatch Clip: NA

Topic 3: Writing one number as % of another. MW: 88

Topic 4: Standard Form. Mathswatch Clip: 83

Topic 5: Changing Ratios. Mathswatch Clip: NA

1) Similar Shapes - linear scale factors only: Easier

1) Work out

Solution for Question 1:

$$\begin{aligned} \text{a) } & 9 \times 1.5 \\ & 9 \times \frac{3}{2} = \frac{27}{2} \\ & = 13.5 \end{aligned}$$

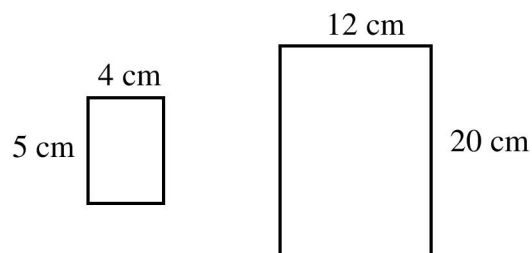
$$\begin{aligned} \text{b) } & \frac{5}{2} \times 6 \\ & \frac{30}{2} \\ & = 15 \end{aligned}$$

$$\begin{aligned} \text{c) } & 9 \div 1.5 \\ & 9 \div \frac{3}{2} \\ & \frac{18}{3} \\ & = 6 \end{aligned}$$

$$\begin{aligned} \text{d) } & 21 \div \frac{7}{2} \\ & \frac{42}{7} \\ & = 6 \end{aligned}$$

(4 Marks)

2) Are these Shapes Similar? Explain



$4 \times 3 = 12$ so, if similar have scale factor 3, but $5 \times 3 = 15 (\neq 20)$

So these shapes are not similar.

(2 Marks)

1) Similar Shapes - linear scale factors only: Medium

3) The diagram shows two quadrilaterals that are mathematically similar

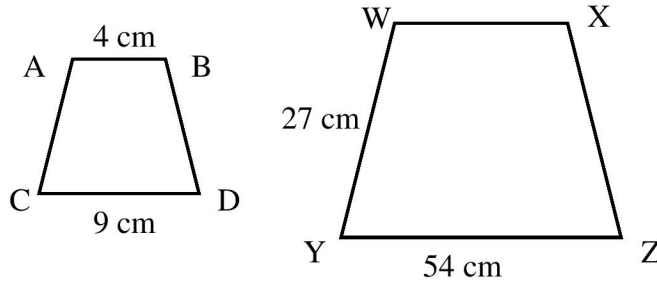


Diagram NOT accurately drawn

a) Calculate the length of WX

$$\text{Scale factor} = 54 \div 9 = 6$$

$$4 \times 6 = 24 \text{ cm}$$

24 cm

b) Calculate the length of AC

$$27 \div 6 = \frac{27}{6} = \frac{9}{2} = 4.5 \text{ cm}$$

4.5 cm

(3 Marks)

4)

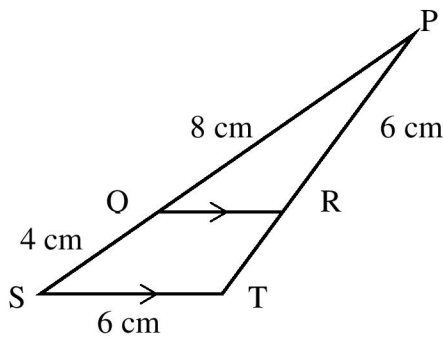


Diagram NOT accurately drawn

a) Calculate the length of QR

$$\text{SF} = 12 \div 8 = \frac{12}{8} = \frac{3}{2} \quad 6 \div \frac{3}{2} = 6 \times \frac{2}{3} = 4 \text{ cm}$$

4 cm

b) Calculate the length of RT

$$\text{PT} = 6 \times \frac{3}{2} = 9 \text{ cm} \quad \text{RT} = \text{PT} - \text{PR} = 9 - 6 = 3 \text{ cm}$$

3 cm

(2 Marks)

1) Similar Shapes - linear scale factors only: Harder

5)

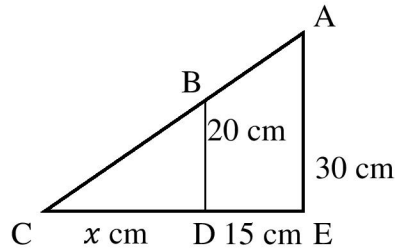


Diagram NOT accurately drawn

Find the value of x

$$SF = 30 \div 20 = \frac{3}{2}$$

$$CE = \frac{3}{2} \times CD$$

$$x + 15 = \frac{3x}{2}$$

$$15 = \frac{3x}{2} - x = \frac{x}{2}$$

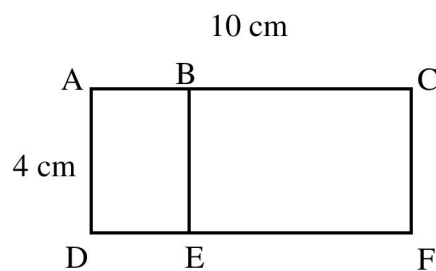
So $x = 15 \times 2 = 30$

$x = 30$

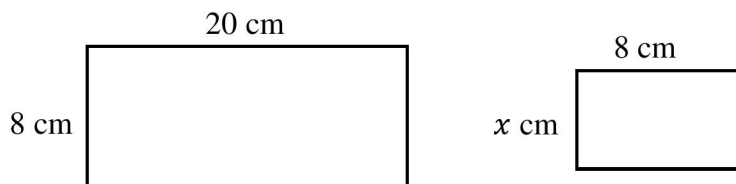
(2 Marks)

6) The rectangle ACFD is mathematically similar to rectangle ABED

Diagram NOT accurately drawn



Rotate smaller rectangle



$$\text{Scale factor: } \frac{20}{8} = \frac{5}{2} = 2.5$$

$$8 \div \frac{5}{2} = \frac{16}{5}$$

$$3\frac{1}{5} = 3.2 \text{ cm}$$

3.2 cm

(2 Marks)

2) Missing Mean Questions: Easier

1) The mean of 8 and another number is 13.

What is the other number?

$$\text{Solution: } (8+x)/2 = 13 \quad \times 2$$

$$8 + x = 26 \quad - 8$$

$$x = 18$$

$$\underline{\hspace{2cm}} 18 \underline{\hspace{2cm}}$$

(3 Marks)

2) The mean of 2, 5, 8 and x is 4

Find x

$$\text{Solution: } (2 + 5 + 8 + x) / 4 = 4 \quad \times 4$$

$$15 + x = 16 \quad -15$$

$$x = 1$$

$$\underline{\hspace{2cm}} x = 1 \underline{\hspace{2cm}}$$

(3 Marks)

3) After measuring the heights of 7 people, they have an average height of 156cm. After measuring the heights of 8 people they have an average height of 158cm. How tall is the 8th person?

$$\text{Solution: } 7 \times 156 = 1092$$

$$8 \times 158 = 1264$$

$$1092 - 1264 = 172$$

(3 Marks)

$$\underline{\hspace{2cm}} 172 \underline{\hspace{2cm}}$$

2) Missing Mean Questions: Medium

4) The mean weight of a group of 7 girls is 58kg

a) Work out their total weight

$$\text{Solution: } 7 \times 58 = 406\text{kg}$$

_____406_____Kg

When a 8th girl joins the group, the mean weight goes up to 59kg.

b) What is the weight of the 8th girl?

$$\text{Solution: } 59 \times 8 = 472$$

$$472 - 406 = 66 \text{ Kg}$$

_____66_____Kg

(3 Marks)

5) The mean distance that Jack runs in his last 10 runs is 5.7 miles. Work out the distance that he would need to run to make this exactly 6 miles.

$$\text{Solution: } 10 \times 5.7 = 57$$

$$11 \times 6 = 66$$

$$66 - 57 = 9$$

_____9 miles_____

(2 Marks)

2) Missing Mean Questions: Harder

- 6) Waitresses and kitchen staff in a restaurant decide to share their tips. There are 8 kitchen staff 10 waitresses. The kitchen staff receives a mean of £23 weekly and the waitresses receive a mean of £28 weekly.

Work out the mean of all 18 members of staff.

$$\begin{aligned} \text{Solution: } 23 \times 8 &= 184 \\ 28 \times 10 &= 280 \end{aligned}$$

$$\text{Total} = 184 + 280 = 464$$

$$\text{Mean} = 464/18 = 25.78$$

$$\underline{\quad \quad \quad \text{£}25.78 \quad \quad \quad \underline{\quad \quad \quad}}$$

(3 Marks)

- 7) The mean of a, a, b is 30

The mean of a, a, b, b, b is 20

Find the values of a and b

Solution:

$$(2a + b) / 3 = 30 \quad \times 3$$

$$(2a + 3b) / 5 = 20 \quad \times 5$$

$$2a + b = 90 \quad - \quad \text{solve simultaneously}$$

$$2a + 3b = 100$$

$$-2b = -10$$

$$b = 5$$

$$2a + 5 = 90$$

$$2a = 85$$

$$a = 42.5$$

$$a = 42.5 \quad b = 5 \underline{\quad \quad \quad}$$

(5 Marks)

3) Writing one number as % of another: Easier

1) Write 24 as a percentage of 40

$$\frac{24}{40} \times 100 = 60\% \qquad 60\%$$

.....

(1 Mark)

2) Write 62 as a percentage of 50

$$\frac{62}{50} \times 100 = 124\%$$

124%.....

(1 Mark)

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$$\frac{27}{70} \times 100 = 38.57\%$$

Hawys did better as she got 39% which is higher than 32%

.....

(1 Mark)

4) In 2001, 2050 attended a theatre in December. In 2002, 3501 attended the same theatre in December. Work out the percentage increase in theatre attendees. Give your answer to 3 significant figures.

$$\text{Percentage increase} = \frac{\text{actual increase}}{\text{original amount}} \times 100$$

$$\text{actual increase} = 3501 - 2050 = 1451$$

$$\text{Percentage increase} = \frac{1451}{2050} \times 100 = 70.8\%$$

70.8%

.....

(2 Marks)

3) Writing one number as % of another: Medium

- 5) In a sale a coat costs £240. Before the sale the coat was priced at £350. Work out the percentage reduction.

$$\text{Percentage reduction} = \frac{\text{actual reduction}}{\text{original amount}} \times 100$$

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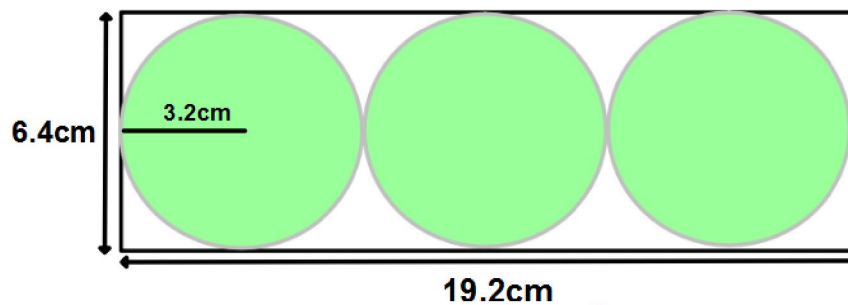
31.4%

.....

(2 Marks)

- 6) The diagram shows the side elevation of a cylinder container of tennis balls. Each tennis ball has a radius of 3.2cm. What percentage of the volume of the container is filled by tennis balls?

$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$



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$$\text{Volume of sphere} = \frac{4}{3}\pi r^3$$

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$$3 \text{ tennis balls so } 137.258277\text{cm}^3 \times 3 = 411.7748\text{cm}^3$$

$$\text{Percentage volume taken up by tennis balls} = \frac{411.77}{617.7} \times 100 = 66.7\%$$

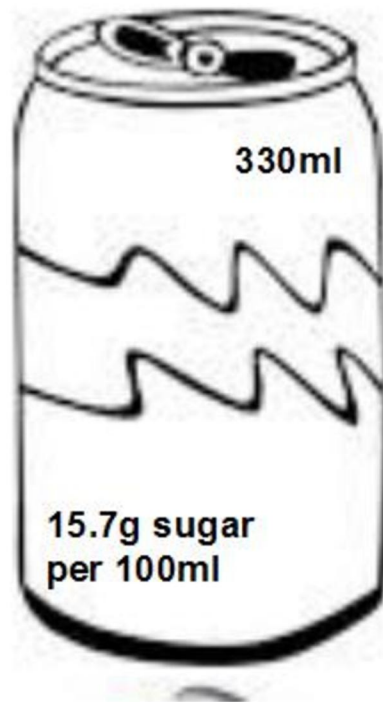
66.7%

.....

(5 Marks)

3) Writing one number as % of another: Harder

7) The average adult should have a maximum of 90g of sugar a day.



Tom buys this can of soft drink. His friend tells him that it is over 55% of his daily allowance. Is she correct? You **must** show your working.

$$1\text{ml contains } \frac{15.7}{100} = 0.157\text{g sugar}$$

$$330\text{ml contains } 0.157 \times 330 = 51.81\text{g sugar}$$

$$\frac{51.81}{90} \times 100 = 57.6\%$$

His friend is correct. The drink is 57.6% of his daily sugar allowance.

(4 Marks)

4) Standard Form: Easier

1. (a) Write the number 0.00037 in standard form.

(1)

$$3.7 \times 10^4$$

- (b) Write 8.25×10^3 as an ordinary number.

(1)

$$8250$$

- (c) Work out $(2.1 \times 10^8) \times (6 \times 10^{-5})$.
Write your answer in standard form.

$$\begin{aligned} 2.1 \times 10^8 \times 6 \times 10^{-5} \\ = 12.6 \times 10^3 \\ = 1.26 \times 10^4 \end{aligned}$$

(2)

$$1.26 \times 10^4$$

(4 marks)

2. (a) Write 6.43×10^5 as an ordinary number.

$$643000$$

(1)

- (b) Work out the value of $2 \times 10^7 \times 8 \times 10^{-12}$.
Give your answer in standard form.

$$\begin{aligned} 2 \times 10^7 \times 8 \times 10^{-12} \\ = 16 \times 10^{-5} \\ = 1.6 \times 10^{-4} \end{aligned}$$

$$1.6 \times 10^{-4}$$

(2)

(3 marks)

4) Standard Form: Medium

15.
$$p^2 = \frac{x-y}{xy}$$

$$x = 8.5 \times 10^9$$

$$y = 4 \times 10^8$$

Find the value of p .

Give your answer in standard form correct to 2 significant figures.

$$p^2 = \frac{8.5 \times 10^9 - 4 \times 10^8}{8.5 \times 10^9 \times 4 \times 10^8} = \frac{8.1 \times 10^9}{3.4 \times 10^{18}}$$

$$= 2.38235... \times 10^{-9}$$

$$= 2.4 \times 10^{-9} \text{ (2sf)}$$

$$p = \sqrt{2.38235... \times 10^{-9}}$$

$$= 4.880935... \times 10^{-5}$$

$$= 4.9 \times 10^{-5} \text{ (2sf)}$$

$$4.9 \times 10^{-5} \text{ (2sf)}$$

$$\underline{\underline{4.9 \times 10^{-5}}}$$

(4 marks)

16.

$$y^2 = \frac{ab}{a+b}$$

$$a = 3 \times 10^8$$

$$b = 2 \times 10^7$$

Find y .

Give your answer in standard form correct to 2 significant figures.

$$y^2 = \frac{3 \times 10^8 \times 2 \times 10^7}{3 \times 10^8 + 2 \times 10^7}$$

$$= \frac{6 \times 10^{15}}{3.2 \times 10^8}$$

$$= 18750000$$

$$y = \sqrt{18750000}$$

$$= 4330.127...$$

$$= 4300 \text{ (2sf)}$$

$$= 4.3 \times 10^3 \text{ (2sf)}$$

$$y = \underline{\underline{4.3 \times 10^3 \text{ (2sf)}}}$$

(4 marks)

4) Standard Form: Harder

Worded Standard Form

1) The world's smallest snail travels 4×10^{-3} m a month.

How many months would it take for the snail to travel?

2×10^{-1} m?

$$\frac{2 \times 10^{-1}}{4 \times 10^{-3}} = \frac{2}{4} \times 10^2$$

$$= 0.5 \times 10^2$$

$$= 5 \times 10^3$$

-1 - -3 = 2
↙

2)

The time taken for light to reach Earth from the edge of the known universe is 14 000 000 000 years.

Light travels at the speed of 9.46×10^{12} km/year.

Work out the distance, in kilometres, from the edge of the known universe to Earth.
Give your answer in standard form.

$$S = \frac{D}{T}$$

$$D = ST$$

$$D = 9.46 \times 10^{12} \times 1.4 \times 10^{10}$$

$$= 13.244 \times 10^{22}$$

$$= 1.3244 \times 10^{23}$$

5) Changing Ratios: Easier

Solution for Question 1:

a) Red : Blue = 8:12

Divide through by 4 to simplify: 2:3

b) Red : Blue = 8:10

Divide through by 2 to simplify: 4:5

Solution for Question 2:

a) Pen : Pencils = 2:3

Equivalent to 20:30

30 pencils in pencil case

b) Only pencils removed so still 20 pens, ratio 4:3 equivalent to 20:15 so removed 15 pencils

5) Changing Ratios: Medium

Solution for Question 3:

$$1:3:5$$

$$1:3+5 = 1:8$$

Solution for Question 4:

$$\text{Orange : Red} = 2:3$$

$$2:3 = 5$$

$$x:51 = y$$

$$\frac{51}{3} = 17$$

$$x = 2 \times 17 = 34$$

$$y = 5 \times 17 = 85$$

$$\text{Ratio of Orange to Red} = 34:51$$

Compare 2:3 to 10:17, achieving same number for red sweets

$$2:3 = 34:51$$

Multiply ratio 10:17 by 3

$$30:51$$

4 orange sweets were eaten by Solomon.

Solution for Question 5:

$$\text{HW : No HW} = 5:4$$

$$5:4 = 9$$

$$15:x = y$$

$$\frac{15}{5} = 3$$

$$x = 4 \times 3 = 12$$

$$y = 9 \times 3 = 27$$

$$\text{Ratio of HW done to HW not done} = 15:12$$

Compare 5:4 to 2:1

$$5:4 = 15:12$$

$$2:1 = ??:?$$

Same number of pupils in the class = 27

Multiply ratio 2:1 by 9 ($\frac{27}{3}$)

$$18:9$$

3 more pupils did do their homework, the teacher was correct.

5) Changing Ratios: Harder

Solution for Question 6:

Sedimentary : Metamorphic = 2:3

Metamorphic : Igneous = 9:10

Multiply ratio 2:3 by 3 = 6:9

Therefore, sedimentary to igneous = 6:10

Solution for Question 7:

Road bikes: Mountain bikes

3:5

The minimum number of bikes sold is 3 road and 5 mountain, if the ratio changes to 2:1 but no more mountain bikes are sold then ratio is 10:5 so 7 more road bikes must have been sold.

It is not the only answer as there could have been many numbers of bikes sold, the ratio is 3:5 this could be 6:10 or any equivalent ratio. If it was 6 to 10 for example to change to 2:1 ratio must be 20:10 which would mean 14 more road bikes sold, so the number more road bikes sold is any multiple of 7

PAVEY Samuel

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Index Notation. Mathswatch Clip: 131

Topic 2: Bearings. Mathswatch Clip: 124

Topic 3: Missing Mean Questions. Mathswatch Clip: NA

Topic 4: Solving Quadratics Using the Formula. MW: 191

Topic 5: Venn diagrams.. Mathswatch Clip: 127

1) Index Notation: Easier

1. (a) Simplify $m^3 \times m^6 = m^{3+6}$ m^9

 (1)

(b) Simplify $\frac{p^8}{p^2} p^{8-2}$ p^6

 (1)

(c) Simplify $(2n^3)^4 16n^{3 \times 4}$ $16n^{12}$

 (2)

(4 marks)

2. (a) Simplify $m^6 \times m^7 m^{6+7}$ m^{13}

 (1)

(b) Simplify x^0 1

 (1)

(c) Simplify $(16y^6)^{\frac{1}{2}}$ $4y^3$
 $\sqrt{16} y^{\frac{6}{2}}$

 (2)

(4 marks)

3. (a) Simplify $m^5 \div m^3 m^{5-3}$ m^2

 (1)

(b) Simplify $5x^4y^3 \times x^2y 5x^{4+2}y^{3+1}$ $5x^6y^4$

 (2)

(3 marks)

1) Index Notation: Medium

17. Simplify

(i) $x^4 \times x^5$ x^{4+5} x^9

(ii) $\frac{p^8}{p^3}$ p^{8-3} p^5

(iii) $3s^2t^3 \times 4s^4t^2$ $12s^{2+4}t^{3+2}$ $12s^6t^5$

(iv) $(q^3)^4$ $q^{3 \times 4}$ q^{12}

(6 marks)

18. Simplify fully

(i) $(p^3)^3$ $p^{3 \times 3}$ p^9

(ii) $\frac{3q^4 \times 2q^5}{q^3}$ $\frac{6q^{4+5}}{q^3} = 6q^{9-3}$ $6q^6$

(4 marks)

19. Work out

(i) 4^0 1

(ii) $4^{-2} = \frac{1}{4^2}$ $\frac{1}{16}$ or 0.0625

(iii) $16^{\frac{3}{2}}$ $= (\sqrt{16})^3$
 $= 4^3 = 64$

(4 marks)

1) Index Notation: Harder

20. (a) Find the value of

(i) 64^0

1

(ii) $64^{\frac{1}{2}}$

$\sqrt{64}$

8

(iii) $64^{-\frac{2}{3}}$

$= \frac{1}{64^{\frac{2}{3}}}$
 $= \frac{1}{(\sqrt[3]{64})^2} = \frac{1}{4^2}$

$\frac{1}{16}$ or 0.0625

(4 marks)

2) Bearings: Easier

1.

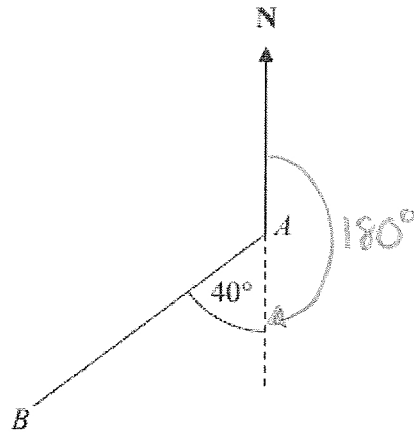


Diagram NOT accurately drawn

$$180 + 40$$

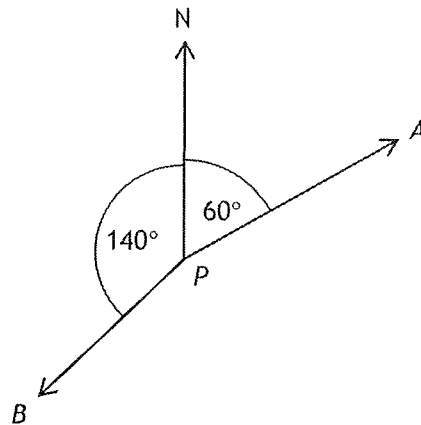
Work out the bearing of B from A .

START POINT

..... 220 °

(2 marks)

2.



(a) Write down the bearing of A from P .

Bearings are always 3 digits

..... 060 °

(b) Work out the bearing of B from P .

$$360 - 140$$

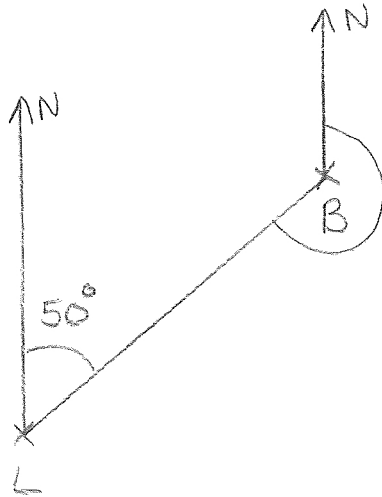
..... 220 °

(3 marks)

2) Bearings: Medium

9. The bearing of a ship from a lighthouse is 050°

Work out the bearing of the lighthouse from the ship.



DRAW A SKETCH!
If accurate, you can
measure the bearing

.....
230.....°

(2 marks)

2) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

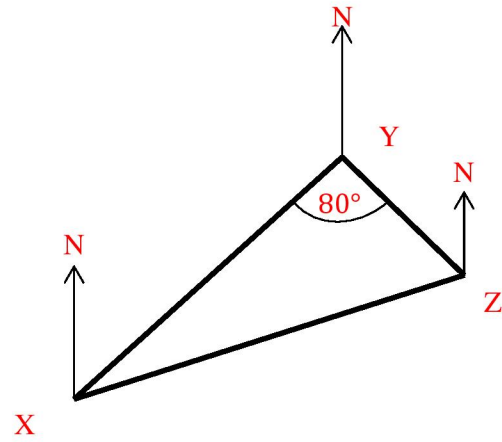
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

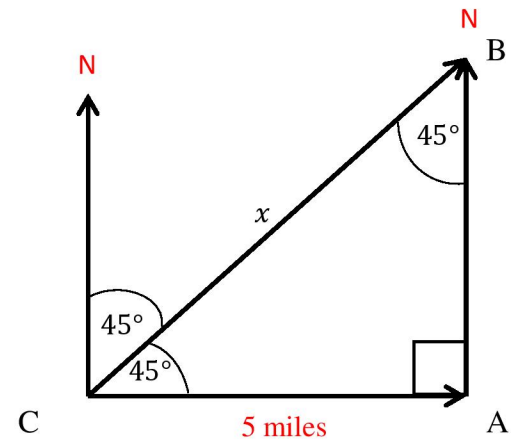
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



3) Missing Mean Questions: Easier

1) The mean of 8 and another number is 13.

What is the other number?

$$\begin{aligned} \text{Solution: } (8+x)/2 &= 13 && \times 2 \\ 8 + x &= 26 && - 8 \\ x &= 18 \end{aligned}$$

_____18_____

(3 Marks)

2) The mean of 2, 5, 8 and x is 4
Find x

$$\begin{aligned} \text{Solution: } (2 + 5 + 8 + x) / 4 &= 4 && \times 4 \\ 15 + x &= 16 && -15 \\ x &= 1 \end{aligned}$$

_____x = 1_____

(3 Marks)

3) After measuring the heights of 7 people, they have an average height of 156cm. After measuring the heights of 8 people they have an average height of 158cm. How tall is the 8th person?

$$\begin{aligned} \text{Solution: } 7 \times 156 &= 1092 \\ 8 \times 158 &= 1264 \\ 1092 - 1264 &= 172 \end{aligned}$$

(3 Marks)

_____172_____

3) Missing Mean Questions: Medium

4) The mean weight of a group of 7 girls is 58kg

a) Work out their total weight

Solution: $7 \times 58 = 406\text{kg}$

_____406_____Kg

When a 8th girl joins the group, the mean weight goes up to 59kg.

b) What is the weight of the 8th girl?

Solution: $59 \times 8 = 472$

$472 - 406 = 66 \text{ Kg}$

_____66_____Kg

(3 Marks)

5) The mean distance that Jack runs in his last 10 runs is 5.7 miles. Work out the distance that he would need to run to make this exactly 6 miles.

Solution: $10 \times 5.7 = 57$

$11 \times 6 = 66$

$66 - 57 = 9$

_____9 miles_____

(2 Marks)

3) Missing Mean Questions: Harder

- 6) Waitresses and kitchen staff in a restaurant decide to share their tips. There are 8 kitchen staff 10 waitresses. The kitchen staff receives a mean of £23 weekly and the waitresses receive a mean of £28 weekly.

Work out the mean of all 18 members of staff.

$$\begin{aligned} \text{Solution: } 23 \times 8 &= 184 \\ 28 \times 10 &= 280 \end{aligned}$$

$$\text{Total} = 184 + 280 = 464$$

$$\text{Mean} = 464/18 = 25.78$$

_____ £25.78 _____

(3 Marks)

- 7) The mean of a, a, b is 30

The mean of a, a, b, b, b is 20

Find the values of a and b

Solution:

$$(2a + b) / 3 = 30 \quad \times 3$$

$$(2a + 3b) / 5 = 20 \quad \times 5$$

$$2a + b = 90 \quad - \quad \text{solve simultaneously}$$

$$2a + 3b = 100$$

$$-2b = -10$$

$$b = 5$$

$$2a + 5 = 90$$

$$2a = 85$$

$$a = 42.5$$

$a = 42.5$ $b = 5$ _____

(5 Marks)

4) Solving Quadratics Using the Formula: Easier

1. Solve $3x^2 + 7x - 13 = 0$
Give your solutions correct to 2 decimal places.

$$a = 3 \quad b = 7 \quad c = -13$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-7 \pm \sqrt{7^2 - 4 \times 3 \times -13}}{2 \times 3} = \frac{-7 \pm \sqrt{205}}{6}$$

$$= 1.219636844 \quad \text{or} \quad -3.552970177$$

$$x = \underline{1.22} \dots\dots\dots \text{or } x = \underline{-3.55} \dots\dots\dots$$

(3 marks)

2. Solve the equation

$$2x^2 + 6x - 95 = 0$$

Give your solutions correct to 3 significant figures.

$$a = 2 \quad b = 6 \quad c = -95$$

$$x = \frac{-6 \pm \sqrt{36 - (4 \times 2 \times -95)}}{4}$$

$$= \frac{-6 \pm \sqrt{796}}{4}$$

$$= 5.55336799 \quad \text{or} \quad -8.55336799$$

$$x = \underline{5.55} \dots\dots\dots \text{or } x = \underline{-8.55} \dots\dots\dots$$

(3 marks)

4) Solving Quadratics Using the Formula: Medium

8. The diagram below shows a 6-sided shape.

All the corners are right angles.

All measurements are given in centimetres.

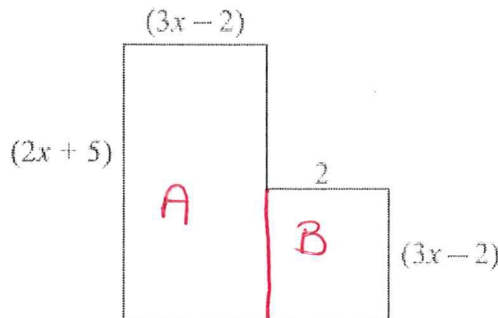


Diagram NOT accurately drawn

The area of the shape is 25 cm^2 .

(a) Show that $6x^2 + 17x - 39 = 0$

$$\begin{aligned} \text{Area A} &= (2x+5)(3x-2) \\ &= 6x^2 - 4x + 15x - 10 \\ &= 6x^2 + 11x - 10 \end{aligned}$$

$$\begin{aligned} \text{Area B} &= 2(3x-2) \\ &= 6x - 4 \end{aligned}$$

$$\begin{aligned} \text{TOTAL AREA} &= 6x^2 + 11x - 10 + 6x - 4 \\ &= 6x^2 + 17x - 14 \end{aligned}$$

$$\begin{aligned} \text{SO } 6x^2 + 17x - 14 &= 25 \\ 6x^2 + 17x - 39 &= 0 \end{aligned}$$

(b) (i) Solve the equation

$$6x^2 + 17x - 39 = 0$$

$$a = 6 \quad b = 17 \quad c = -39$$

$$x = \frac{-17 \pm \sqrt{17^2 - 4(6)(-39)}}{12}$$

$$x = 1.5 \quad \text{or} \quad x = -4.3$$

$x = \dots\dots\dots$ or $x = \dots\dots\dots$

(ii) Hence work out the length of the longest side of the shape.

$$(2 \times 1.5) + 5 = 8$$

$\dots\dots\dots 8 \dots\dots\dots \text{cm}$

(4)

4) Solving Quadratics Using the Formula: Harder

9. The diagram shows a 6-sided shape.
All the corners are right angles.
All the measurements are given in centimetres.

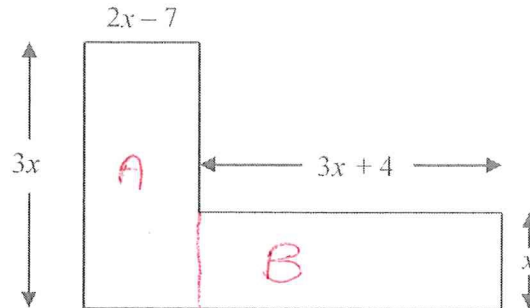


Diagram NOT accurately drawn

The area of the shape is 85 cm^2 .

- (a) Show that $9x^2 - 17x - 85 = 0$

$$A = 3x(2x-7) \quad B = x(3x+4)$$

$$= 6x^2 - 21x \quad = 3x^2 + 4x$$

$$6x^2 - 21x + 3x^2 + 4x = 85$$

$$9x^2 - 17x - 85 = 0 \quad (3)$$

- (b) (i) Solve $9x^2 - 17x - 85 = 0$

Give your solutions correct to 3 significant figures.

$$a=9 \quad b=-17 \quad c=-85$$

$$x = \frac{17 \pm \sqrt{17^2 - 4(9)(-85)}}{18}$$

$$x = 4.159474732 \quad \text{or} \quad x = -2.270585844$$

$$x = 4.16 \dots \quad \text{or} \quad x = -2.27 \dots$$

- (ii) Hence, work out the length of the shortest side of the 6-sided shape.

$$2x-7$$

$$\dots 1.38 \dots \text{ cm}$$

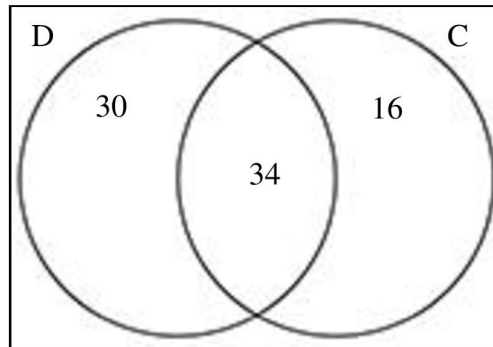
(4)

5) Venn diagrams.: Easier

Solution for Question 1:

Number of people that owned dogs only: $64 - 34 = 30$

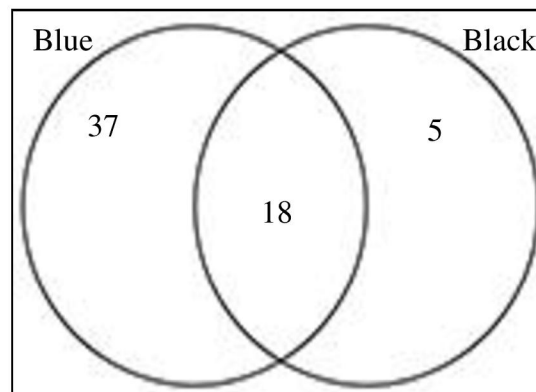
Number of people that owned cats only: $80 - 34 - 30 = 16$



Solution for Question 2:

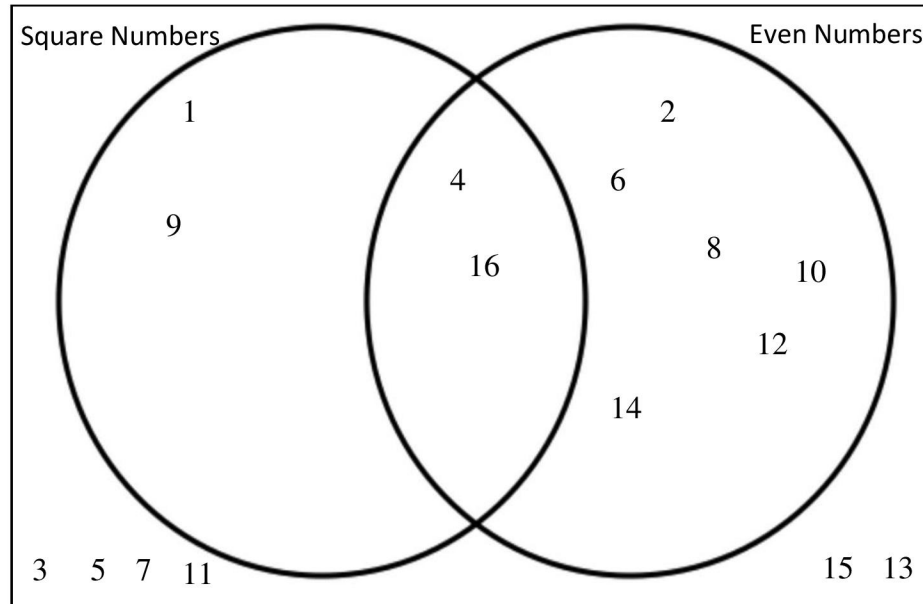
a) Number of people that only had a black pen:
 $60 - 37 - 18 = 5$

b) Probability of a person owning both types of pen:
 $\frac{18}{60} = \frac{3}{10}$



5) Venn diagrams.: Medium

Solution for Question 3:



Solution for Question 4:

- a) Tea: $6 + 12 = 18$
 Coffee: $9 + 12 = 21$
 Therefore, False
- b) False
- c) False

Solution for Question 5:

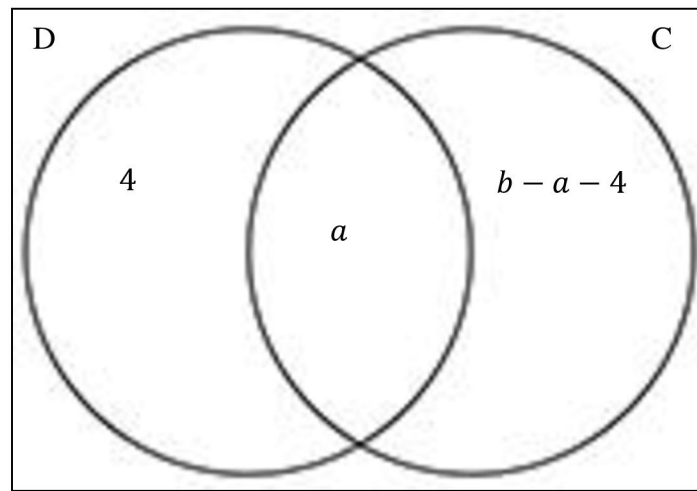
- a)
- i) $A \cap B = A$ and $B = \{9,15\}$
- ii) $A \cup B = A$ or $B = \{3,5,6,12,18\}$

5) Venn diagrams.: Harder

Solution for Question 6:

Number of people who replied with cats only:

$$b - a - 4$$



RYAN Natalie

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Index Notation. Mathswatch Clip: 131

Topic 2: Bearings. Mathswatch Clip: 124

Topic 3: Standard Form. Mathswatch Clip: 83

Topic 4: Changing Ratios. Mathswatch Clip: NA

Topic 5: More Difficult Rearranging Formulae. MW: 190

1) Index Notation: Easier

1. (a) Simplify $m^3 \times m^6 = m^{3+6}$ m^9

 (1)

(b) Simplify $\frac{p^8}{p^2} p^{8-2}$ p^6

 (1)

(c) Simplify $(2n^3)^4 16n^{3 \times 4}$ $16n^{12}$

 (2)

(4 marks)

2. (a) Simplify $m^6 \times m^7 m^{6+7}$ m^{13}

 (1)

(b) Simplify x^0 1

 (1)

(c) Simplify $(16y^6)^{\frac{1}{2}}$ $4y^3$
 $\sqrt{16} y^{\frac{6}{2}}$

 (2)

(4 marks)

3. (a) Simplify $m^5 \div m^3 m^{5-3}$ m^2

 (1)

(b) Simplify $5x^4y^3 \times x^2y 5x^{4+2}y^{3+1}$ $5x^6y^4$

 (2)

(3 marks)

1) Index Notation: Medium

4. (a) Simplify $a^4 \times a^5$ a^{4+5} a^9 (1)

(b) Simplify $\frac{45e^6 f^8}{5ef^2}$ $9e^{6-1} f^{8-2}$ $9e^5 f^6$ (2)

(c) Write down the value of $9^{\frac{1}{2}}$ $\sqrt{9}$ 3 (1)

(4 marks)

5. (a) Simplify $m^2 \times m^4$ m^{2+4} m^6 (1)

(b) Simplify $y^7 \div y^5$ y^{7-5} y^2 (1)

(c) Simplify $(m^3)^5$ $m^{3 \times 5}$ m^{15} (2)

(4 marks)

6. Simplify fully

(a) $p^2 \times p^7$ p^{2+7} p^9 (1)

(b) $\frac{3q^4 \times 2q^5}{q^3}$ $\frac{(3 \times 2)q^{4+5}}{q^3} = 6q^{9-3}$ $6q^6$ (2)

(c) $(2xy^3)^5$ $2^5 x^5 y^{3 \times 5}$ $32x^5 y^{15}$ (2)

(4 marks)

1) Index Notation: Harder

20. (a) Find the value of

(i) 64^0

1

(ii) $64^{\frac{1}{2}}$

$\sqrt{64}$

8

(iii) $64^{-\frac{2}{3}}$

$$= \frac{1}{64^{\frac{2}{3}}} = \frac{1}{(\sqrt[3]{64})^2} = \frac{1}{4^2}$$

$\frac{1}{16}$ or 0.0625

(4 marks)

2) Bearings: Easier

1.

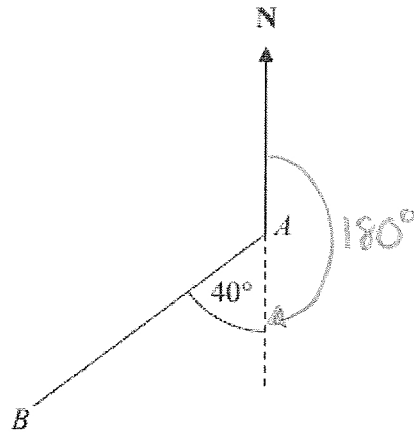


Diagram NOT accurately drawn

$$180 + 40$$

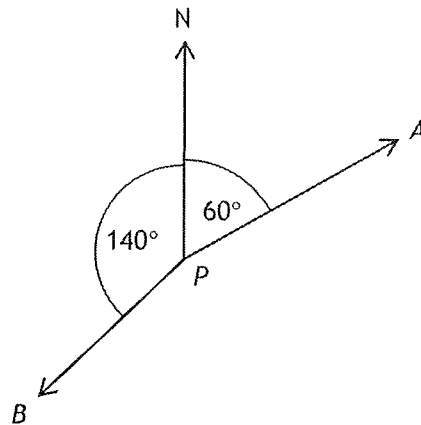
Work out the bearing of B from A .

START POINT

.....
220°

(2 marks)

2.



(a) Write down the bearing of A from P .

Bearings are always 3 digits

.....
060°

(b) Work out the bearing of B from P .

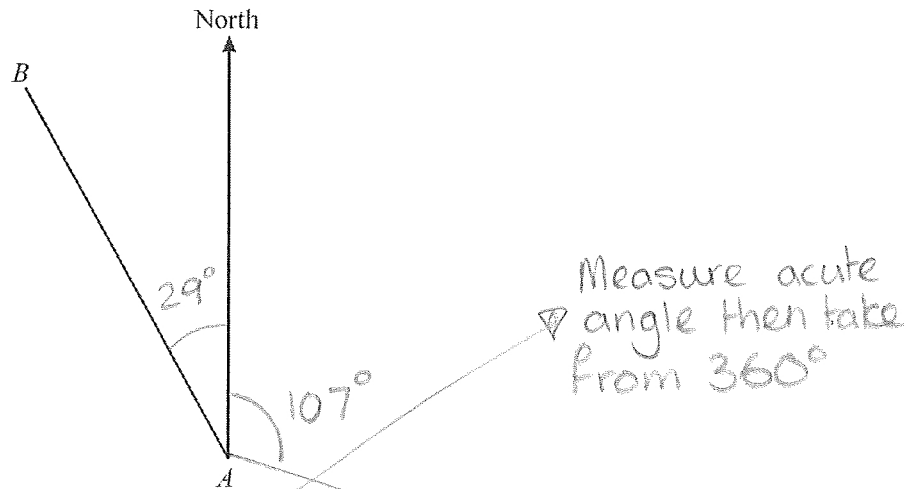
$$360 - 140$$

.....
220°

(3 marks)

2) Bearings: Medium

3.



(a) Measure and write down the bearing of B from A.

$$360 - 29$$

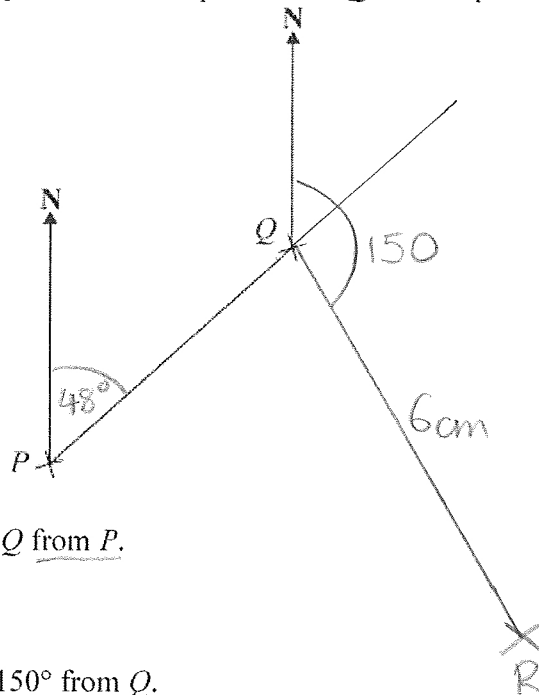
Measure acute angle then take from 360°
 331 $^\circ$
 (1)

(b) On the diagram, draw a line on a bearing of 107° from A.

clockwise

(1)
 (2 marks)

4. The diagram shows the position of two ports P and Q on a map.



(a) Measure the bearing of Q from P.

..... 048 $^\circ$
 (1)

A rock R is on a bearing of 150° from Q.
 On the map R is 6 cm from Q.

(b) Mark the position of R with a cross (x) and label it R.

(2)

2) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

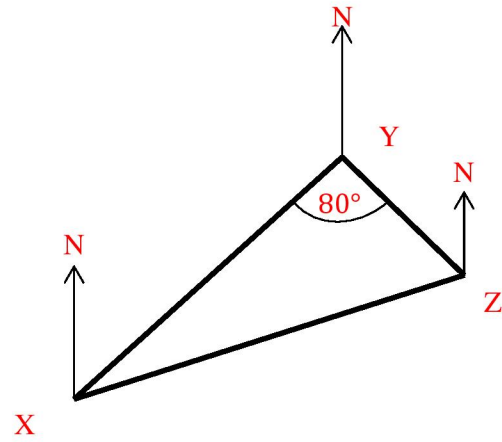
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

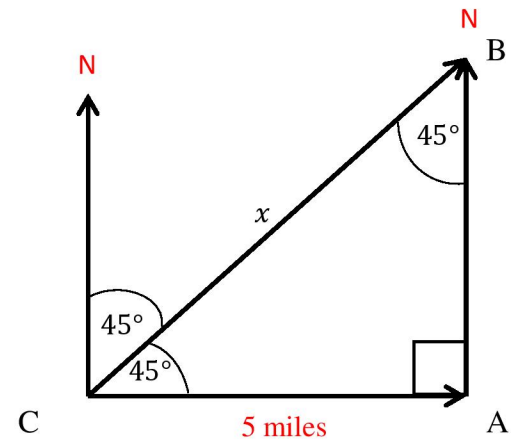
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



3) Standard Form: Easier

1. (a) Write the number 0.00037 in standard form.

(1)

$$3.7 \times 10^4$$

- (b) Write 8.25×10^3 as an ordinary number.

(1)

$$8250$$

- (c) Work out $(2.1 \times 10^8) \times (6 \times 10^{-5})$.
Write your answer in standard form.

$$\begin{aligned} 2.1 \times 10^8 \times 6 \times 10^{-5} \\ = 12.6 \times 10^3 \\ = 1.26 \times 10^4 \end{aligned}$$

(2)

$$1.26 \times 10^4$$

(4 marks)

2. (a) Write 6.43×10^5 as an ordinary number.

$$643000$$

(1)

- (b) Work out the value of $2 \times 10^7 \times 8 \times 10^{-12}$.
Give your answer in standard form.

$$\begin{aligned} 2 \times 10^7 \times 8 \times 10^{-12} \\ = 16 \times 10^{-5} \\ = 1.6 \times 10^{-4} \end{aligned}$$

$$1.6 \times 10^{-4}$$

(2)

(3 marks)

3) Standard Form: Medium

3. (a) Write down the value of 10^0

..... 1

(1)

- (b) Write 6.7×10^{-5} as an ordinary number.

..... 0.000067

(1)

- (c) Work out the value of $(3 \times 10^7) \times (9 \times 10^6)$
Give your answer in standard form.

$$\begin{aligned} 3 \times 10^7 \times 9 \times 10^6 \\ = 27 \times 10^{13} \\ = 2.7 \times 10^{14} \end{aligned}$$

..... 2.7×10^{14}

(2)

(4 marks)

4. (a) Write 8.2×10^5 as an ordinary number.

..... 820000

(1)

- (b) Write 0.000 376 in standard form.

..... 3.76×10^{-4}

(1)

- (c) Work out the value of $(2.3 \times 10^{12}) \div (4.6 \times 10^3)$
Give your answer in standard form.

$$\begin{aligned} \frac{2.3 \times 10^{12}}{4.6 \times 10^3} &= 0.5 \times 10^9 \\ &= 5 \times 10^8 \end{aligned}$$

..... 5×10^8

(2)

(4 marks)

3) Standard Form: Harder

Worded Standard Form

1) The world's smallest snail travels 4×10^{-3} m a month.

How many months would it take for the snail to travel?

2×10^{-1} m?

$$\frac{2 \times 10^{-1}}{4 \times 10^{-3}} = \frac{2}{4} \times 10^2$$

$$= 0.5 \times 10^2$$

$$= 5 \times 10^3$$

(-1 - -3 = 2)

2)

The time taken for light to reach Earth from the edge of the known universe is 14 000 000 000 years.

Light travels at the speed of 9.46×10^{12} km/year.

Work out the distance, in kilometres, from the edge of the known universe to Earth.
Give your answer in standard form.

$$S = \frac{D}{T}$$

$$D = ST$$

$$D = 9.46 \times 10^{12} \times 1.4 \times 10^{10}$$

$$= 13.244 \times 10^{22}$$

$$= 1.3244 \times 10^{23}$$

4) Changing Ratios: Easier

Solution for Question 1:

a) Red : Blue = 8:12

Divide through by 4 to simplify: 2:3

b) Red : Blue = 8:10

Divide through by 2 to simplify: 4:5

Solution for Question 2:

a) Pen : Pencils = 2:3

Equivalent to 20:30

30 pencils in pencil case

b) Only pencils removed so still 20 pens, ratio 4:3 equivalent to 20:15 so removed 15 pencils

4) Changing Ratios: Medium

Solution for Question 3:

$$1:3:5$$

$$1:3+5 = 1:8$$

Solution for Question 4:

$$\text{Orange : Red} = 2:3$$

$$2:3 = 5$$

$$x:51 = y$$

$$\frac{51}{3} = 17$$

$$x = 2 \times 17 = 34$$

$$y = 5 \times 17 = 85$$

$$\text{Ratio of Orange to Red} = 34:51$$

Compare 2:3 to 10:17, achieving same number for red sweets

$$2:3 = 34:51$$

Multiply ratio 10:17 by 3

$$30:51$$

4 orange sweets were eaten by Solomon.

Solution for Question 5:

$$\text{HW : No HW} = 5:4$$

$$5:4 = 9$$

$$15:x = y$$

$$\frac{15}{5} = 3$$

$$x = 4 \times 3 = 12$$

$$y = 9 \times 3 = 27$$

$$\text{Ratio of HW done to HW not done} = 15:12$$

Compare 5:4 to 2:1

$$5:4 = 15:12$$

$$2:1 = ??:?$$

Same number of pupils in the class = 27

Multiply ratio 2:1 by 9 ($\frac{27}{3}$)

$$18:9$$

3 more pupils did do their homework, the teacher was correct.

4) Changing Ratios: Harder

Solution for Question 6:

Sedimentary : Metamorphic = 2:3

Metamorphic : Igneous = 9:10

Multiply ratio 2:3 by 3 = 6:9

Therefore, sedimentary to igneous = 6:10

Solution for Question 7:

Road bikes: Mountain bikes

3:5

The minimum number of bikes sold is 3 road and 5 mountain, if the ratio changes to 2:1 but no more mountain bikes are sold then ratio is 10:5 so 7 more road bikes must have been sold.

It is not the only answer as there could have been many numbers of bikes sold, the ratio is 3:5 this could be 6:10 or any equivalent ratio. If it was 6 to 10 for example to change to 2:1 ratio must be 20:10 which would mean 14 more road bikes sold, so the number more road bikes sold is any multiple of 7

5) More Difficult Rearranging Formulae: Easier

1. Rearrange $a(q - c) = d$ to make q the subject.

$$aq - ac = d$$

$$aq = d + ac$$

$$q = \frac{d + ac}{a}$$

$$q = \frac{d + ac}{a} \dots \dots \dots (3)$$

(Total 5 marks)

2. (a) Make n the subject of the formula $m = 5n - 21$

$$m + 21 = 5n$$

$$n = \frac{m + 21}{5}$$

5) More Difficult Rearranging Formulae: Medium

(b) Make p the subject of the formula $4(p - 2q) = 3p + 2$

$$4p - 8q = 3p + 2$$

$$p = 2 + 8q$$

$$p = \dots\dots\dots$$

(3)

(Total 5 marks)

3.

$$P = \pi r + 2r + 2a$$

Make r the subject of the formula

$$P - 2a = r(\pi + 2)$$

$$r = \frac{P - 2a}{\pi + 2}$$

(Total 3 marks)

5) More Difficult Rearranging Formulae: Harder

12. Rearrange $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

to make u the subject of the formula.

Give your answer in its simplest form.

$$fv + fu = uv$$

$$fu - uv = fv$$

$$u(f - v) = fv$$

$$u = \frac{fv}{f - v}$$

STREET Tom

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Angles in Polygons. Mathswatch Clip: 123

Topic 2: Bearings. Mathswatch Clip: 124

Topic 3: Changing Ratios. Mathswatch Clip: NA

Topic 4: Venn diagrams.. Mathswatch Clip: 127

Topic 5: Inequalities Regions. Mathswatch Clip: 198

1) Angles in Polygons: Easier

1. Each exterior angle of a regular polygon is 30° .

Work out the number of sides of the polygon.

$$360 \div 30 = 12$$

.....
12

(2 marks)

- 2.

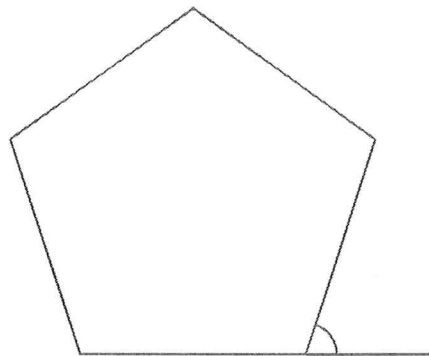


Diagram NOT accurately drawn

Work out the size of an exterior angle of a regular pentagon.

$$360 \div 5 = 72$$

.....
72°

(2 marks)

- 3.

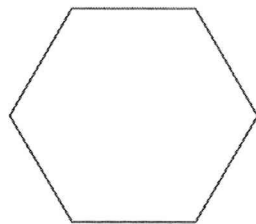


Diagram NOT accurately drawn

Calculate the size of the exterior angle of a regular hexagon.

$$360 \div 6 = 60$$

.....
60°

(2 marks)

1) Angles in Polygons: Medium

4. The size of each exterior angle of a regular polygon is 40° .

Work out the number of sides of the regular polygon.

$$360 \div 40 = 9$$

..... 9

(2 marks)

5. The size of each interior angle of a regular polygon is 156° .

Work out the number of sides of the polygon.

$$180 - 156 = 24 \text{ (Exterior angle)}$$

$$360 \div 24 = 15$$

..... 15

(3 marks)

6. Here is a regular polygon with 9 sides.

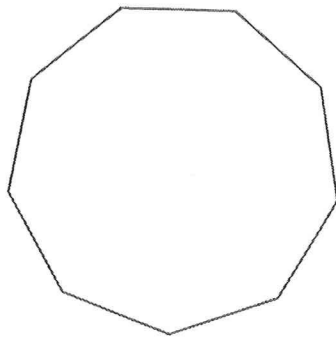


Diagram **NOT** accurately drawn

Work out the size of an exterior angle.

$$360 \div 9 = 40$$

..... 40

(2 marks)

1) Angles in Polygons: Harder

11.

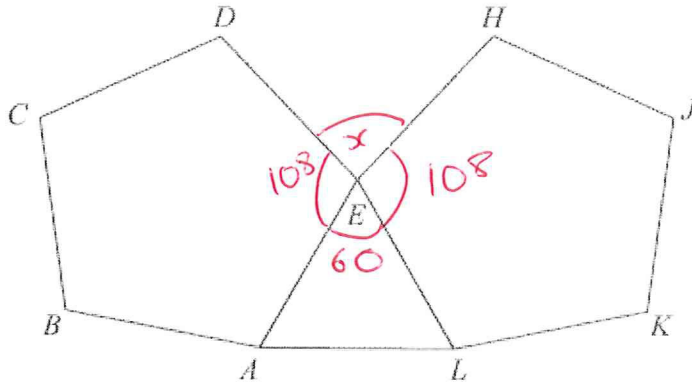


Diagram NOT accurately drawn

ABCDE and *EHJKL* are regular pentagons.
AEL is an equilateral triangle.

Work out the size of angle *DEH*.

$$\begin{aligned} \text{Pentagon} &= \frac{180 \times (n-2)}{n} \\ &= \frac{180 \times 3}{5} = \frac{540}{5} = 108 \end{aligned}$$

$$360 - 108 - 108 - 60 = 84$$

84

.....°
 (4 marks)

2) Bearings: Easier

1.

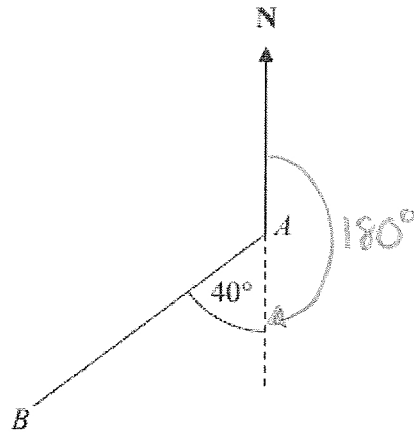


Diagram NOT accurately drawn

$$180 + 40$$

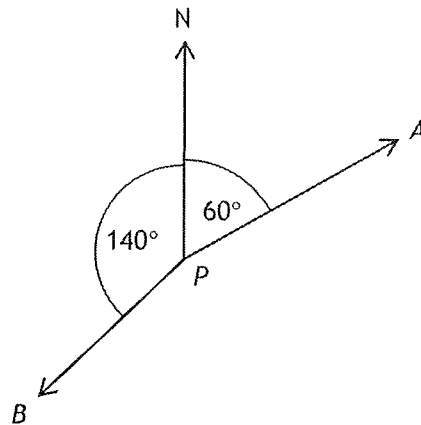
Work out the bearing of B from A .

START POINT

..... 220 °

(2 marks)

2.



(a) Write down the bearing of A from P .

Bearings are always 3 digits

..... 060 °

(b) Work out the bearing of B from P .

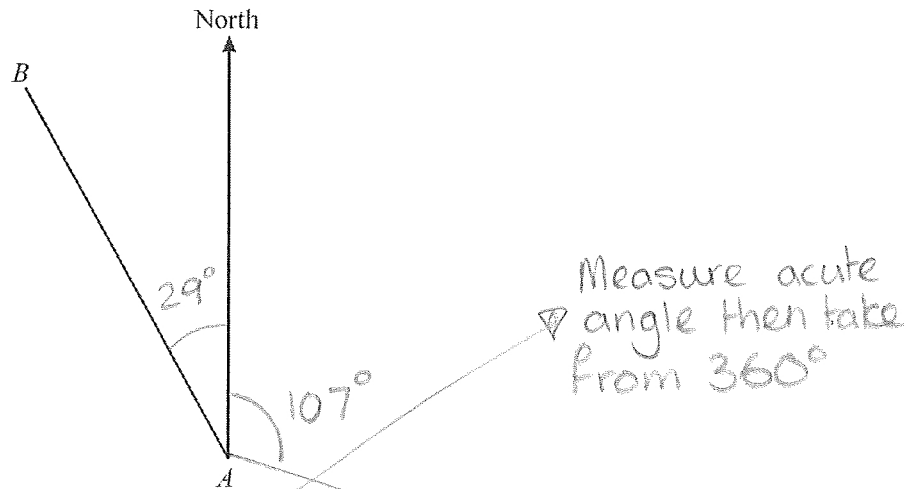
$$360 - 140$$

..... 220 °

(3 marks)

2) Bearings: Medium

3.



(a) Measure and write down the bearing of B from A.

$$360 - 29$$

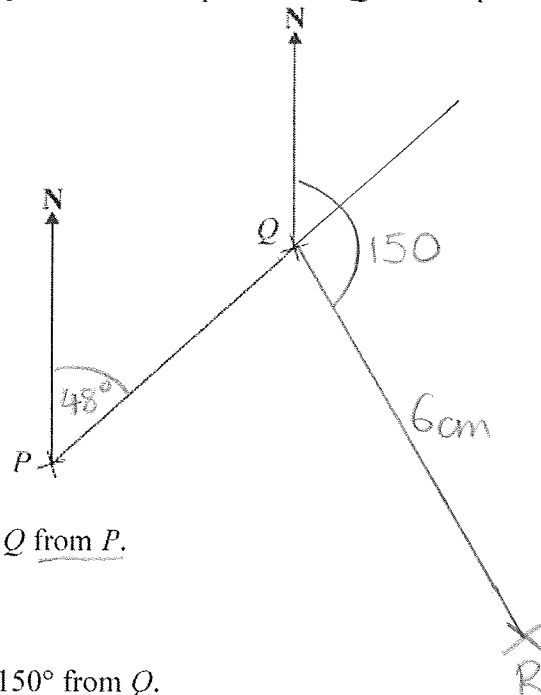
Measure acute angle then take from 360°
 331 $^\circ$
 (1)

(b) On the diagram, draw a line on a bearing of 107° from A.

clockwise

(1)
 (2 marks)

4. The diagram shows the position of two ports P and Q on a map.



(a) Measure the bearing of Q from P.

..... 048 $^\circ$
 (1)

A rock R is on a bearing of 150° from Q.
 On the map R is 6 cm from Q.

(b) Mark the position of R with a cross (x) and label it R.

(2)

2) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

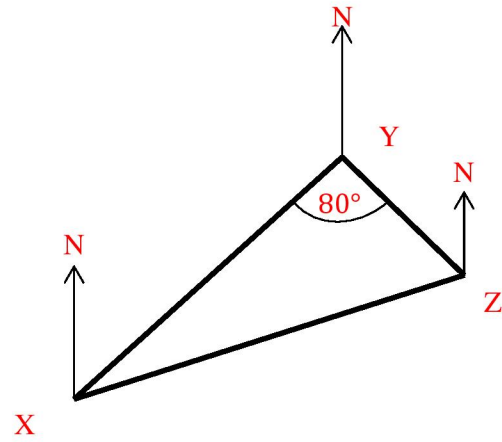
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

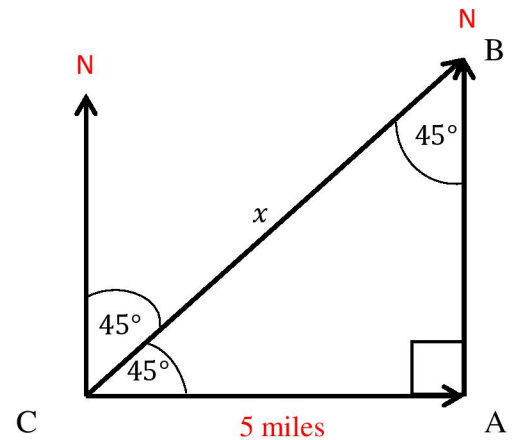
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



3) Changing Ratios: Easier

Solution for Question 1:

a) Red : Blue = 8:12

Divide through by 4 to simplify: 2:3

b) Red : Blue = 8:10

Divide through by 2 to simplify: 4:5

Solution for Question 2:

a) Pen : Pencils = 2:3

Equivalent to 20:30

30 pencils in pencil case

b) Only pencils removed so still 20 pens, ratio 4:3 equivalent to 20:15 so removed 15 pencils

3) Changing Ratios: Medium

Solution for Question 3:

$$1:3:5$$

$$1:3+5 = 1:8$$

Solution for Question 4:

$$\text{Orange : Red} = 2:3$$

$$2:3 = 5$$

$$x:51 = y$$

$$\frac{51}{3} = 17$$

$$x = 2 \times 17 = 34$$

$$y = 5 \times 17 = 85$$

$$\text{Ratio of Orange to Red} = 34:51$$

Compare 2:3 to 10:17, achieving same number for red sweets

$$2:3 = 34:51$$

Multiply ratio 10:17 by 3

$$30:51$$

4 orange sweets were eaten by Solomon.

Solution for Question 5:

$$\text{HW : No HW} = 5:4$$

$$5:4 = 9$$

$$15:x = y$$

$$\frac{15}{5} = 3$$

$$x = 4 \times 3 = 12$$

$$y = 9 \times 3 = 27$$

$$\text{Ratio of HW done to HW not done} = 15:12$$

Compare 5:4 to 2:1

$$5:4 = 15:12$$

$$2:1 = ??:?$$

Same number of pupils in the class = 27

Multiply ratio 2:1 by 9 ($\frac{27}{3}$)

$$18:9$$

3 more pupils did do their homework, the teacher was correct.

3) Changing Ratios: Harder

Solution for Question 6:

Sedimentary : Metamorphic = 2:3

Metamorphic : Igneous = 9:10

Multiply ratio 2:3 by 3 = 6:9

Therefore, sedimentary to igneous = 6:10

Solution for Question 7:

Road bikes: Mountain bikes

3:5

The minimum number of bikes sold is 3 road and 5 mountain, if the ratio changes to 2:1 but no more mountain bikes are sold then ratio is 10:5 so 7 more road bikes must have been sold.

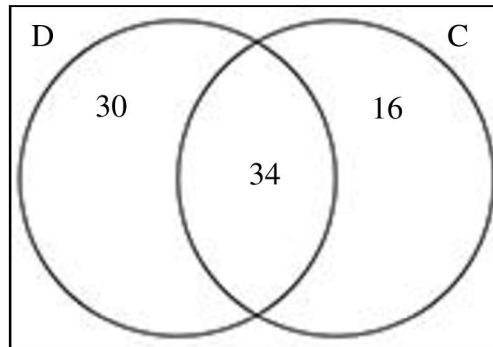
It is not the only answer as there could have been many numbers of bikes sold, the ratio is 3:5 this could be 6:10 or any equivalent ratio. If it was 6 to 10 for example to change to 2:1 ratio must be 20:10 which would mean 14 more road bikes sold, so the number more road bikes sold is any multiple of 7

4) Venn diagrams.: Easier

Solution for Question 1:

Number of people that owned dogs only: $64 - 34 = 30$

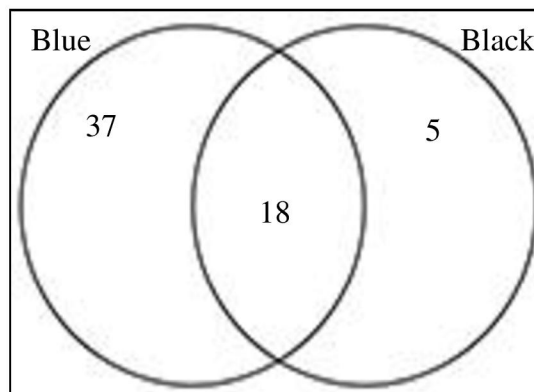
Number of people that owned cats only: $80 - 34 - 30 = 16$



Solution for Question 2:

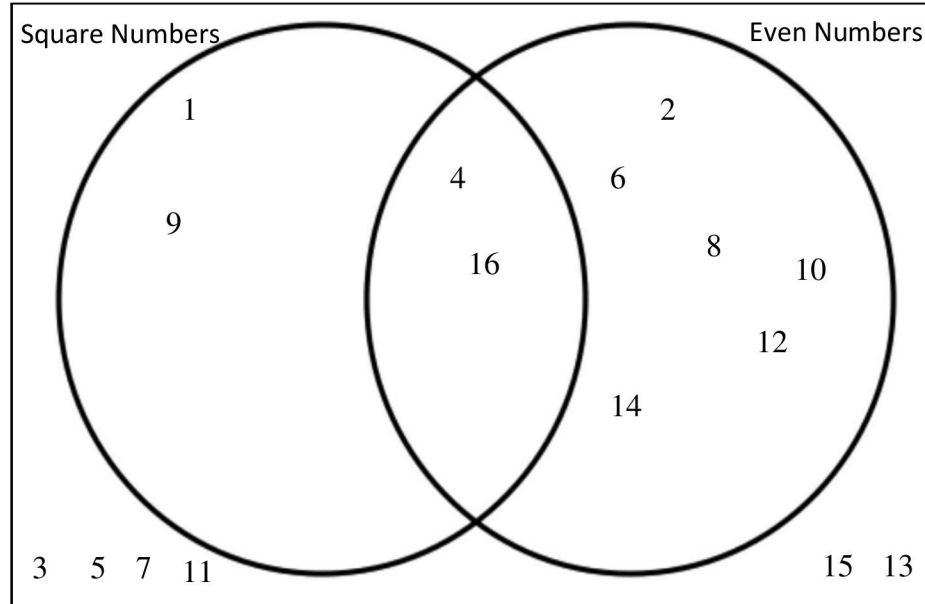
a) Number of people that only had a black pen:
 $60 - 37 - 18 = 5$

b) Probability of a person owning both types of pen:
 $\frac{18}{60} = \frac{3}{10}$



4) Venn diagrams.: Medium

Solution for Question 3:



Solution for Question 4:

- a) Tea: $6 + 12 = 18$
 Coffee: $9 + 12 = 21$
 Therefore, False
- b) False
- c) False

Solution for Question 5:

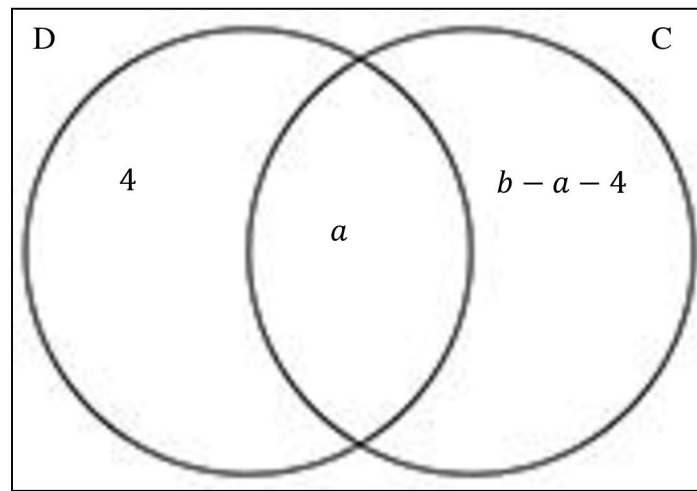
- a)
- i) $A \cap B = A$ and $B = \{9, 15\}$
- ii) $A \cup B = A$ or $B = \{3, 5, 6, 12, 18\}$

4) Venn diagrams.: Harder

Solution for Question 6:

Number of people who replied with cats only:

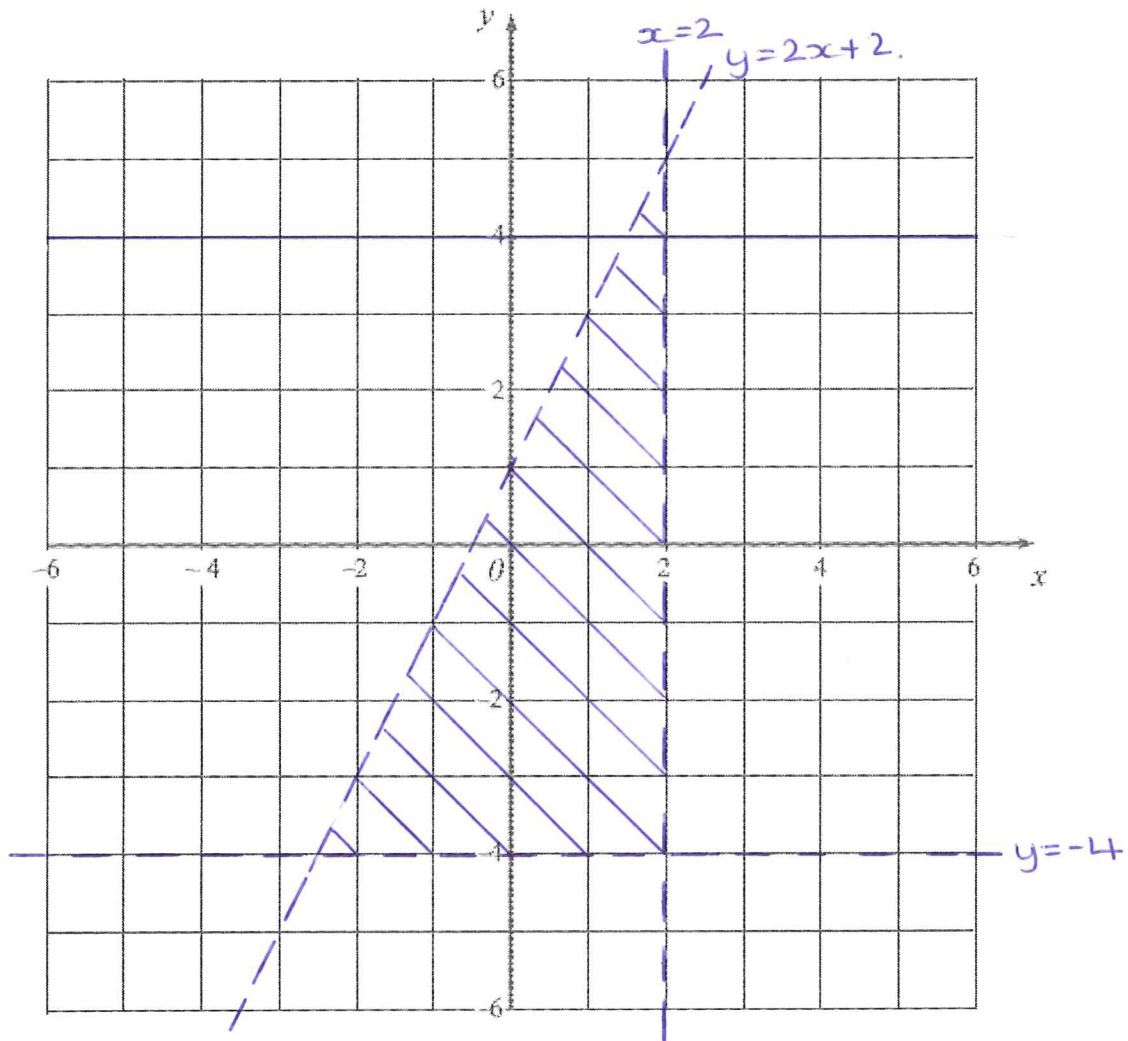
$$b - a - 4$$



5) Inequalities Regions: Easier

1. On the grid, shade the region that satisfies all three of these inequalities

$$y > -4 \quad x < 2 \quad y < 2x + 1$$



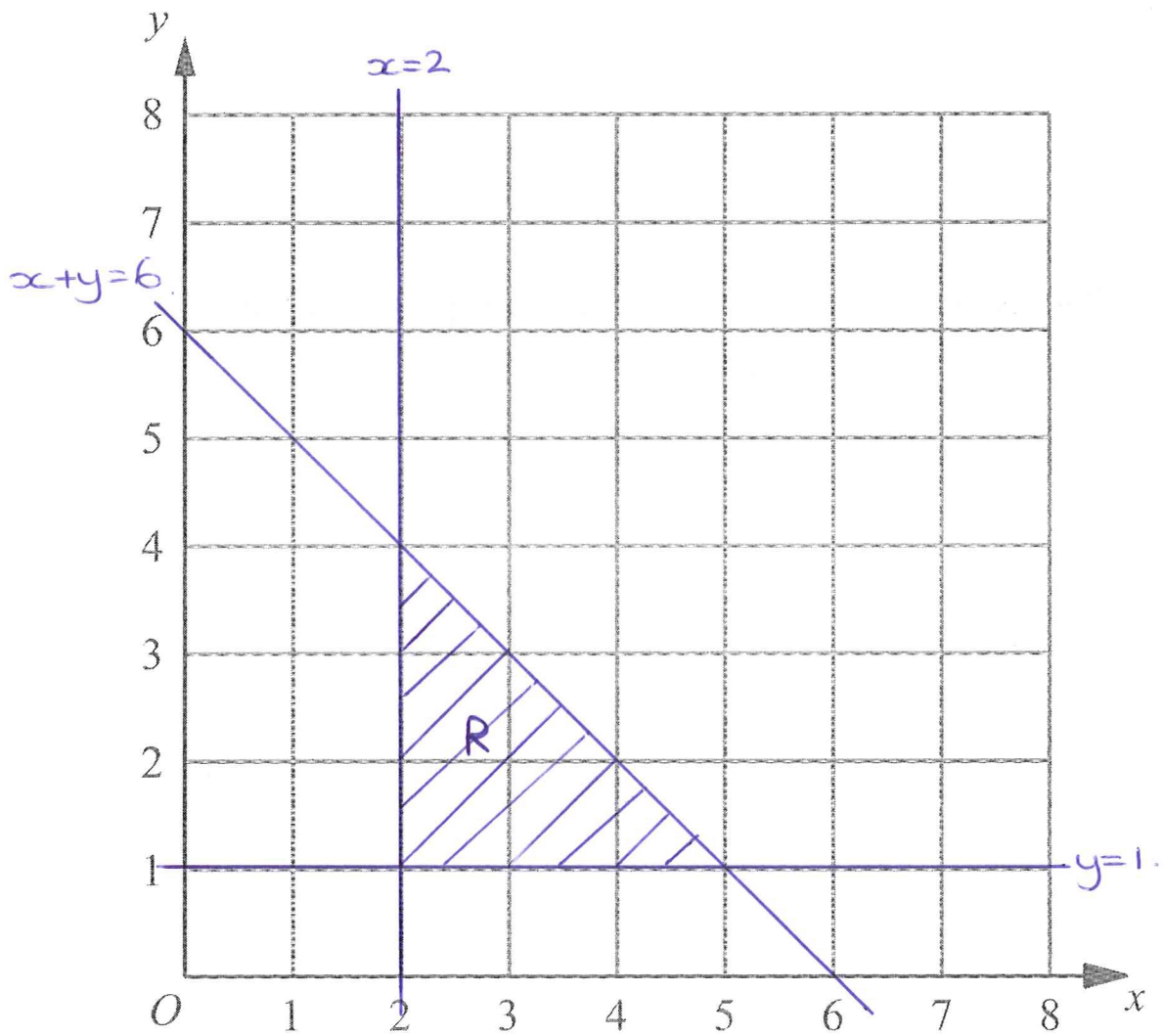
(Total for Question 19 = 4 marks)

5) Inequalities Regions: Medium

2. The region **R** satisfies the inequalities

$$x \geq 2, \quad y \geq 1, \quad x + y \leq 6$$

On the grid below, draw straight lines and use shading to show the region **R**.



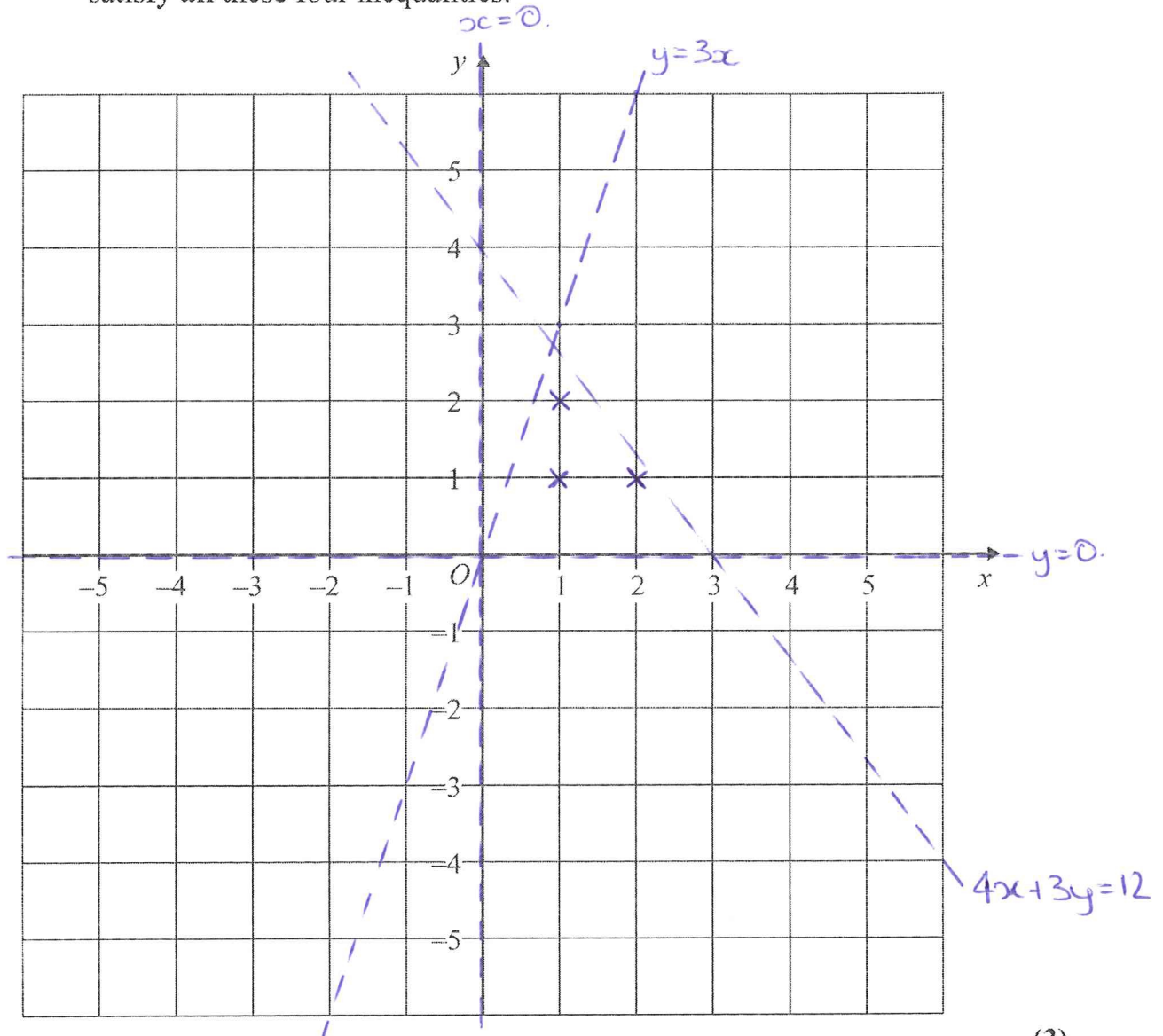
(Total 3 marks)

5) Inequalities Regions: Harder

7. $4x + 3y < 12$, $y < 3x$, $y > 0$, $x > 0$

x and y are both integers.

On the grid, mark with a cross (\times), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

TALMAGE Rheanna

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Angles in Polygons. Mathswatch Clip: 123

Topic 2: Bearings. Mathswatch Clip: 124

Topic 3: Simple Bounds. Mathswatch Clip: 132

Topic 4: Changing Ratios. Mathswatch Clip: NA

Topic 5: Solving Quadratics Using the Formula. MW: 191

1) Angles in Polygons: Easier

1. Each exterior angle of a regular polygon is 30° .

Work out the number of sides of the polygon.

$$360 \div 30 = 12$$

.....
12

(2 marks)

- 2.

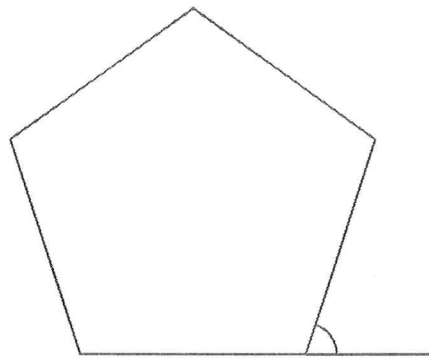


Diagram NOT accurately drawn

Work out the size of an exterior angle of a regular pentagon.

$$360 \div 5 = 72$$

.....
72°

(2 marks)

- 3.

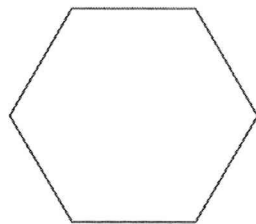


Diagram NOT accurately drawn

Calculate the size of the exterior angle of a regular hexagon.

$$360 \div 6 = 60$$

.....
60°

(2 marks)

1) Angles in Polygons: Medium

4. The size of each exterior angle of a regular polygon is 40° .

Work out the number of sides of the regular polygon.

$$360 \div 40 = 9$$

..... 9

(2 marks)

5. The size of each interior angle of a regular polygon is 156° .

Work out the number of sides of the polygon.

$$180 - 156 = 24 \text{ (Exterior angle)}$$

$$360 \div 24 = 15$$

..... 15

(3 marks)

6. Here is a regular polygon with 9 sides.

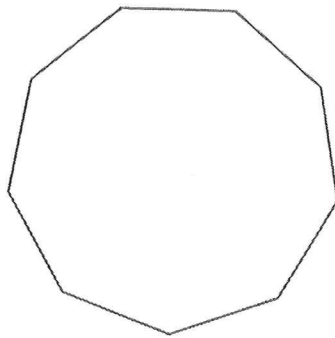


Diagram NOT accurately drawn

Work out the size of an exterior angle.

$$360 \div 9 = 40$$

..... 40

(2 marks)

1) Angles in Polygons: Harder

11.

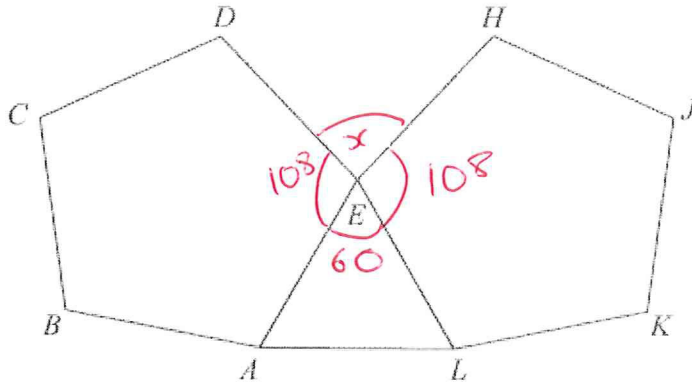


Diagram NOT accurately drawn

ABCDE and *EHJKL* are regular pentagons.
AEL is an equilateral triangle.

Work out the size of angle *DEH*.

$$\begin{aligned} \text{Pentagon} &= \frac{180 \times (n-2)}{n} \\ &= \frac{180 \times 3}{5} = \frac{540}{5} = 108 \end{aligned}$$

$$360 - 108 - 108 - 60 = 84$$

84

.....°
 (4 marks)

2) Bearings: Easier

1.

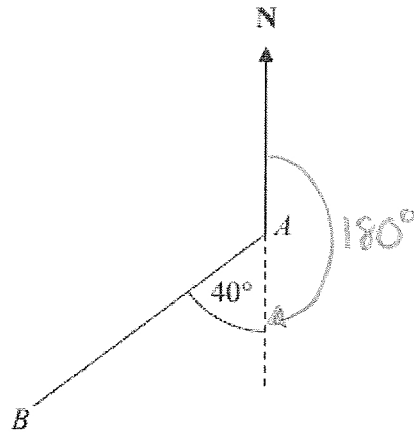


Diagram NOT
accurately drawn

$$180 + 40$$

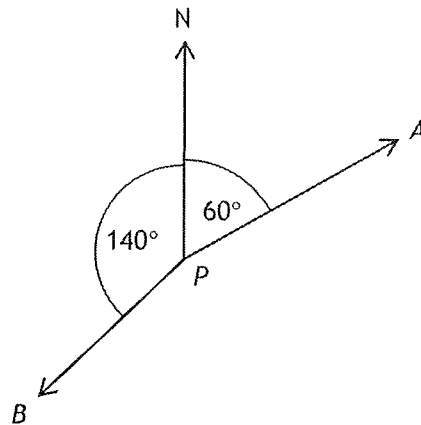
Work out the bearing of B from A .

START POINT

.....
220°

(2 marks)

2.



(a) Write down the bearing of A from P .

Bearings
are always
3 digits

.....
060°

(b) Work out the bearing of B from P .

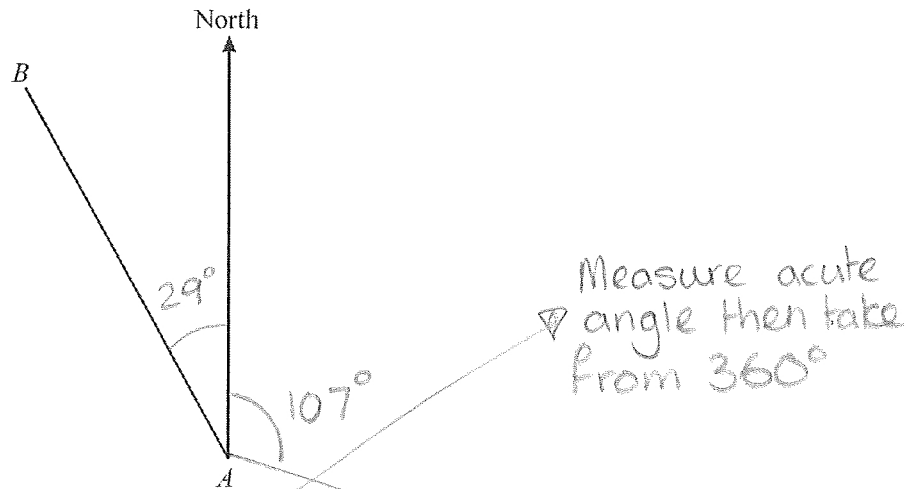
$$360 - 140$$

.....
220°

(3 marks)

2) Bearings: Medium

3.



(a) Measure and write down the bearing of B from A.

$$360 - 29$$

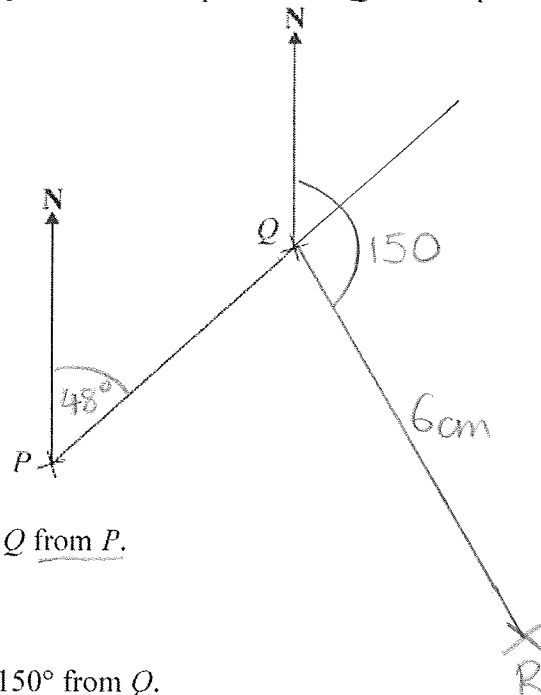
.....
331°
(1)

(b) On the diagram, draw a line on a bearing of 107° from A.

clockwise

(1)
(2 marks)

4. The diagram shows the position of two ports P and Q on a map.



(a) Measure the bearing of Q from P.

.....
048°
(1)

A rock R is on a bearing of 150° from Q.
On the map R is 6 cm from Q.

(b) Mark the position of R with a cross (×) and label it R.

(2)

2) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

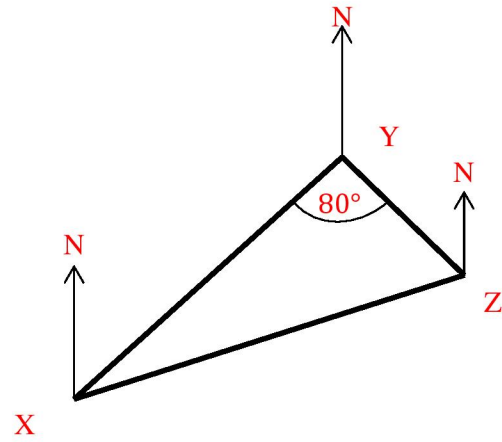
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

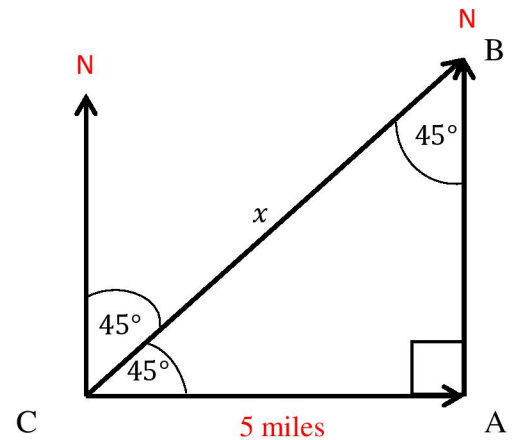
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



3) Simple Bounds: Easier

1. A piece of string has a length of 55 mm to the nearest mm.

(a) Write down the shortest possible length of the piece of string.

_____ 54.5 _____ mm (1)

(b) Write down the greatest possible length of the piece of string.

_____ 55.5 _____ mm (1)
(2 marks)

2. Chelsea's height is 158 cm to the nearest cm.

(a) Write down Chelsea's minimum possible height.

_____ 157.5 _____ cm (1)

(b) Write down Chelsea's maximum possible height.

_____ 158.5 _____ cm (1)
(2 marks)

3) Simple Bounds: Medium

3. A is 4.2 correct to the nearest decimal place.
B is 13 correct to the nearest whole number.

a) What is the error interval for A?

$$4.15 \leq A < 4.25$$

_____ cm

(1)

b) What is the lower bound of B?

$$12.5$$

_____ cm

(1)

c) What is the error interval of A + B?

$$\text{Lower bound A+B} \quad 4.15 + 12.5 = 16.65$$

$$\text{Upper bound A+B} \quad 4.25 + 13.5 = 17.75$$

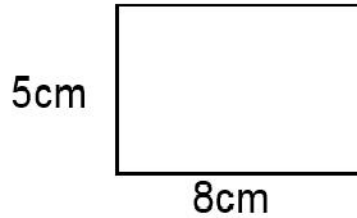
$$16.65 \leq A + B < 17.75$$

_____ cm

(1)

3) Simple Bounds: Harder

4.



The sides of the rectangle above are measured to the nearest cm.

a) Work out a lower bound for the perimeter.

Lower bounds for the sides are 4.5cm and 7.5cm

So lower bounds for perimeter is $2 \times 4.5 + 2 \times 7.5 = 9 + 15 = 24\text{cm}$

24cm

b) Work out the upper bound for the perimeter.

Upper bounds for the sides are 5.5cm and 8.5cm

So lower bounds for perimeter is $2 \times 5.5 + 2 \times 8.5 = 11 + 17 = 28\text{cm}$

28cm

(4 marks)

5. Tom has 100 identical pens.

Each of these pen weighs 5 grams to the nearest gram.

Work out the greatest possible total weight of all 100 pens.

Give your answer in kilograms.

Upper bound for weight of one pen: 5.5 g

So for 100 pens upper bound is $100 \times 5.5 = 550\text{g}$

One kilogram = 1000 grams so

$$550\text{g} = 0.55\text{kg}$$

0.55 kg

(3 marks)

4) Changing Ratios: Easier

Solution for Question 1:

a) Red : Blue = 8:12

Divide through by 4 to simplify: 2:3

b) Red : Blue = 8:10

Divide through by 2 to simplify: 4:5

Solution for Question 2:

a) Pen : Pencils = 2:3

Equivalent to 20:30

30 pencils in pencil case

b) Only pencils removed so still 20 pens, ratio 4:3 equivalent to 20:15 so removed 15 pencils

4) Changing Ratios: Medium

Solution for Question 3:

$$1:3:5$$

$$1:3+5 = 1:8$$

Solution for Question 4:

$$\text{Orange : Red} = 2:3$$

$$2:3 = 5$$

$$x:51 = y$$

$$\frac{51}{3} = 17$$

$$x = 2 \times 17 = 34$$

$$y = 5 \times 17 = 85$$

$$\text{Ratio of Orange to Red} = 34:51$$

Compare 2:3 to 10:17, achieving same number for red sweets

$$2:3 = 34:51$$

Multiply ratio 10:17 by 3

$$30:51$$

4 orange sweets were eaten by Solomon.

Solution for Question 5:

$$\text{HW : No HW} = 5:4$$

$$5:4 = 9$$

$$15:x = y$$

$$\frac{15}{5} = 3$$

$$x = 4 \times 3 = 12$$

$$y = 9 \times 3 = 27$$

$$\text{Ratio of HW done to HW not done} = 15:12$$

Compare 5:4 to 2:1

$$5:4 = 15:12$$

$$2:1 = ?:?$$

Same number of pupils in the class = 27

Multiply ratio 2:1 by 9 ($\frac{27}{3}$)

$$18:9$$

3 more pupils did do their homework, the teacher was correct.

4) Changing Ratios: Harder

Solution for Question 6:

Sedimentary : Metamorphic = 2:3

Metamorphic : Igneous = 9:10

Multiply ratio 2:3 by 3 = 6:9

Therefore, sedimentary to igneous = 6:10

Solution for Question 7:

Road bikes: Mountain bikes

3:5

The minimum number of bikes sold is 3 road and 5 mountain, if the ratio changes to 2:1 but no more mountain bikes are sold then ratio is 10:5 so 7 more road bikes must have been sold.

It is not the only answer as there could have been many numbers of bikes sold, the ratio is 3:5 this could be 6:10 or any equivalent ratio. If it was 6 to 10 for example to change to 2:1 ratio must be 20:10 which would mean 14 more road bikes sold, so the number more road bikes sold is any multiple of 7

5) Solving Quadratics Using the Formula: Easier

1. Solve $3x^2 + 7x - 13 = 0$
Give your solutions correct to 2 decimal places.

$$a = 3 \quad b = 7 \quad c = -13$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-7 \pm \sqrt{7^2 - 4 \times 3 \times -13}}{2 \times 3} = \frac{-7 \pm \sqrt{205}}{6}$$

$$= 1.219636844 \quad \text{or} \quad -3.552970177$$

$$x = \underline{1.22} \dots \dots \dots \text{or } x = \underline{-3.55} \dots \dots \dots$$

(3 marks)

2. Solve the equation

$$2x^2 + 6x - 95 = 0$$

Give your solutions correct to 3 significant figures.

$$a = 2 \quad b = 6 \quad c = -95$$

$$x = \frac{-6 \pm \sqrt{36 - (4 \times 2 \times -95)}}{4}$$

$$= \frac{-6 \pm \sqrt{796}}{4}$$

$$= 5.55336799 \quad \text{or} \quad -8.55336799$$

$$x = \underline{5.55} \dots \dots \dots \text{or } x = \underline{-8.55} \dots \dots \dots$$

(3 marks)

5) Solving Quadratics Using the Formula: Medium

3. Solve $x^2 + 3x - 5 = 0$
Give your solutions correct to 4 significant figures.

$$a = 1 \quad b = 3 \quad c = -5$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-3 \pm \sqrt{9 - (4 \times 1 \times -5)}}{2}$$

$$= \frac{-3 \pm \sqrt{29}}{2}$$

$$x = 1.192582404 \text{ or } -4.192582404$$

$$x = 1.193 \text{ or } -4.193$$

(3 marks)

4. Solve this quadratic equation.

$$x^2 - 5x - 8 = 0$$

Give your answers correct to 3 significant figures.

$$a = 1 \quad b = -5 \quad c = -8$$

$$x = \frac{5 \pm \sqrt{25 - (4 \times 1 \times -8)}}{2}$$

$$= \frac{5 \pm \sqrt{57}}{2}$$

$$x = 6.274917218 \text{ or } -1.274917218$$

$$x = 6.27 \text{ or } -1.27$$

(3 marks)

5) Solving Quadratics Using the Formula: Harder

9. The diagram shows a 6-sided shape.
 All the corners are right angles.
 All the measurements are given in centimetres.

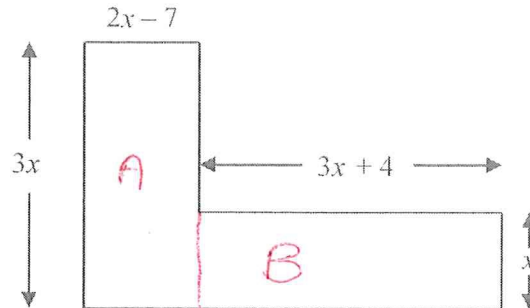


Diagram NOT accurately drawn

The area of the shape is 85 cm^2 .

- (a) Show that $9x^2 - 17x - 85 = 0$

$$A = 3x(2x-7) \quad B = x(3x+4)$$

$$= 6x^2 - 21x \quad = 3x^2 + 4x$$

$$6x^2 - 21x + 3x^2 + 4x = 85$$

$$9x^2 - 17x - 85 = 0 \quad (3)$$

- (b) (i) Solve $9x^2 - 17x - 85 = 0$

Give your solutions correct to 3 significant figures.

$$a=9 \quad b=-17 \quad c=-85$$

$$x = \frac{17 \pm \sqrt{17^2 - 4(9)(-85)}}{18}$$

$$x = 4.159474732 \quad \text{or} \quad x = -2.270585844$$

$$x = 4.16 \dots \quad \text{or} \quad x = -2.27 \dots$$

- (ii) Hence, work out the length of the shortest side of the 6-sided shape.

$$2x-7$$

$$\dots 1.38 \dots \text{ cm}$$

(4)

THOMPSON Angus

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Bearings. Mathswatch Clip: 124

Topic 2: Missing Mean Questions. Mathswatch Clip: NA

Topic 3: Solving Quadratics Using the Formula. MW: 191

Topic 4: Inequalities Regions. Mathswatch Clip: 198

Topic 5: More Difficult Rearranging Formulae. MW: 190

1) Bearings: Easier

1.

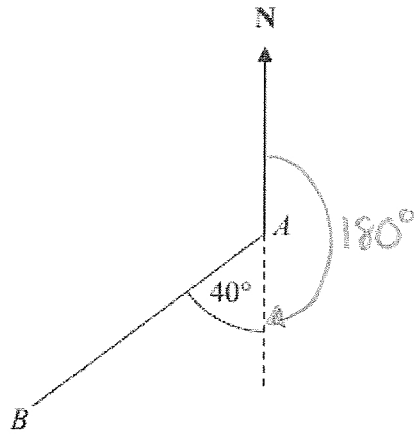


Diagram NOT accurately drawn

$180 + 40$

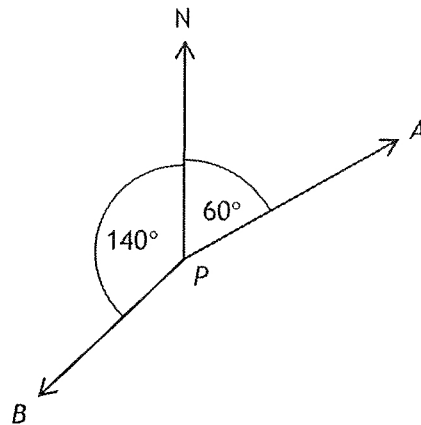
Work out the bearing of B from A.

START POINT

.....220.....°

(2 marks)

2.



(a) Write down the bearing of A from P.

Bearings are always 3 digits

.....060.....°

(b) Work out the bearing of B from P.

$360 - 140$

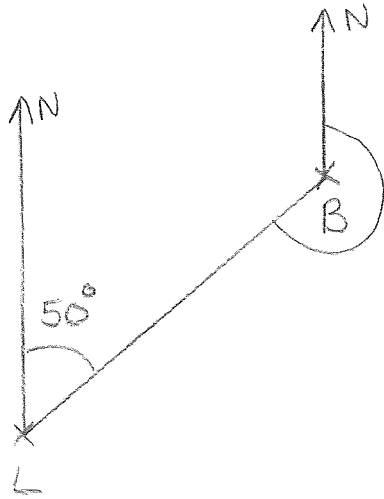
.....220.....°

(3 marks)

1) Bearings: Medium

9. The bearing of a ship from a lighthouse is 050°

Work out the bearing of the lighthouse from the ship.



DRAW A SKETCH!
If accurate, you can measure the bearing

.....
230.....°

(2 marks)

1) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

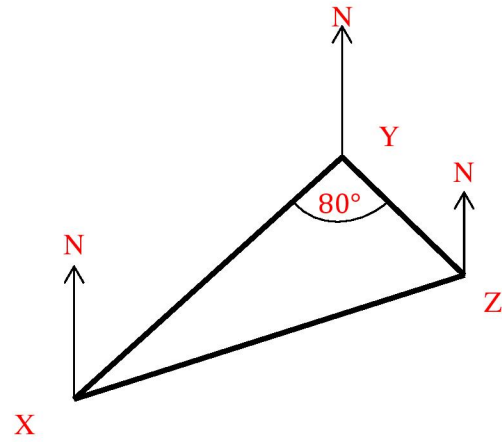
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

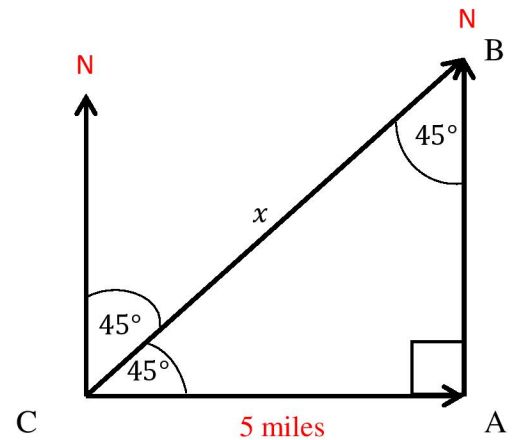
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



2) Missing Mean Questions: Easier

1) The mean of 8 and another number is 13.

What is the other number?

$$\text{Solution: } (8+x)/2 = 13 \quad \times 2$$

$$8 + x = 26 \quad - 8$$

$$x = 18$$

$$\underline{\hspace{2cm}} 18 \underline{\hspace{2cm}}$$

(3 Marks)

2) The mean of 2, 5, 8 and x is 4

Find x

$$\text{Solution: } (2 + 5 + 8 + x) / 4 = 4 \quad \times 4$$

$$15 + x = 16 \quad -15$$

$$x = 1$$

$$\underline{\hspace{2cm}} x = 1 \underline{\hspace{2cm}}$$

(3 Marks)

3) After measuring the heights of 7 people, they have an average height of 156cm. After measuring the heights of 8 people they have an average height of 158cm. How tall is the 8th person?

$$\text{Solution: } 7 \times 156 = 1092$$

$$8 \times 158 = 1264$$

$$1092 - 1264 = 172$$

(3 Marks)

$$\underline{\hspace{2cm}} 172 \underline{\hspace{2cm}}$$

2) Missing Mean Questions: Medium

4) The mean weight of a group of 7 girls is 58kg

a) Work out their total weight

Solution: $7 \times 58 = 406\text{kg}$

_____406_____Kg

When a 8th girl joins the group, the mean weight goes up to 59kg.

b) What is the weight of the 8th girl?

Solution: $59 \times 8 = 472$

$472 - 406 = 66 \text{ Kg}$

_____66_____Kg

(3 Marks)

5) The mean distance that Jack runs in his last 10 runs is 5.7 miles. Work out the distance that he would need to run to make this exactly 6 miles.

Solution: $10 \times 5.7 = 57$

$11 \times 6 = 66$

$66 - 57 = 9$

_____9 miles_____

(2 Marks)

2) Missing Mean Questions: Harder

- 6) Waitresses and kitchen staff in a restaurant decide to share their tips. There are 8 kitchen staff 10 waitresses. The kitchen staff receives a mean of £23 weekly and the waitresses receive a mean of £28 weekly.

Work out the mean of all 18 members of staff.

$$\begin{aligned} \text{Solution: } 23 \times 8 &= 184 \\ 28 \times 10 &= 280 \end{aligned}$$

$$\text{Total} = 184 + 280 = 464$$

$$\text{Mean} = 464/18 = 25.78$$

_____ £25.78 _____

(3 Marks)

- 7) The mean of a, a, b is 30

The mean of a, a, b, b, b is 20

Find the values of a and b

Solution:

$$(2a + b) / 3 = 30 \quad \times 3$$

$$(2a + 3b) / 5 = 20 \quad \times 5$$

$$2a + b = 90 \quad - \quad \text{solve simultaneously}$$

$$2a + 3b = 100$$

$$-2b = -10$$

$$b = 5$$

$$2a + 5 = 90$$

$$2a = 85$$

$$a = 42.5$$

$a = 42.5 \quad b = 5$ _____

3) Solving Quadratics Using the Formula: Easier

1. Solve $3x^2 + 7x - 13 = 0$
Give your solutions correct to 2 decimal places.

$$a = 3 \quad b = 7 \quad c = -13$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-7 \pm \sqrt{7^2 - 4 \times 3 \times -13}}{2 \times 3} = \frac{-7 \pm \sqrt{205}}{6}$$

$$= 1.219636844 \quad \text{or} \quad -3.552970177$$

$$x = \underline{1.22} \dots \dots \dots \text{or } x = \underline{-3.55} \dots \dots \dots$$

(3 marks)

2. Solve the equation

$$2x^2 + 6x - 95 = 0$$

Give your solutions correct to 3 significant figures.

$$a = 2 \quad b = 6 \quad c = -95$$

$$x = \frac{-6 \pm \sqrt{36 - (4 \times 2 \times -95)}}{4}$$

$$= \frac{-6 \pm \sqrt{796}}{4}$$

$$= 5.55336799 \quad \text{or} \quad -8.55336799$$

$$x = \underline{5.55} \dots \dots \dots \text{or } x = \underline{-8.55} \dots \dots \dots$$

(3 marks)

3) Solving Quadratics Using the Formula: Medium

8. The diagram below shows a 6-sided shape.

All the corners are right angles.

All measurements are given in centimetres.

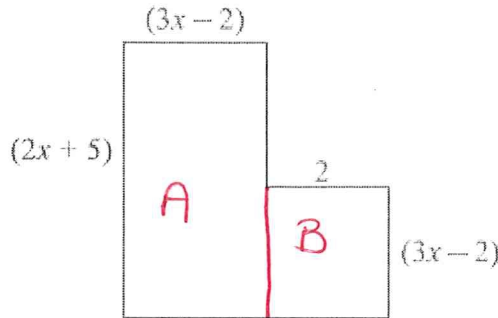


Diagram NOT accurately drawn

The area of the shape is 25 cm^2 .

(a) Show that $6x^2 + 17x - 39 = 0$

$$\begin{aligned} \text{Area A} &= (2x+5)(3x-2) \\ &= 6x^2 - 4x + 15x - 10 \\ &= 6x^2 + 11x - 10 \end{aligned}$$

$$\begin{aligned} \text{Area B} &= 2(3x-2) \\ &= 6x - 4 \end{aligned}$$

$$\begin{aligned} \text{TOTAL AREA} &= 6x^2 + 11x - 10 + 6x - 4 \\ &= 6x^2 + 17x - 14 \end{aligned}$$

$$\begin{aligned} \text{SO } 6x^2 + 17x - 14 &= 25 \\ 6x^2 + 17x - 39 &= 0 \end{aligned}$$

(b) (i) Solve the equation

$$6x^2 + 17x - 39 = 0$$

$$a = 6 \quad b = 17 \quad c = -39$$

$$x = \frac{-17 \pm \sqrt{17^2 - 4(6)(-39)}}{12}$$

$$x = 1.5 \quad \text{or} \quad x = -4.3$$

$x = \dots\dots\dots$ or $x = \dots\dots\dots$

(ii) Hence work out the length of the longest side of the shape.

$$(2 \times 1.5) + 5 = 8$$

$\dots\dots\dots 8 \dots\dots\dots \text{cm}$

(4)

3) Solving Quadratics Using the Formula: Harder

9. The diagram shows a 6-sided shape.
 All the corners are right angles.
 All the measurements are given in centimetres.

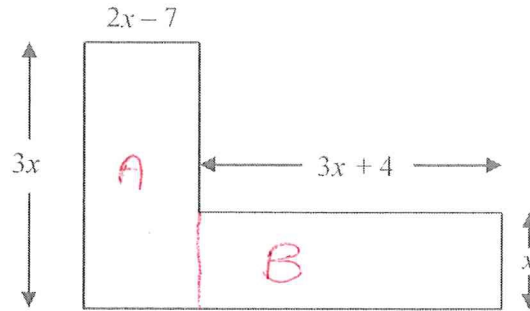


Diagram NOT accurately drawn

The area of the shape is 85 cm^2 .

- (a) Show that $9x^2 - 17x - 85 = 0$

$$A = 3x(2x-7) \quad B = x(3x+4)$$

$$= 6x^2 - 21x \quad = 3x^2 + 4x$$

$$6x^2 - 21x + 3x^2 + 4x = 85$$

$$9x^2 - 17x - 85 = 0 \quad (3)$$

- (b) (i) Solve $9x^2 - 17x - 85 = 0$

Give your solutions correct to 3 significant figures.

$$a=9 \quad b=-17 \quad c=-85$$

$$x = \frac{17 \pm \sqrt{17^2 - 4(9)(-85)}}{18}$$

$$x = 4.159474732 \quad \text{or} \quad x = -2.270585844$$

$$x = 4.16 \dots \quad \text{or} \quad x = -2.27 \dots$$

- (ii) Hence, work out the length of the shortest side of the 6-sided shape.

$$2x-7$$

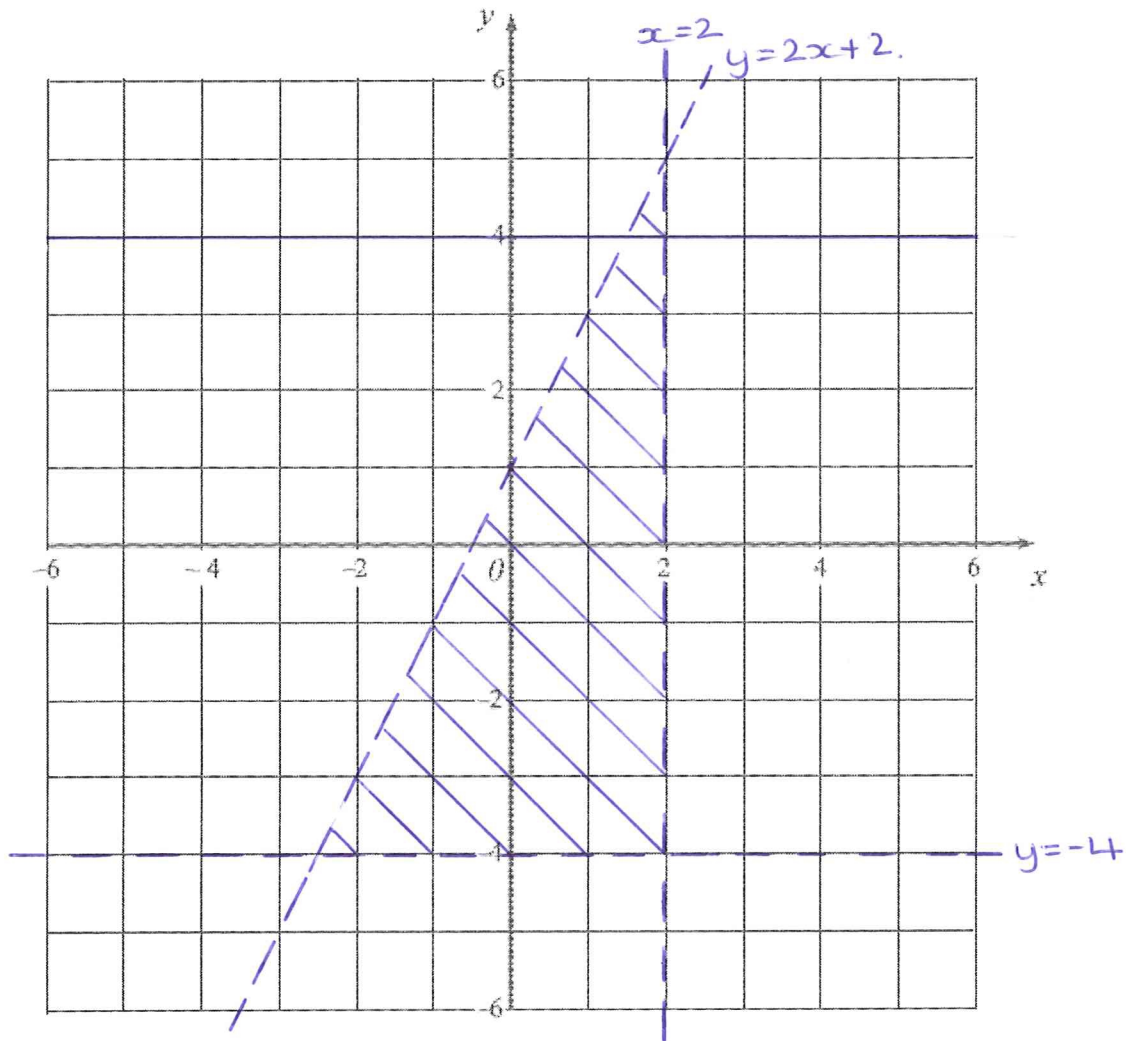
$$\dots 1.38 \dots \text{ cm}$$

(4)

4) Inequalities Regions: Easier

1. On the grid, shade the region that satisfies all three of these inequalities

$$y > -4 \quad x < 2 \quad y < 2x + 1$$



(Total for Question 19 = 4 marks)

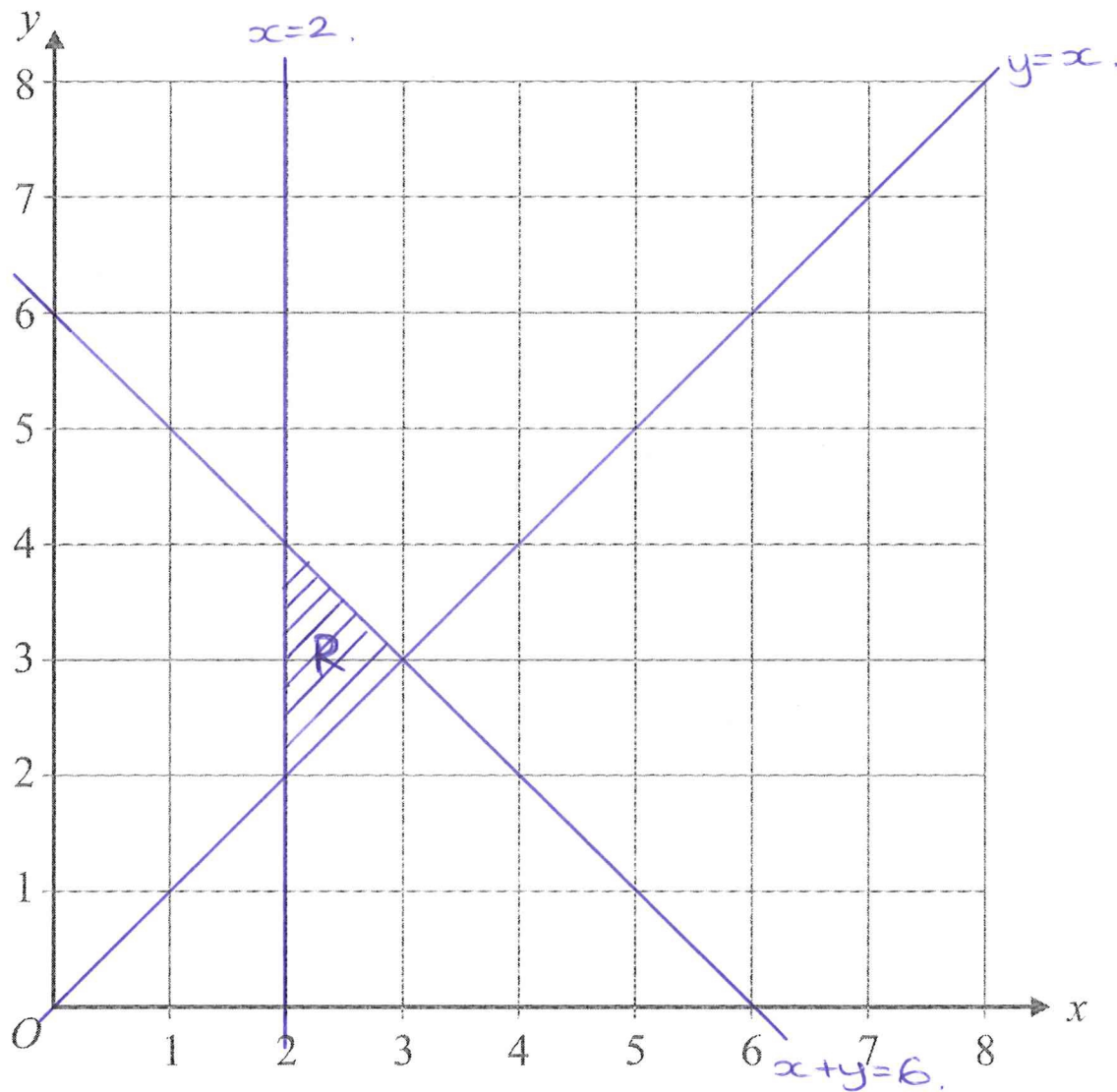
4) Inequalities Regions: Medium

6. (a) On the grid below, draw straight lines and use shading to show the region **R** that satisfies the inequalities

$$x \geq 2$$

$$y \geq x$$

$$x + y \leq 6$$



(3)

The point P with coordinates (x, y) lies inside the region **R**.
 x and y are **integers**.

- (b) Write down the coordinates of **all** the points of **R** whose coordinates are both integers.

$(2, 2)$ $(2, 3)$ $(2, 4)$ $(3, 3)$

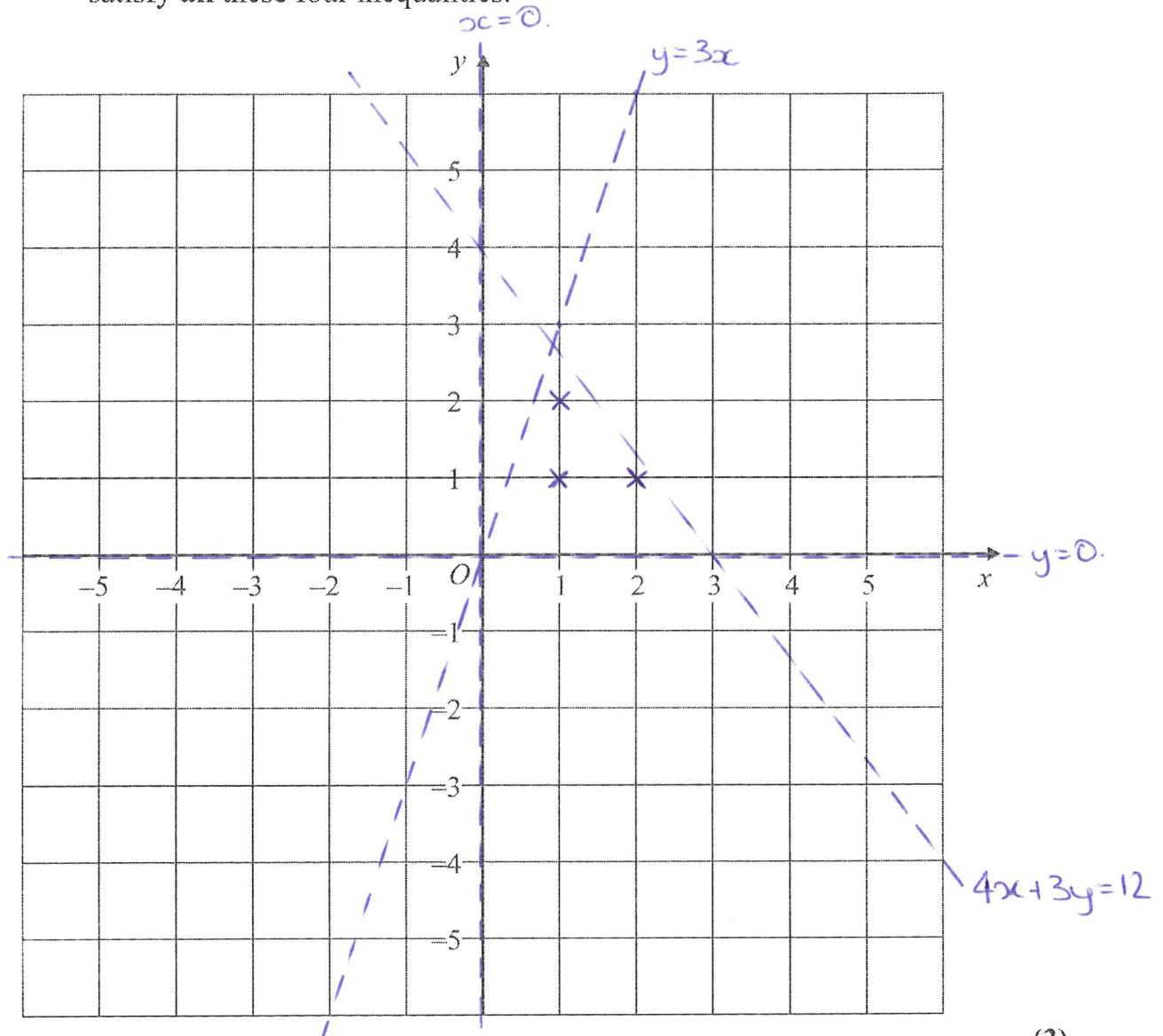
(2)

4) Inequalities Regions: Harder

7. $4x + 3y < 12$, $y < 3x$, $y > 0$, $x > 0$

x and y are both integers.

On the grid, mark with a cross (\times), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

5) More Difficult Rearranging Formulae: Easier

1. Rearrange $a(q - c) = d$ to make q the subject.

$$aq - ac = d$$

$$aq = d + ac$$

$$q = \frac{d + ac}{a}$$

$$q = \frac{d + ac}{a} \dots \dots \dots (3)$$

(Total 5 marks)

2. (a) Make n the subject of the formula $m = 5n - 21$

$$m + 21 = 5n$$

$$n = \frac{m + 21}{5}$$

5) More Difficult Rearranging Formulae: Medium

10. $P = \frac{n^2 + a}{n + a}$

Rearrange the formula to make a the subject.

$$p(n+a) = n^2 + a$$

$$pn + pa = n^2 + a$$

$$pa - a = n^2$$

$$a(p-1) = n^2$$

$$a = \frac{n^2}{p-1}$$

$$a = \dots\dots\dots$$

(Total 4 marks)

11. $\frac{x}{x+c} = \frac{p}{q}$

Make x the subject of the formula.

$$xq = p(x+c)$$

$$xq = px + cp$$

$$x(q-p) = cp$$

$$x = \frac{cp}{q-p}$$

$$x = \dots\dots\dots$$

(Total 4 marks)

5) More Difficult Rearranging Formulae: Harder

12. Rearrange $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

to make u the subject of the formula.

Give your answer in its simplest form.

$$fv + fu = uv$$

$$fu - uv = fv$$

$$u(f - v) = fv$$

$$u = \frac{fv}{f - v}$$

THOMPSON Daniel

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Missing Mean Questions. Mathswatch Clip: NA

Topic 2: Inequalities Regions. Mathswatch Clip: 198

Topic 3: More Difficult Rearranging Formulae. MW: 190

Topic 4: Proof. Mathswatch Clip: 193

Topic 5: Proof with vectors. Mathswatch Clip: 219

1) Missing Mean Questions: Easier

1) The mean of 8 and another number is 13.

What is the other number?

$$\begin{aligned} \text{Solution: } (8+x)/2 &= 13 && \times 2 \\ 8 + x &= 26 && - 8 \\ x &= 18 \end{aligned}$$

_____18_____

(3 Marks)

2) The mean of 2, 5, 8 and x is 4

Find x

$$\begin{aligned} \text{Solution: } (2 + 5 + 8 + x) / 4 &= 4 && \times 4 \\ 15 + x &= 16 && -15 \\ x &= 1 \end{aligned}$$

_____x = 1_____

(3 Marks)

3) After measuring the heights of 7 people, they have an average height of 156cm. After measuring the heights of 8 people they have an average height of 158cm. How tall is the 8th person?

$$\begin{aligned} \text{Solution: } 7 \times 156 &= 1092 \\ 8 \times 158 &= 1264 \\ 1092 - 1264 &= 172 \end{aligned}$$

(3 Marks)

_____172_____

1) Missing Mean Questions: Medium

4) The mean weight of a group of 7 girls is 58kg

a) Work out their total weight

Solution: $7 \times 58 = 406\text{kg}$

_____406_____Kg

When a 8th girl joins the group, the mean weight goes up to 59kg.

b) What is the weight of the 8th girl?

Solution: $59 \times 8 = 472$

$472 - 406 = 66 \text{ Kg}$

_____66_____Kg

(3 Marks)

5) The mean distance that Jack runs in his last 10 runs is 5.7 miles. Work out the distance that he would need to run to make this exactly 6 miles.

Solution: $10 \times 5.7 = 57$

$11 \times 6 = 66$

$66 - 57 = 9$

_____9 miles_____

(2 Marks)

1) Missing Mean Questions: Harder

- 6) Waitresses and kitchen staff in a restaurant decide to share their tips. There are 8 kitchen staff 10 waitresses. The kitchen staff receives a mean of £23 weekly and the waitresses receive a mean of £28 weekly.
Work out the mean of all 18 members of staff.

Solution: $23 \times 8 = 184$
 $28 \times 10 = 280$

Total = $184 + 280 = 464$

Mean = $464/18 = 25.78$

_____ £25.78 _____

(3 Marks)

- 7) The mean of a, a, b is 30

The mean of a, a, b, b, b is 20

Find the values of a and b

Solution:

$$(2a + b) / 3 = 30 \quad \times 3$$

$$(2a + 3b) / 5 = 20 \quad \times 5$$

$$2a + b = 90 \quad - \quad \text{solve simultaneously}$$

$$2a + 3b = 100$$

$$-2b = -10$$

$$b = 5$$

$$2a + 5 = 90$$

$$2a = 85$$

$$a = 42.5$$

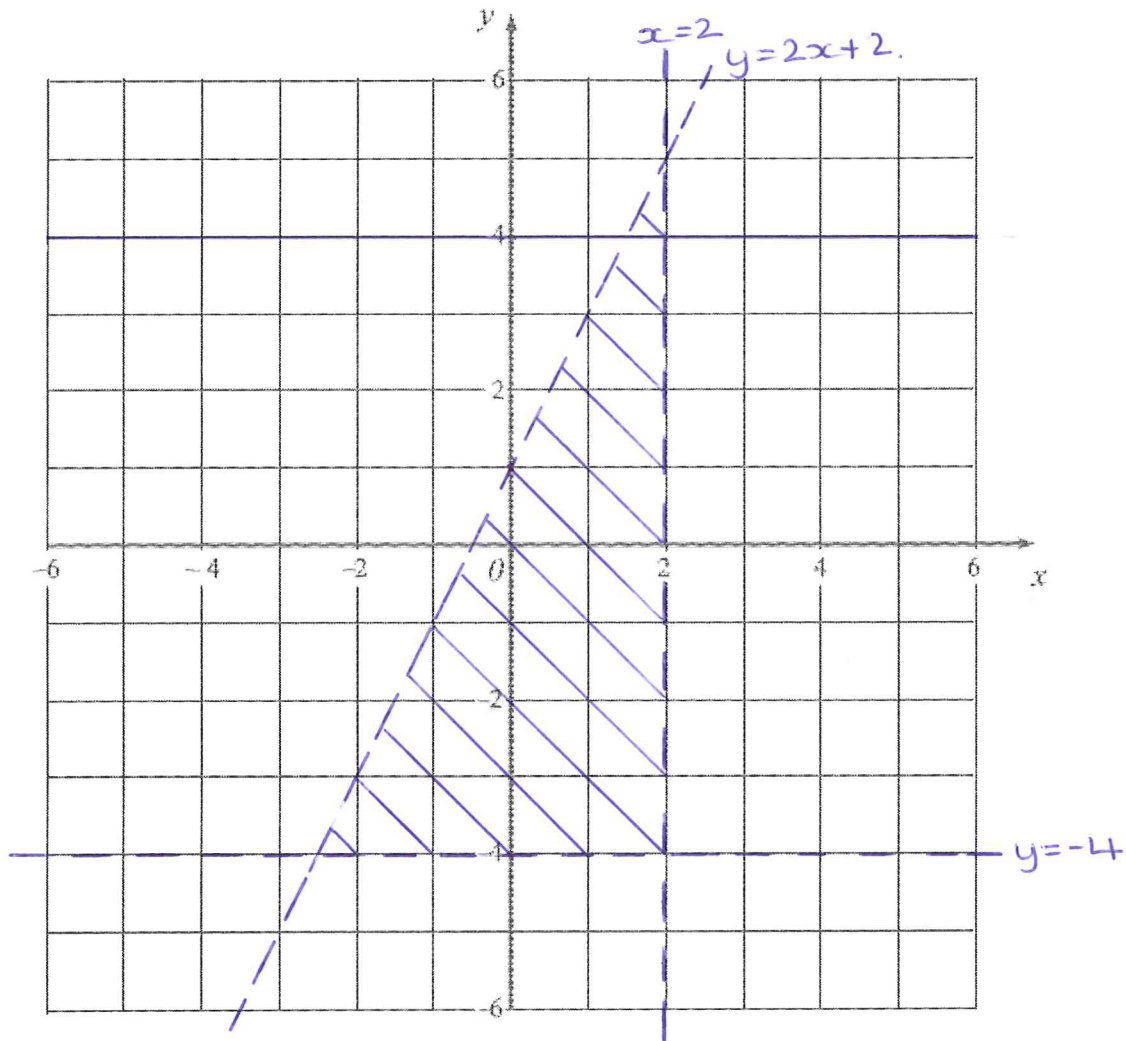
$a = 42.5 \quad b = 5$ _____

(5 Marks)

2) Inequalities Regions: Easier

1. On the grid, shade the region that satisfies all three of these inequalities

$$y > -4 \quad x < 2 \quad y < 2x + 1$$



(Total for Question 19 = 4 marks)

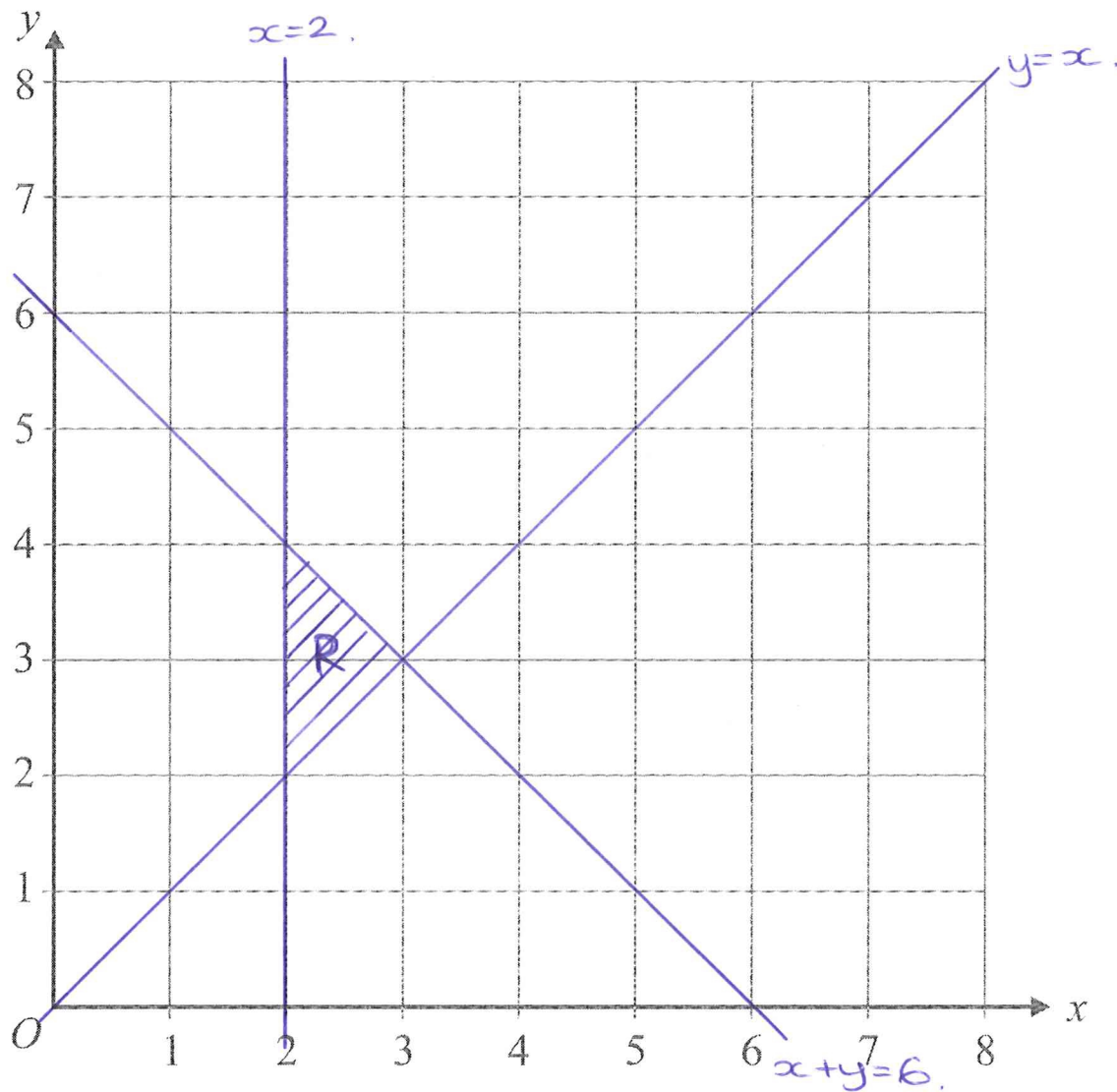
2) Inequalities Regions: Medium

6. (a) On the grid below, draw straight lines and use shading to show the region **R** that satisfies the inequalities

$$x \geq 2$$

$$y \geq x$$

$$x + y \leq 6$$



(3)

The point P with coordinates (x, y) lies inside the region **R**.
 x and y are **integers**.

- (b) Write down the coordinates of **all** the points of **R** whose coordinates are both integers.

$(2, 2)$ $(2, 3)$ $(2, 4)$ $(3, 3)$

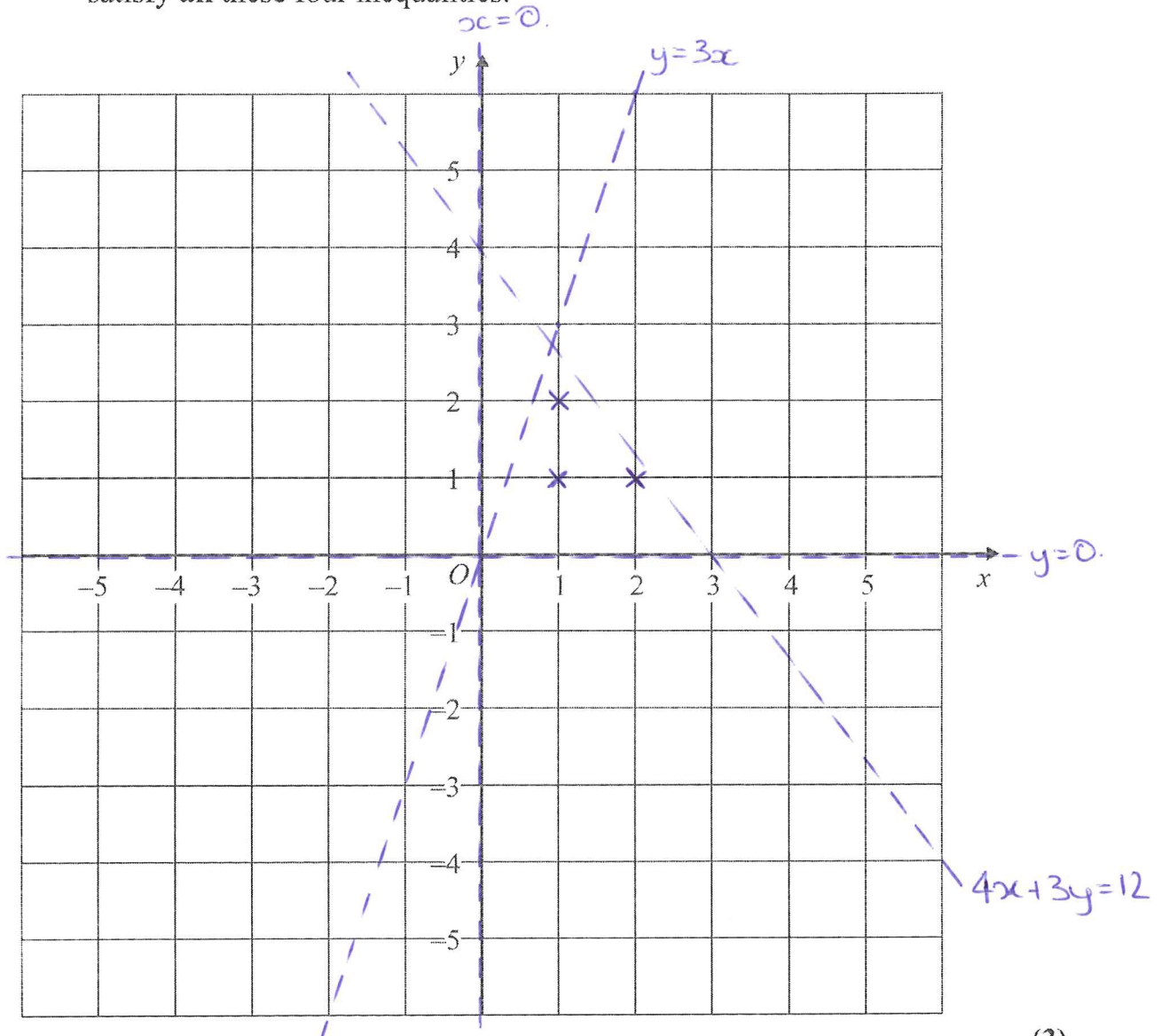
(2)

2) Inequalities Regions: Harder

7. $4x + 3y < 12$, $y < 3x$, $y > 0$, $x > 0$

x and y are both integers.

On the grid, mark with a cross (\times), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

3) More Difficult Rearranging Formulae: Easier

1. Rearrange $a(q - c) = d$ to make q the subject.

$$aq - ac = d$$

$$aq = d + ac$$

$$q = \frac{d + ac}{a}$$

$$q = \frac{d + ac}{a} \dots\dots\dots (3)$$

(Total 5 marks)

2. (a) Make n the subject of the formula $m = 5n - 21$

$$m + 21 = 5n$$

$$n = \frac{m + 21}{5}$$

3) More Difficult Rearranging Formulae: Medium

10. $P = \frac{n^2 + a}{n + a}$

Rearrange the formula to make a the subject.

$$\begin{aligned}
 p(n+a) &= n^2 + a \\
 pn + pa &= n^2 + a \\
 pa - a &= n^2 \\
 a(p-1) &= n^2 \\
 a &= \frac{n^2}{p-1}
 \end{aligned}$$

$a = \dots\dots\dots$

(Total 4 marks)

11. $\frac{x}{x+c} = \frac{p}{q}$

Make x the subject of the formula.

$$\begin{aligned}
 xq &= p(x+c) \\
 xq &= px + cp \\
 x(q-p) &= cp \\
 x &= \frac{cp}{q-p}
 \end{aligned}$$

THOMPSON Daniel, Page 441 / 480 $x = \dots\dots\dots$

(Total 4 marks)

3) More Difficult Rearranging Formulae: Harder

12. Rearrange $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

to make u the subject of the formula.

Give your answer in its simplest form.

$$fv + fu = uv$$

$$fu - uv = fv$$

$$u(f-v) = fv$$

$$u = \frac{fv}{f-v}$$

4) Proof: Easier

1. The n th even number is $2n$.

The next even number after $2n$ is $2n + 2$

- (a) Explain why.

Every alternate integer is even. As $2n$ is even
 $2n + 1$ will be odd and so $2n + 2$ is even.

(1)

- (b) Write down an expression, in terms of n , for the next even number after $2n + 2$

$$2n + 2 + 2 = 2n + 4$$

$$\dots\dots\dots 2n + 4 \dots\dots\dots$$

(1)

- (c) Show algebraically that the sum of any 3 consecutive even numbers is always a multiple of 6

$$\begin{aligned}
 & 2n + 2n + 2 + 2n + 4 \\
 = & 6n + 6 \\
 = & 6(n + 1) \\
 & \uparrow \text{ a multiple of 6. }
 \end{aligned}$$

(3)

(5 marks)

4) Proof: Medium

8. Prove that

$(n+1)^2 - (n-1)^2 + 1$ is always odd for all positive integer values of n .

$$(n+1)^2 = n^2 + 2n + 1$$

$$(n-1)^2 = n^2 - 2n + 1$$

$$\begin{aligned} (n+1)^2 - (n-1)^2 + 1 &= (n^2 + 2n + 1) - (n^2 - 2n + 1) + 1 \\ &= n^2 + 2n + 1 - n^2 + 2n - 1 + 1 \\ &= 4n + 1 \end{aligned}$$

$4n$ is a multiple of 4 so it must be even which means $4n+1$ is odd.

4) Proof: Harder

9. Prove algebraically that the sum of the squares of any two consecutive numbers always leaves a remainder of 1 when divided by 4.

consecutive numbers are n and $n+1$

$$\begin{aligned} & n^2 + (n+1)^2 \\ &= n^2 + n^2 + 2n + 1 \\ &= 2n^2 + 2n + 1 \\ &= 2n(n+1) + 1 \end{aligned}$$

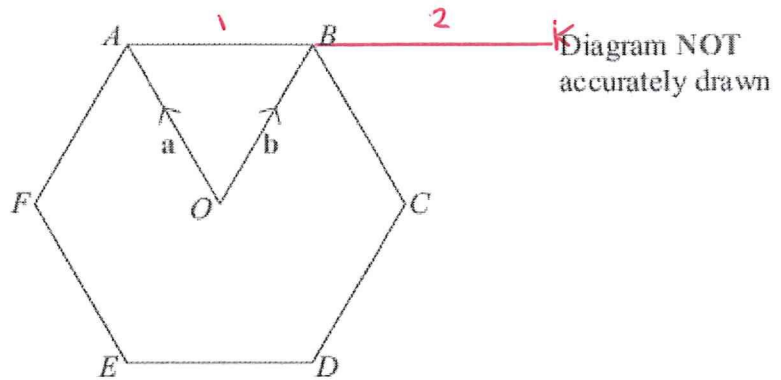
$n(n+1)$ is the product of 2 consecutive numbers. As one of them is even the product must be even.

$2n(n+1)$ is $2 \times$ an even number which has to be a multiple of 4

So $2n(n+1) + 1$ is a multiple of 4 plus 1 and will leave a remainder of 1 when divided by 4

5) Proof with vectors: Easier

1.



$ABCDEF$ is a regular hexagon, with centre O .

$$\vec{OA} = \mathbf{a}, \vec{OB} = \mathbf{b}.$$

(a) Write the vector \vec{AB} in terms of \mathbf{a} and \mathbf{b} .

$$\underline{\underline{-\mathbf{a} + \mathbf{b}}}$$

(1)

The line AB is extended to the point K so that $AB : BK = 1 : 2$

(b) Write the vector \vec{CK} in terms of \mathbf{a} and \mathbf{b} .
Give your answer in its simplest form.

$$\vec{AB} = -\mathbf{a} + \mathbf{b}$$

$$\vec{BK} = -2\mathbf{a} + 2\mathbf{b}$$

$$\vec{CK} = -\mathbf{a} + 2\mathbf{b}$$

$$\underline{\underline{-\mathbf{a} + 2\mathbf{b}}}$$

(3)

(4 marks)

5) Proof with vectors: Medium

6.

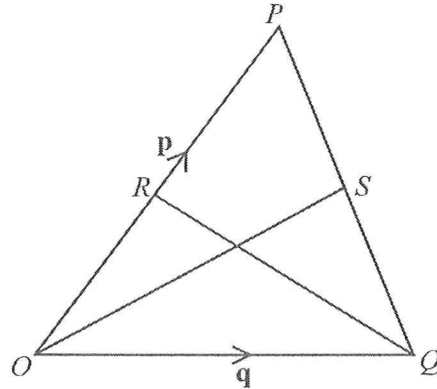


Diagram NOT
accurately drawn

OPQ is a triangle.

R is the midpoint of OP .

S is the midpoint of OQ .

$\vec{OP} = p$ and $\vec{OQ} = q$

$$\vec{PQ} = -p + q$$

$$\vec{PS} = -\frac{1}{2}p + \frac{1}{2}q$$

(i) Find \vec{OS} in terms of p and q .

$$\vec{OS} = p - \frac{1}{2}p + \frac{1}{2}q$$

$$= \frac{1}{2}p + \frac{1}{2}q$$

$$\vec{OS} = \dots \frac{1}{2}(p+q)$$

(ii) Show that RS is parallel to OQ .

$$\vec{RP} = \frac{1}{2}p$$

$$\vec{RS} = \frac{1}{2}p - \frac{1}{2}p + \frac{1}{2}q$$

$$= \frac{1}{2}q$$

\therefore As $\vec{OQ} = q$, \vec{RS} is parallel

(5 marks)

5) Proof with vectors: Harder

6.

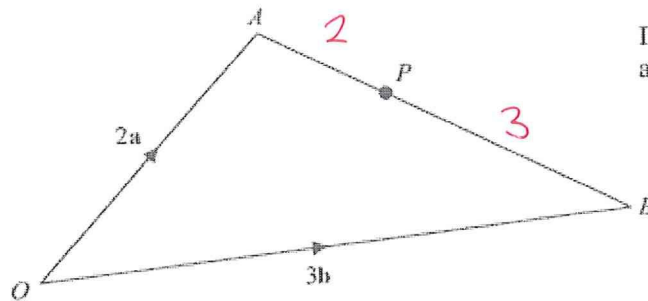


Diagram NOT accurately drawn

OAB is a triangle.

$$\vec{OA} = 2\mathbf{a}$$

$$\vec{OB} = 3\mathbf{b}$$

(a) Find AB in terms of \mathbf{a} and \mathbf{b} .

$$\vec{AB} = \frac{-2\mathbf{a} + 3\mathbf{b}}{\dots\dots\dots} \quad (1)$$

P is the point on AB such that $AP : PB = 2 : 3$

(b) Show that \vec{OP} is parallel to the vector $\mathbf{a} + \mathbf{b}$.

$$\begin{aligned} \vec{AP} &= \frac{2}{5}(-2\mathbf{a} + 3\mathbf{b}) \\ &= -\frac{4}{5}\mathbf{a} + \frac{6}{5}\mathbf{b} \\ \vec{OP} &= 2\mathbf{a} - \frac{4}{5}\mathbf{a} + \frac{6}{5}\mathbf{b} \\ &= \frac{6}{5}\mathbf{a} + \frac{6}{5}\mathbf{b} \\ &= \frac{6}{5}(\mathbf{a} + \mathbf{b}) \end{aligned} \quad (3)$$

(4 marks)

Therefore \vec{OP} is parallel as it has been

WATERS Tom

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Angles in Polygons. Mathswatch Clip: 123

Topic 2: Bearings. Mathswatch Clip: 124

Topic 3: Missing Mean Questions. Mathswatch Clip: NA

Topic 4: Changing Ratios. Mathswatch Clip: NA

Topic 5: Inequalities Regions. Mathswatch Clip: 198

1) Angles in Polygons: Easier

1. Each exterior angle of a regular polygon is 30° .

Work out the number of sides of the polygon.

$$360 \div 30 = 12$$

.....
12

(2 marks)

- 2.

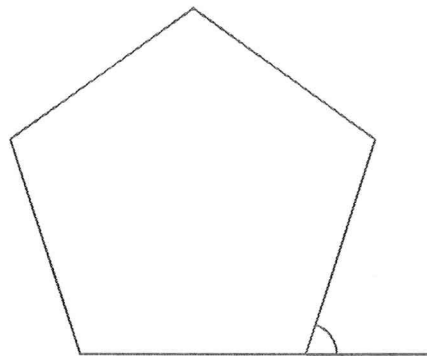


Diagram NOT accurately drawn

Work out the size of an exterior angle of a regular pentagon.

$$360 \div 5 = 72$$

.....
72°

(2 marks)

- 3.

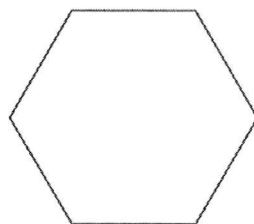


Diagram NOT accurately drawn

Calculate the size of the exterior angle of a regular hexagon.

$$360 \div 6 = 60$$

.....
60°

(2 marks)

1) Angles in Polygons: Medium

10.

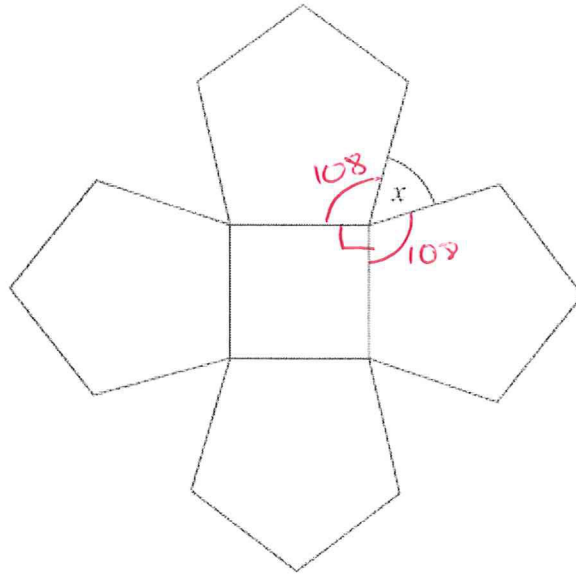


Diagram NOT accurately drawn

The diagram shows a square and 4 regular pentagons.

Work out the size of the angle marked x .

$$\begin{aligned} \text{Pentagon} &= \frac{180 \times (n-2)}{n} \\ &= \frac{180 \times 3}{5} = \frac{540}{5} = 108 \end{aligned}$$

$$360 - 108 - 108 - 90 = 54$$

.....^o

(4 marks)

1) Angles in Polygons: Harder

11.

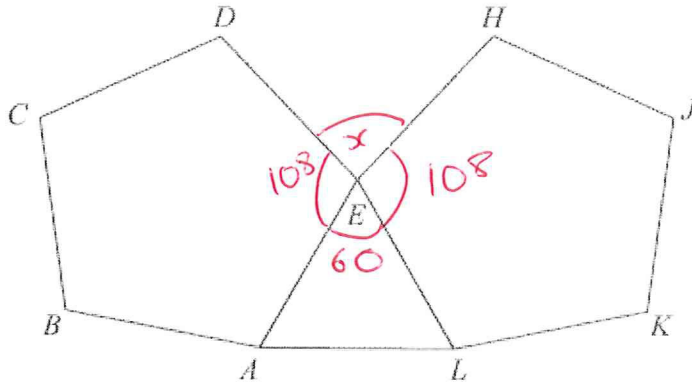


Diagram NOT accurately drawn

ABCDE and *EHJKL* are regular pentagons.
AEL is an equilateral triangle.

Work out the size of angle *DEH*.

$$\begin{aligned} \text{Pentagon} &= \frac{180 \times (n-2)}{n} \\ &= \frac{180 \times 3}{5} = \frac{540}{5} = 108 \end{aligned}$$

$$360 - 108 - 108 - 60 = 84$$

84

.....°
 (4 marks)

2) Bearings: Easier

1.

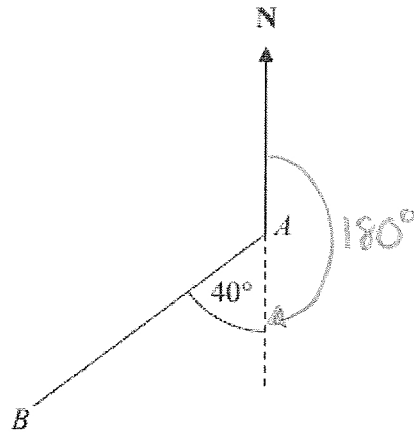


Diagram NOT accurately drawn

$$180 + 40$$

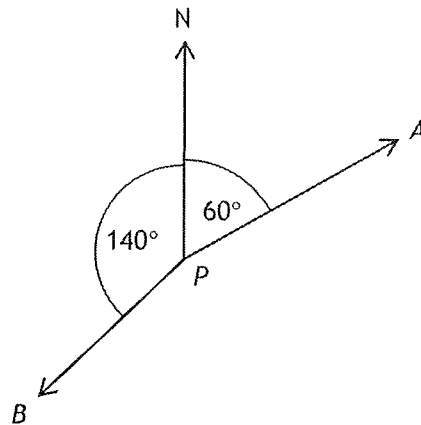
Work out the bearing of B from A .

START POINT

..... 220 °

(2 marks)

2.



(a) Write down the bearing of A from P .

Bearings are always 3 digits

..... 060 °

(b) Work out the bearing of B from P .

$$360 - 140$$

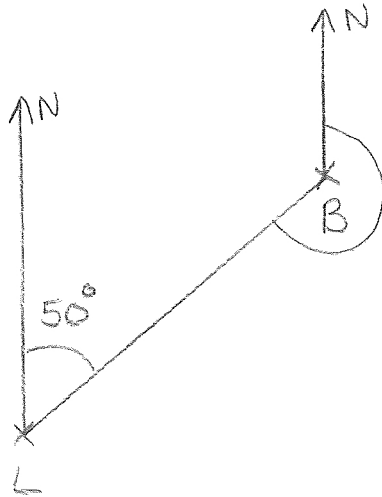
..... 220 °

(3 marks)

2) Bearings: Medium

9. The bearing of a ship from a lighthouse is 050°

Work out the bearing of the lighthouse from the ship.



DRAW A SKETCH!
If accurate, you can
measure the bearing

.....
230.....°

(2 marks)

2) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

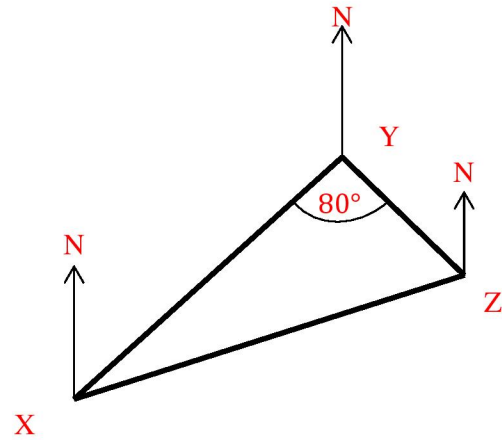
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

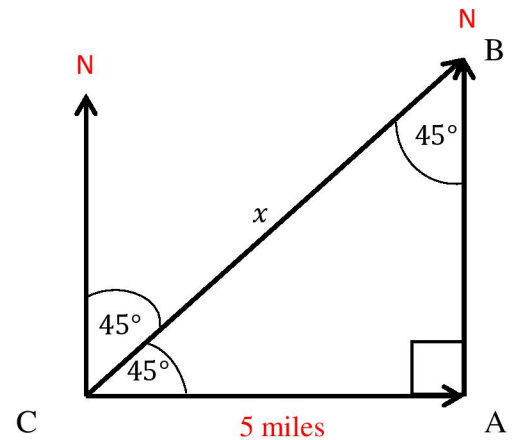
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



3) Missing Mean Questions: Easier

1) The mean of 8 and another number is 13.

What is the other number?

$$\begin{aligned} \text{Solution: } (8+x)/2 &= 13 && \times 2 \\ 8 + x &= 26 && - 8 \\ x &= 18 \end{aligned}$$

_____18_____

(3 Marks)

2) The mean of 2, 5, 8 and x is 4

Find x

$$\begin{aligned} \text{Solution: } (2 + 5 + 8 + x) / 4 &= 4 && \times 4 \\ 15 + x &= 16 && -15 \\ x &= 1 \end{aligned}$$

_____x = 1_____

(3 Marks)

3) After measuring the heights of 7 people, they have an average height of 156cm. After measuring the heights of 8 people they have an average height of 158cm. How tall is the 8th person?

$$\begin{aligned} \text{Solution: } 7 \times 156 &= 1092 \\ 8 \times 158 &= 1264 \\ 1092 - 1264 &= 172 \end{aligned}$$

(3 Marks)

_____172_____

3) Missing Mean Questions: Medium

4) The mean weight of a group of 7 girls is 58kg

a) Work out their total weight

Solution: $7 \times 58 = 406\text{kg}$

_____406_____Kg

When a 8th girl joins the group, the mean weight goes up to 59kg.

b) What is the weight of the 8th girl?

Solution: $59 \times 8 = 472$

$472 - 406 = 66 \text{ Kg}$

_____66_____Kg

(3 Marks)

5) The mean distance that Jack runs in his last 10 runs is 5.7 miles. Work out the distance that he would need to run to make this exactly 6 miles.

Solution: $10 \times 5.7 = 57$

$11 \times 6 = 66$

$66 - 57 = 9$

_____9 miles_____

(2 Marks)

3) Missing Mean Questions: Harder

- 6) Waitresses and kitchen staff in a restaurant decide to share their tips. There are 8 kitchen staff 10 waitresses. The kitchen staff receives a mean of £23 weekly and the waitresses receive a mean of £28 weekly.

Work out the mean of all 18 members of staff.

$$\begin{aligned} \text{Solution: } 23 \times 8 &= 184 \\ 28 \times 10 &= 280 \end{aligned}$$

$$\text{Total} = 184 + 280 = 464$$

$$\text{Mean} = 464/18 = 25.78$$

_____ £25.78 _____

(3 Marks)

- 7) The mean of a, a, b is 30

The mean of a, a, b, b, b is 20

Find the values of a and b

Solution:

$$(2a + b) / 3 = 30 \quad \times 3$$

$$(2a + 3b) / 5 = 20 \quad \times 5$$

$$2a + b = 90 \quad - \quad \text{solve simultaneously}$$

$$2a + 3b = 100$$

$$-2b = -10$$

$$b = 5$$

$$2a + 5 = 90$$

$$2a = 85$$

$$a = 42.5$$

$a = 42.5$ $b = 5$ _____

(5 Marks)

4) Changing Ratios: Easier

Solution for Question 1:

a) Red : Blue = 8:12

Divide through by 4 to simplify: 2:3

b) Red : Blue = 8:10

Divide through by 2 to simplify: 4:5

Solution for Question 2:

a) Pen : Pencils = 2:3

Equivalent to 20:30

30 pencils in pencil case

b) Only pencils removed so still 20 pens, ratio 4:3 equivalent to 20:15 so removed 15 pencils

4) Changing Ratios: Medium

Solution for Question 3:

$$1:3:5$$

$$1:3+5 = 1:8$$

Solution for Question 4:

$$\text{Orange : Red} = 2:3$$

$$2:3 = 5$$

$$x:51 = y$$

$$\frac{51}{3} = 17$$

$$x = 2 \times 17 = 34$$

$$y = 5 \times 17 = 85$$

$$\text{Ratio of Orange to Red} = 34:51$$

Compare 2:3 to 10:17, achieving same number for red sweets

$$2:3 = 34:51$$

Multiply ratio 10:17 by 3

$$30:51$$

4 orange sweets were eaten by Solomon.

Solution for Question 5:

$$\text{HW : No HW} = 5:4$$

$$5:4 = 9$$

$$15:x = y$$

$$\frac{15}{5} = 3$$

$$x = 4 \times 3 = 12$$

$$y = 9 \times 3 = 27$$

$$\text{Ratio of HW done to HW not done} = 15:12$$

Compare 5:4 to 2:1

$$5:4 = 15:12$$

$$2:1 = ?:?$$

Same number of pupils in the class = 27

Multiply ratio 2:1 by 9 ($\frac{27}{3}$)

$$18:9$$

3 more pupils did do their homework, the teacher was correct.

4) Changing Ratios: Harder

Solution for Question 6:

Sedimentary : Metamorphic = 2:3

Metamorphic : Igneous = 9:10

Multiply ratio 2:3 by 3 = 6:9

Therefore, sedimentary to igneous = 6:10

Solution for Question 7:

Road bikes: Mountain bikes

3:5

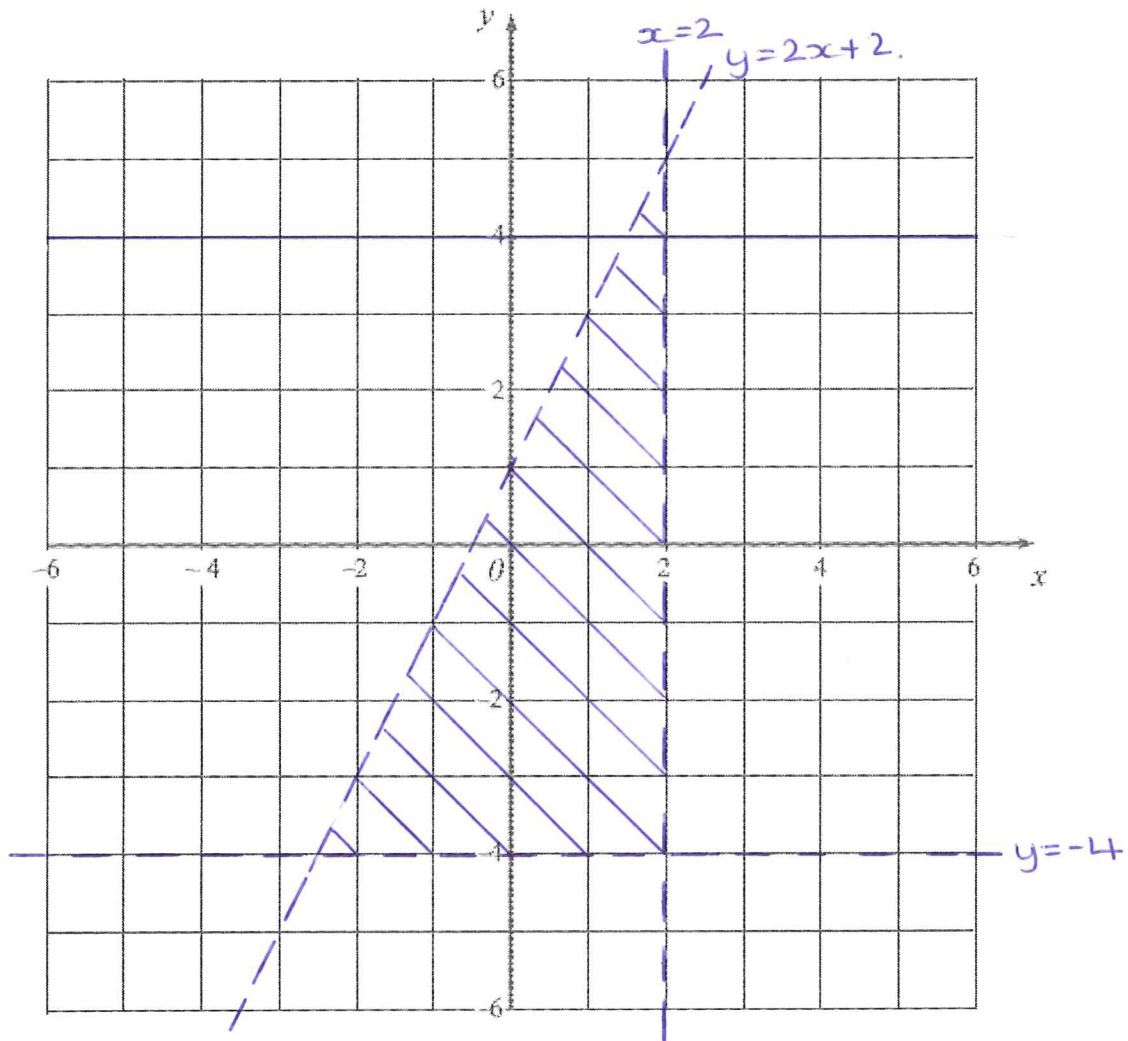
The minimum number of bikes sold is 3 road and 5 mountain, if the ratio changes to 2:1 but no more mountain bikes are sold then ratio is 10:5 so 7 more road bikes must have been sold.

It is not the only answer as there could have been many numbers of bikes sold, the ratio is 3:5 this could be 6:10 or any equivalent ratio. If it was 6 to 10 for example to change to 2:1 ratio must be 20:10 which would mean 14 more road bikes sold, so the number more road bikes sold is any multiple of 7

5) Inequalities Regions: Easier

1. On the grid, shade the region that satisfies all three of these inequalities

$$y > -4 \quad x < 2 \quad y < 2x + 1$$



(Total for Question 19 = 4 marks)

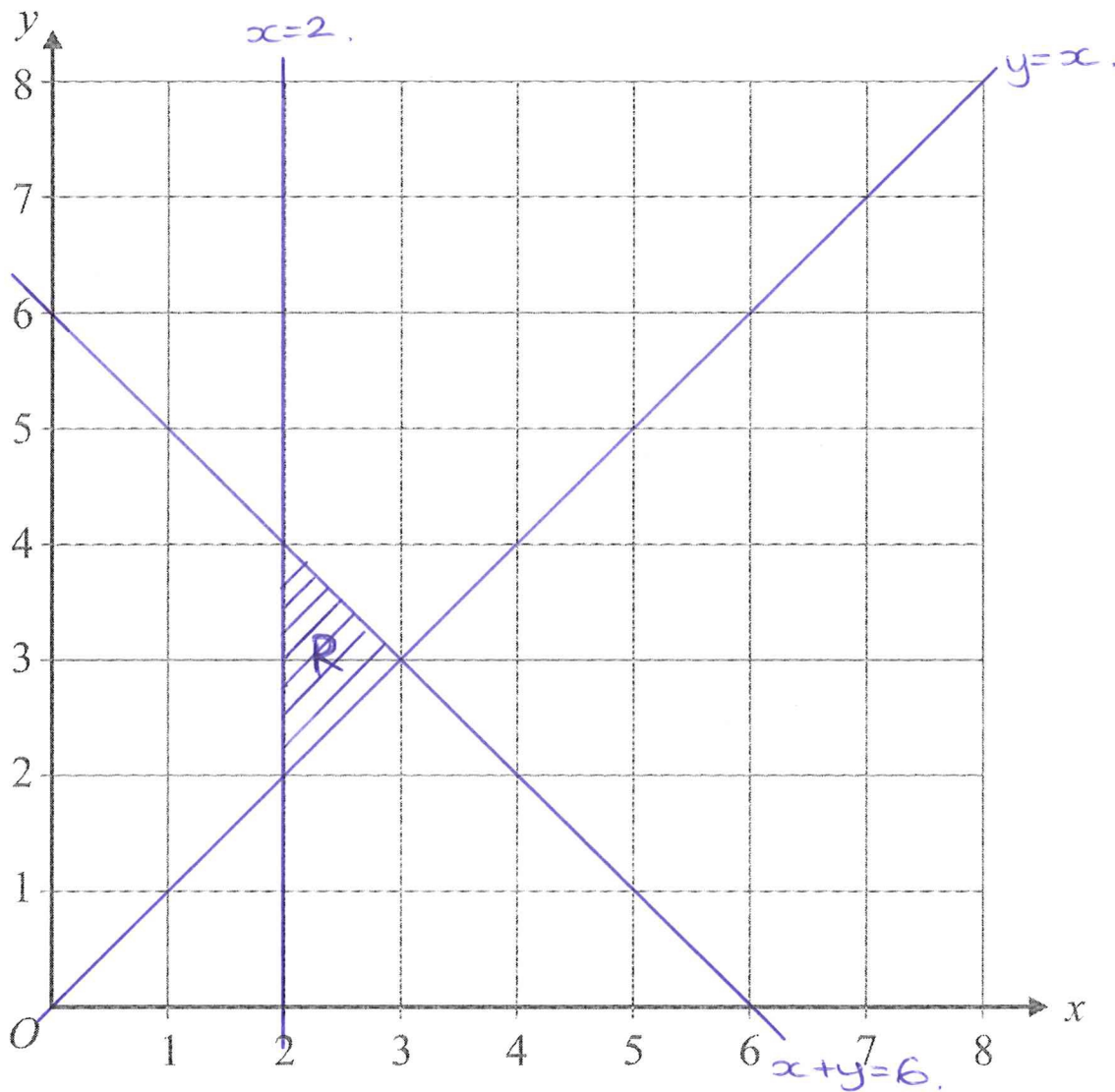
5) Inequalities Regions: Medium

6. (a) On the grid below, draw straight lines and use shading to show the region **R** that satisfies the inequalities

$$x \geq 2$$

$$y \geq x$$

$$x + y \leq 6$$



(3)

The point P with coordinates (x, y) lies inside the region **R**.
 x and y are **integers**.

- (b) Write down the coordinates of **all** the points of **R** whose coordinates are both integers.

$(2, 2)$ $(2, 3)$ $(2, 4)$ $(3, 3)$

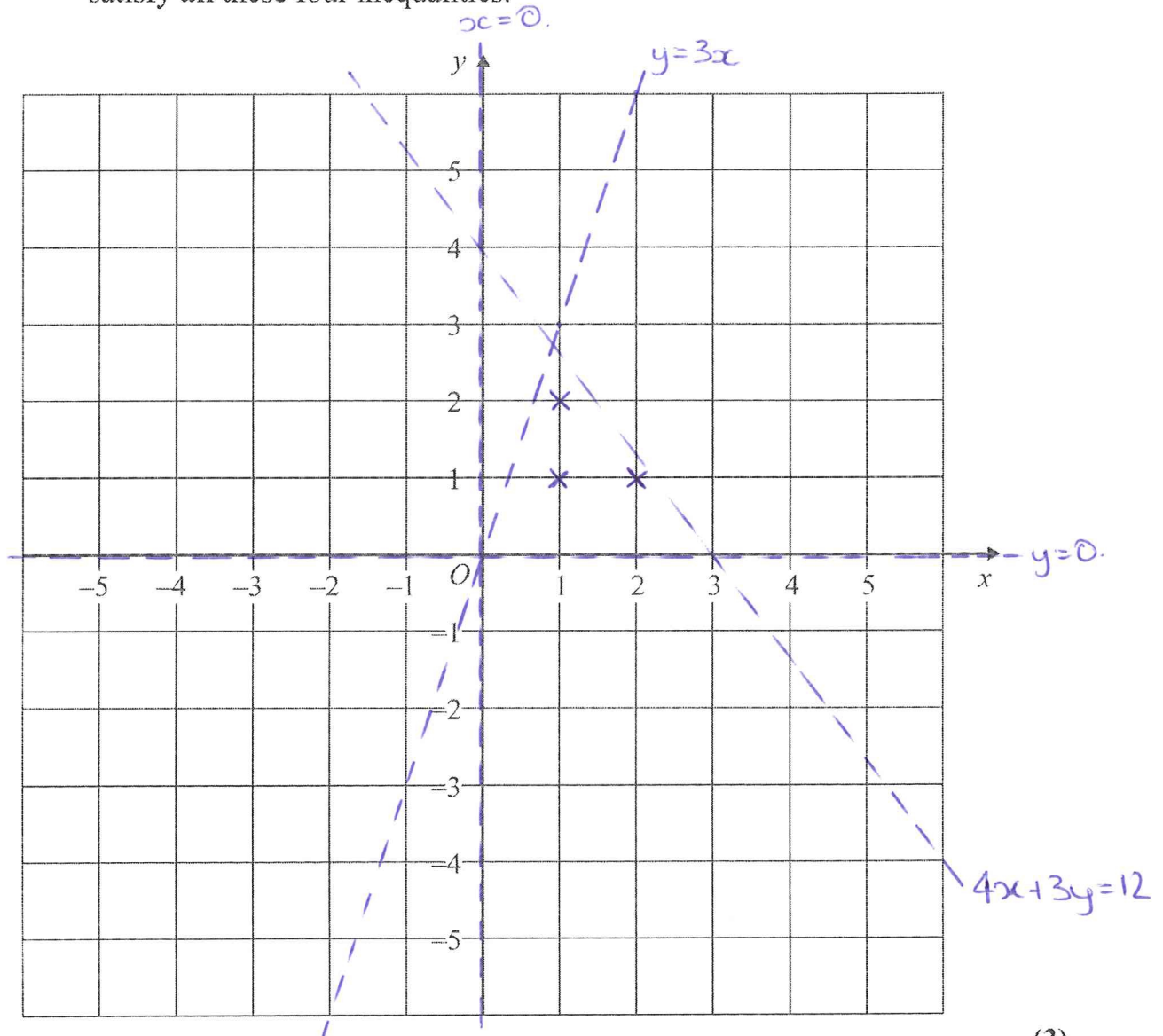
(2)

5) Inequalities Regions: Harder

7. $4x + 3y < 12$, $y < 3x$, $y > 0$, $x > 0$

x and y are both integers.

On the grid, mark with a cross (\times), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

WATKINS Tom

9to1_AQA_PracticeSet2_3H

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	from	from	from	from	from	from
A02 and 3	from	from	from	from	from	from
Total	from	from	from	from	from	from

Your Pinpoint Topics

Topic 1: Index Notation. Mathswatch Clip: 131

Topic 2: Bearings. Mathswatch Clip: 124

Topic 3: Solving Quadratics Using the Formula. MW: 191

Topic 4: Inequalities Regions. Mathswatch Clip: 198

Topic 5: More Difficult Rearranging Formulae. MW: 190

1) Index Notation: Easier

1. (a) Simplify $m^3 \times m^6 = m^{3+6}$ m^9
.....
(1)

(b) Simplify $\frac{p^8}{p^2} = p^{8-2}$ p^6
.....
(1)

(c) Simplify $(2n^3)^4 = 16n^{3 \times 4}$ $16n^{12}$
.....
(2)

(4 marks)

2. (a) Simplify $m^6 \times m^7 = m^{6+7}$ m^{13}
.....
(1)

(b) Simplify x^0 1
.....
(1)

(c) Simplify $(16y^6)^{\frac{1}{2}} = \sqrt{16} y^{\frac{6}{2}}$ $4y^3$
.....
(2)

(4 marks)

3. (a) Simplify $m^5 \div m^3 = m^{5-3}$ m^2
.....
(1)

(b) Simplify $5x^4y^3 \times x^2y = 5x^{4+2}y^{3+1}$ $5x^6y^4$
.....
(2)

(3 marks)

1) Index Notation: Medium

4. (a) Simplify $a^4 \times a^5$ a^{4+5} a^9 (1)

(b) Simplify $\frac{45e^6 f^8}{5ef^2}$ $9e^{6-1} f^{8-2}$ $9e^5 f^6$ (2)

(c) Write down the value of $9^{\frac{1}{2}}$ $\sqrt{9}$ 3 (1)

(4 marks)

5. (a) Simplify $m^2 \times m^4$ m^{2+4} m^6 (1)

(b) Simplify $y^7 \div y^5$ y^{7-5} y^2 (1)

(c) Simplify $(m^3)^5$ $m^{3 \times 5}$ m^{15} (2)

(4 marks)

6. Simplify fully

(a) $p^2 \times p^7$ p^{2+7} p^9 (1)

(b) $\frac{3q^4 \times 2q^5}{q^3}$ $\frac{(3 \times 2)q^{4+5}}{q^3} = 6q^{9-3}$ $6q^6$ (2)

(c) $(2xy^3)^5$ $2^5 x^5 y^{3 \times 5}$ $32x^5 y^{15}$ (2)

(4 marks)

1) Index Notation: Harder

20. (a) Find the value of

(i) 64^0

1

(ii) $64^{\frac{1}{2}}$

$\sqrt{64}$

8

(iii) $64^{-\frac{2}{3}}$

$= \frac{1}{64^{\frac{2}{3}}}$
 $= \frac{1}{(\sqrt[3]{64})^2} = \frac{1}{4^2}$

$\frac{1}{16}$ or 0.0625

(4 marks)

2) Bearings: Easier

1.

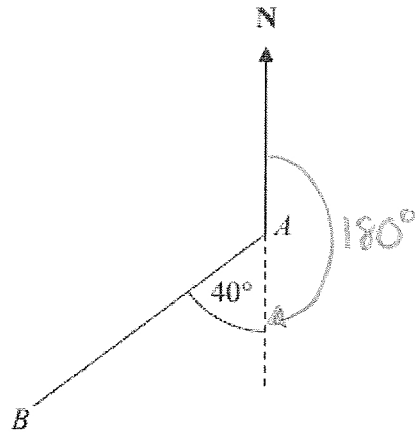


Diagram NOT accurately drawn

$$180 + 40$$

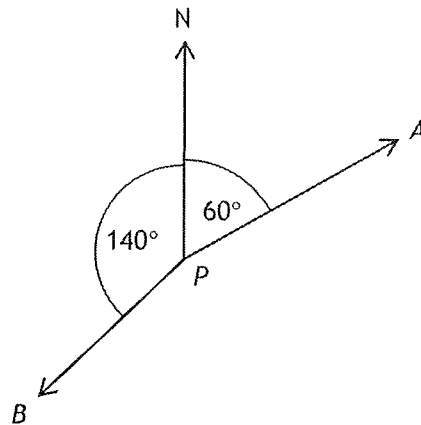
Work out the bearing of B from A .

START POINT

..... 220 °

(2 marks)

2.



(a) Write down the bearing of A from P .

Bearings are always 3 digits

..... 060 °

(b) Work out the bearing of B from P .

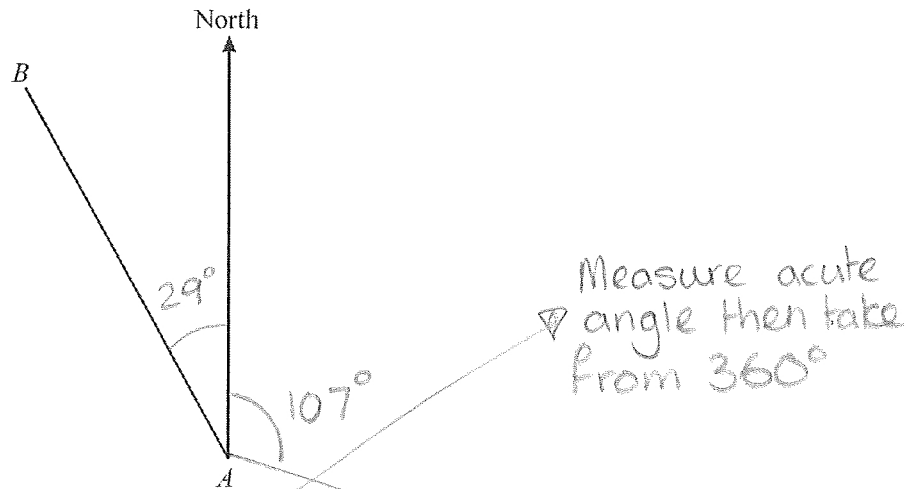
$$360 - 140$$

..... 220 °

(3 marks)

2) Bearings: Medium

3.



- (a) Measure and write down the bearing of B from A .

$$360 - 29$$

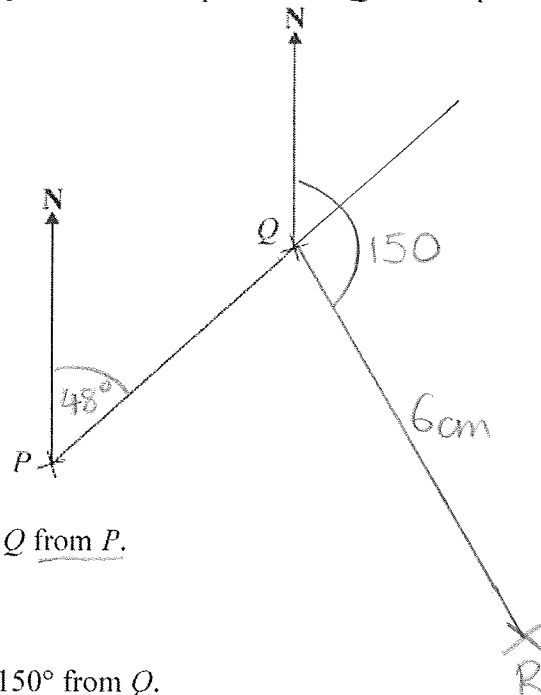
Measure acute angle then take from 360°
 331°
 (1)

- (b) On the diagram, draw a line on a bearing of 107° from A .

clockwise

(1)
 (2 marks)

4. The diagram shows the position of two ports P and Q on a map.



- (a) Measure the bearing of Q from P .

..... 048°
 (1)

A rock R is on a bearing of 150° from Q .
 On the map R is 6 cm from Q .

- (b) Mark the position of R with a cross (\times) and label it R .

(2)

2) Bearings: Harder

Solutions for Question 1:

Identify angle XYZ: 80°

If $XY = ZY$

\therefore

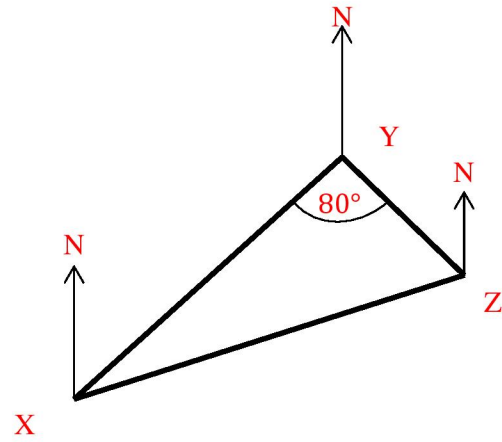
Isosceles triangle

Angle Z = Angle X:

$$\frac{180 - 80}{2} = 50^\circ$$

Bearing of Z from X: $020^\circ + 050^\circ$

70°



Solutions for Questions 2:

Construct bearings:

Construct triangle; identify all angles in the triangle:

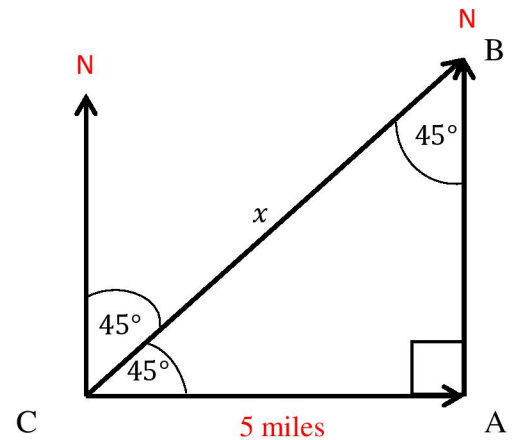
Use trigonometry to find x :

$$\sin 45 = \frac{5}{x}$$

$$x = \frac{5}{\sin 45}$$

$$x = 5\sqrt{2}$$

$$x = 7.07 \text{ miles}$$



3) Solving Quadratics Using the Formula: Easier

1. Solve $3x^2 + 7x - 13 = 0$
Give your solutions correct to 2 decimal places.

$$a = 3 \quad b = 7 \quad c = -13$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-7 \pm \sqrt{7^2 - 4 \times 3 \times -13}}{2 \times 3} = \frac{-7 \pm \sqrt{205}}{6}$$

$$= 1.219636844 \quad \text{or} \quad -3.552970177$$

$$x = \underline{1.22} \dots \dots \dots \text{or } x = \underline{-3.55} \dots \dots \dots$$

(3 marks)

2. Solve the equation

$$2x^2 + 6x - 95 = 0$$

Give your solutions correct to 3 significant figures.

$$a = 2 \quad b = 6 \quad c = -95$$

$$x = \frac{-6 \pm \sqrt{36 - (4 \times 2 \times -95)}}{4}$$

$$= \frac{-6 \pm \sqrt{796}}{4}$$

$$= 5.55336799 \quad \text{or} \quad -8.55336799$$

$$x = \underline{5.55} \dots \dots \dots \text{or } x = \underline{-8.55} \dots \dots \dots$$

(3 marks)

3) Solving Quadratics Using the Formula: Medium

3. Solve $x^2 + 3x - 5 = 0$
Give your solutions correct to 4 significant figures.

$$a = 1 \quad b = 3 \quad c = -5$$

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$= \frac{-3 \pm \sqrt{9 - (4 \times 1 \times -5)}}{2}$$

$$= \frac{-3 \pm \sqrt{29}}{2}$$

$$x = 1.192582404 \text{ or } -4.192582404$$

$$x = 1.193 \text{ or } -4.193$$

(3 marks)

4. Solve this quadratic equation.

$$x^2 - 5x - 8 = 0$$

Give your answers correct to 3 significant figures.

$$a = 1 \quad b = -5 \quad c = -8$$

$$x = \frac{5 \pm \sqrt{25 - (4 \times 1 \times -8)}}{2}$$

$$= \frac{5 \pm \sqrt{57}}{2}$$

$$x = 6.274917218 \text{ or } -1.274917218$$

$$x = 6.27 \text{ or } -1.27$$

(3 marks)

3) Solving Quadratics Using the Formula: Harder

9. The diagram shows a 6-sided shape.
All the corners are right angles.
All the measurements are given in centimetres.

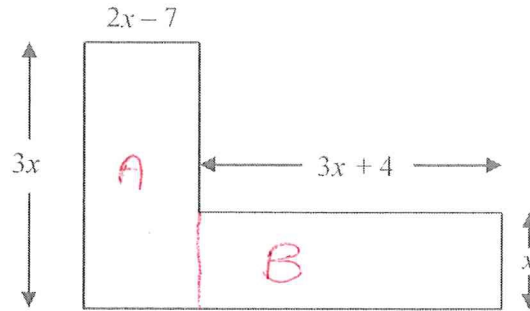


Diagram NOT accurately drawn

The area of the shape is 85 cm^2 .

- (a) Show that $9x^2 - 17x - 85 = 0$

$$A = 3x(2x-7) \quad B = x(3x+4)$$

$$= 6x^2 - 21x \quad = 3x^2 + 4x$$

$$6x^2 - 21x + 3x^2 + 4x = 85$$

$$9x^2 - 17x - 85 = 0 \quad (3)$$

- (b) (i) Solve $9x^2 - 17x - 85 = 0$

Give your solutions correct to 3 significant figures.

$$a=9 \quad b=-17 \quad c=-85$$

$$x = \frac{17 \pm \sqrt{17^2 - 4(9)(-85)}}{18}$$

$$x = 4.159474732 \quad \text{or} \quad x = -2.270585844$$

$$x = 4.16 \dots \quad \text{or} \quad x = -2.27 \dots$$

- (ii) Hence, work out the length of the shortest side of the 6-sided shape.

$$2x-7$$

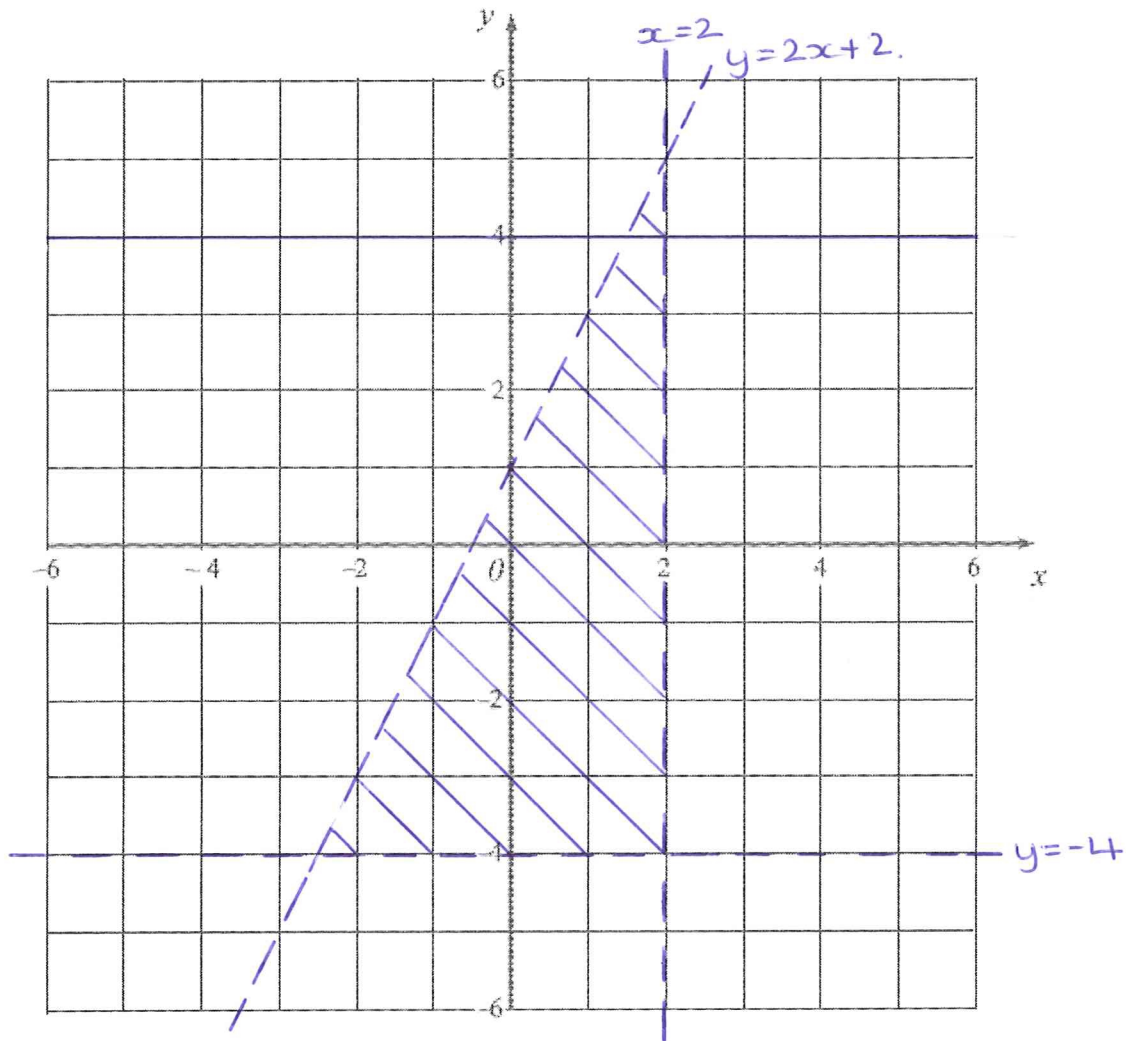
$$\dots 1.38 \dots \text{ cm}$$

(4)

4) Inequalities Regions: Easier

1. On the grid, shade the region that satisfies all three of these inequalities

$$y > -4 \quad x < 2 \quad y < 2x + 1$$



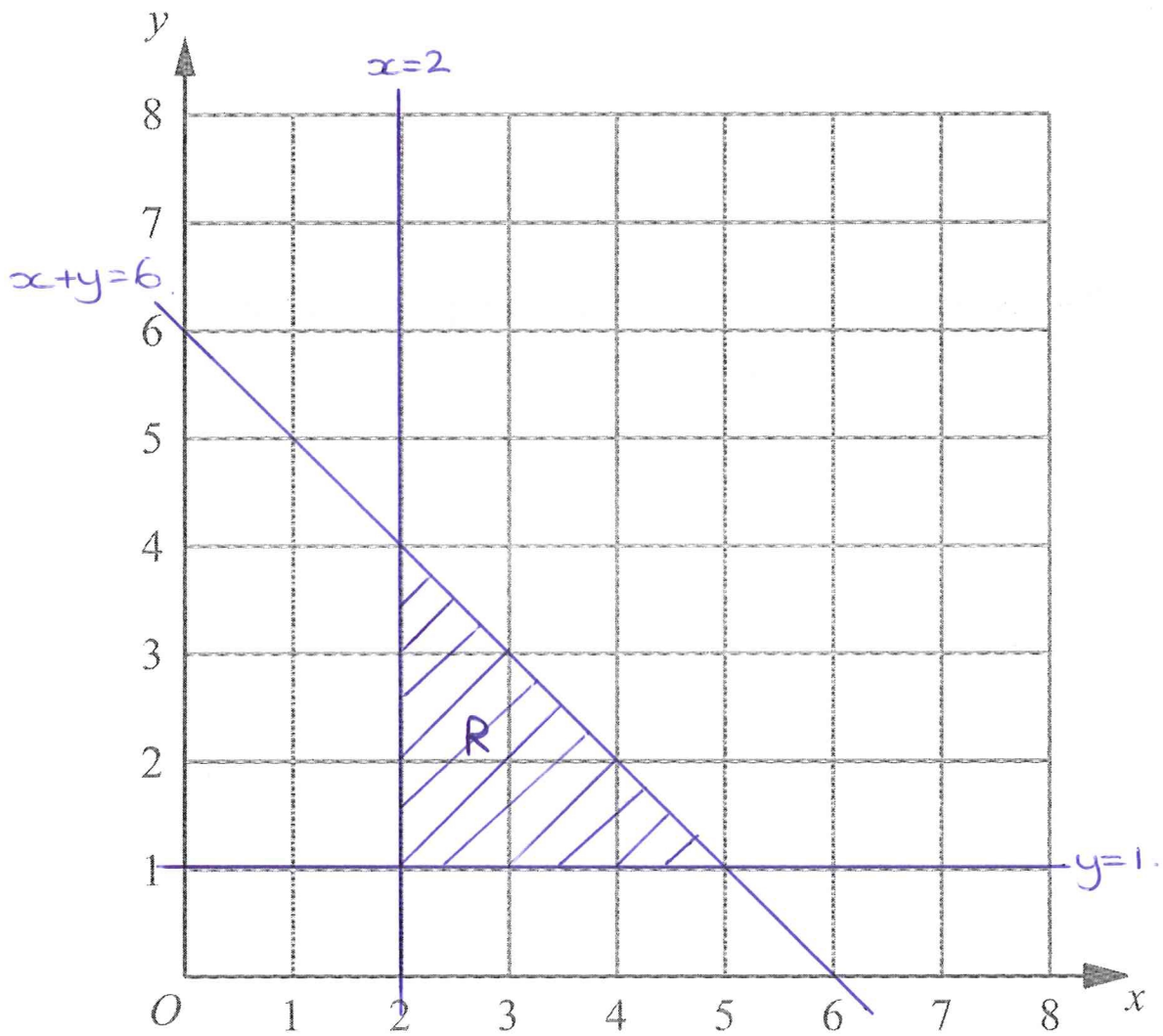
(Total for Question 19 = 4 marks)

4) Inequalities Regions: Medium

2. The region **R** satisfies the inequalities

$$x \geq 2, \quad y \geq 1, \quad x + y \leq 6$$

On the grid below, draw straight lines and use shading to show the region **R**.



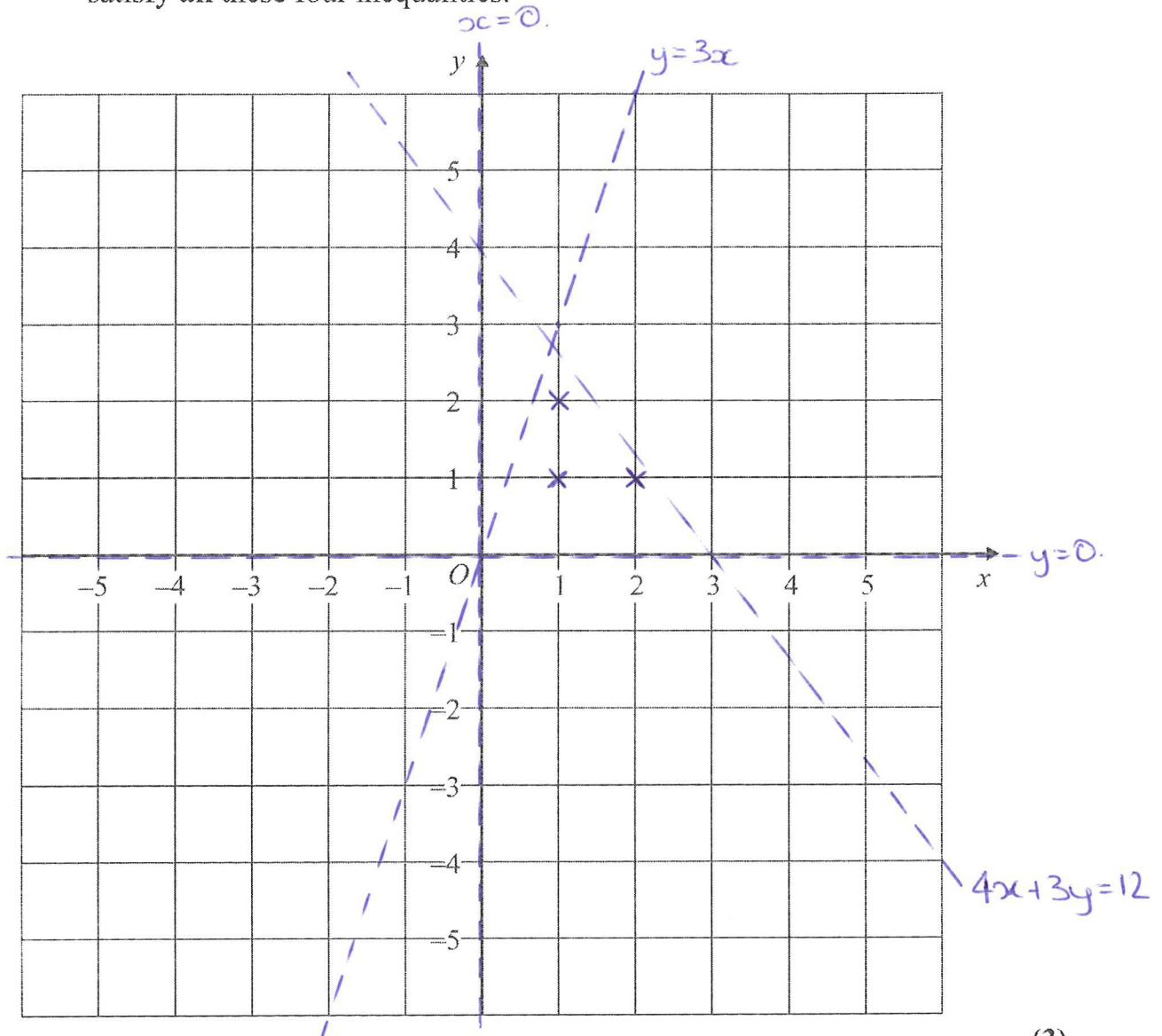
(Total 3 marks)

4) Inequalities Regions: Harder

7. $4x + 3y < 12$, $y < 3x$, $y > 0$, $x > 0$

x and y are both integers.

On the grid, mark with a cross (\times), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

5) More Difficult Rearranging Formulae: Easier

1. Rearrange $a(q - c) = d$ to make q the subject.

$$aq - ac = d$$

$$aq = d + ac$$

$$q = \frac{d + ac}{a}$$

$$q = \frac{d + ac}{a} \dots \dots \dots (3)$$

(Total 5 marks)

2. (a) Make n the subject of the formula $m = 5n - 21$

$$m + 21 = 5n$$

$$n = \frac{m + 21}{5}$$

5) More Difficult Rearranging Formulae: Medium

(b) Make p the subject of the formula $4(p - 2q) = 3p + 2$

$$4p - 8q = 3p + 2$$

$$p = 2 + 8q$$

$$p = \dots\dots\dots$$

(3)

(Total 5 marks)

3.

$$P = \pi r + 2r + 2a$$

Make r the subject of the formula

$$P - 2a = r(\pi + 2)$$

$$r = \frac{P - 2a}{\pi + 2}$$

(Total 3 marks)

5) More Difficult Rearranging Formulae: Harder

12. Rearrange $\frac{1}{u} + \frac{1}{v} = \frac{1}{f}$

to make u the subject of the formula.

Give your answer in its simplest form.

$$fv + fu = uv$$

$$fu - uv = fv$$

$$u(f-v) = fv$$

$$u = \frac{fv}{f-v}$$