BAKASH Sophie

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	22 from 28	3 from 3	14 from 20	1 from 1	4 from 4	0 from 0
A02 and 3	37 from 52	11 from 12	3 from 9	9 from 13	12 from 16	2 from 2
Total	59 from 80	14 from 15	17 from 29	10 from 14	16 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Compound Interest and Depreciation. MW: 164

Topic 2: Averages from Frequency Tables. Mathswatch Clip: 130

Topic 3: Venn diagrams.. Mathswatch Clip: 127

Topic 4: Cumulative Frequency. Mathswatch Clip: 186

Topic 5: Inequalities Regions. Mathswatch Clip: 198

1) Compound Interest and Depreciation: Easier

1. Tom invested £2500 for 3 years into his savings account. The bank paid him 3% per year compound interest. How much did Tom have in his bank account at the end of the 3 years?

$$2500 \times 1.03^3$$

$$= 2731.818$$

£2731.82 **(3)**

2. Dennis invested £1000 for four years into a savings account. He received 5% per annum compound interest. How much did he have in his account at the end of the four years

$$1000 \times 1.05^4$$

$$= 1215.506$$

£1215.51 **(3)**

3. The value of a smartphone depreciates by 55% each year. At the end of 2015, the value of the phone is £350. What is the value of the phone at the end of 2017?

$$350 \times 0.45^2$$

$$=70.875$$

= £70.88 **(3)**

1) Compound Interest and Depreciation: Medium

7. Patrick invested £5000 in a savings account. The introductory offer was 5.5% compound interest for the first three years. It then reduces to 3.5% for all the remaining years. How much will he have in his bank account at the end of the eight year?

$$5000 \times 1.055^3 = 5871.207$$
$$5871.207\ x\ 1.035^5 = 6973.152$$

£6973.15

…… **(3)**

8. Natasha invests into a savings account at an interest rate of 3% per annum. At the end of 4 years she has £7315.81 to the nearest penny. How much did she invest (to the nearest pound)?

$$£7315.81 \div 1.03^4$$

=6695.003

=£6695.00

…… **(3)**

9. Yusra invested £2000 in a savings account. The introductory offer was 4% compound interest for the first three years. It then reduces to 2.5% for all the remaining years. After n years, Yusra has £2483.28 to the nearest penny. What is the value of n?

$$£2000 \times 1.04^3$$

= 2249.728

$$£2249.728 \times 1.025^4 = £2483.279$$

So in total 7 years

n=7 **(3)**

1) Compound Interest and Depreciation: Harder

*10. Jeremy wants to invest £3000 into a savings account.

TQ Bank
Compound interest
6% for the first 2 years
2% for each extra year

AMC Bank
Compound Interest
8% for the first year
1.5% for each extra year

Jeremy is going to invest his money for 8 years. Which bank will give Jeremy the most money at the end of the eight years?

TQ BANK

$$3000 \times 1.06^2 = £3370.80$$

$$£3370.80 \times 1.02^6 = 3796.068$$

= £3796.07

AMC BANK $3000 \times 1.08 = £3240$

$$3240 \times 1.015^7 = 3595.898$$

$$= £3595.90$$

So Jeremy would make the most with TQ Bank

…… **(4)**

2) Averages from Frequency Tables: Easier

1. Amanda collected 20 leaves and wrote down their lengths, in cm.

Here are her results.

5 6 5 2 4 5 8 7 5 4

7 6 4 3 5 7 6 4 8 5

(a) Complete the frequency table to show Amanda's results.

Length in cm	Tally	Frequency
2	|	1
3	|	1
4	||||	4
5	𝍸 |	6
6	|||	3
7	|||	3
8	||	2

(2)

(b) Write down the modal length → highest frequency 5 .....cm **(1)**

(c) Work out the range. 6 .....cm **(1)**

8 − 2

(4 marks)

2. Rosie had 10 boxes of drawing pins.

She counted the number of drawing pins in each box.

The table gives information about her results.

Number of drawing pins	Frequency	Number × freq
29	2	58
30	5	150
31	2	62
32	1	32
	10	302

TOTAL NUMBER OF PINS

Work out the mean number of drawing pins in a box.

302 ÷ 10 30·2 .....

(3 marks)

2) Averages from Frequency Tables: Medium

8. Caleb measured the heights of 30 plants.
The table gives some information about the heights, h cm, of the plants.

Height (h cm) of plants	Frequency	Midpoint	f × m
$0 < h \leq 10$	2	5	10
$10 < h \leq 20$	8	15	120
$20 < h \leq 30$	9	25	225
$30 < h \leq 40$	7	35	245
$40 < h \leq 50$	4	45	180
	30		780

(a) Work out an estimate for the mean height of a plant.

780 ÷ 30

26

(3)

(b) Write down the modal class interval.

group with highest freq

$20 < h \leq 30$

(1)

(c) Find the class interval that contains the median.

30 plants → median between 15 and 16

2 + 8 = 10
10 + 9 = 19 (median in here)

$20 < h \leq 30$

(2)

(d) Why is your answer to part (a) and estimate?

We don't know actual plant heights as data is grouped.

(1)
(7 marks)

2) Averages from Frequency Tables: Harder

9. Marcus collected some pebbles.
He weighed each pebble.

The grouped frequency table gives some information about weights.

Weight (w grams)	Frequency	Midpoint	f × m
$50 \leq w < 60$	5	55	275
$60 \leq w < 70$	9	65	585
$70 \leq w < 80$	22	75	1650
$80 \leq w < 90$	27	85	2295
$90 \leq w < 100$	17	95	1615
	80		6420

(a) Work out an estimate for the mean weight of the pebbles.

6420 ÷ 80

80.25g
(3)

(b) Write down the modal class interval.

group with highest freq

80≤w<90
(1)

(c) Find the class interval that contains the median.

80 → median between 40 and 41

5+9=16
16+22=38
38+27=65 (median in here)

80≤w<90
(2)

(d) Why is your answer to part (a) and estimate?

Data is grouped and so we don't know actual values

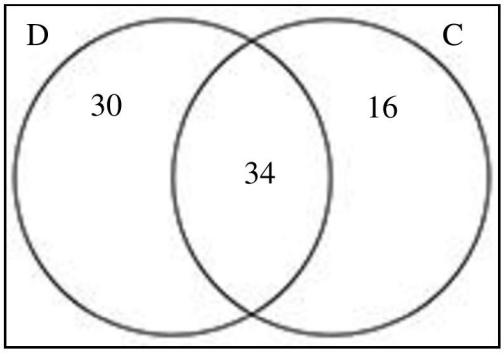
(1)
(7 marks)

3) Venn diagrams.: Easier

Solution for Question 1:

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

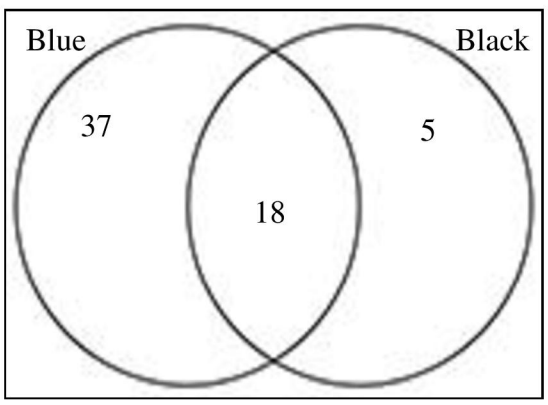
Number of people that owned cats only: $80 - 34 - 30 = 16$



Solution for Question 2:

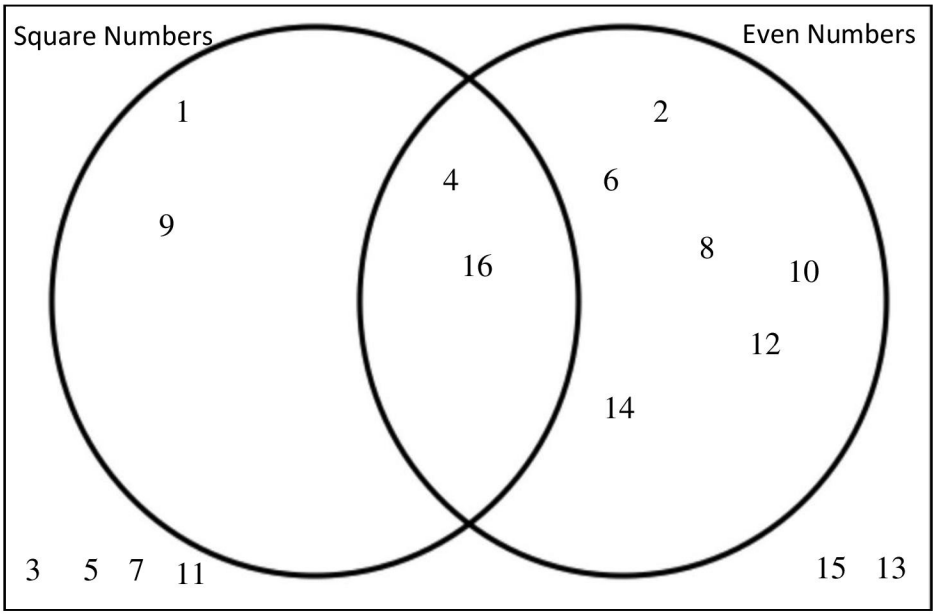
a) Number of people that only had a black pen:
$60 - 37 - 18 = 5$

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 $B = \{9,15\}$

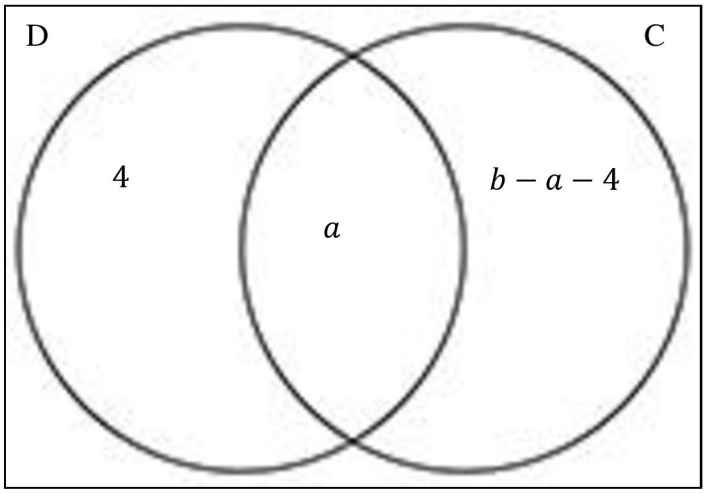
ii) $A \cup B = A$ or $B = \{3,5,6,12,18\}$

3) Venn diagrams.: Harder

Solution for Question 6:

Number of people who replied with cats only:

$b - a - 4$



4) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

(a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	12
$20 < A \leq 40$	27
$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

41 years

(2)

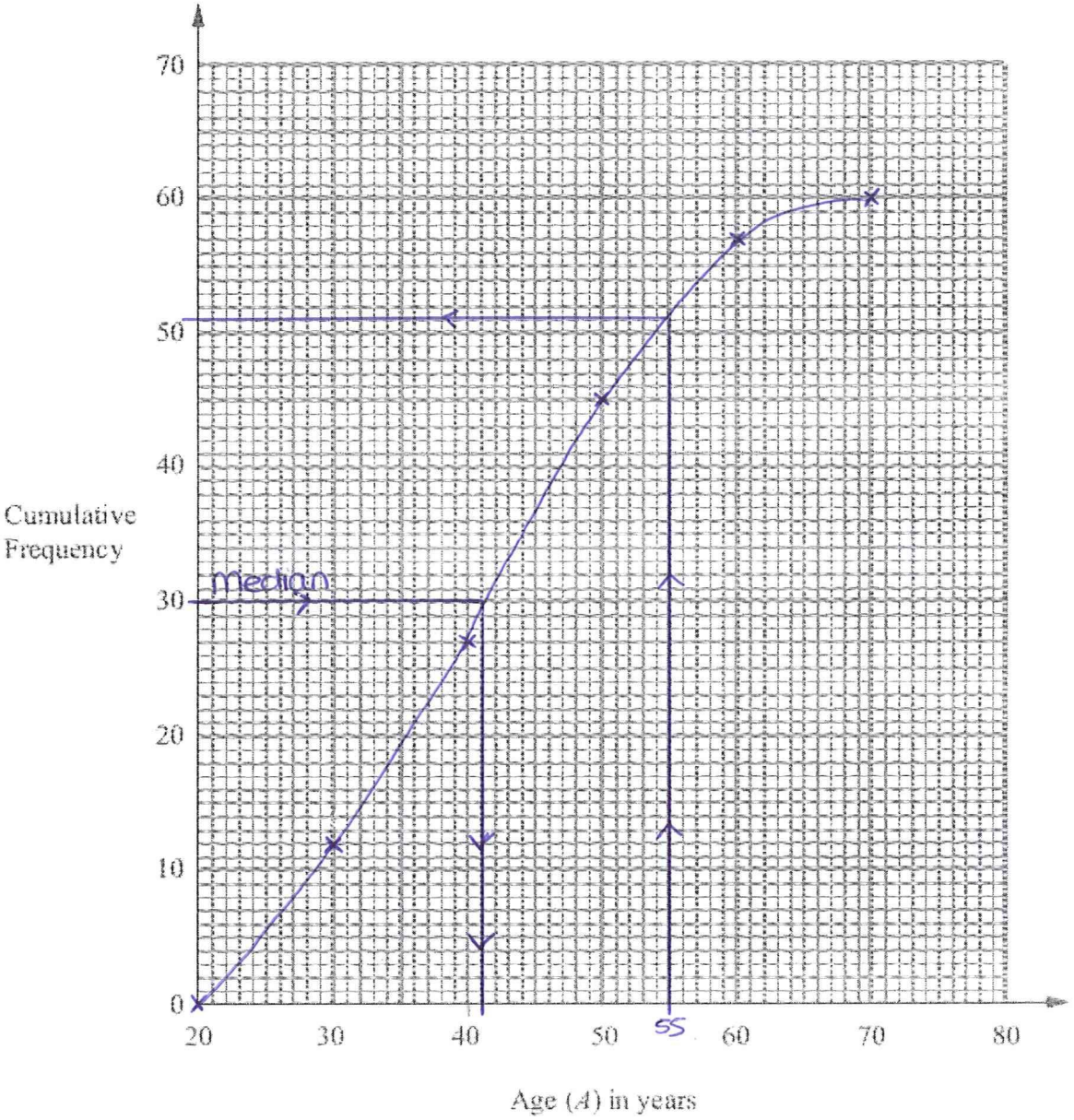
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so $60 - 51 = 9$ are older.

9

(2)

4) Cumulative Frequency: Medium



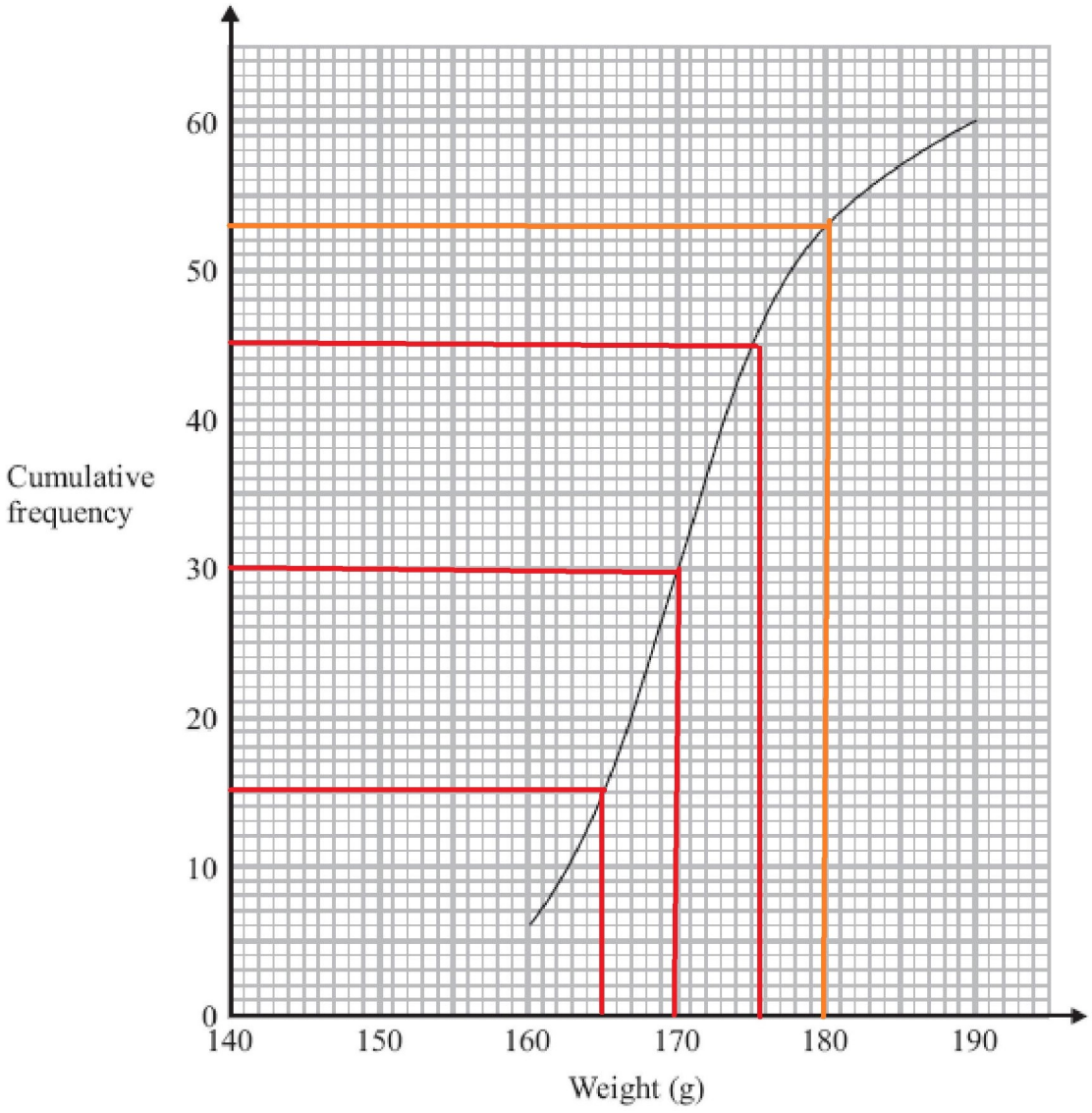
(7 marks)

4) Cumulative Frequency: Harder

4. Harry grows tomatoes.
This year he put his tomato plants into two groups, group A and group B.

Harry gave fertiliser to the tomato plants in group A.
He did not give fertiliser to the tomato plants in group B.

Harry weighed 60 tomatoes from group A.
The cumulative frequency graph shows some information about these weights.



ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

ii) The Upper Quartile 175 .....

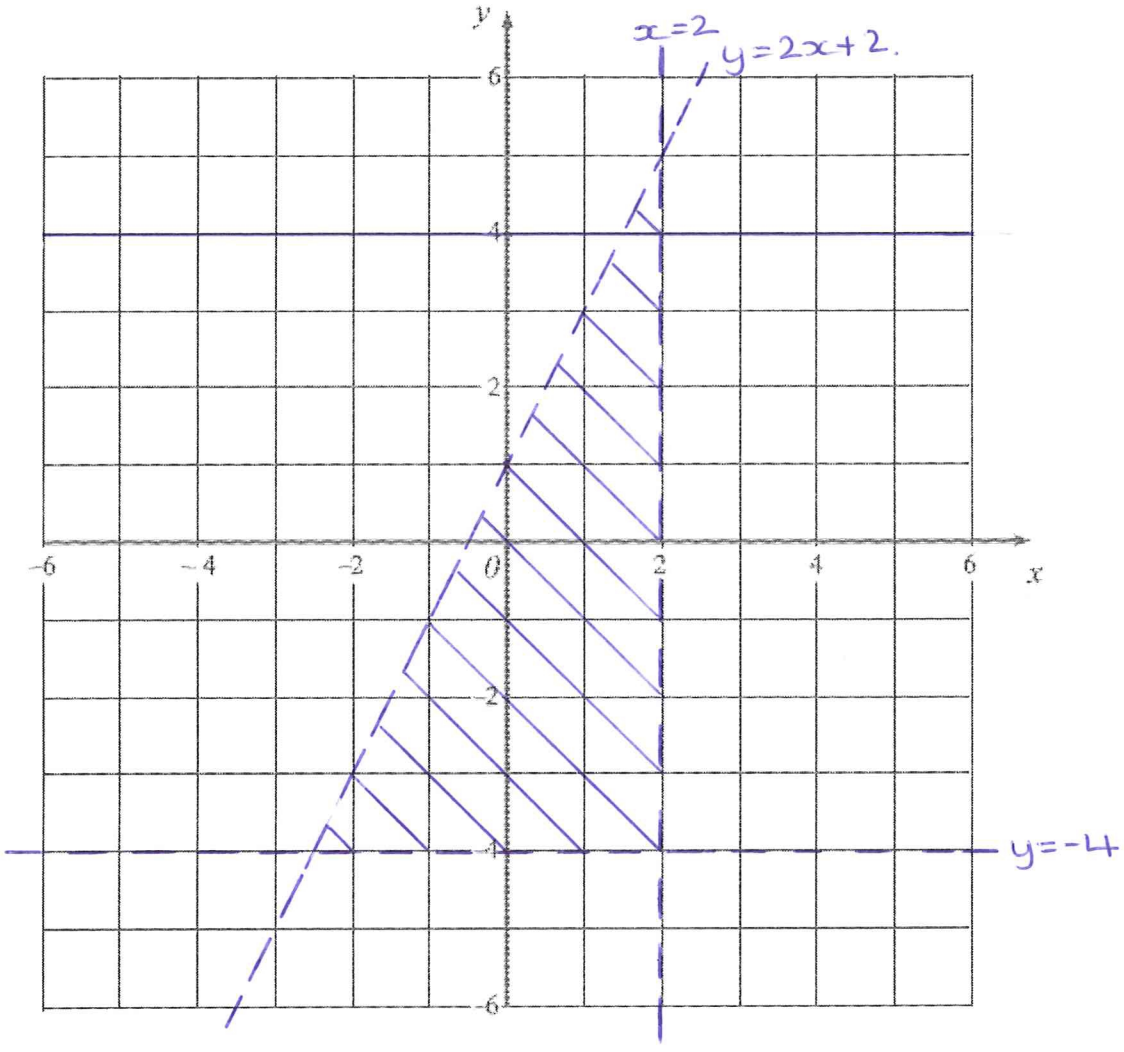
(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

5) Inequalities Regions: Easier

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

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

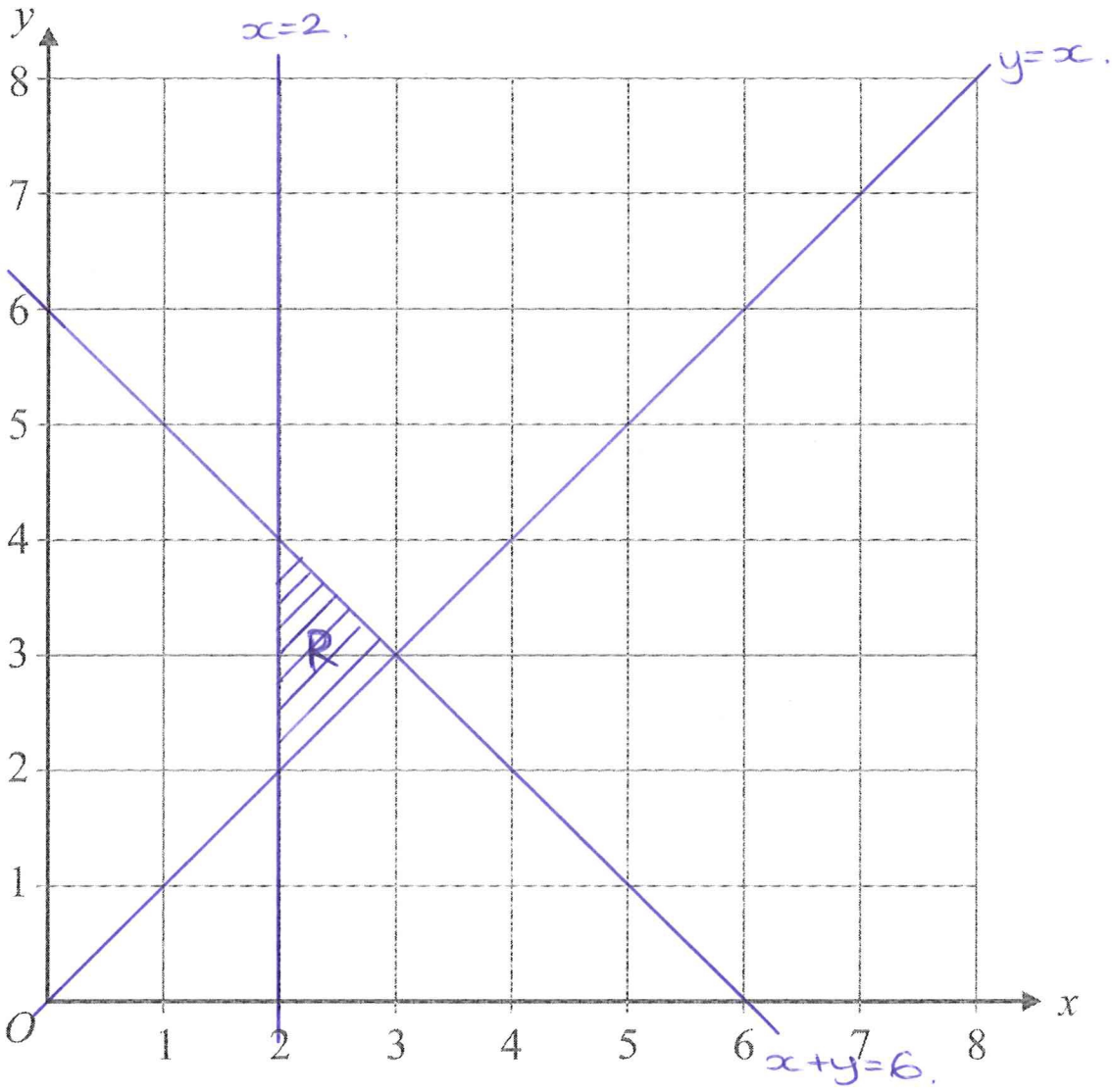


(Total for Question 19 = 4 marks)

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

$$x \geq 2 \qquad y \geq x \qquad x + y \leq 6$$



(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)

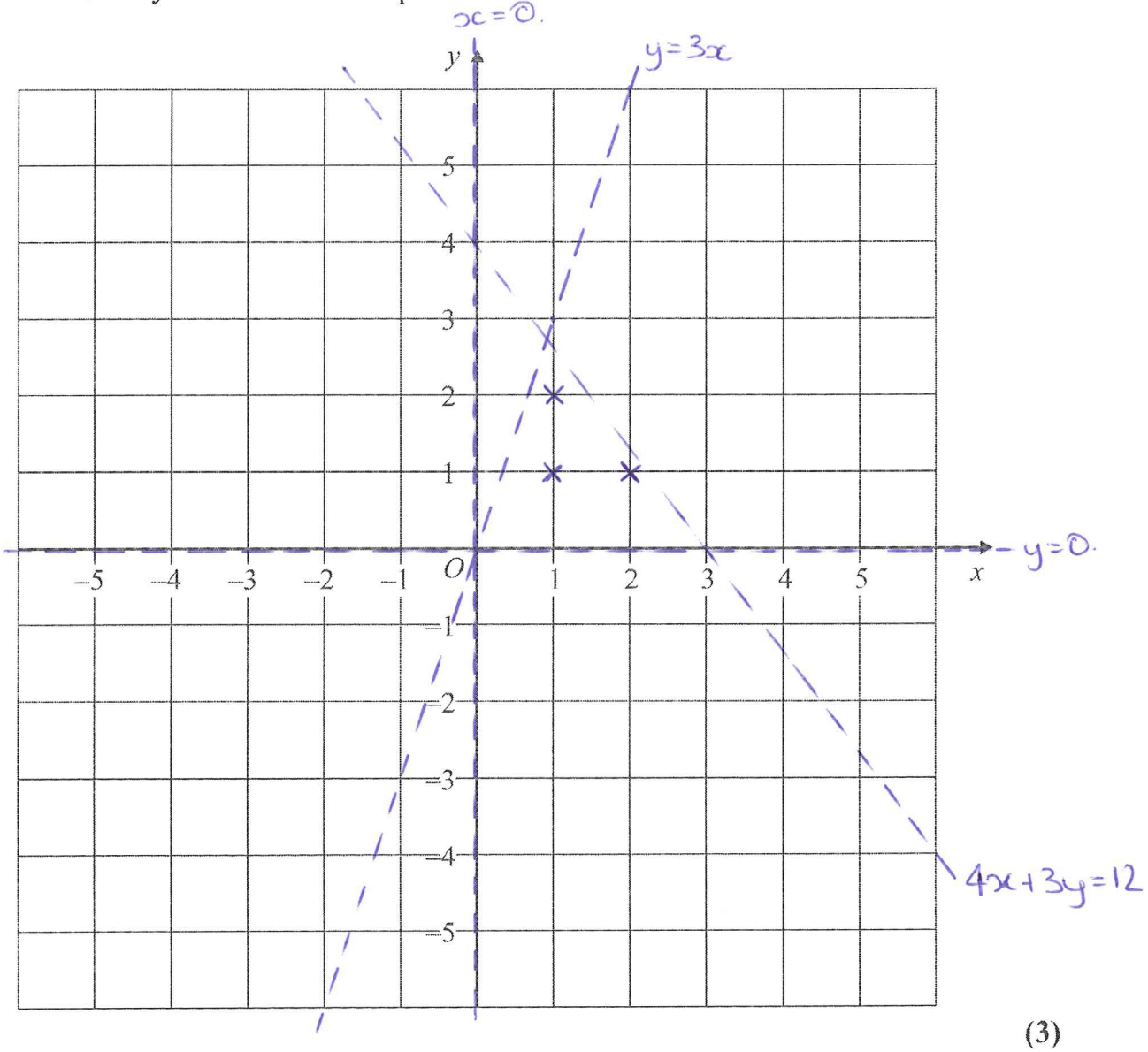
(Total 5 marks)

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 (×), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

BROOKES Max

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Your Pinpoint Topics

Topic 1: Index Notation. Mathswatch Clip: 131

Topic 2: Applied Trig Problems. Mathswatch Clip: 168

Topic 3: Standard Form. Mathswatch Clip: 83

Topic 4: Reverse Percentage. Mathswatch Clip: 110

Topic 5: Composite functions. Mathswatch Clip: 215

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 $(2n^3)^4$ $16n^{3\times4}$

$16n^{12}$

(2)

(4 marks)

---

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

(1)

m^{13}

(b) Simplify x^0

(1)

1

(c) Simplify $(16y^6)^{\frac{1}{2}}$

$\sqrt{16}\, y^{\frac{6}{2}}$

(2)

$4y^3$

(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 $(m^3)^5$

$m^{3\times5}$

m^{15}

(2)

(4 marks)

---

6. Simplify fully

(a) $p^2 \times p^7$

p^{2+7}

p^9 **(1)**

(b) $\frac{3q^4 \times 2q^5}{q^3}$

$\frac{(3\times2)q^{4+5}}{q^3} = 6q^{9-3}$

$6q^6$ **(2)**

(c) $(2xy^3)^5$

$2^5 x^5 y^{3\times5}$

$32x^5y^{15}$ **(2)**

(4 marks)

---

1) Index Notation: Harder

20. (a) Find the value of

(i) 64°

1

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

8

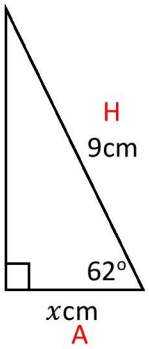
(iii) $64^{-\frac{2}{3}}$ $= \frac{1}{64^{2/3}}$ $= \left(\sqrt[3]{64}\right)^2 = \frac{1}{4^2}$

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

(4 marks)

2) Applied Trig Problems: Easier

1) (a) Find the missing length x to two decimal places.



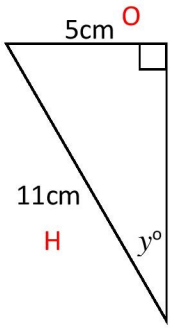
$\cos 62 = \frac{x}{9}$

$9 \cos 62 = x$

$x = 4.22524...$

$x = 4.23$ cm

(b) Find the missing angle y to two decimal places.



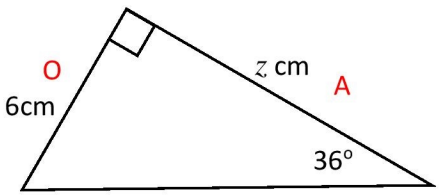
$\sin y = \frac{5}{11}$

$y = \sin^{-1}(\frac{5}{11})$

$y = 27.03569$

$y = 27.04°$

(c) Find the missing length z



$\tan 36 = \frac{6}{z}$

$z \tan 36 = 6$

$z = \frac{6}{\tan 36}$

$z = 8.25829$

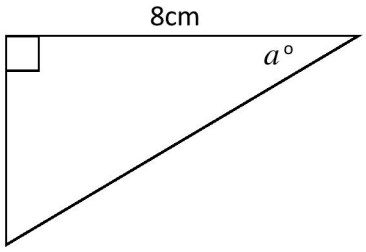
$z = 8.26cm$

(6 Marks)

2) Applied Trig Problems: Medium

2) The area of this triangle is $24cm^2$

Calculate the size of angle a to three significant figures.



Calculating the missing height:

$$Area = \frac{1}{2} \times base \times height$$

$$24 = \frac{1}{2} \times 8 \times height$$

$$24 = 4 \times height$$

$$height = 6cm$$

Calculating the missing angle using trig:

$$\tan a = \frac{6}{8}$$

$$a = \tan^{-1}\left(\frac{6}{8}\right)$$

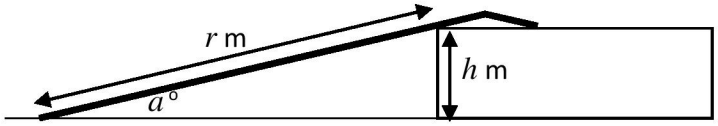
$$a = 36.8698976458$$

$$a = 36.8°$$

(4 Marks)

2) Applied Trig Problems: Harder

3) A wheelchair ramp is placed over a step, as shown.



The step is h meters high, and the ramp is r meters long to where it touches the step.

The angle between the ground and the ramp is a^o.

In order to function safely, then ramp has to be 6 times as long, as the height of the step it is covering

(a) Work out the value of a when $r = 6h$, to the nearest degree.

$$\sin a = \frac{h}{r}$$

$$\sin a = \frac{h}{6h}$$

$$\sin a = \frac{1}{6}$$

$$a = \sin^{-1}\left(\frac{1}{6}\right)$$

$$a = 9.59406822686$$

$$a = 10°$$

(b) New safety regulations replace the initial ones, saying that the angle between the ramp and the ground cannot be more than 8^o. How does this affect the height of step that the ramp can be used with?

Tick one box

- ☐ It can now be used with higher steps.
- ☐ There is no change to the step height with which the ramp can be used.
- ☐ It can now only be used with lower steps.

(4 Marks)

3) Standard Form: Easier

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

(1)

3.7×10^{-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.

$2.1 \times 10^8 \times 6 \times 10^{-5}$

$= 12.6 \times 10^3$

$= 1.26 \times 10^4$

1.26×10^4 (2)

(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.

$2 \times 10^7 \times 8 \times 10^{-12}$

$= 16 \times 10^{-5}$

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

1.6×10^{-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.

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

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.

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

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?

$-1 - -3 = 2$

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

$$= 0.5 \times 10^{2}$$

$$= 5 \times 10^{3}$$

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.

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

$D = ST$

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

$= 13.244 \times 10^{22}$

$= 1.3244 \times 10^{23}$

1.3244×10^{23} ..... km

(3 marks)

4) Reverse Percentage: Easier

1. A shop offers 25% discount on its products in the January Sale. A Sofa costs £450 in the sale. How much did it cost originally?

$$450 \div 0.75 = 600$$

£600

…… **(3)**

2. A low fat yoghurt claims to have 20% less fat than its full fat equivalent. The low fat yoghurt has 12g of fat. How much does the full fat equivalent have?

$$12g \div 0.8 = 15g$$

$15g$

…… **(3)**

3. A telephone company comes up with a strategy that reduces their customers wait time by 30%. After they have implemented the strategy a customer waits for 14 minutes. How long would they have waited for before the strategy was implemented?

$$14 \div 0.7 = 20\ mins$$

$20\ mins$

…… **(3)**

4) Reverse Percentage: Medium

4. A tax on sugary products at 5% is implemented by a new government. After the tax a chocolate bar costs 84p. How much has is increased by in pence?4

$84 \div 1.05 = 80p$

$80p$

…..…… **(3)**

5. A smartphone depreciates in value every year by 25%. After 2 years the value of the smartphone is £236.25. What was its value when new?

£236.25÷ 0.75^2

= £420

…..…… **(3)**

4) Reverse Percentage: Harder

*6. Two cities have different population growths

CITY A	CITY B
Growth 2% per year	Growth 5% Per year

At the end of 2015 the population of City A was 20400, and the population of City B was 20475. By how much did the populations differ at the end of 2014?

CITY A

$$20400 \div 1.02 = 20000$$

CITY B

$$20475 \div 1.05 = 19500$$

$$20000 - 19500 = 500$$

There was a difference of 500 people at the end of 2014

…… **(4)**

5) Composite functions: Easier

Q1. The functions f and g are such that

$$f(x) = 2x + 3 \text{ and } g(x) = \frac{x}{4} - 2$$

(a) Find the value of f(8)

F(8) = 2(8) + 3
=16 + 3
= 19

19

.....

(1)

(b) Find gf(*4*)

f(4) = 2(4) + 3 = 11

$$g(11) = \frac{11}{4} - 2 = \frac{3}{4}$$

$\frac{3}{4}$

.....

(2)

(b) Show that

$$fg(x) = \frac{1}{2}x - 1$$

$$fg(x) = 2\left(\frac{x}{4} - 2\right) + 3$$

$$fg(x) = \frac{2x}{4} - 4 + 3$$

$$fg(x) = \frac{1}{2}x - 1$$

(2)

(Total for question = 5 marks)

5) Composite functions: Medium

2. The functions f and g are such that

$$f(x) = \frac{2}{x+3} \text{ and } g(x) = 3(x-2)$$

a) Show that $gf(5) = -\frac{21}{4}$

$$f(5) = \frac{2}{5+3} = \frac{1}{4}$$

$$g\left(\frac{1}{4}\right) = 3\left(\frac{1}{4} - 2\right)$$

$$g\left(\frac{1}{4}\right) = \frac{3}{4} - 6$$

$$g\left(\frac{1}{4}\right) = -\frac{21}{4}$$

.....

(2)

b) Show that fg(x) can be written in the form

$$\frac{2}{k(x-1)}$$

where k is an integer to be found.

$$fg(x) = \frac{2}{3(x-2)+3}$$

$$fg(x) = \frac{2}{3x-6+3}$$

$$fg(x) = \frac{2}{3x-3}$$

$$fg(x) = \frac{2}{3(x-1)} \quad , \quad k = 3$$

(3)

c) Find an expression for gg(x)

$$gg(x) = 3(3x-6) - 6$$

$$gg(x) = 9x - 24$$

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

(Total for question = 7 marks)

5) Composite functions: Harder

3. The functions f, g and h are such that

$$f(x) = 2x + 2 \quad , \quad g(x) = \frac{a}{x} \text{ and } h(x) = 3x^2 \quad for\ x > 0$$

a) Find hgf(3) in terms of a

$$f(3) = 2(3) + 2 = 8$$
$$g(8) = \frac{a}{8}$$
$$h\left(\frac{a}{8}\right) = 3\left(\frac{a}{8}\right)^2 = \frac{3a^2}{64}$$

$$hgf(3) = \frac{3a^2}{64}$$

.....

(2)

b) Given that $fg(10) = \frac{14}{5}$ find the value of a

$$2\left(\frac{a}{10}\right) + 2 = \frac{14}{5}$$

$$\frac{2a}{10} = \frac{4}{5}$$

$$a = 4$$

.....

(2)

(Total for question = 4 marks)

4. The functions f, g are such that

$$f(x) = 3x + a \text{ and } g(x) = 6x - b$$

Given that fg(2) = 19 and gf(3) = 48, find the values of a and b.

From fg(2) =19

$3(6(2) - b) + a = 19$

$36 - 3b + a = 19$

$a - 3b = -17$

From gf(3) =54

$6(3(3) + a) - b = 54$

$54 + 6a - b = 54$

$6a - b = 0$

Solving simutaneously

$6a - 18b = -102$

-17b = -102

b= -6, a =1

.....(5) **(Total for question = 5 marks)**

BURNS Megan

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	18 from 28	3 from 3	12 from 20	1 from 1	2 from 4	0 from 0
A02 and 3	36 from 52	12 from 12	6 from 9	9 from 13	7 from 16	2 from 2
Total	54 from 80	15 from 15	18 from 29	10 from 14	9 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Expand double brackets. Mathswatch Clip: 134b

Topic 2: Finding volume, then mass and density. MW: NA

Topic 3: Applied Trig Problems. Mathswatch Clip: 168

Topic 4: Venn diagrams.. Mathswatch Clip: 127

Topic 5: Cumulative Frequency. Mathswatch Clip: 186

1) Expand double brackets (Non-Calc): Easier

Solution for Question 1:

$(x + 3)(x + 2)$
$x^2 + 3x + 2x + 6$
$x^2 + 5x + 6$

Solution for Question 2:

a) $(x + 2)(x + 6)$
$x^2 + 2x + 6x + 12$
$x^2 + 8x + 12$

b) $(x + 2)(x - 6)$
$x^2 + 2x - 6x - 12$
$x^2 - 4x - 12$

c) $(x - 2)(x - 6)$
$x^2 - 2x - 6x + 12$
$x^2 - 8x + 12$

1) Expand double brackets (Non-Calc): Medium

Solution for Question 3:

a) $(3x + 1)(x + 2)$
$3x^2 + 6x + x + 2$
$3x^2 + 7x + 2$

b) $(3x - 1)(x + 2)$
$3x^2 + 6x - x - 2$
$3x^2 + 5x - 2$

c) $(3x + 1)(3x + 2)$
$9x^2 + 6x + 3x + 2$
$9x^2 + 9x + 2$

Solution for Question 4:

a) $(3 - x)(2x + 1)$
$6x + 3 - 2x^2 - x$
$-2x^2 + 5x + 3$

b) $(5 - 2x)(3 - x)$
$15 - 5x - 6x + 2x^2$
$2x^2 - 11x + 15$

c) $(2x - 3)(2x + 3)$
$4x^2 + 6x - 6x - 9$
$4x^2 - 9$

1) Expand double brackets (Non-Calc): Harder

Solution for Question 5:

$(x+5)(2x+3) - 3(x-2)(6x+5)$
$2x^2 + 3x + 10x + 15 - 3[6x^2 + 5x - 12x - 10]$
$2x^2 + 3x + 10x + 15 - 18x^2 - 15x + 36x + 30$
$-16x^2 + 34x + 45$

Solution for Question 6:

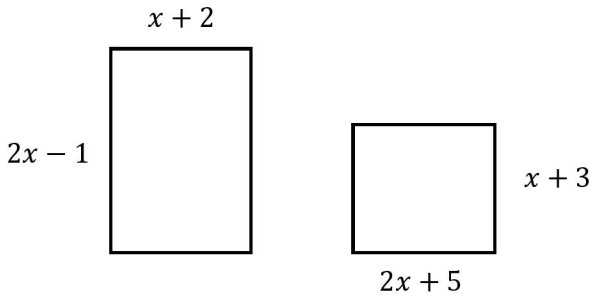
$\times$	$3x$	4
$2x$	$6x^2$	$8x$
-1	$-3x$	-4

$6x^2 + 8x - 3x - 4$
$6x^2 + 5x - 4$

He has added the terms $2x$ and $3x$ instead of multiplying. He has missed of a negative on $3x$

Solution for Question 7:

Split shape into 2



$2x + 5 = 3x + 7 - (x + 2)$

Area:

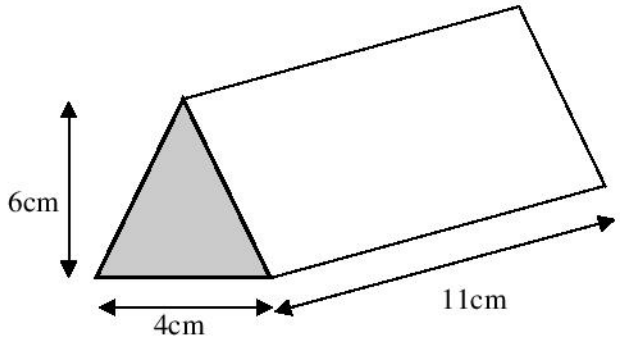
$(x+2)(2x-1) + (x+3)(2x+5)$

$2x^2 - x + 4x - 2 + 2x^2 + 5x + 6x + 15$

$4x^2 + 14x + 13$

2) Finding volume, then mass and density: Easier

1) A metal triangular prism is shown.



(a) What is the **volume** of the prism?

Prism volume = x-section area × length

$$= \frac{6 \times 4}{2} \times 11$$

$$= 132$$

$132cm^3$

(b) The **density** of the metal is $4.8g/cm^3$.

What is the mass of the prism to the nearest gram?

Mass = volume × density

= 132 x 4.8

= 633.6

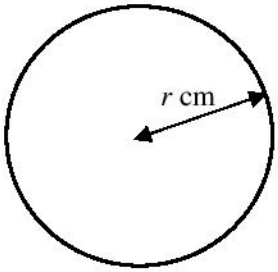
634g

(4 Marks)

2) Finding volume, then mass and density: Medium

3) A solid sphere is shown.

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



The mass of the sphere is 200g and its density 5.2g/m^3

(a) What is the **volume** of the sphere to three significant figures?

Volume = mass ÷ density

= 200 ÷ 5.2

= 38.46

38.5m^3

(b) What is the **radius** of the sphere to three significant figures?

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

$38.5 = \frac{4\times\pi\times r^3}{3}$

$38.5 \times 3 \div 4 \div \pi = r^3$

$r = \sqrt[3]{9.191\ldots} = 2.09$

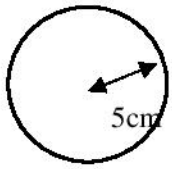
2.09cm

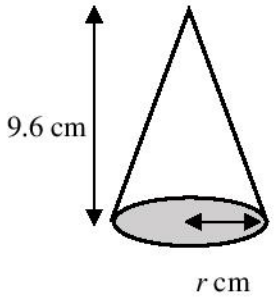
(5 Marks)

2) Finding volume, then mass and density: Harder

4) A solid sphere and cone are shown.

Volume of a sphere $= \frac{4\pi r^3}{3}$ Volume of a cone $= \frac{\pi r^2 h}{3}$





(a) What is the **volume** of the sphere to the nearest cubic centimetre?

Volume of the sphere $= \frac{4\times\pi\times5^3}{3} = 523.6$

524cm^3

The cone has the **same** volume as the sphere to the nearest cubic centimetre.

(b) What is the **radius** of the cone to one decimal place?

$524 = \frac{\pi\times r^2\times9.6}{3}$

$524 \times 3 \div 9.6 \div \pi = r^2$

$r = \sqrt{52.12} = 7.22$

7.2cm

The cone is made of a material with a density of 6.2g/cm^3.

(c) What is the **mass** of the cone to one decimal place?

Mass = volume × density

= 524 × 6.2

= 3248.8 3248.8g

The mass of the sphere is also the same as the mass of the cone.

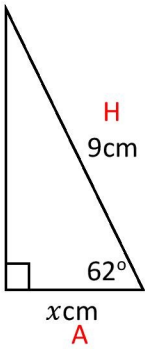
(d) What can you say about the density of the sphere?

The density of the sphere is the same as the cone. Ie. 6.2g/cm^3

(7 Marks)

3) Applied Trig Problems: Easier

1) (a) Find the missing length x to two decimal places.



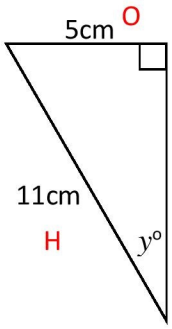
$\cos 62 = \frac{x}{9}$

$9 \cos 62 = x$

$x = 4.22524...$

$x = 4.23$ cm

(b) Find the missing angle y to two decimal places.



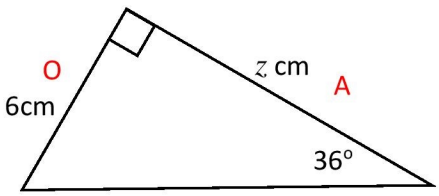
$\sin y = \frac{5}{11}$

$y = \sin^{-1}(\frac{5}{11})$

$y = 27.03569$

$y = 27.04°$

(c) Find the missing length z



$\tan 36 = \frac{6}{z}$

$z \tan 36 = 6$

$z = \frac{6}{\tan 36}$

$z = 8.25829$

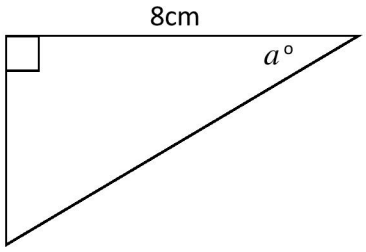
$z = 8.26cm$

(6 Marks)

3) Applied Trig Problems: Medium

2) The area of this triangle is $24cm^2$

Calculate the size of angle a to three significant figures.



Calculating the missing height:

$$Area = \frac{1}{2} \times base \times height$$

$$24 = \frac{1}{2} \times 8 \times height$$

$$24 = 4 \times height$$

$$height = 6cm$$

Calculating the missing angle using trig:

$$\tan a = \frac{6}{8}$$

$$a = \tan^{-1}\left(\frac{6}{8}\right)$$

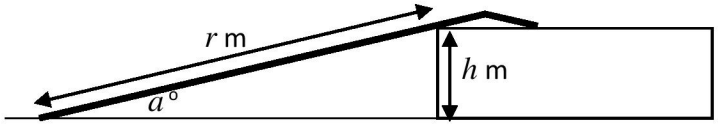
$$a = 36.8698976458$$

$$a = 36.8°$$

(4 Marks)

3) Applied Trig Problems: Harder

3) A wheelchair ramp is placed over a step, as shown.



The step is h meters high, and the ramp is r meters long to where it touches the step.

The angle between the ground and the ramp is a^o.

In order to function safely, then ramp has to be 6 times as long, as the height of the step it is covering

(a) Work out the value of a when $r = 6h$, to the nearest degree.

$$\sin a = \frac{h}{r}$$

$$\sin a = \frac{h}{6h}$$

$$\sin a = \frac{1}{6}$$

$$a = \sin^{-1}\left(\frac{1}{6}\right)$$

$$a = 9.59406822686$$

$$a = 10°$$

(b) New safety regulations replace the initial ones, saying that the angle between the ramp and the ground cannot be more than 8^o. How does this affect the height of step that the ramp can be used with?

Tick one box

- ☐ It can now be used with higher steps.
- ☐ There is no change to the step height with which the ramp can be used.
- ■ It can now only be used with lower steps.

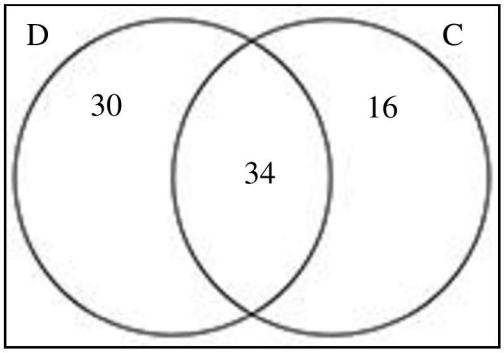
(4 Marks)

4) Venn diagrams.: Easier

Solution for Question 1:

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

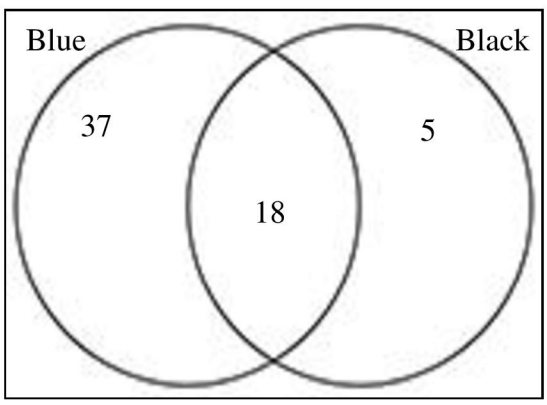
Number of people that owned cats only: $80 - 34 - 30 = 16$



Solution for Question 2:

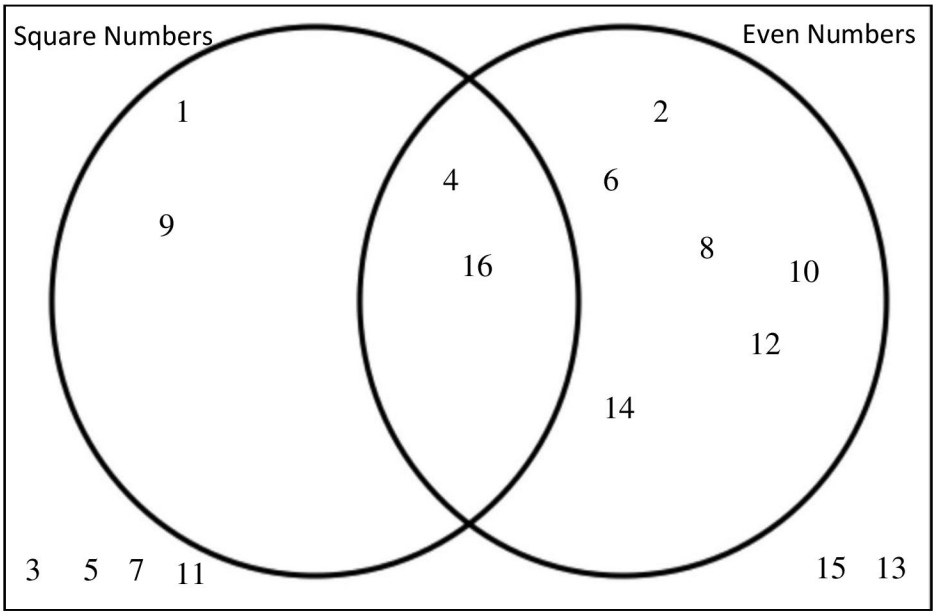
a) Number of people that only had a black pen:
$60 - 37 - 18 = 5$

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 $B = \{9,15\}$

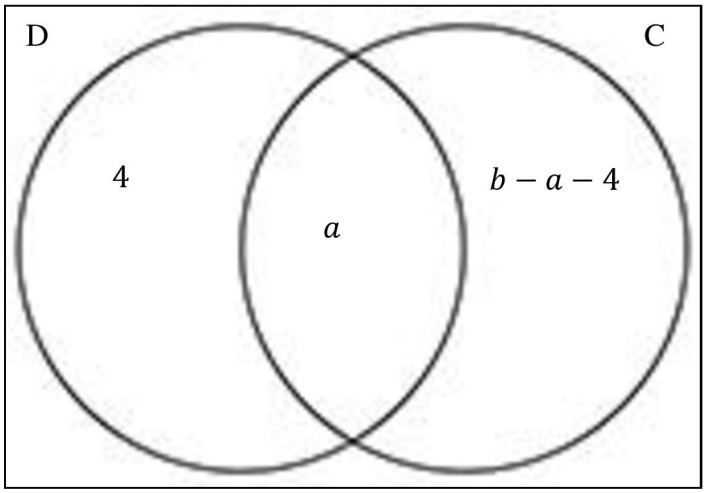
ii) $A \cup B = A$ or $B = \{3,5,6,12,18\}$

4) Venn diagrams.: Harder

Solution for Question 6:

Number of people who replied with cats only:

$b - a - 4$



5) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

(a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	12
$20 < A \leq 40$	27
$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

..... 41 ..... years

(2)

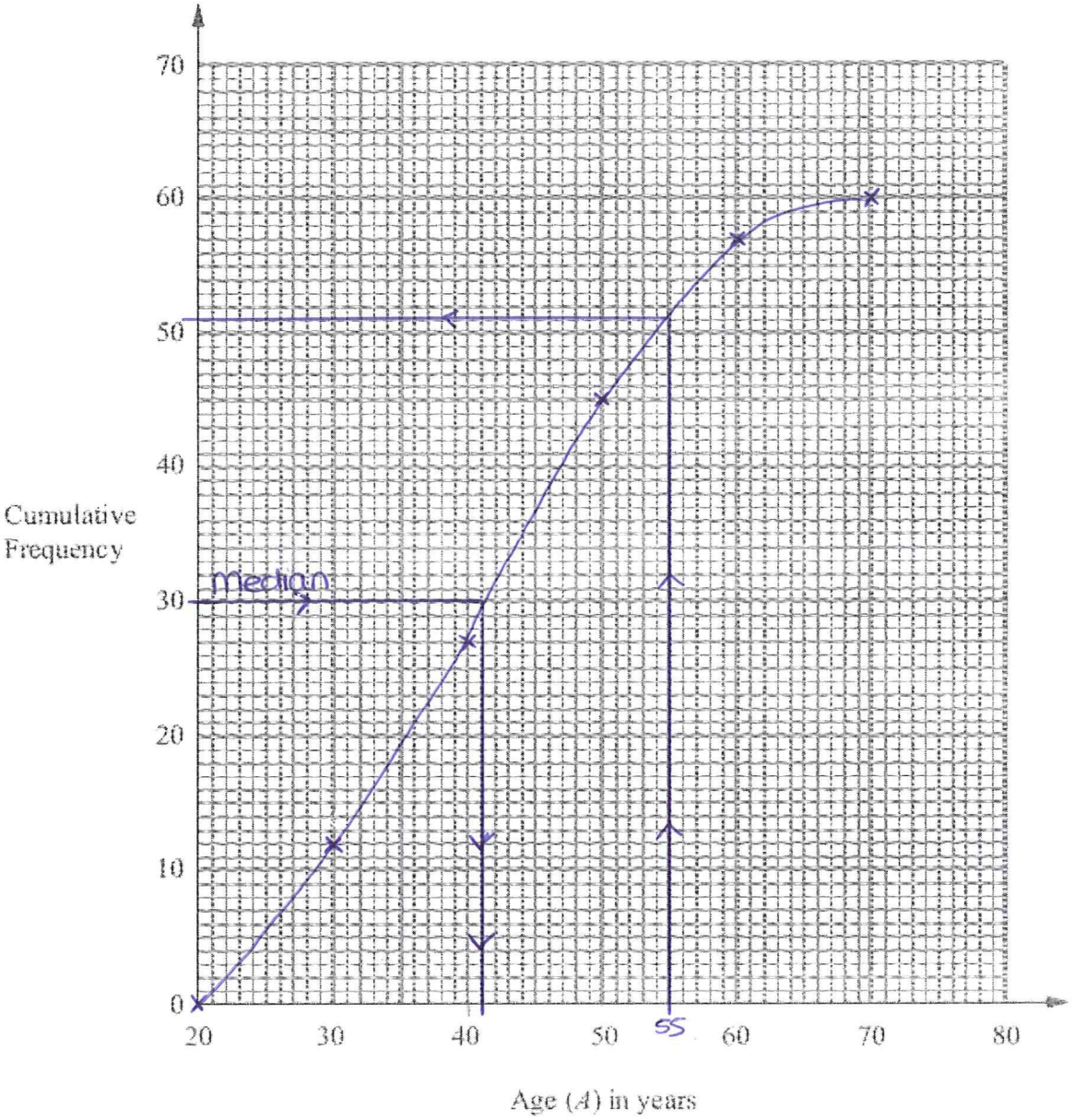
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so 60 - 51 = 9 are older.

..... 9 .....

(2)

5) Cumulative Frequency: Medium



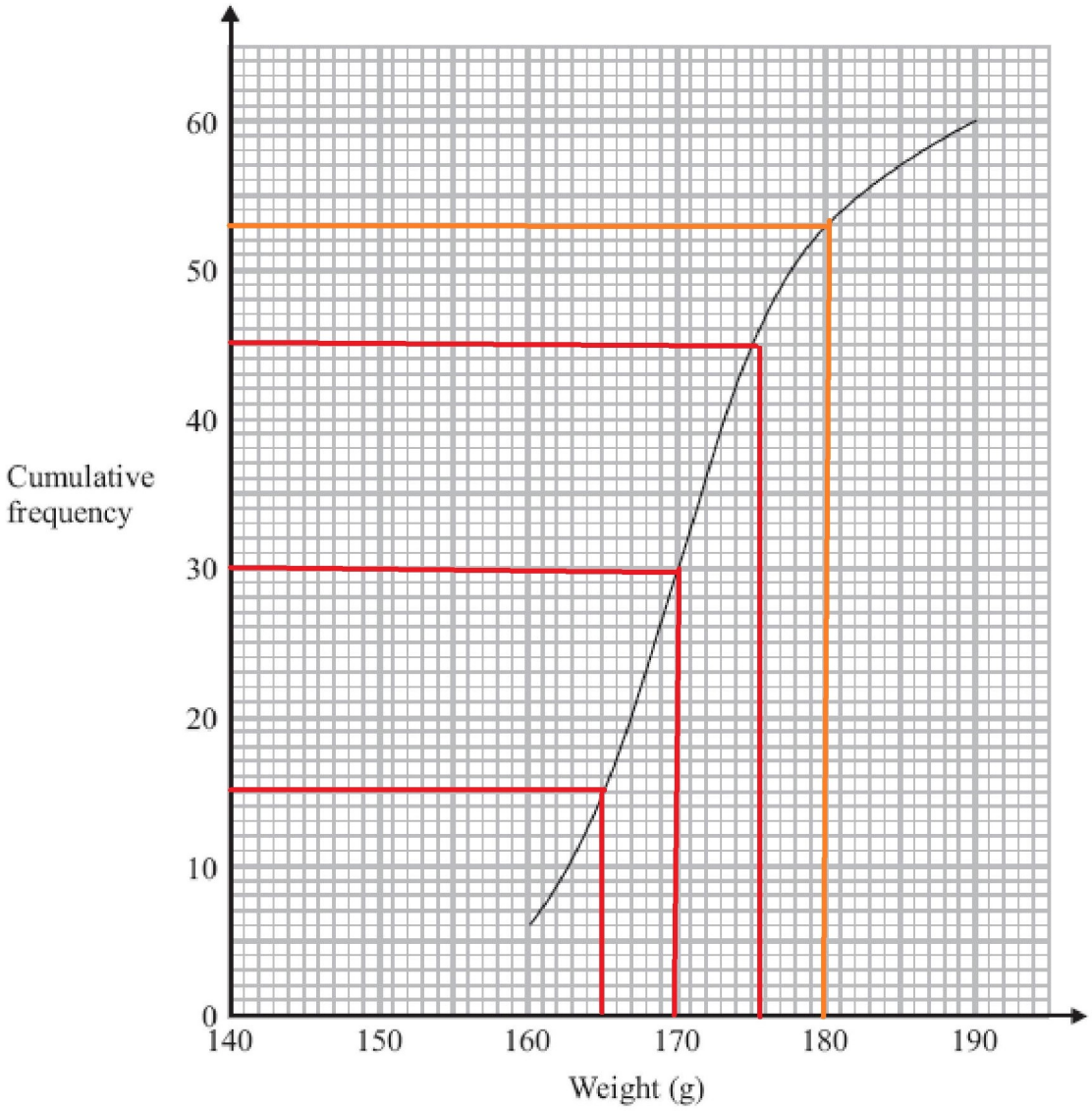
(7 marks)

5) Cumulative Frequency: Harder

4. Harry grows tomatoes.
This year he put his tomato plants into two groups, group A and group B.

Harry gave fertiliser to the tomato plants in group A.
He did not give fertiliser to the tomato plants in group B.

Harry weighed 60 tomatoes from group A.
The cumulative frequency graph shows some information about these weights.



ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

ii) The Upper Quartile 175 .....

(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

FARTHING Rachel

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
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A02 and 3	17 from 52	5 from 12	1 from 9	9 from 13	2 from 16	0 from 2
Total	32 from 80	7 from 15	10 from 29	9 from 14	6 from 20	0 from 2

Your Pinpoint Topics

Topic 1: Index Notation. Mathswatch Clip: 131

Topic 2: Applied Trig Problems. Mathswatch Clip: 168

Topic 3: Dividing into a ratio. Mathswatch Clip: 106

Topic 4: Equivalence of ratio and fractions. MW: NA

Topic 5: Reverse Percentage. Mathswatch Clip: 110

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 $(2n^3)^4$ $16n^{3\times4}$

$16n^{12}$

(2)

(4 marks)

---

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

(1)

m^{13}

(b) Simplify x^0

(1)

1

(c) Simplify $(16y^6)^{\frac{1}{2}}$

$\sqrt{16}\, y^{\frac{6}{2}}$

(2)

$4y^3$

(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 $(m^3)^5$

$m^{3\times5}$

m^{15}

(2)

(4 marks)

---

6. Simplify fully

(a) $p^2 \times p^7$

p^{2+7}

p^9 **(1)**

(b) $\frac{3q^4 \times 2q^5}{q^3}$

$\frac{(3\times2)q^{4+5}}{q^3} = 6q^{9-3}$

$6q^6$ **(2)**

(c) $(2xy^3)^5$

$2^5 x^5 y^{3\times5}$

$32x^5y^{15}$ **(2)**

(4 marks)

---

1) Index Notation: Harder

20. (a) Find the value of

(i) 64°

1

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

8

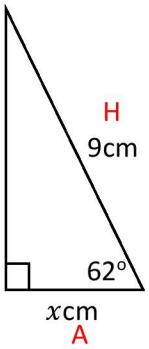
(iii) $64^{-\frac{2}{3}}$ $= \frac{1}{64^{2/3}}$ $= \left(\sqrt[3]{64}\right)^2 = \frac{1}{4^2}$

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

(4 marks)

2) Applied Trig Problems: Easier

1) (a) Find the missing length x to two decimal places.



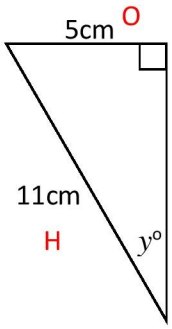
$\cos 62 = \frac{x}{9}$

$9 \cos 62 = x$

$x = 4.22524...$

$x = 4.23$ cm

(b) Find the missing angle y to two decimal places.



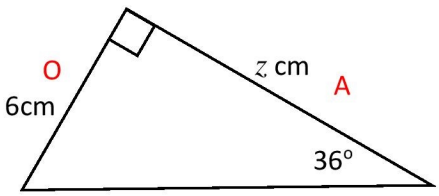
$\sin y = \frac{5}{11}$

$y = \sin^{-1}(\frac{5}{11})$

$y = 27.03569$

$y = 27.04°$

(c) Find the missing length z



$\tan 36 = \frac{6}{z}$

$z \tan 36 = 6$

$z = \frac{6}{\tan 36}$

$z = 8.25829$

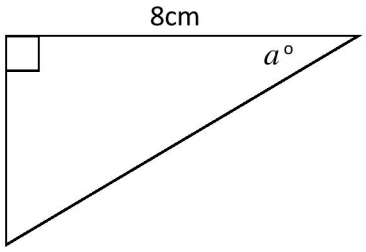
$z = 8.26cm$

(6 Marks)

2) Applied Trig Problems: Medium

2) The area of this triangle is $24cm^2$

Calculate the size of angle a to three significant figures.



Calculating the missing height:

$$Area = \frac{1}{2} \times base \times height$$

$$24 = \frac{1}{2} \times 8 \times height$$

$$24 = 4 \times height$$

$$height = 6cm$$

Calculating the missing angle using trig:

$$\tan a = \frac{6}{8}$$

$$a = \tan^{-1}\left(\frac{6}{8}\right)$$

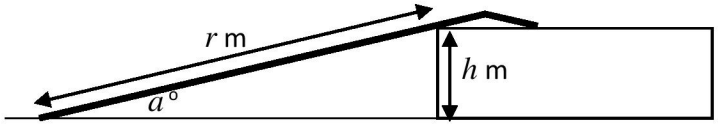
$$a = 36.8698976458$$

$$a = 36.8°$$

(4 Marks)

2) Applied Trig Problems: Harder

3) A wheelchair ramp is placed over a step, as shown.



The step is h meters high, and the ramp is r meters long to where it touches the step.

The angle between the ground and the ramp is a^o.

In order to function safely, then ramp has to be 6 times as long, as the height of the step it is covering

(a) Work out the value of a when $r = 6h$, to the nearest degree.

$$\sin a = \frac{h}{r}$$

$$\sin a = \frac{h}{6h}$$

$$\sin a = \frac{1}{6}$$

$$a = \sin^{-1}\left(\frac{1}{6}\right)$$

$$a = 9.59406822686$$

$$a = 10°$$

(b) New safety regulations replace the initial ones, saying that the angle between the ramp and the ground cannot be more than 8^o. How does this affect the height of step that the ramp can be used with?

Tick one box

- ☐ It can now be used with higher steps.
- ☐ There is no change to the step height with which the ramp can be used.
- ■ It can now only be used with lower steps.

(4 Marks)

3) Dividing into a ratio: Easier

Solution for Question 1:

Ratio 1:3 total 1+3= 4

$£40 \div 4 = 10$

Multiply each part of ratio 1:3 by 10:

10:30

Solution for Question 2:

Ratio total 8:9 8+9= 17

$153kg \div 17 = 9$

Multiply ratio 8:9 by 9

72:81

$81 - 72 = 9$

Patrick is 9kg heavier than Connor

Solution for Question 3:

Ratio 1:2

x:50

$50 \div 2 = 25$

$1 \times 25 = 25$

Tim gets 25 sweets

Solution for Question 4:

Ratio Holly to Wei-Kong to Wilfred: 6:3:1

6:3:1 = 10

$£850 \div 10 = 85$

Holly receives $6 \times 85 = £510$

3) Dividing into a ratio: Medium

Solution for Question 5:

Ratio 5:2

Difference in ratio parts 5-2 = 3

$28.5 \div 3 = 9.5$

Multiply ratio 5:2 by 9.5

47.5:19

47.5 km + 19km = 66.5km

Solution for Question 6:

Ratio 5:2:3

x:22:y

$22 \div 2 = 11$

Therefore x, Carbohydrates, = $5 \times 11 = 55$g

3) Dividing into a ratio: Harder

Solution for Question 7:

Ratio Red to Blue = 3:7

3+7 = 10

30 litres$\div$ 10 = 3

Multiply ratio 3:7 by 3

9:21 litres needed.

$£20 \times \frac{9}{3\ (litre\ tin)} + £30 \times \frac{21}{3\ (litre\ tin)}$

$£20 \times 3 + £30 \times 7 = £270$

Solution for Question 8:

Superheroes to princesses = 5:4

Princesses to Celebrities = 3:1

Multiply ratio 5:4 by 3 = 15:12

Multiply ratio 3:1 by 4 = 12:4

Therefore ratio as a whole = 15:12:4

15:12:1 = 31

$\frac{93(Costumes)}{31} = 3$

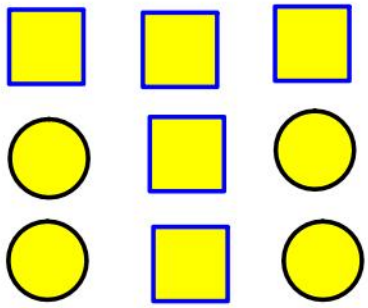
Multiply ratio 15:12:4 by 3

45:36:12

36 people dressed as princesses

4) Equivalence of ratio and fractions: Easier

1) The diagram below shows some squares and some circles



a) What is the ratio of squares to circles?

5: 4

_____

(1 Mark)

b) What is the total amount of shapes?

9

_____

(1 Mark)

c) What is fraction of the total amount of shapes are squares?

$\frac{5}{9}$

_____

(1 Mark)

d) A different picture has squares and circles in the ratio 1:2
What fraction of the shapes are squares?

$\frac{1}{3}$

_____

(1 Mark)

4) Equivalence of ratio and fractions: Medium

2) There are 20 sweets in a packet. The sweets are either red or blue. 12 of the sweets are red.

a) What fraction of sweets are red?

$\frac{12}{20} = \frac{3}{5}$

_____

(1 Mark)

b) What is the ratio of red sweets to blue sweets. Give your answer in simplest form

12:8 3:2

_____

(1 Mark)

---

3) Simone has a selection of green and red pens. $\frac{3}{5}$ of the pens are red.
Write down the ratio of green to red pens.

2:3

_____

(1 Mark)

4) Equivalence of ratio and fractions: Harder

4) Alex has a set of toy cars, the cars come in three colours, blue, red and green. The ratio of blue to red to green cars is 2:3:4. What fraction of the cars are blue?

2+3+4=9

$\frac{2}{9}$

1 Mark

5) A company sells t-shirts in medium or large sizes. One month the ratio of medium to large sold was $a : b$.

What fraction of T shirts sold were medium?

$\frac{a}{a+b}$

1 Mark

5) Reverse Percentage: Easier

1. A shop offers 25% discount on its products in the January Sale. A Sofa costs £450 in the sale. How much did it cost originally?

$$450 \div 0.75 = 600$$

£600

…… **(3)**

2. A low fat yoghurt claims to have 20% less fat than its full fat equivalent. The low fat yoghurt has 12g of fat. How much does the full fat equivalent have?

$$12g \div 0.8 = 15g$$

$15g$

…… **(3)**

3. A telephone company comes up with a strategy that reduces their customers wait time by 30%. After they have implemented the strategy a customer waits for 14 minutes. How long would they have waited for before the strategy was implemented?

$$14 \div 0.7 = 20\ mins$$

$20\ mins$

…… **(3)**

5) Reverse Percentage: Medium

4. A tax on sugary products at 5% is implemented by a new government. After the tax a chocolate bar costs 84p. How much has is increased by in pence?4

$84 \div 1.05 = 80p$

$80p$

…..…… **(3)**

5. A smartphone depreciates in value every year by 25%. After 2 years the value of the smartphone is £236.25. What was its value when new?

£236.25÷ 0.75^2

= £420

…..…… **(3)**

5) Reverse Percentage: Harder

*6. Two cities have different population growths

CITY A	CITY B
Growth 2% per year	Growth 5% Per year

At the end of 2015 the population of City A was 20400, and the population of City B was 20475. By how much did the populations differ at the end of 2014?

CITY A

$$20400 \div 1.02 = 20000$$

CITY B

$$20475 \div 1.05 = 19500$$

$$20000 - 19500 = 500$$

There was a difference of 500 people at the end of 2014

…… **(4)**

GREAVES Will

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	15 from 28	1 from 3	11 from 20	0 from 1	3 from 4	0 from 0
A02 and 3	28 from 52	12 from 12	2 from 9	8 from 13	5 from 16	1 from 2
Total	43 from 80	13 from 15	13 from 29	8 from 14	8 from 20	1 from 2

Your Pinpoint Topics

Topic 1: Simple Bounds. Mathswatch Clip: 132

Topic 2: Equivalence of ratio and fractions. MW: NA

Topic 3: Cumulative Frequency. Mathswatch Clip: 186

Topic 4: Inequalities Regions. Mathswatch Clip: 198

Topic 5: Areas under velocity time graph. MW: 216

1) Simple Bounds (Non-Calc): 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)

1) Simple Bounds (Non-Calc): 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?

Lower bound A+B 4.15 + 12.5 =16.65
Upper bound A+B 4.25 +13.5 = 17.75

$16.65 \leq A + B < 17.75$

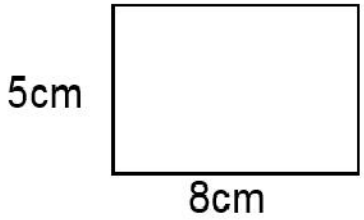
_____ cm

(1)

(4 Marks)

1) Simple Bounds (Non-Calc): 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 $2\times4.5 + 2\times7.5 = 9 + 15 = 24cm$

_____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 $2\times5.5 + 2\times8.5 = 11 + 17 = 28cm$

_____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 $100\times5.5 = 550g$

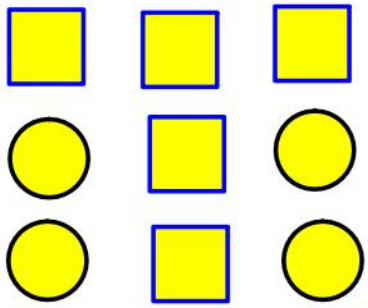
One kilogram = 1000 grams so

$$550g = 0.55kg$$

_____0.55_____ kg **(3 marks)**

2) Equivalence of ratio and fractions: Easier

1) The diagram below shows some squares and some circles



a) What is the ratio of squares to circles?

5: 4

_____

(1 Mark)

b) What is the total amount of shapes?

9

_____

(1 Mark)

c) What is fraction of the total amount of shapes are squares?

$\frac{5}{9}$

_____

(1 Mark)

d) A different picture has squares and circles in the ratio 1:2
What fraction of the shapes are squares?

$\frac{1}{3}$

_____

(1 Mark)

2) Equivalence of ratio and fractions: Medium

2) There are 20 sweets in a packet. The sweets are either red or blue. 12 of the sweets are red.

a) What fraction of sweets are red?

$\frac{12}{20} = \frac{3}{5}$

_____

(1 Mark)

b) What is the ratio of red sweets to blue sweets. Give your answer in simplest form

12:8 3:2

_____

(1 Mark)

---

3) Simone has a selection of green and red pens. $\frac{3}{5}$ of the pens are red.
Write down the ratio of green to red pens.

2:3

_____

(1 Mark)

2) Equivalence of ratio and fractions: Harder

4) Alex has a set of toy cars, the cars come in three colours, blue, red and green. The ratio of blue to red to green cars is 2:3:4. What fraction of the cars are blue?

2+3+4=9

$\frac{2}{9}$

1 Mark

5) A company sells t-shirts in medium or large sizes. One month the ratio of medium to large sold was $a : b$.

What fraction of T shirts sold were medium?

$\frac{a}{a+b}$

1 Mark

3) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

(a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	12
$20 < A \leq 40$	27
$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

.....41..... years

(2)

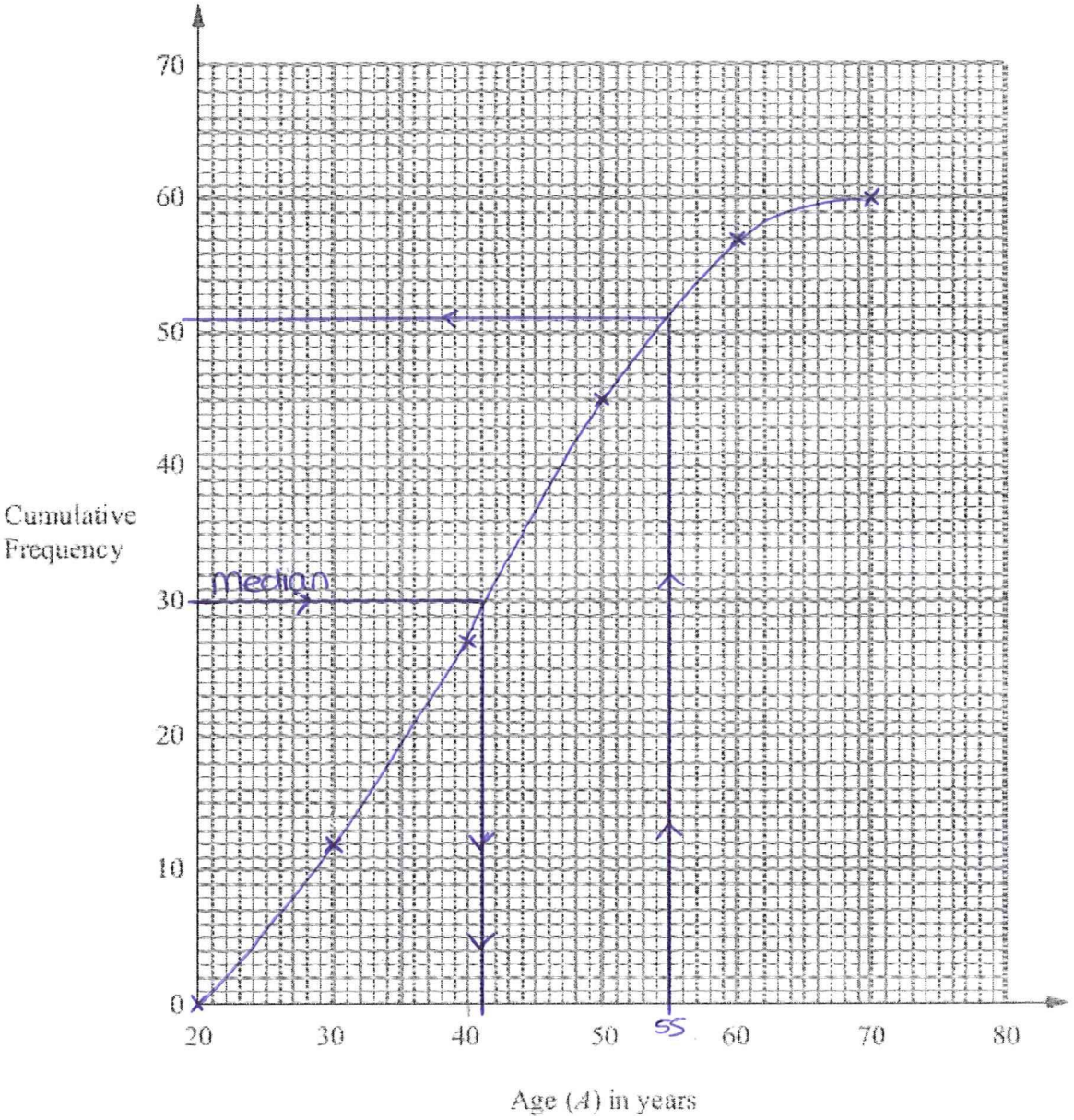
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so 60 - 51 = 9 are older.

.....9.....

(2)

3) Cumulative Frequency: Medium



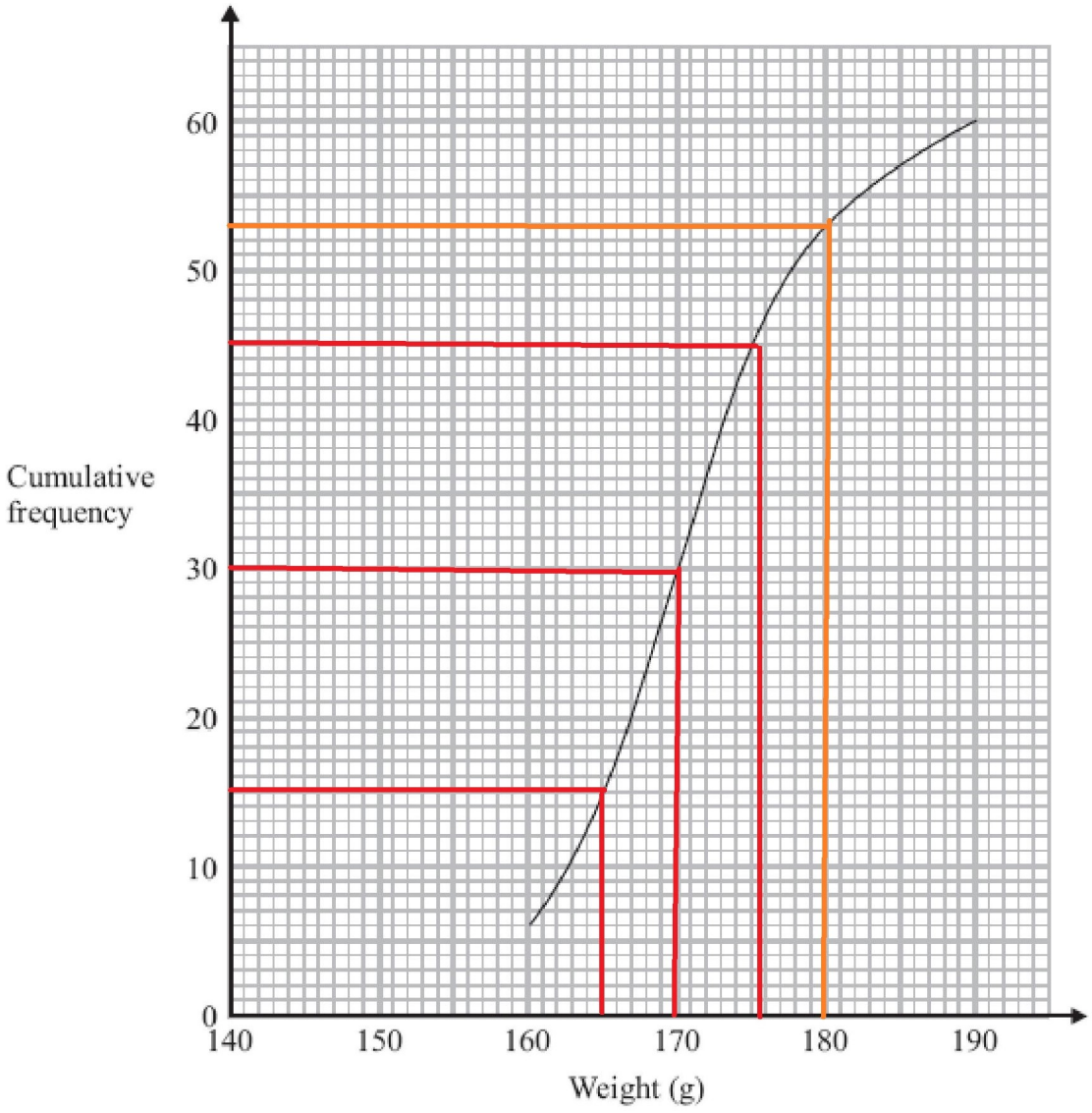
(7 marks)

3) Cumulative Frequency: Harder

4. Harry grows tomatoes.
This year he put his tomato plants into two groups, group A and group B.

Harry gave fertiliser to the tomato plants in group A.
He did not give fertiliser to the tomato plants in group B.

Harry weighed 60 tomatoes from group A.
The cumulative frequency graph shows some information about these weights.



ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

ii) The Upper Quartile 175 .....

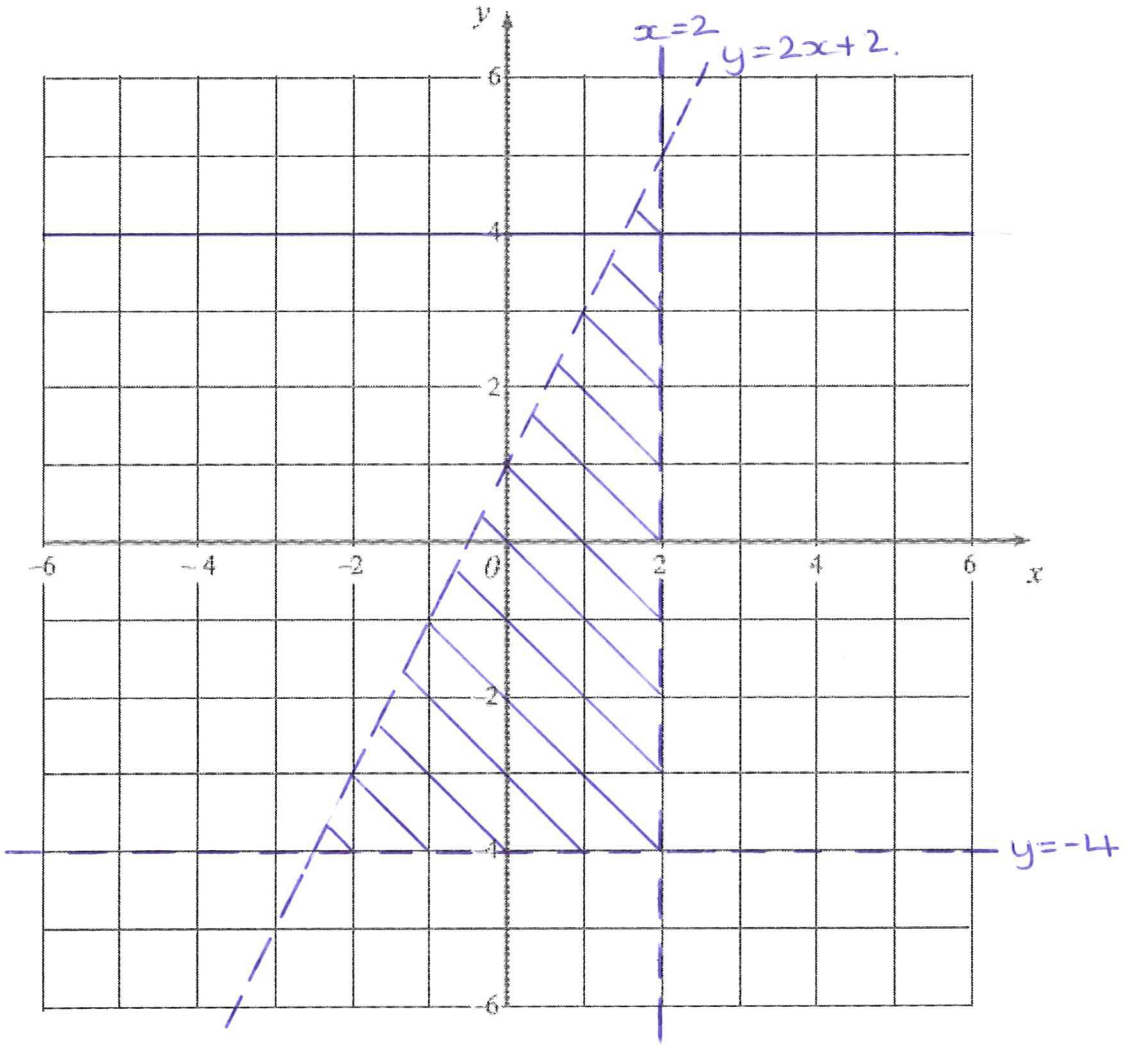
(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

4) Inequalities Regions: Easier

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

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



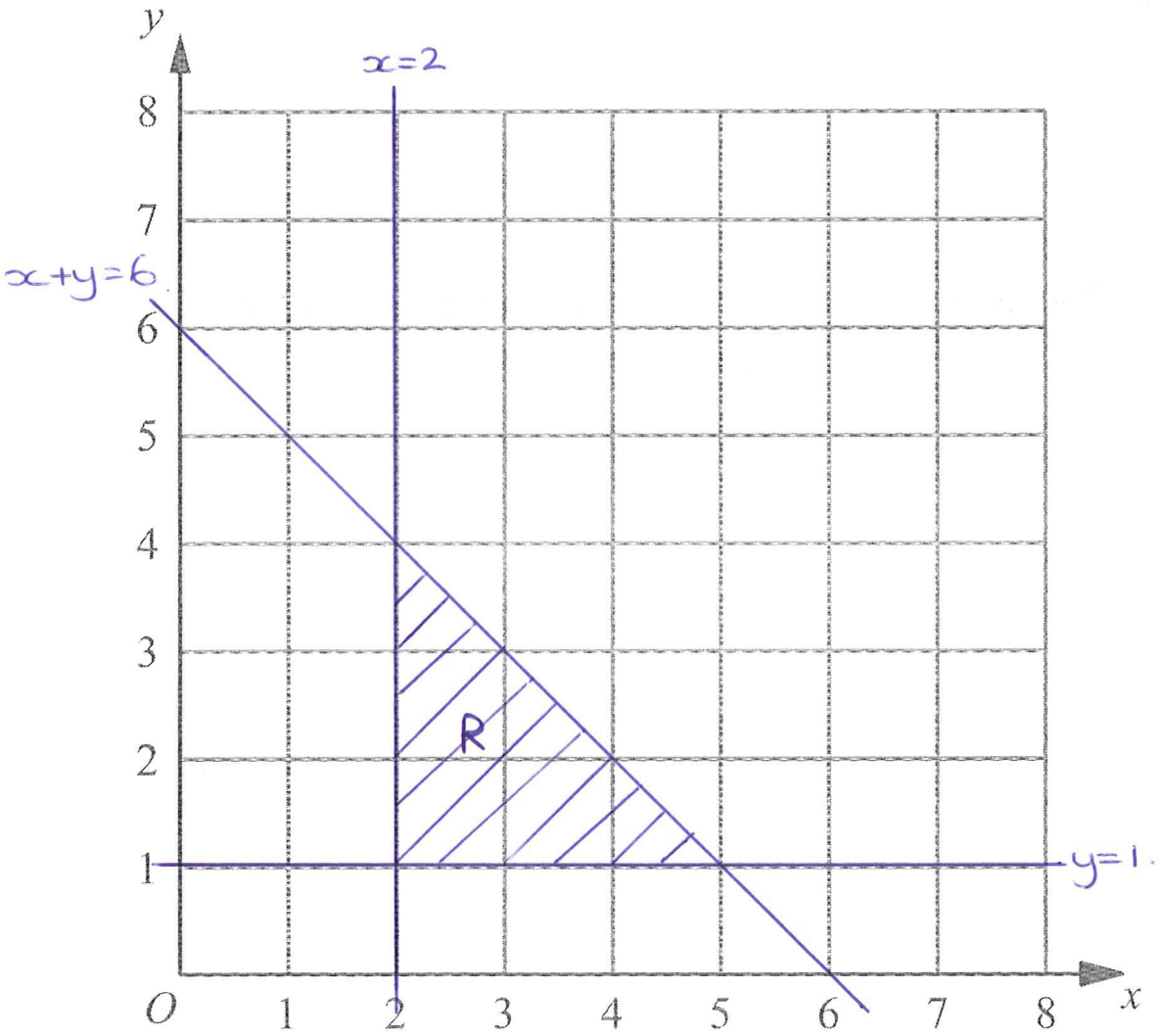
(Total for Question 19 = 4 marks)

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**.



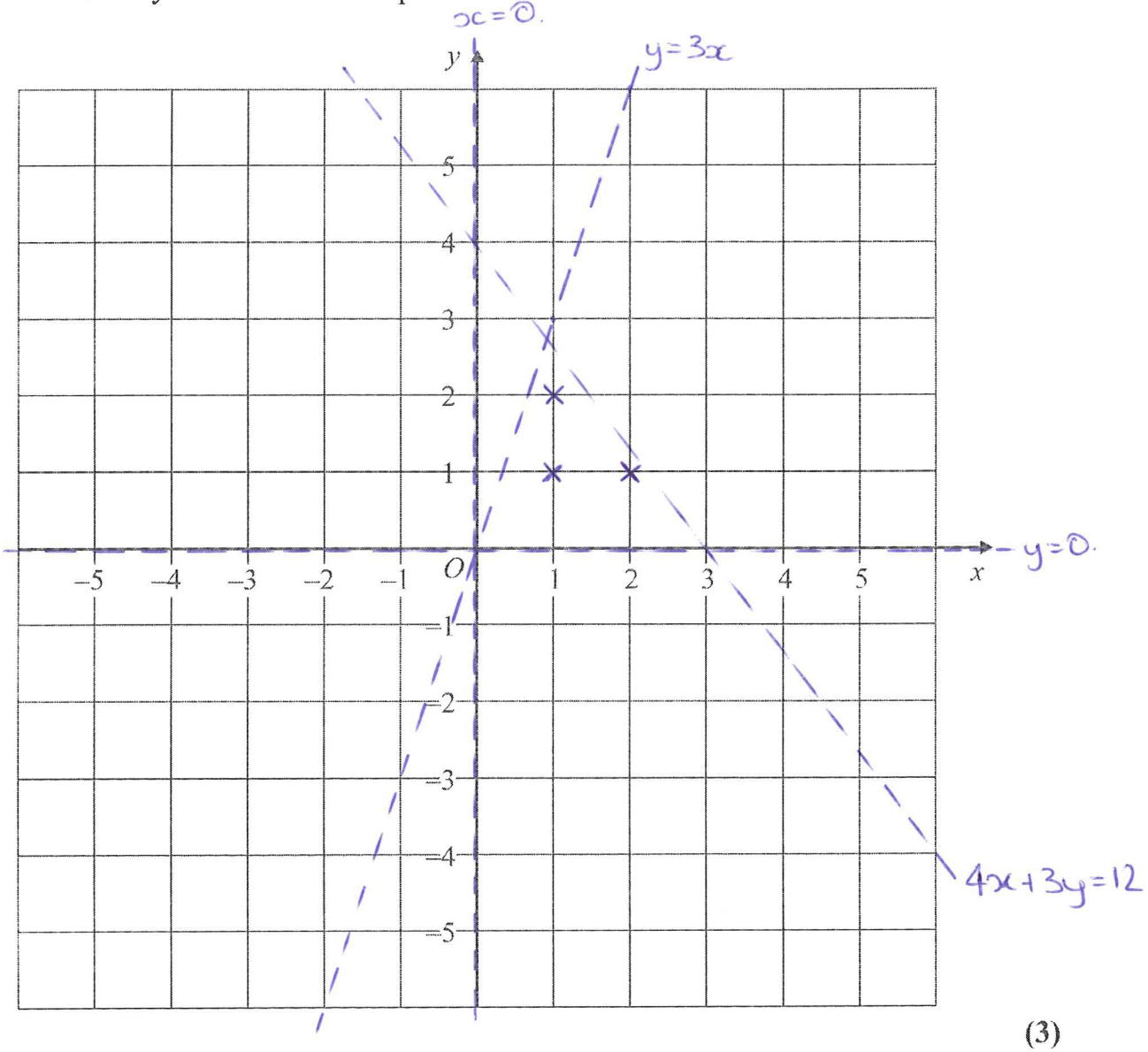
(Total 3 marks)

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 (×), each of the **three** points which satisfy **all** these four inequalities.

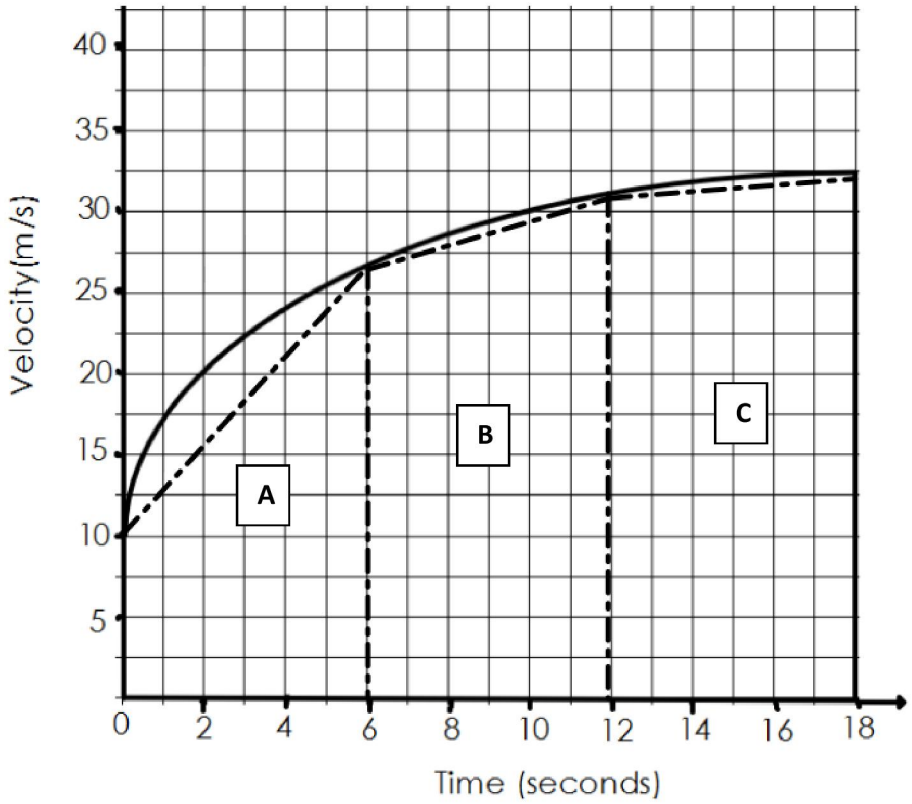


(3)

(Total 5 marks)

5) Areas under velocity time graph: Easier

1) The graph below shows a velocity time graph



1) a) By estimating the area under the graph using the three trapezia shown by dashed lines, work out the distance travelled in the 18 seconds.

Area of trapezium $= \frac{1}{2}(a + b)h$

Area of trapezium A $= \frac{1}{2}(10 + 27)(6) = 111$

Area of trapezium B $= \frac{1}{2}(27 + 31)(6) = 174$

Area of trapezium A $= \frac{1}{2}(31 + 32.5)(6) = 190.5$

Total Area under graph $= 111 + 174 + 190.5 = 475.5$

475.5metres travelled in 18 seconds

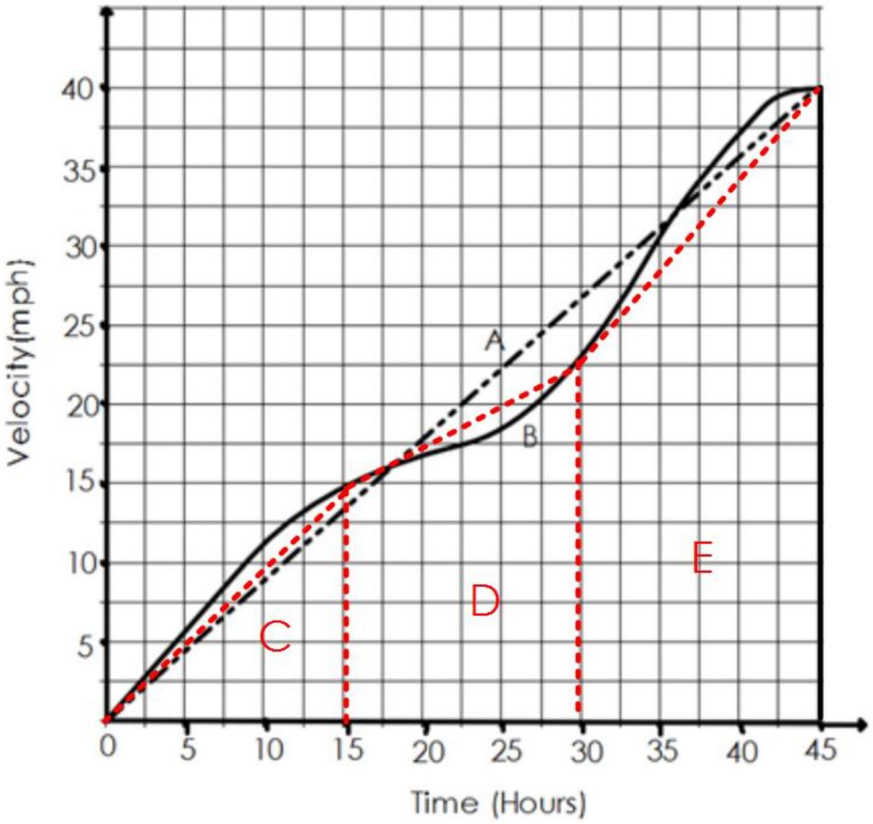
b) By considering the diagram, is your estimate for the distance an overestimate or underestimate? Explain your reasoning.

As each of the trapezia are a smaller area than the actual area, the estimate is an underestimate

(4 marks)

5) Areas under velocity time graph: Medium

2) The graph below shows a velocity time graph for two birds, A and B, over a long distance.



Which bird travels further in the 45 hours? You must show your working. Use 3 equal strips for your estimate for bird B. Comment on the reliability of your answer.

Distance travelled by bird A

Area of triangle $A = \frac{40 \times 45}{2} = 900$

Distance travelled by bird B

$$\text{Triangle C} = \frac{15 \times 15}{2} = 112.5$$

$$\text{Trapezium D} = \frac{1}{2}(15 + 22.5)(15) = 281.25$$

$$\text{Trapezium E} = \frac{1}{2}(22.5 + 40)(15) = 468.75$$

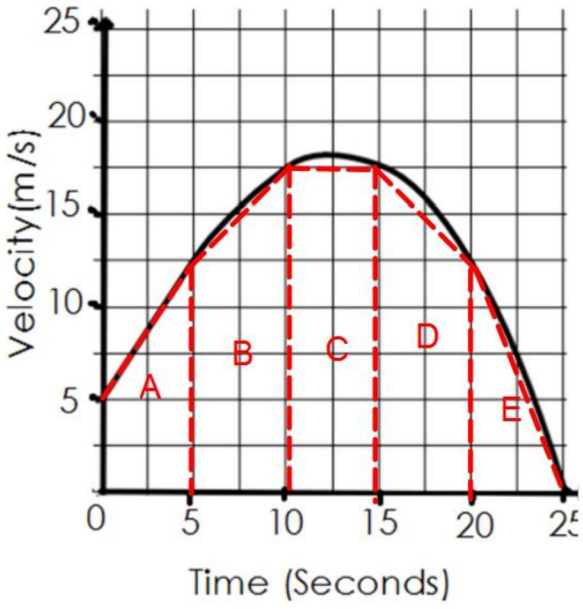
Total area under curve B is 862.5, so bird A travelled further. However, the area under the curve is an estimate and only uses three strips so not very reliable.

(4 marks)

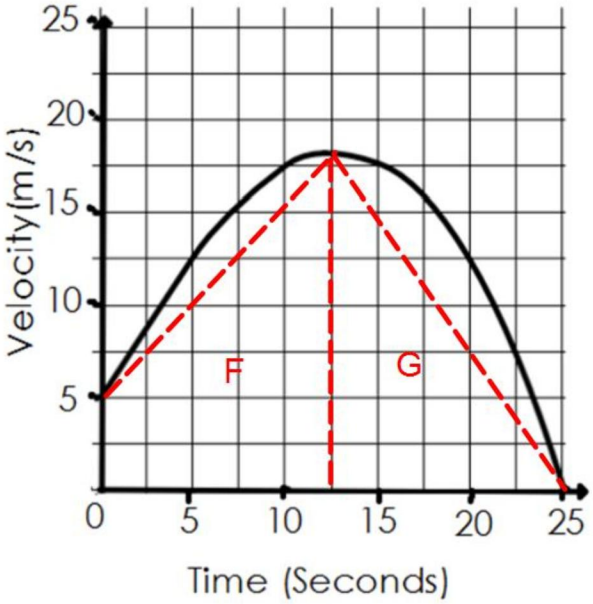
5) Areas under velocity time graph: Harder

3) The graph below shows a velocity-time graph for a drone.

Anna's method



Simone's method



a) Anna works out the distance travelled by using 3 trapezia, a rectangle and a triangle, all of equal width. Simone divides it into a triangle and a trapezium, both of equal width. Find an estimate of the distance using both Anna and Simone's method.

Anna's method :

Area $= \frac{1}{2}(5 + 12.5)(5) + \frac{1}{2}(12.5 + 17.5)(5) + (5 \times 17.5) + \frac{1}{2}(17.5 + 12.5)(5) + \frac{1}{2}(5 \times 12.5)$

Area = 43.75+ 75 + 87.5 + 75+ 31.25

Area = 312.5, distance 312.5 metres

Simone's method:

Area $= \frac{1}{2}(5 + 18)(12.5) + \frac{1}{2}(18 \times 12.5)$

Area = 143.75+ 112.5

Area =256.25 distance 256.25metres

b) Comment on which method you think gives the most reliable results.
Anna's method is more reliable as she has used more strips. we can see from the graph Simone's method is a big underestimate.

(4 marks)

GREGG Samuel

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	25 from 28	3 from 3	17 from 20	1 from 1	4 from 4	0 from 0
A02 and 3	47 from 52	12 from 12	5 from 9	12 from 13	16 from 16	2 from 2
Total	72 from 80	15 from 15	22 from 29	13 from 14	20 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Cumulative Frequency. Mathswatch Clip: 186

Topic 2: Inequalities Regions. Mathswatch Clip: 198

Topic 3: Areas under velocity time graph. MW: 216

Topic 4: Transformations of Functions. Mathswatch Clip: 196

Topic 5: Extention1. Mathswatch Clip:

1) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

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Age (A) in years	Cumulative frequency
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$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

..... 41 ..... years

(2)

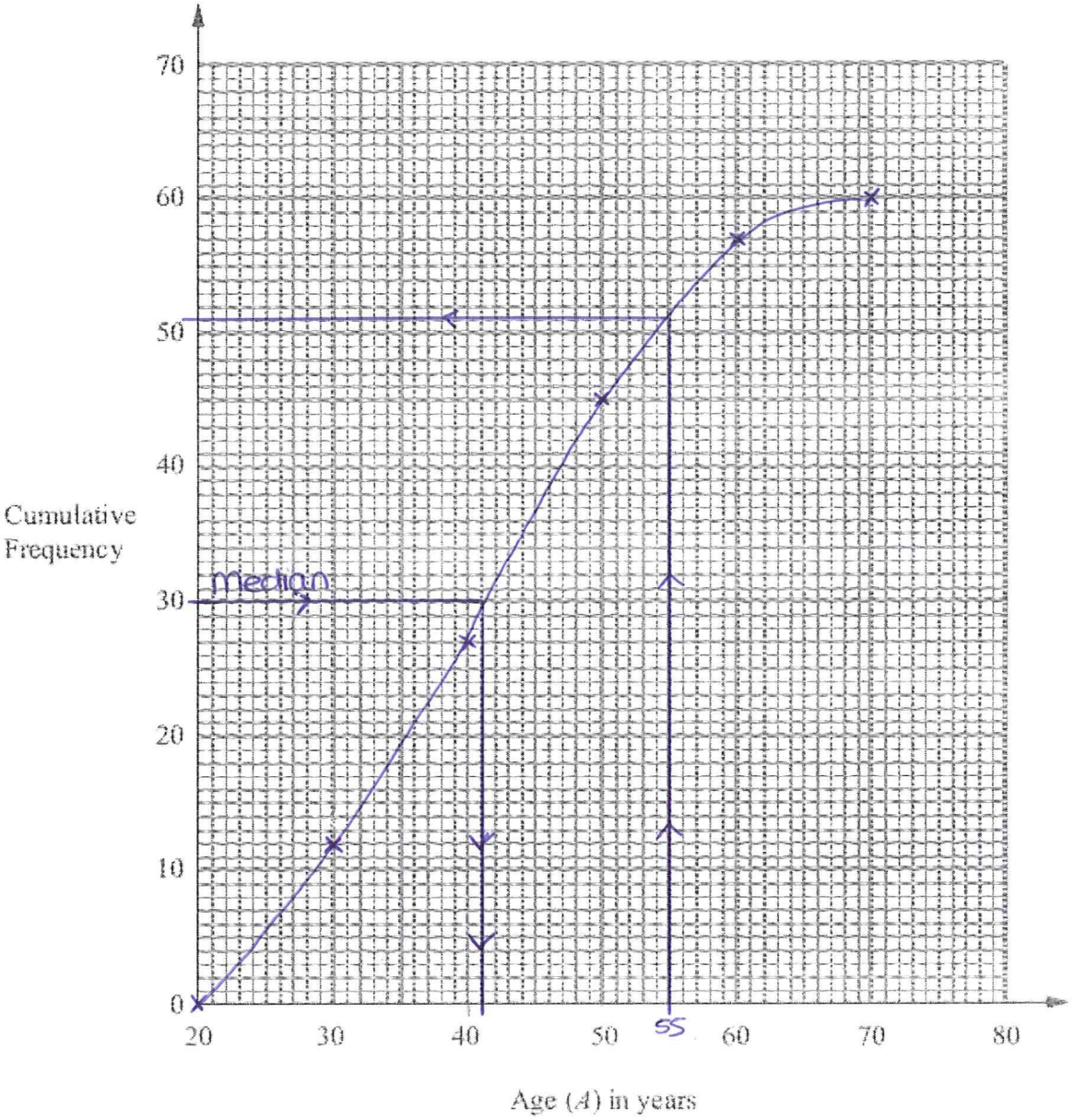
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so $60 - 51 = 9$ are older.

..... 9 .....

(2)

1) Cumulative Frequency: Medium



(7 marks)

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1) Cumulative Frequency: Harder

4. Harry grows tomatoes.
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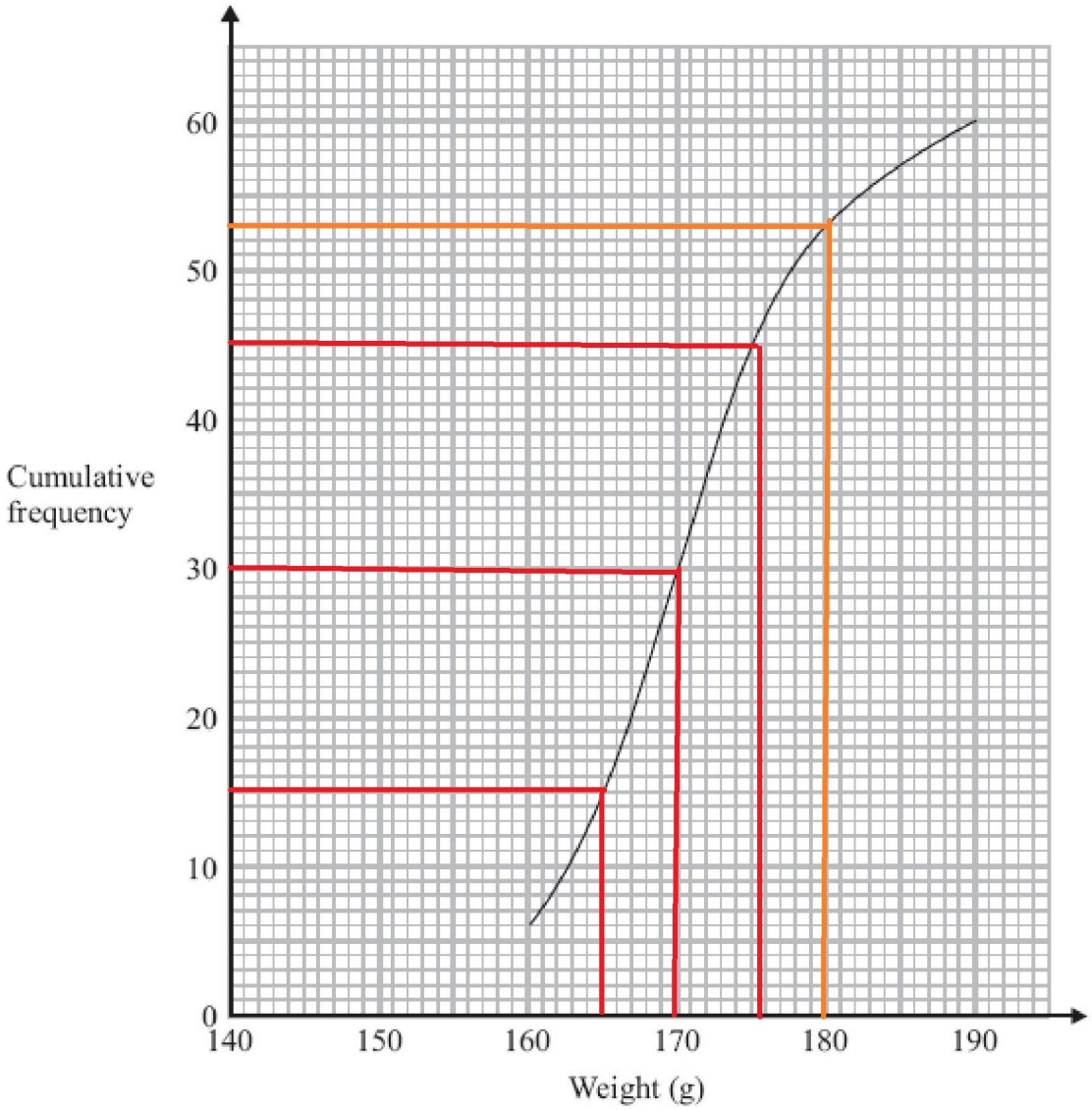


ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

ii) The Upper Quartile 175 .....

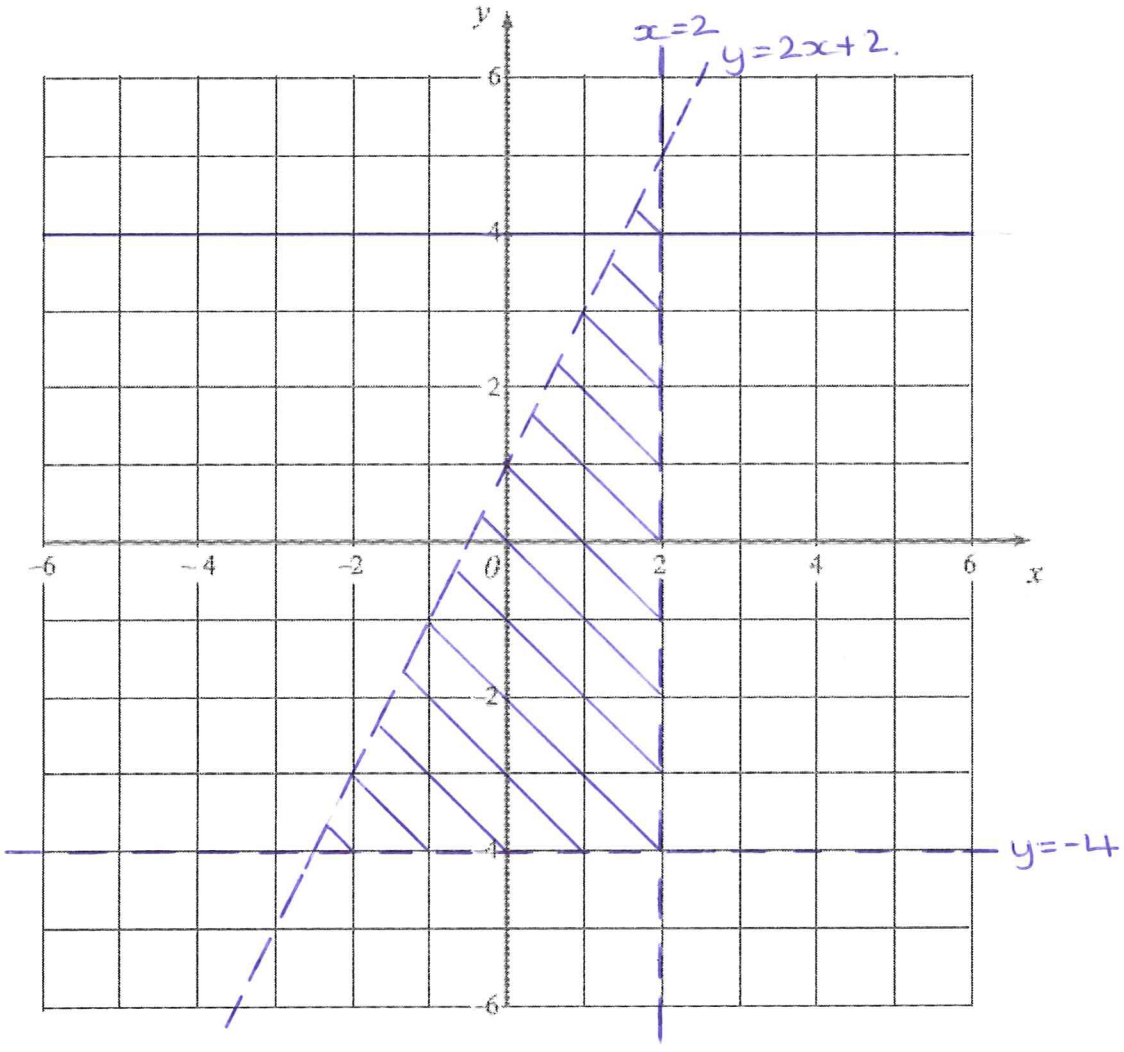
(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

2) Inequalities Regions: Easier

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

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

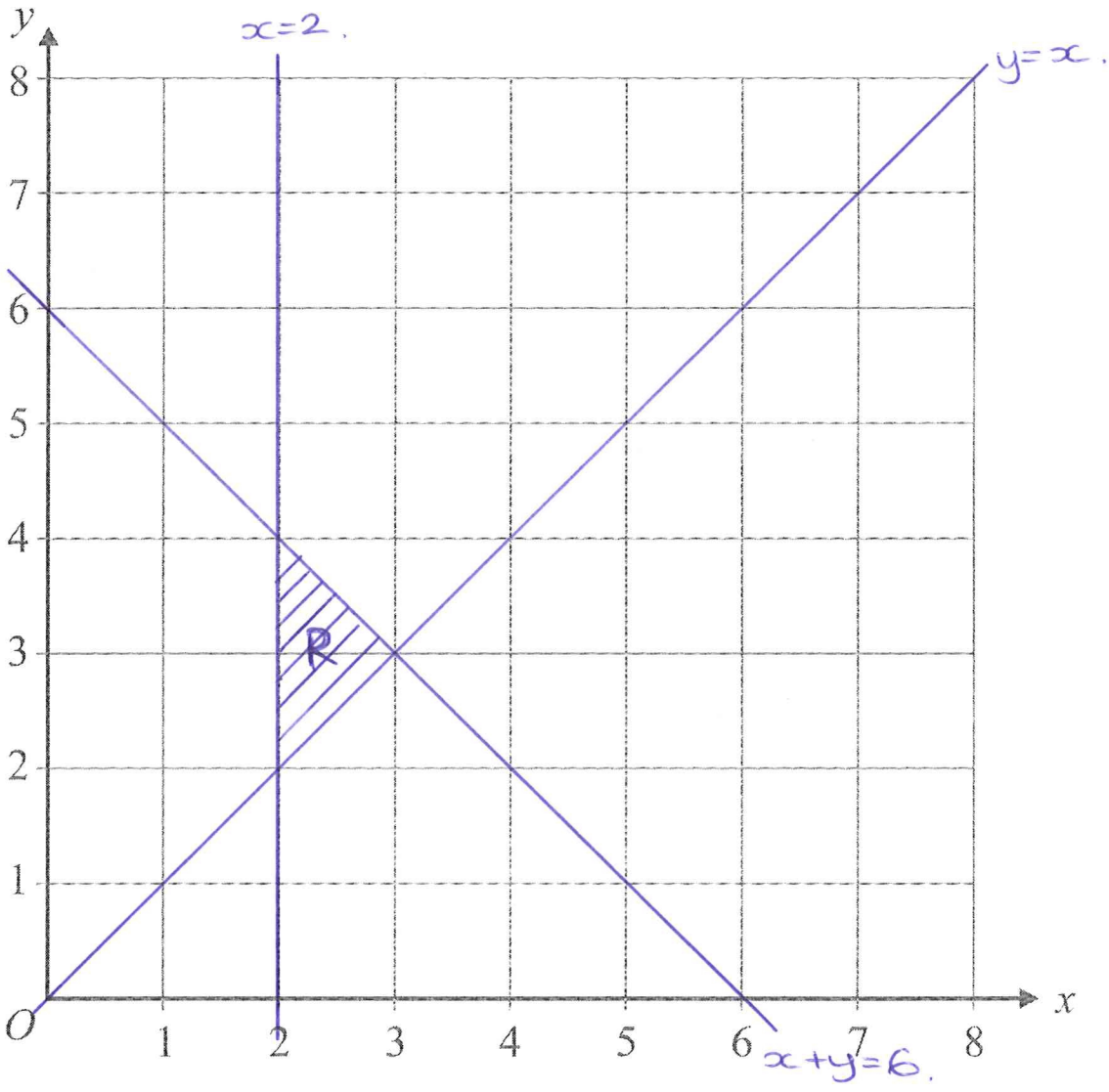


(Total for Question 19 = 4 marks)

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

$$x \geq 2 \qquad y \geq x \qquad x + y \leq 6$$



(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)

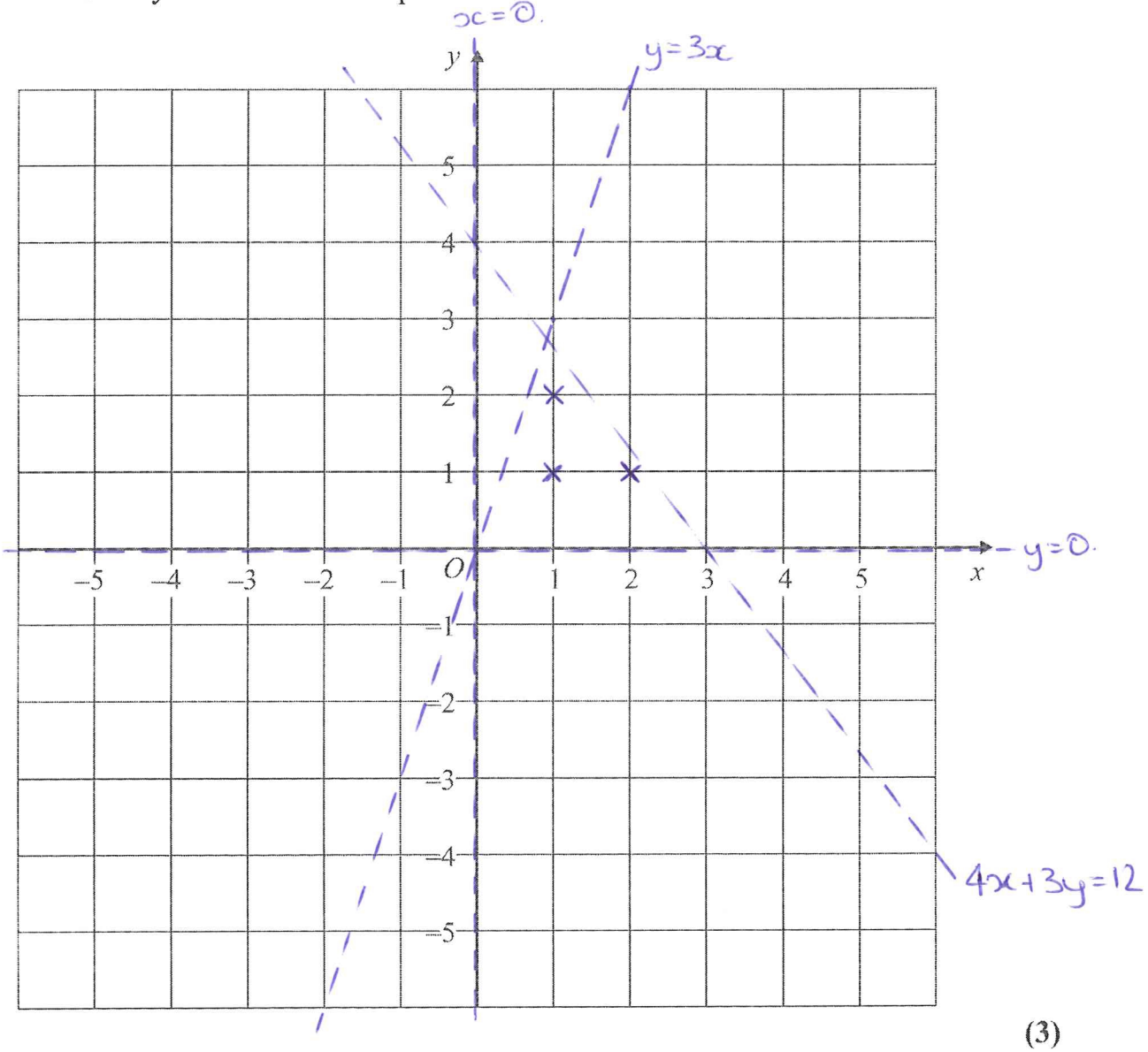
(Total 5 marks)

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 (×), each of the **three** points which satisfy **all** these four inequalities.

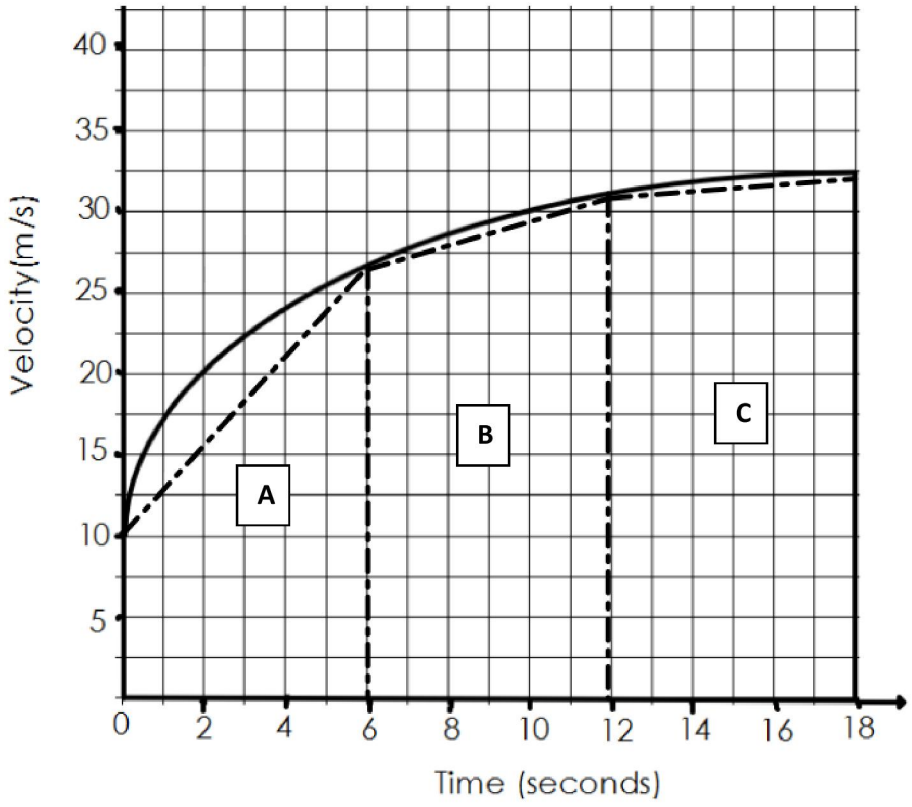


(3)

(Total 5 marks)

3) Areas under velocity time graph: Easier

1) The graph below shows a velocity time graph



1) a) By estimating the area under the graph using the three trapezia shown by dashed lines, work out the distance travelled in the 18 seconds.

Area of trapezium $= \frac{1}{2}(a + b)h$

Area of trapezium A $= \frac{1}{2}(10 + 27)(6) = 111$

Area of trapezium B $= \frac{1}{2}(27 + 31)(6) = 174$

Area of trapezium A $= \frac{1}{2}(31 + 32.5)(6) = 190.5$

Total Area under graph $= 111 + 174 + 190.5 = 475.5$

475.5metres travelled in 18 seconds

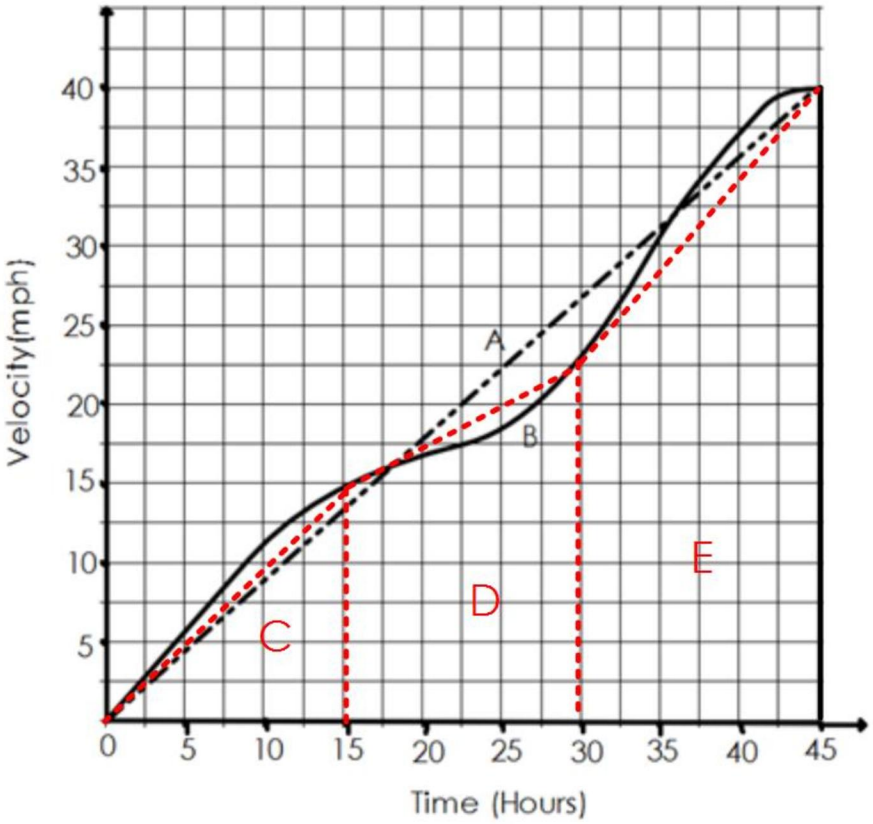
b) By considering the diagram, is your estimate for the distance an overestimate or underestimate? Explain your reasoning.

As each of the trapezia are a smaller area than the actual area, the estimate is an underestimate

(4 marks)

3) Areas under velocity time graph: Medium

2) The graph below shows a velocity time graph for two birds, A and B, over a long distance.



Which bird travels further in the 45 hours? You must show your working. Use 3 equal strips for your estimate for bird B. Comment on the reliability of your answer.

Distance travelled by bird A

Area of triangle $A = \frac{40 \times 45}{2} = 900$

Distance travelled by bird B

$$\text{Triangle C} = \frac{15 \times 15}{2} = 112.5$$

$$\text{Trapezium D} = \frac{1}{2}(15 + 22.5)(15) = 281.25$$

$$\text{Trapezium E} = \frac{1}{2}(22.5 + 40)(15) = 468.75$$

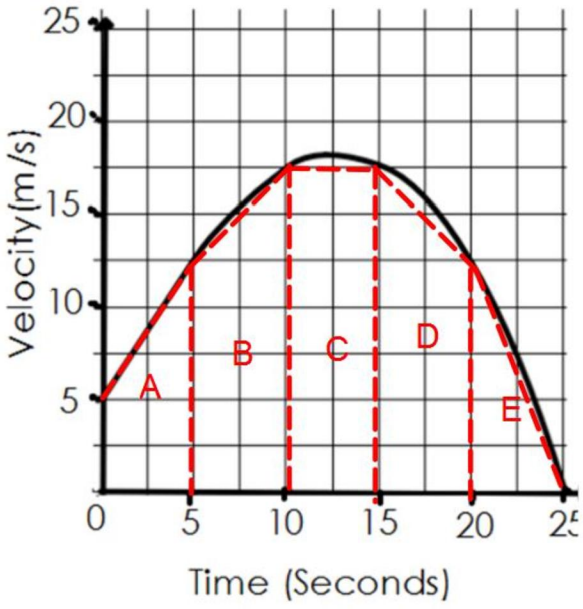
Total area under curve B is 862.5, so bird A travelled further. However, the area under the curve is an estimate and only uses three strips so not very reliable.

(4 marks)

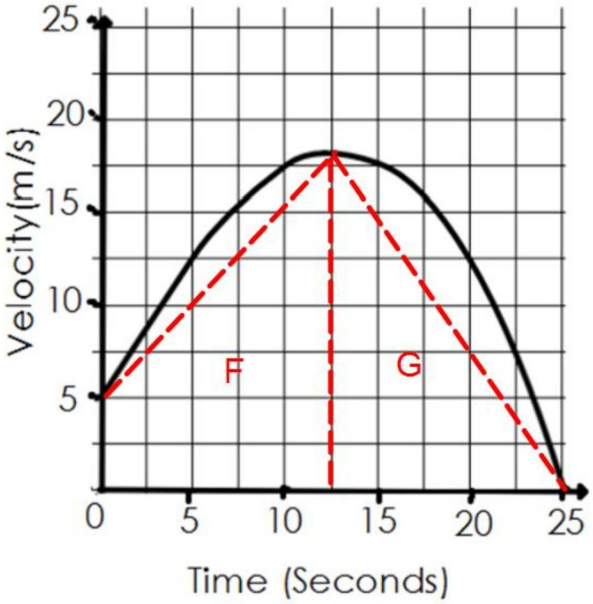
3) Areas under velocity time graph: Harder

3) The graph below shows a velocity-time graph for a drone.

Anna's method



Simone's method



a) Anna works out the distance travelled by using 3 trapezia, a rectangle and a triangle, all of equal width. Simone divides it into a triangle and a trapezium, both of equal width. Find an estimate of the distance using both Anna and Simone's method.

Anna's method :

Area $= \frac{1}{2}(5 + 12.5)(5) + \frac{1}{2}(12.5 + 17.5)(5) + (5 \times 17.5) + \frac{1}{2}(17.5 + 12.5)(5) + \frac{1}{2}(5 \times 12.5)$

Area = 43.75+ 75 + 87.5 + 75+ 31.25

Area = 312.5, distance 312.5 metres

Simone's method:

Area $= \frac{1}{2}(5 + 18)(12.5) + \frac{1}{2}(18 \times 12.5)$

Area = 143.75+ 112.5

Area =256.25 distance 256.25metres

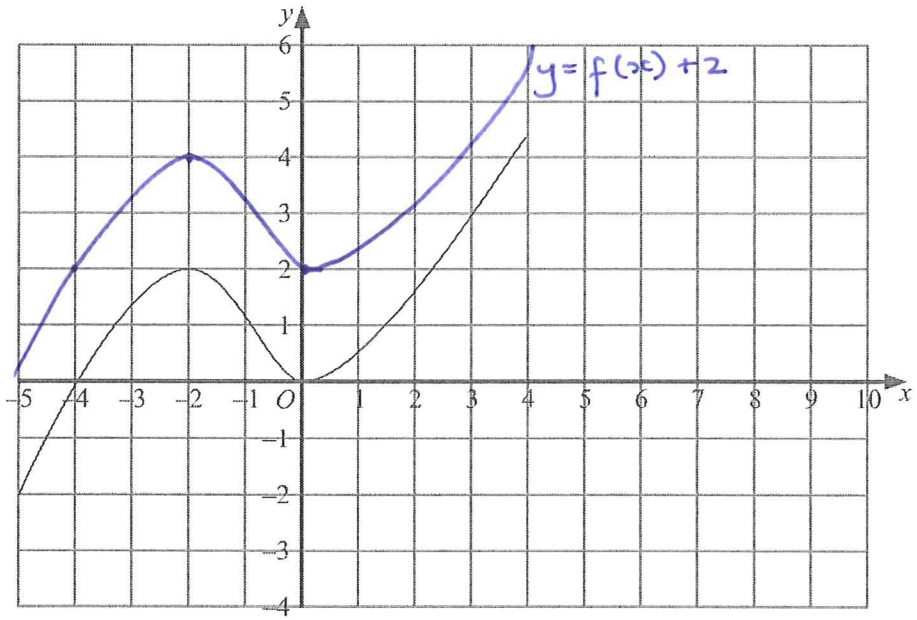
b) Comment on which method you think gives the most reliable results.
Anna's method is more reliable as she has used more strips. we can see from the graph Simone's method is a big underestimate.

(4 marks)

4) Transformations of Functions: Easier

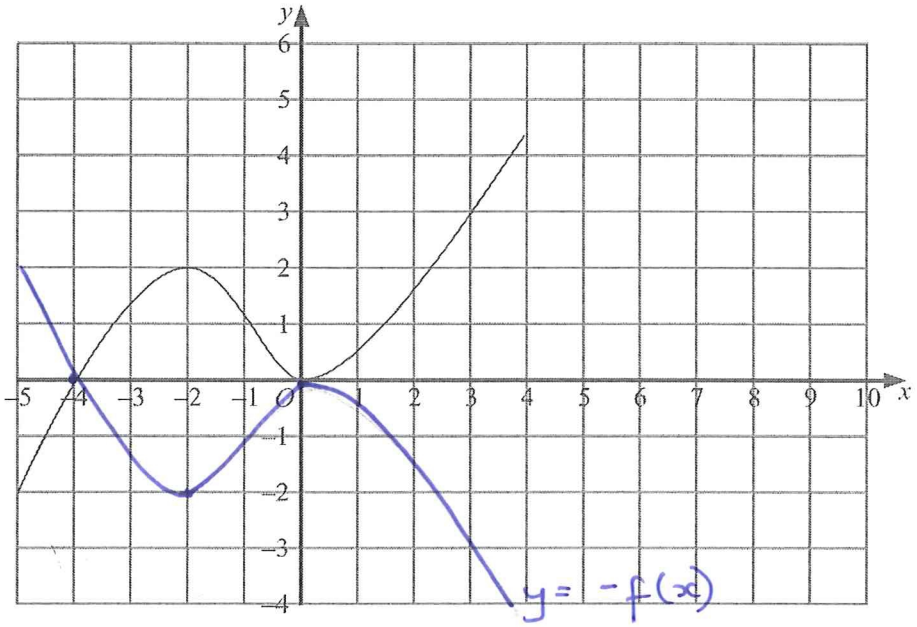
1. The graph of $y = f(x)$ is shown on the grids.

(a) On this grid, sketch the graph of $y = f(x) + 2$



(2)

(b) On this grid, sketch the graph of $y = -f(x)$

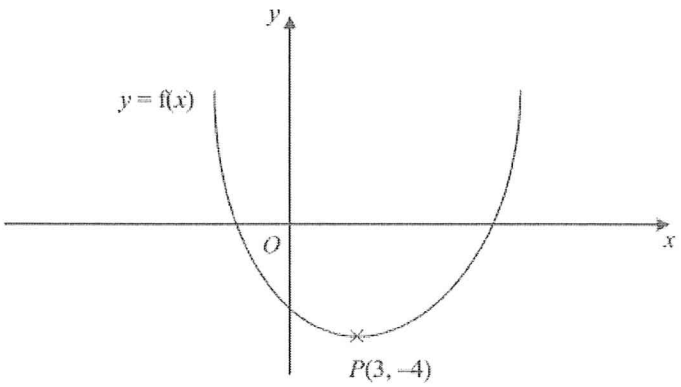


(2)

(4 marks)

4) Transformations of Functions: Medium

9. This is a sketch of the curve with the equation $y = f(x)$.
The only minimum point of the curve is at $P(3, -4)$.



(a) Write down the coordinates of the minimum point of the curve with the equation $y = f(x - 2)$.

(5 , -4)
(2)

(b) Write down the coordinates of the minimum point of the curve with the equation $y = f(x + 5) + 6$

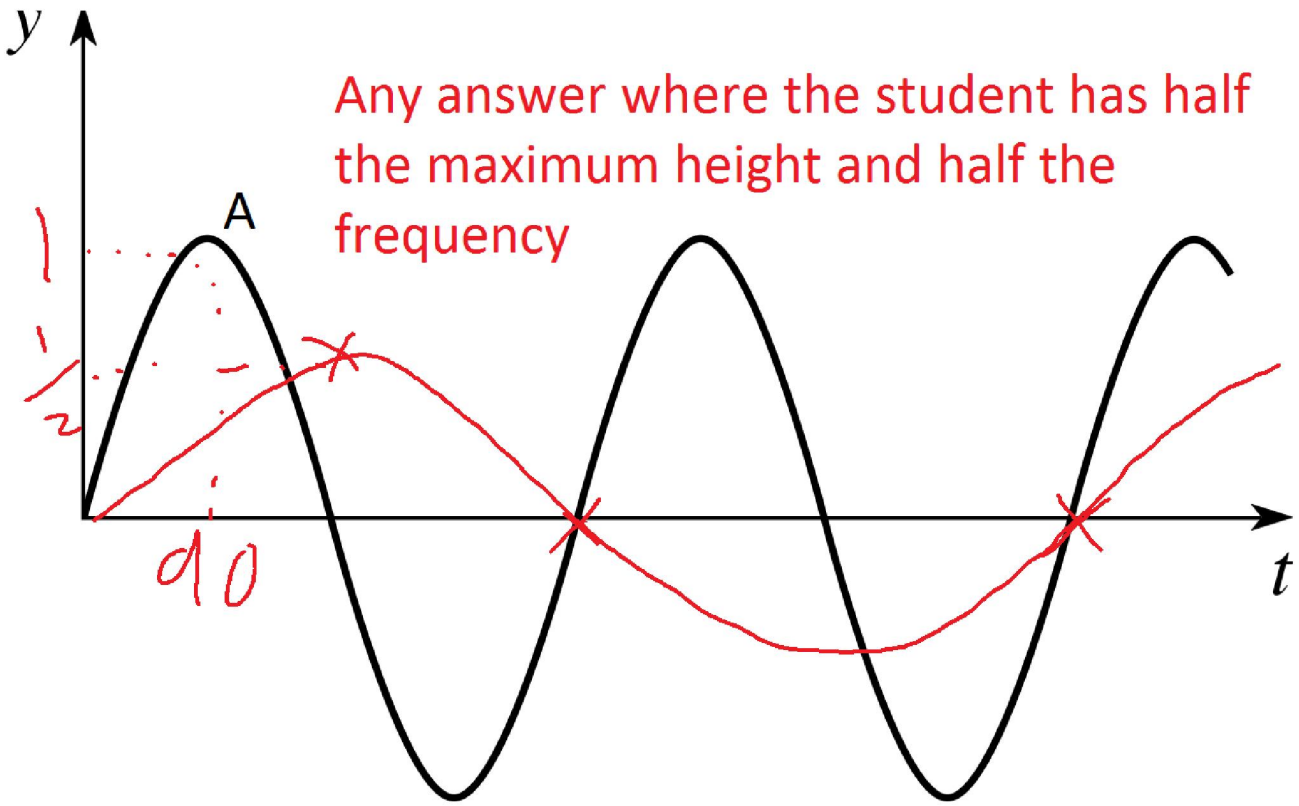
(-2 , 2)
(2)

(4 marks)

4) Transformations of Functions: Harder

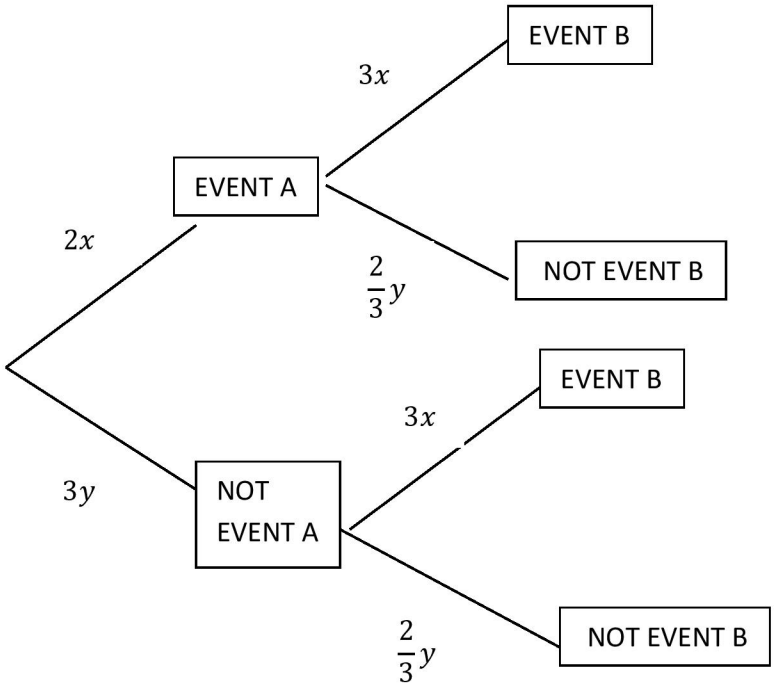
2) a) State the co-ordinates of A (90^o, 1) (2 marks)

b)



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

$$6x + 9y = 3$$

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

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

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

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

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

(4 marks)

5) Extention1: Medium

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

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

$$a = -b$$

$$a + b = 0$$

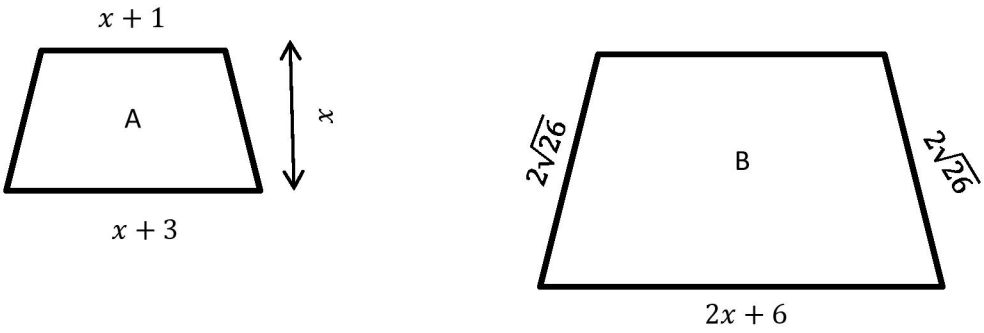
$$2(a + b) = 0$$

$$2a + 2b = 0$$

(3 marks)

5) Extention1: 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 $\frac{1}{2}(x+1+x+3)\times x$

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

$$x^2+2x = 35cm^2$$

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

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

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

The perimeter of Trapezium A is

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

When $x=5$ $\quad 4(5)+8+4\sqrt{26}$

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

(4 marks)

GRIFFIN Joshua

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	22 from 28	2 from 3	15 from 20	1 from 1	4 from 4	0 from 0
A02 and 3	41 from 52	10 from 12	6 from 9	13 from 13	10 from 16	2 from 2
Total	63 from 80	12 from 15	21 from 29	14 from 14	14 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Expand double brackets. Mathswatch Clip: 134b

Topic 2: Standard Form. Mathswatch Clip: 83

Topic 3: Product of Prime Factors, HCF, LCM. MW: 78

Topic 4: Inequalities Regions. Mathswatch Clip: 198

Topic 5: Composite functions. Mathswatch Clip: 215

1) Expand double brackets: Easier

Solution for Question 1:

$(x + 3)(x + 2)$
$x^2 + 3x + 2x + 6$
$x^2 + 5x + 6$

Solution for Question 2:

a) $(x + 2)(x + 6)$
$x^2 + 2x + 6x + 12$
$x^2 + 8x + 12$

b) $(x + 2)(x - 6)$
$x^2 + 2x - 6x - 12$
$x^2 - 4x - 12$

c) $(x - 2)(x - 6)$
$x^2 - 2x - 6x + 12$
$x^2 - 8x + 12$

1) Expand double brackets: Medium

Solution for Question 3:

a) $(3x + 1)(x + 2)$
$3x^2 + 6x + x + 2$
$3x^2 + 7x + 2$

b) $(3x - 1)(x + 2)$
$3x^2 + 6x - x - 2$
$3x^2 + 5x - 2$

c) $(3x + 1)(3x + 2)$
$9x^2 + 6x + 3x + 2$
$9x^2 + 9x + 2$

Solution for Question 4:

a) $(3 - x)(2x + 1)$
$6x + 3 - 2x^2 - x$
$-2x^2 + 5x + 3$

b) $(5 - 2x)(3 - x)$
$15 - 5x - 6x + 2x^2$
$2x^2 - 11x + 15$

c) $(2x - 3)(2x + 3)$
$4x^2 + 6x - 6x - 9$
$4x^2 - 9$

1) Expand double brackets: Harder

Solution for Question 5:

$(x+5)(2x+3) - 3(x-2)(6x+5)$
$2x^2 + 3x + 10x + 15 - 3[6x^2 + 5x - 12x - 10]$
$2x^2 + 3x + 10x + 15 - 18x^2 - 15x + 36x + 30$
$-16x^2 + 34x + 45$

Solution for Question 6:

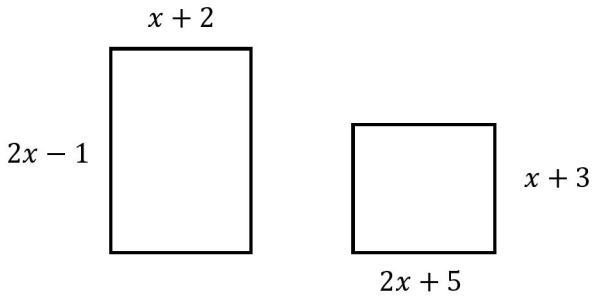
$\times$	$3x$	4
$2x$	$6x^2$	$8x$
-1	$-3x$	-4

$6x^2 + 8x - 3x - 4$
$6x^2 + 5x - 4$

He has added the terms $2x$ and $3x$ instead of multiplying. He has missed of a negative on $3x$

Solution for Question 7:

Split shape into 2



$2x + 5 = 3x + 7 - (x + 2)$

Area:

$(x+2)(2x-1) + (x+3)(2x+5)$

$2x^2 - x + 4x - 2 + 2x^2 + 5x + 6x + 15$

$4x^2 + 14x + 13$

2) Standard Form: Easier

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

(1)

3.7×10^{-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.

$2.1 \times 10^8 \times 6 \times 10^{-5}$

$= 12.6 \times 10^3$

$= 1.26 \times 10^4$

1.26×10^4 (2)

(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.

$2 \times 10^7 \times 8 \times 10^{-12}$

$= 16 \times 10^{-5}$

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

1.6×10^{-4}

(2)

(3 marks)

2) Standard Form: Medium

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

$x = 8.5 \times 10^9$
$y = 4 \times 10^8$

Find the value of p.
Give your answer in standard form correct to 2 significant figures.

$p^2 = \dfrac{8.5\times10^9 - 4\times10^8}{8.5\times10^9 \times 4\times10^8} = \dfrac{8.1\times10^9}{3.4\times10^{18}}$

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

$= 2.4\times10^{-9}$ (2sf).

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

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

$= 4.9\times10^{-5}$ (2sf)

4.9×10^{-5} (2sf)

(4 marks)

---

16. $y^2 = \dfrac{ab}{a + b}$

$a = 3 \times 10^8$
$b = 2 \times 10^7$

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

$y^2 = \dfrac{3\times10^8 \times 2\times10^7}{3\times10^8 + 2\times10^7}$

$= \dfrac{6\times10^{15}}{3.2\times10^8}$

$= 18750000$

$y = \sqrt{18750000}$

$= 4330.127...$

$= 4300$ (2sf)

$= 4.3\times10^3$ (2sf)

$y = 4.3\times10^3$ (2sf)

(4 marks)

---

2) 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?

$-1 - -3 = 2$

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

$$= 0.5 \times 10^{2}$$

$$= 5 \times 10^{3}$$

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.

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

$D = ST$

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

$= 13.244 \times 10^{22}$

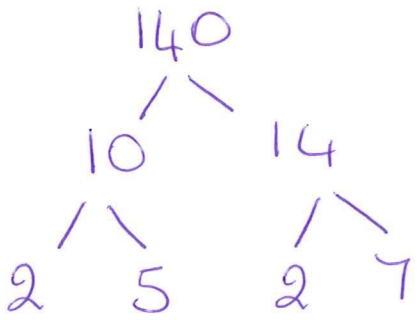
$= 1.3244 \times 10^{23}$

1.3244×10^{23} ..... km

(3 marks)

3) Product of Prime Factors, HCF, LCM: Easier

1. Write 140 as the product of its prime factors.



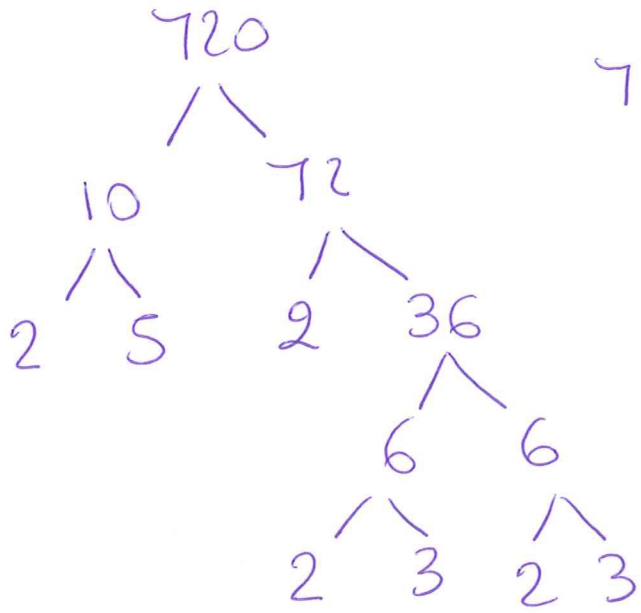
$140 = 2 \times 2 \times 5 \times 7$

$2^2 \times 5 \times 7$

.....

(2 marks)

2. Write 720 as a product of its prime factors.



$720 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$

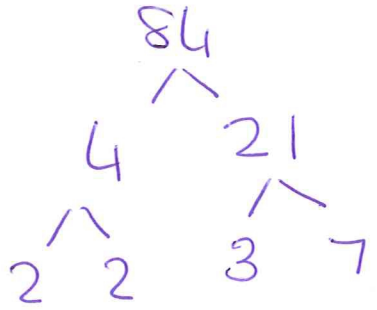
$2^4 \times 3^2 \times 5$

.....

(2 marks)

3) Product of Prime Factors, HCF, LCM: Medium

8. (a) Express 84 as a product of its prime factors.



$2^2 \times 3 \times 7$

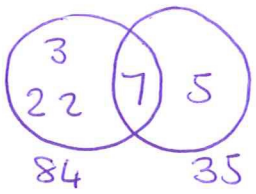
(3)

(b) Find the Highest Common Factor (HCF) of 84 and 35

$84 = 2^2 \times 3 \times 7$

$35 = \quad \times 7$

HCF



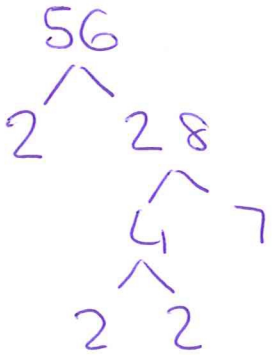
7

(2)

(5 marks)

---

9. (a) Express 56 as the product of its prime factors.



$56 = 2 \times 2 \times 2 \times 7$

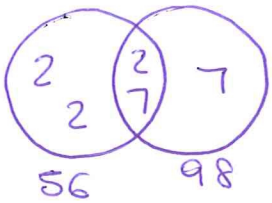
$2^3 \times 7$

(2)

(b) Find the Lowest Common Multiple of 56 and 98

$56 = 2^3 \times 7$

$98 = 2 \times 7 \times 7$



$LCM = 2 \times 2 \times 2 \times 7 \times 7$

$= 392$

392

(2)

(4 marks)

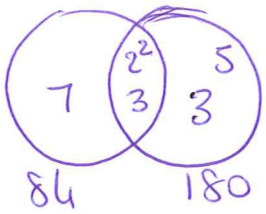
3) Product of Prime Factors, HCF, LCM: Harder

10. Find the Highest Common Factor (HCF) of 84 and 180

$84 = 2^2 \times 3 \times 7$

$180 = 2^2 \times 3^2 \times 5$

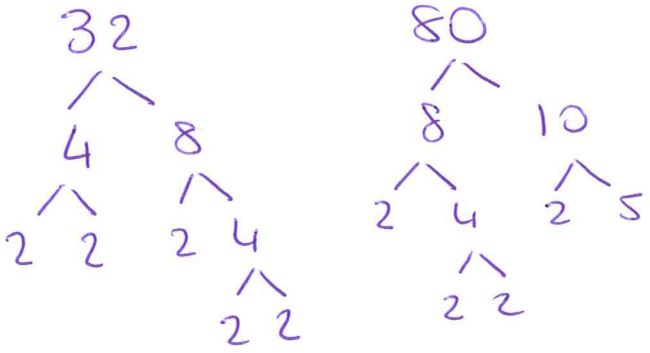
$HCF = 2^2 \times 3 = 12$



12

(3 marks)

11. Find the Highest Common Factor (HCF) of 32 and 80



$HCF = 2^4 = 16$

$32 = 2^5$

$80 = 2^4 \times 5$

$32 = 2 \times 2 \times 2 \times 2 \times 2$

$80 = 2 \times 2 \times 2 \times 2 \times 5$

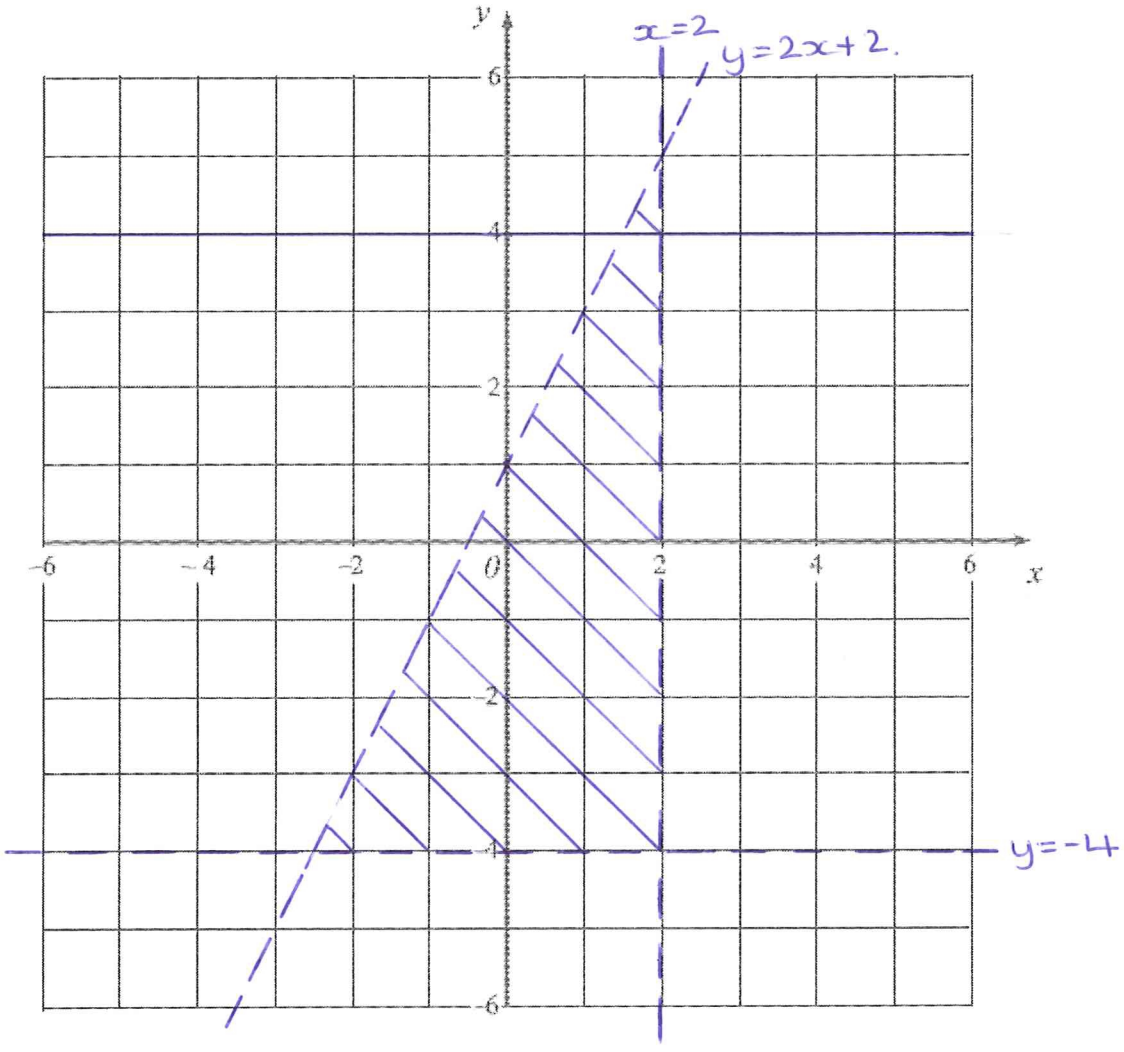
16

(3 marks)

4) Inequalities Regions: Easier

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

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

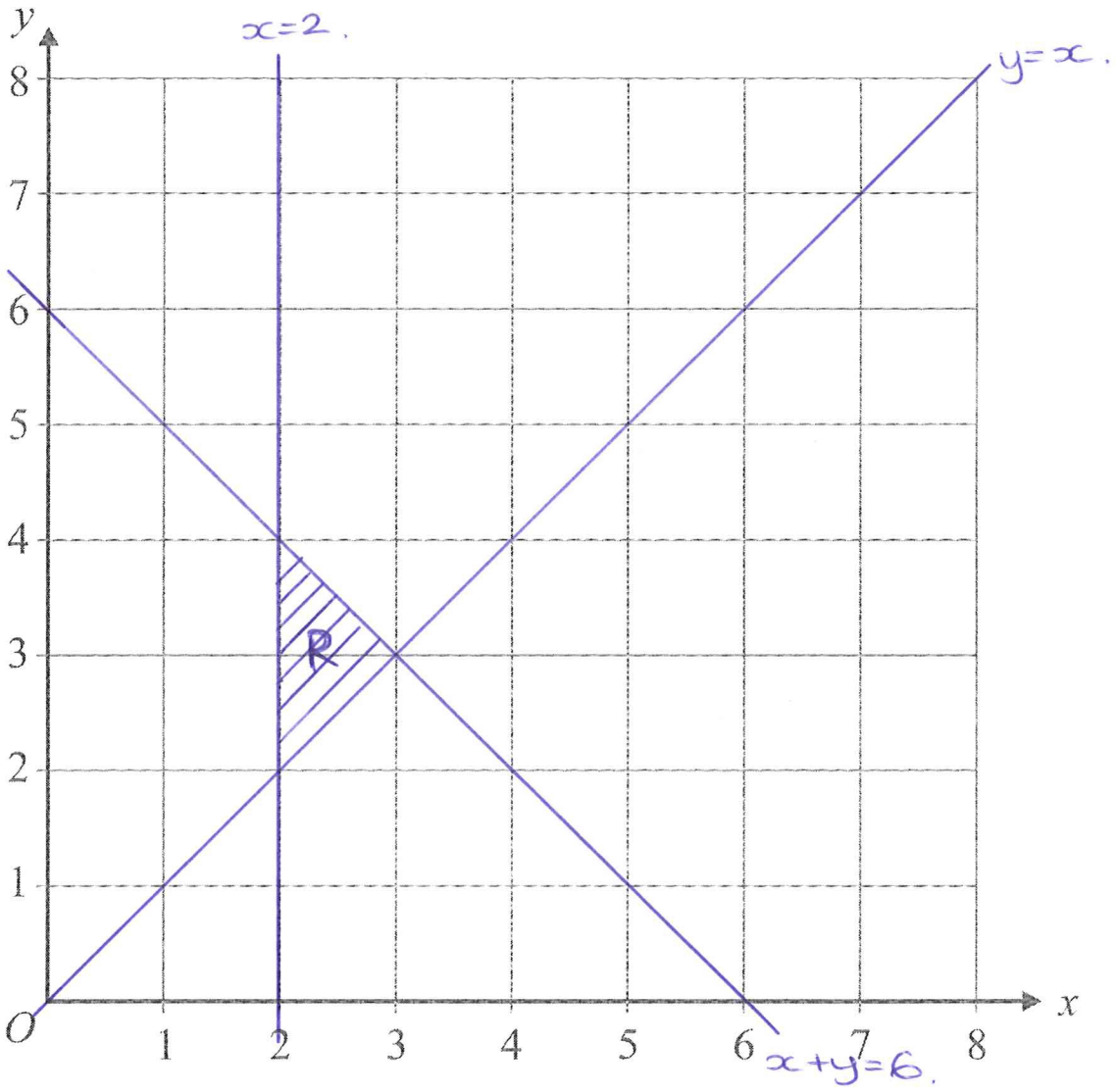


(Total for Question 19 = 4 marks)

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

$$x \geq 2 \qquad y \geq x \qquad x + y \leq 6$$



(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)

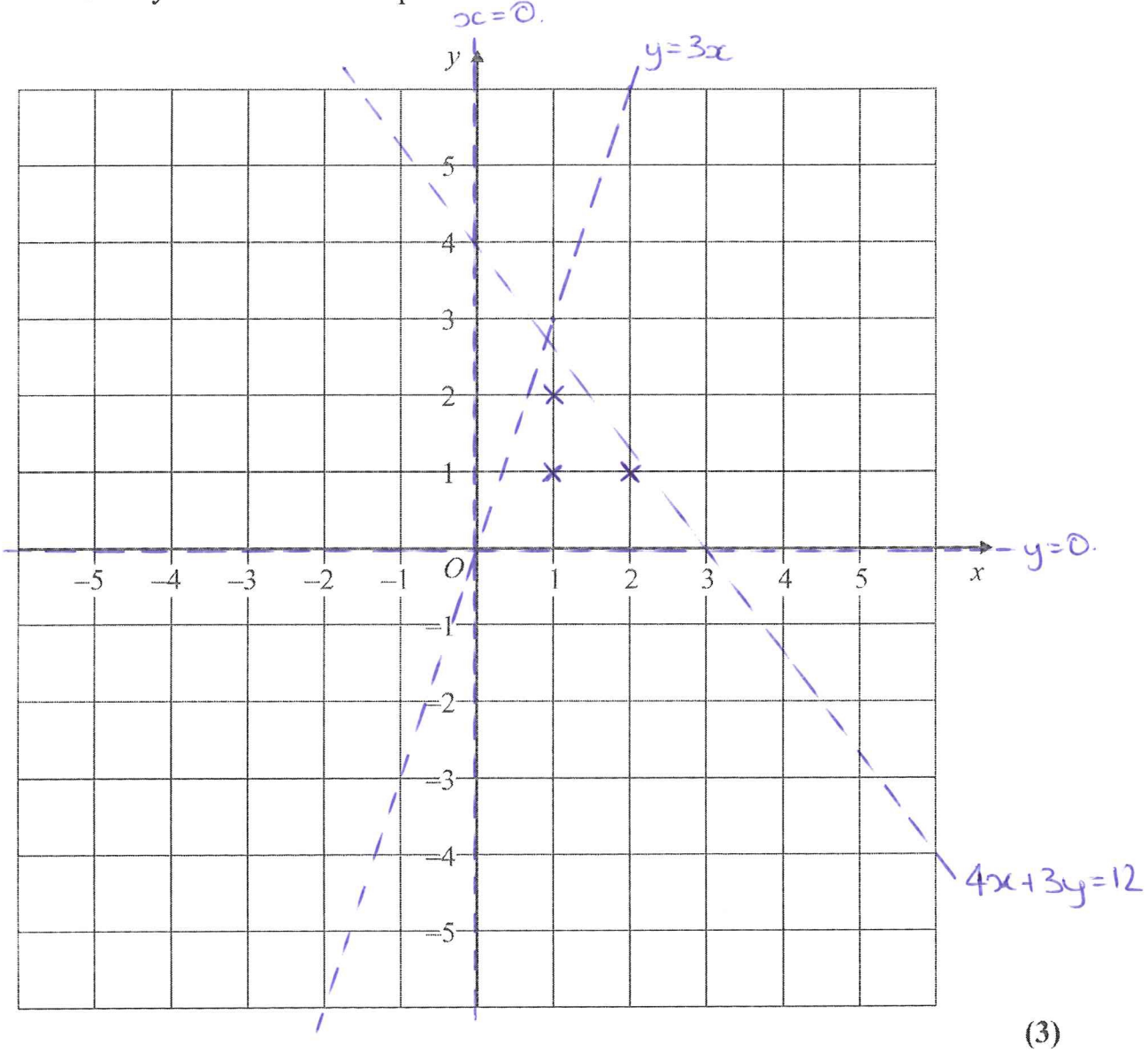
(Total 5 marks)

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 (×), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

5) Composite functions: Easier

Q1. The functions f and g are such that

$$f(x) = 2x + 3 \text{ and } g(x) = \frac{x}{4} - 2$$

(a) Find the value of f(8)

F(8) = 2(8) + 3
=16 + 3
= 19

19

.....

(1)

(b) Find gf(*4*)

f(4) = 2(4) + 3 = 11

$$g(11) = \frac{11}{4} - 2 = \frac{3}{4}$$

$\frac{3}{4}$

.....

(2)

(b) Show that

$$fg(x) = \frac{1}{2}x - 1$$

$$fg(x) = 2\left(\frac{x}{4} - 2\right) + 3$$

$$fg(x) = \frac{2x}{4} - 4 + 3$$

$$fg(x) = \frac{1}{2}x - 1$$

(2)

(Total for question = 5 marks)

5) Composite functions: Medium

2. The functions f and g are such that

$$f(x) = \frac{2}{x+3} \text{ and } g(x) = 3(x-2)$$

a) Show that $gf(5) = -\frac{21}{4}$

$$f(5) = \frac{2}{5+3} = \frac{1}{4}$$

$$g\left(\frac{1}{4}\right) = 3\left(\frac{1}{4} - 2\right)$$

$$g\left(\frac{1}{4}\right) = \frac{3}{4} - 6$$

$$g\left(\frac{1}{4}\right) = -\frac{21}{4}$$

.....

(2)

b) Show that fg(x) can be written in the form

$$\frac{2}{k(x-1)}$$

where k is an integer to be found.

$$fg(x) = \frac{2}{3(x-2)+3}$$

$$fg(x) = \frac{2}{3x-6+3}$$

$$fg(x) = \frac{2}{3x-3}$$

$$fg(x) = \frac{2}{3(x-1)} \quad , \quad k = 3$$

(3)

c) Find an expression for gg(x)

$$gg(x) = 3(3x-6) - 6$$

$$gg(x) = 9x - 24$$

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

(Total for question = 7 marks)

5) Composite functions: Harder

3. The functions f, g and h are such that

$$f(x) = 2x + 2 \quad , \quad g(x) = \frac{a}{x} \text{ and } h(x) = 3x^2 \quad for\ x > 0$$

a) Find hgf(3) in terms of a

$$f(3) = 2(3) + 2 = 8$$
$$g(8) = \frac{a}{8}$$
$$h\left(\frac{a}{8}\right) = 3\left(\frac{a}{8}\right)^2 = \frac{3a^2}{64}$$

$$hgf(3) = \frac{3a^2}{64}$$

.....

(2)

b) Given that $fg(10) = \frac{14}{5}$ find the value of a

$$2\left(\frac{a}{10}\right) + 2 = \frac{14}{5}$$

$$\frac{2a}{10} = \frac{4}{5}$$

$$a = 4$$

.....

(2)

(Total for question = 4 marks)

4. The functions f, g are such that

$$f(x) = 3x + a \text{ and } g(x) = 6x - b$$

Given that fg(2) = 19 and gf(3) = 48, find the values of a and b.

From fg(2) =19

$3(6(2) - b) + a = 19$

$36 - 3b + a = 19$

$a - 3b = -17$

From gf(3) =54

$6(3(3) + a) - b = 54$

$54 + 6a - b = 54$

$6a - b = 0$

Solving simutaneously

$6a - 18b = -102$

-17b = -102

b= -6, a =1

.....(5) **(Total for question = 5 marks)**

GROCH Anna

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	20 from 28	3 from 3	13 from 20	0 from 1	4 from 4	0 from 0
A02 and 3	38 from 52	12 from 12	7 from 9	8 from 13	9 from 16	2 from 2
Total	58 from 80	15 from 15	20 from 29	8 from 14	13 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Cumulative Frequency. Mathswatch Clip: 186

Topic 2: Inequalities Regions. Mathswatch Clip: 198

Topic 3: Composite functions. Mathswatch Clip: 215

Topic 4: Areas under velocity time graph. MW: 216

Topic 5: Vectors. Mathswatch Clip: 219

1) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

(a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	12
$20 < A \leq 40$	27
$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

..... 41 ..... years

(2)

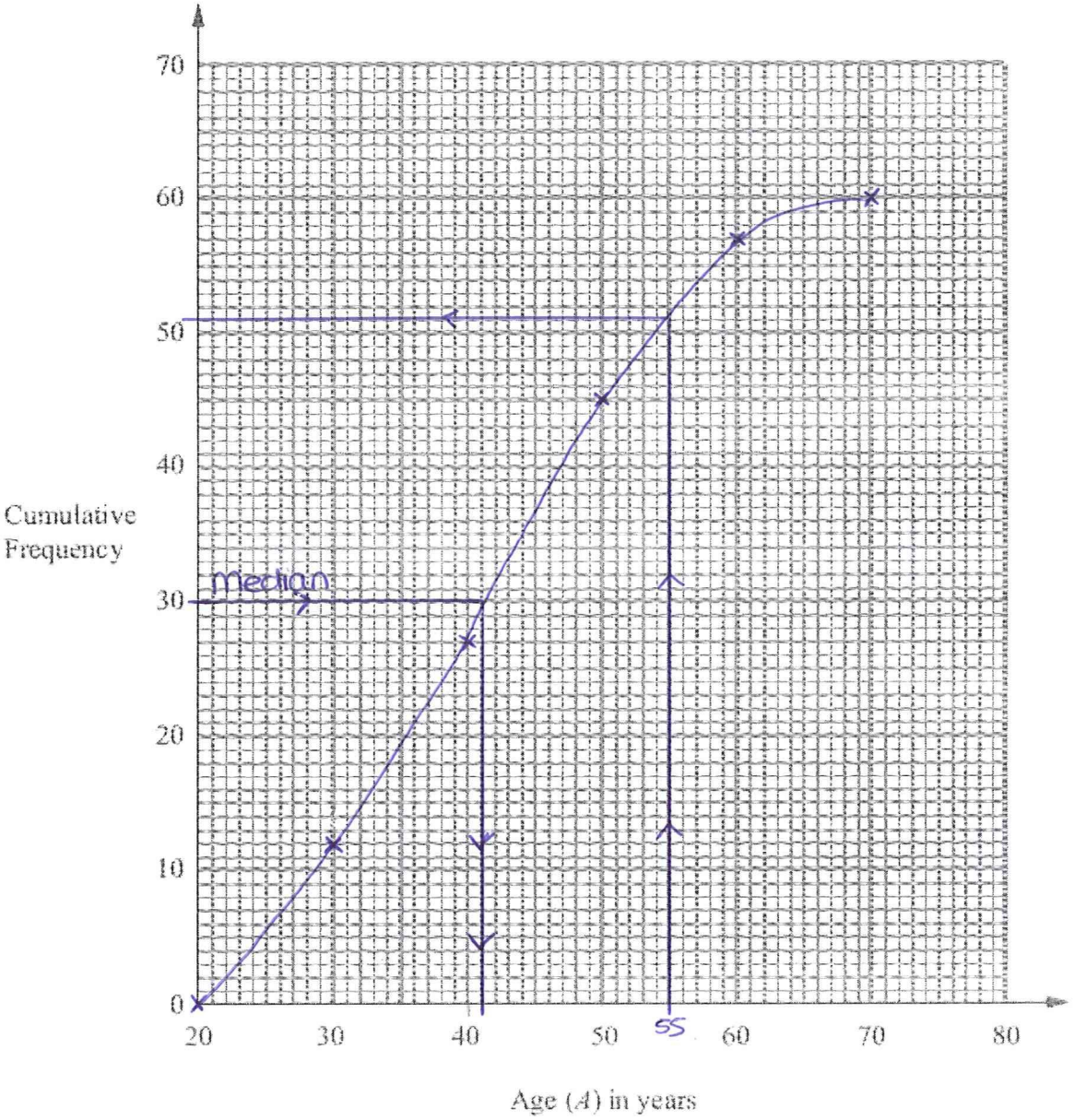
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so $60 - 51 = 9$ are older.

..... 9 .....

(2)

1) Cumulative Frequency: Medium



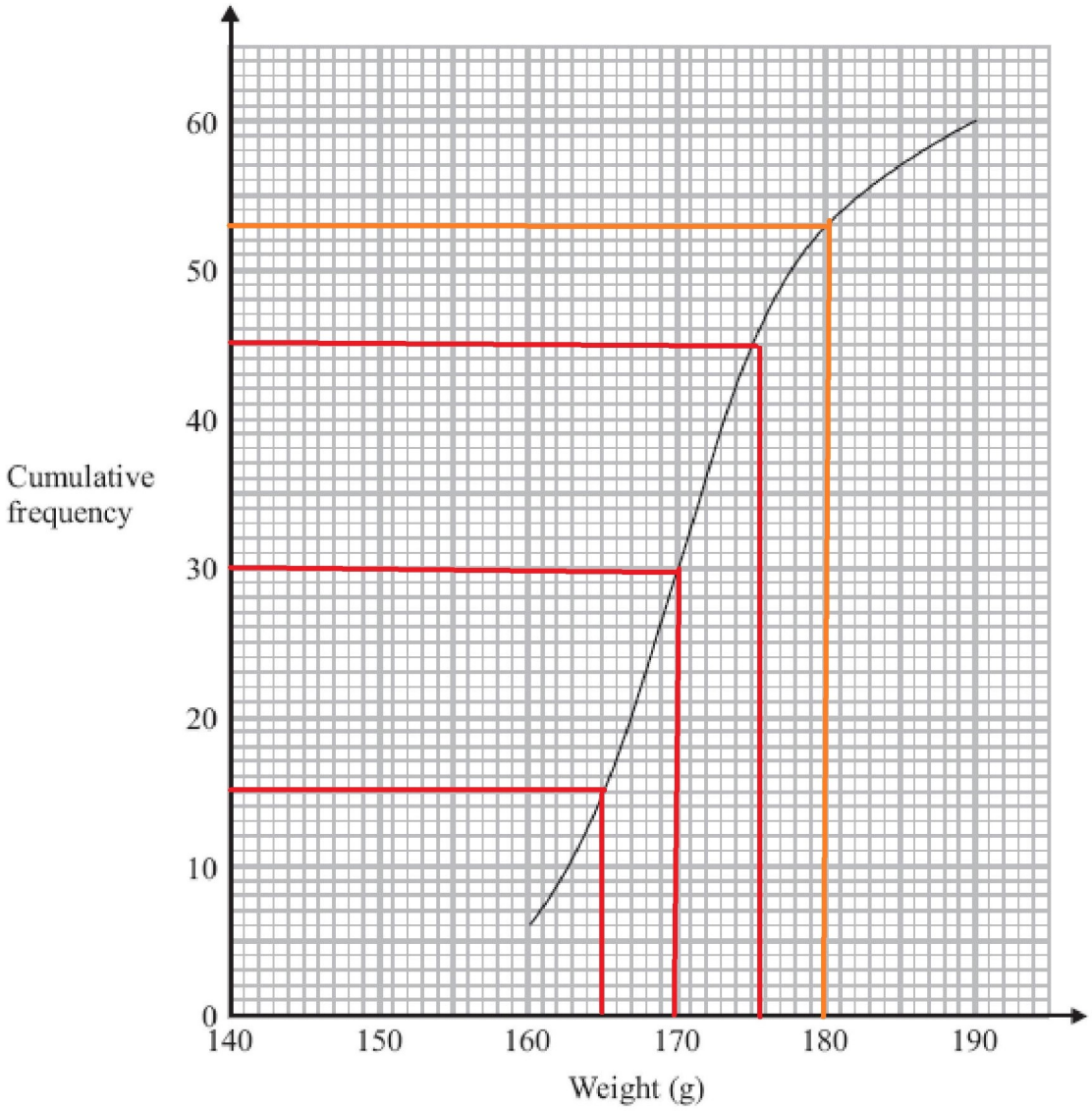
(7 marks)

1) Cumulative Frequency: Harder

4. Harry grows tomatoes.
This year he put his tomato plants into two groups, group A and group B.

Harry gave fertiliser to the tomato plants in group A.
He did not give fertiliser to the tomato plants in group B.

Harry weighed 60 tomatoes from group A.
The cumulative frequency graph shows some information about these weights.



ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

ii) The Upper Quartile 175 .....

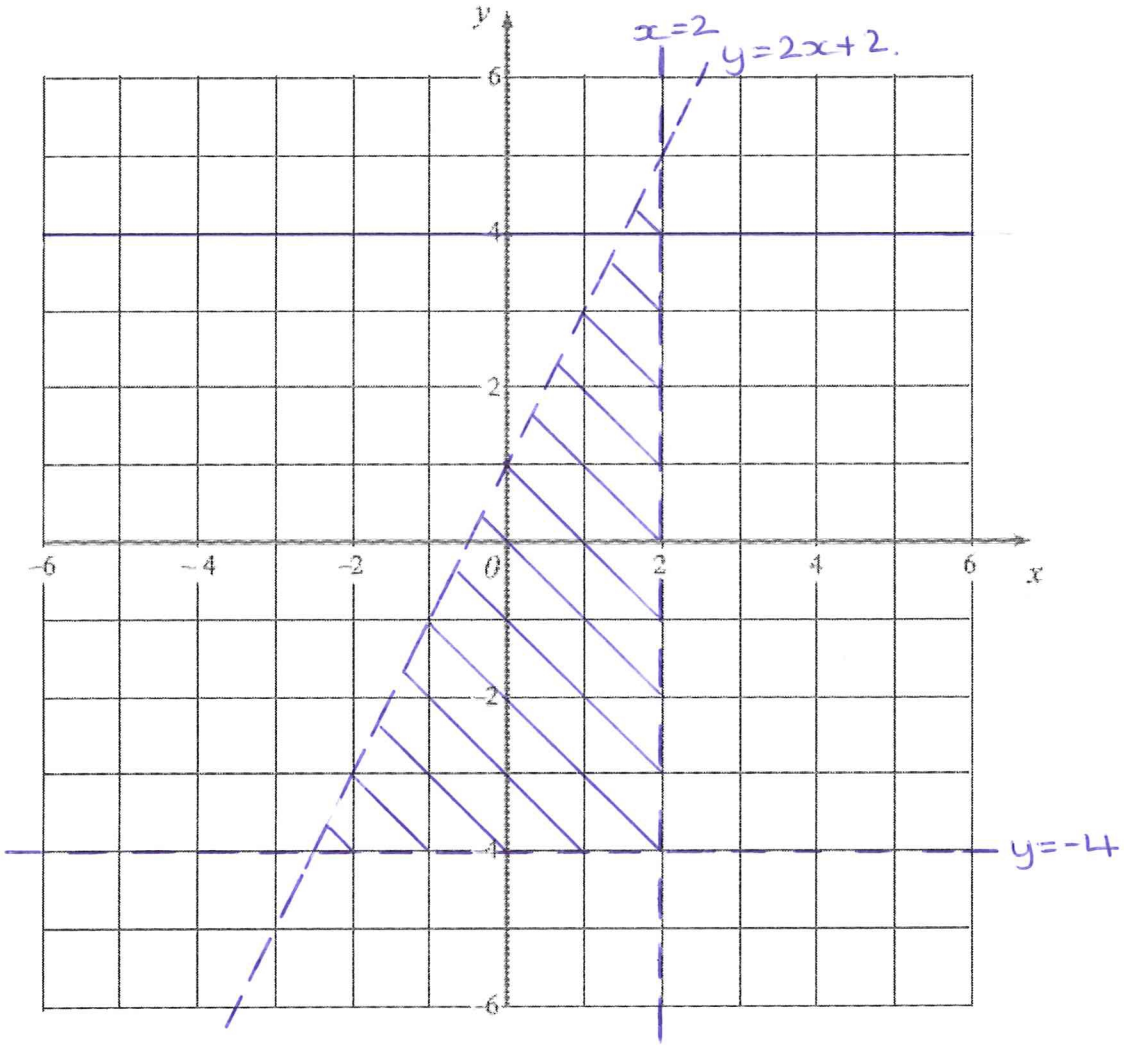
(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

2) Inequalities Regions: Easier

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

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

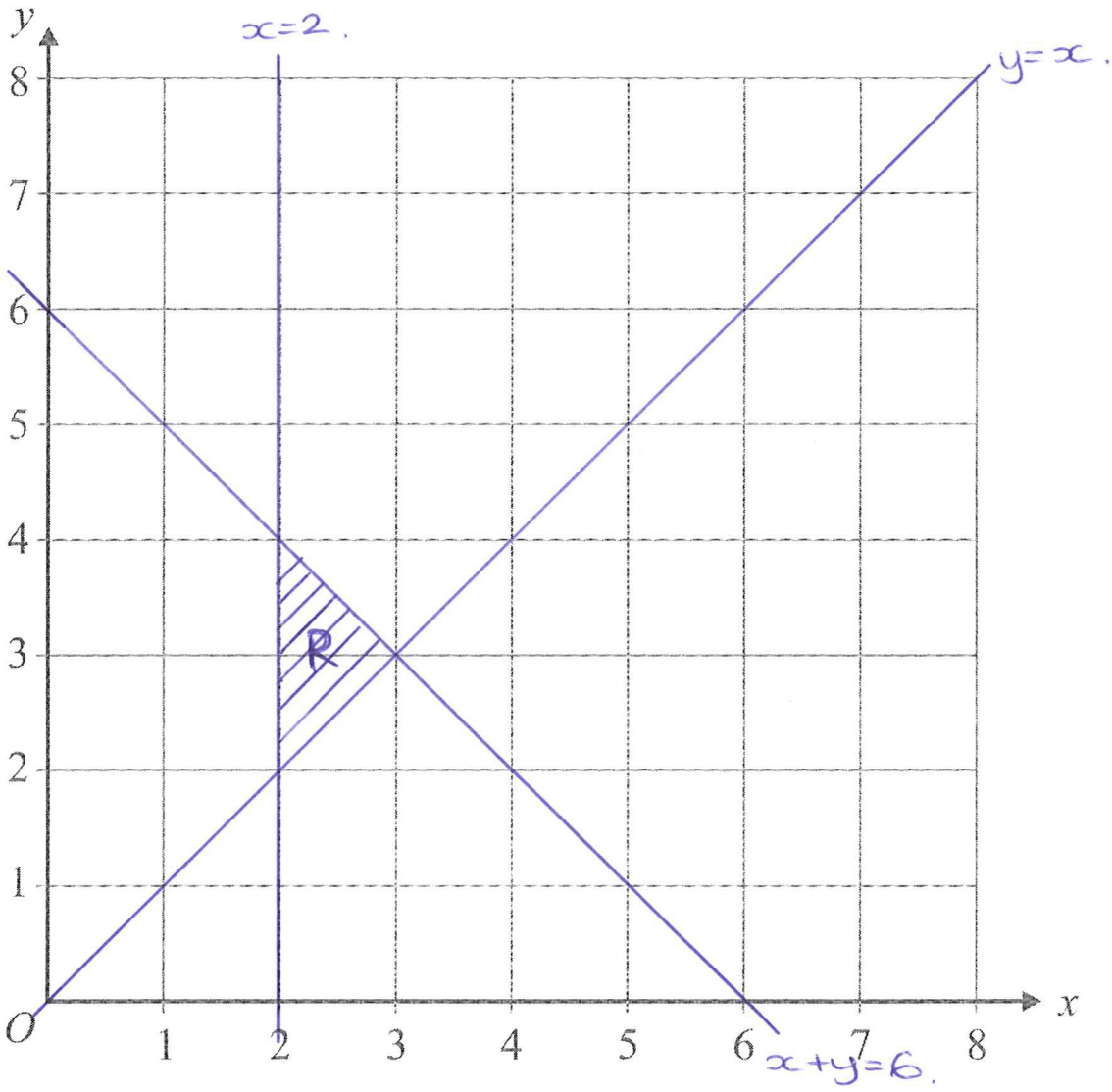


(Total for Question 19 = 4 marks)

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

$$x \geq 2 \qquad y \geq x \qquad x + y \leq 6$$



(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)

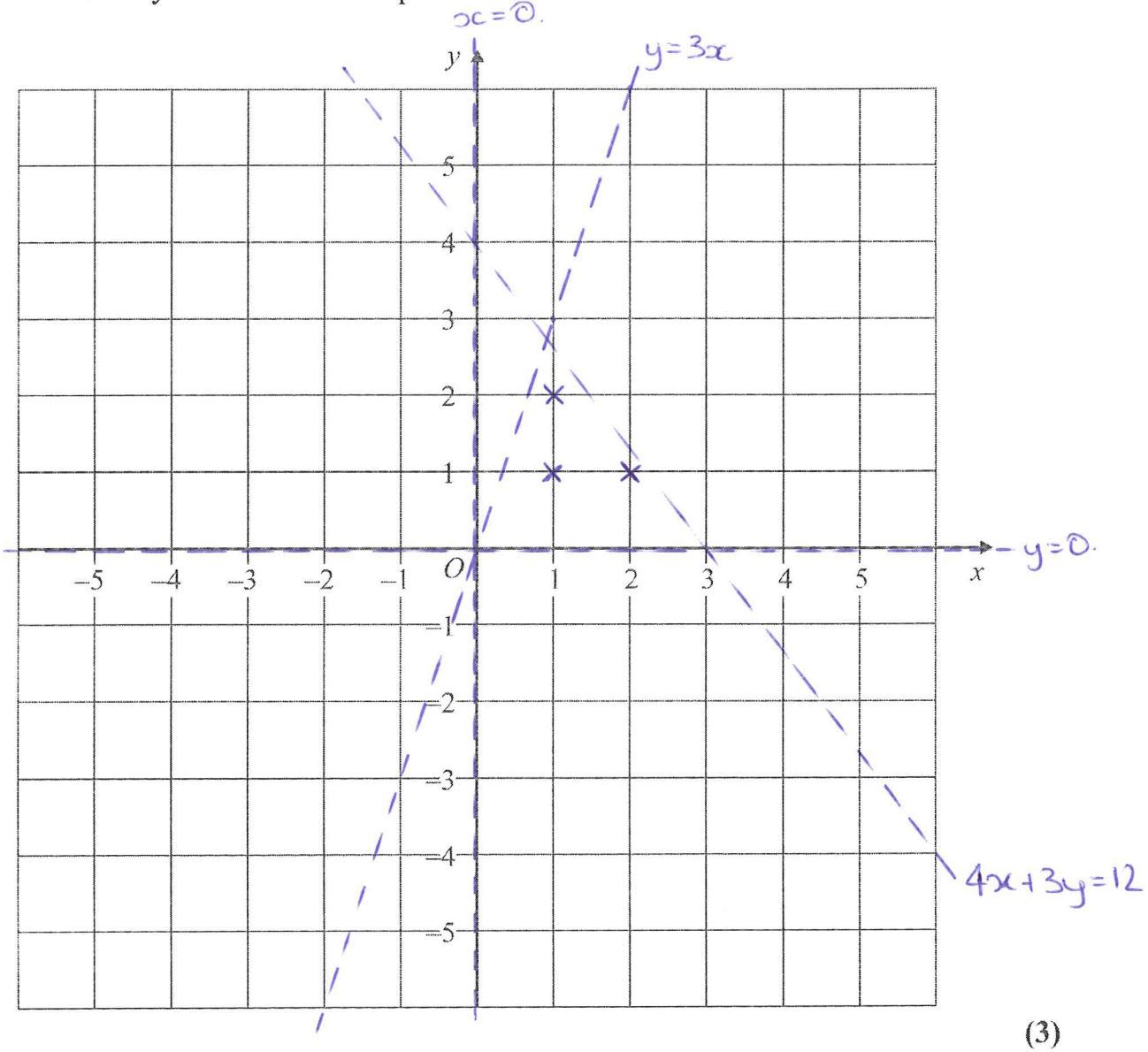
(Total 5 marks)

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 (×), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

3) Composite functions: Easier

Q1. The functions f and g are such that

$$f(x) = 2x + 3 \text{ and } g(x) = \frac{x}{4} - 2$$

(a) Find the value of f(8)

F(8) = 2(8) + 3
=16 + 3
= 19

19

.....

(1)

(b) Find gf(*4*)

f(4) = 2(4) + 3 = 11

$$g(11) = \frac{11}{4} - 2 = \frac{3}{4}$$

$\frac{3}{4}$

.....

(2)

(b) Show that

$$fg(x) = \frac{1}{2}x - 1$$

$$fg(x) = 2\left(\frac{x}{4} - 2\right) + 3$$

$$fg(x) = \frac{2x}{4} - 4 + 3$$

$$fg(x) = \frac{1}{2}x - 1$$

(2)

(Total for question = 5 marks)

3) Composite functions: Medium

2. The functions f and g are such that

$$f(x) = \frac{2}{x+3} \text{ and } g(x) = 3(x-2)$$

a) Show that $gf(5) = -\frac{21}{4}$

$$f(5) = \frac{2}{5+3} = \frac{1}{4}$$

$$g\left(\frac{1}{4}\right) = 3\left(\frac{1}{4} - 2\right)$$

$$g\left(\frac{1}{4}\right) = \frac{3}{4} - 6$$

$$g\left(\frac{1}{4}\right) = -\frac{21}{4}$$

.....

(2)

b) Show that fg(x) can be written in the form

$$\frac{2}{k(x-1)}$$

where k is an integer to be found.

$$fg(x) = \frac{2}{3(x-2)+3}$$

$$fg(x) = \frac{2}{3x-6+3}$$

$$fg(x) = \frac{2}{3x-3}$$

$$fg(x) = \frac{2}{3(x-1)} \quad , \quad k = 3$$

(3)

c) Find an expression for gg(x)

$$gg(x) = 3(3x-6) - 6$$

$$gg(x) = 9x - 24$$

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

(Total for question = 7 marks)

3) Composite functions: Harder

3. The functions f, g and h are such that

$$f(x) = 2x + 2 \quad , \quad g(x) = \frac{a}{x} \text{ and } h(x) = 3x^2 \quad for\ x > 0$$

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$$hgf(3) = \frac{3a^2}{64}$$

.....

(2)

b) Given that $fg(10) = \frac{14}{5}$ find the value of a

$$2\left(\frac{a}{10}\right) + 2 = \frac{14}{5}$$

$$\frac{2a}{10} = \frac{4}{5}$$

$$a = 4$$

.....

(2)

(Total for question = 4 marks)

4. The functions f, g are such that

$$f(x) = 3x + a \text{ and } g(x) = 6x - b$$

Given that fg(2) = 19 and gf(3) = 48, find the values of a and b.

From fg(2) =19

$3(6(2) - b) + a = 19$

$36 - 3b + a = 19$

$a - 3b = -17$

From gf(3) =54

$6(3(3) + a) - b = 54$

$54 + 6a - b = 54$

$6a - b = 0$

Solving simutaneously

$6a - 18b = -102$

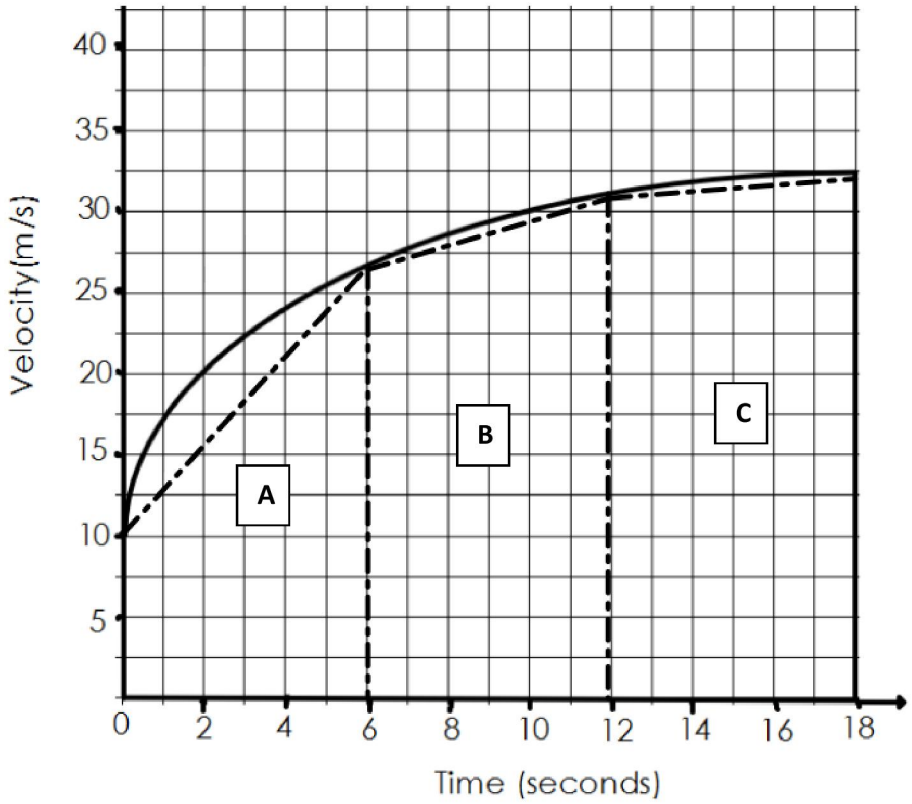
-17b = -102

b= -6, a =1

.....(5) **(Total for question = 5 marks)**

4) Areas under velocity time graph: Easier

1) The graph below shows a velocity time graph



1) a) By estimating the area under the graph using the three trapezia shown by dashed lines, work out the distance travelled in the 18 seconds.

Area of trapezium $= \frac{1}{2}(a + b)h$

Area of trapezium A $= \frac{1}{2}(10 + 27)(6) = 111$

Area of trapezium B $= \frac{1}{2}(27 + 31)(6) = 174$

Area of trapezium A $= \frac{1}{2}(31 + 32.5)(6) = 190.5$

Total Area under graph $= 111 + 174 + 190.5 = 475.5$

475.5metres travelled in 18 seconds

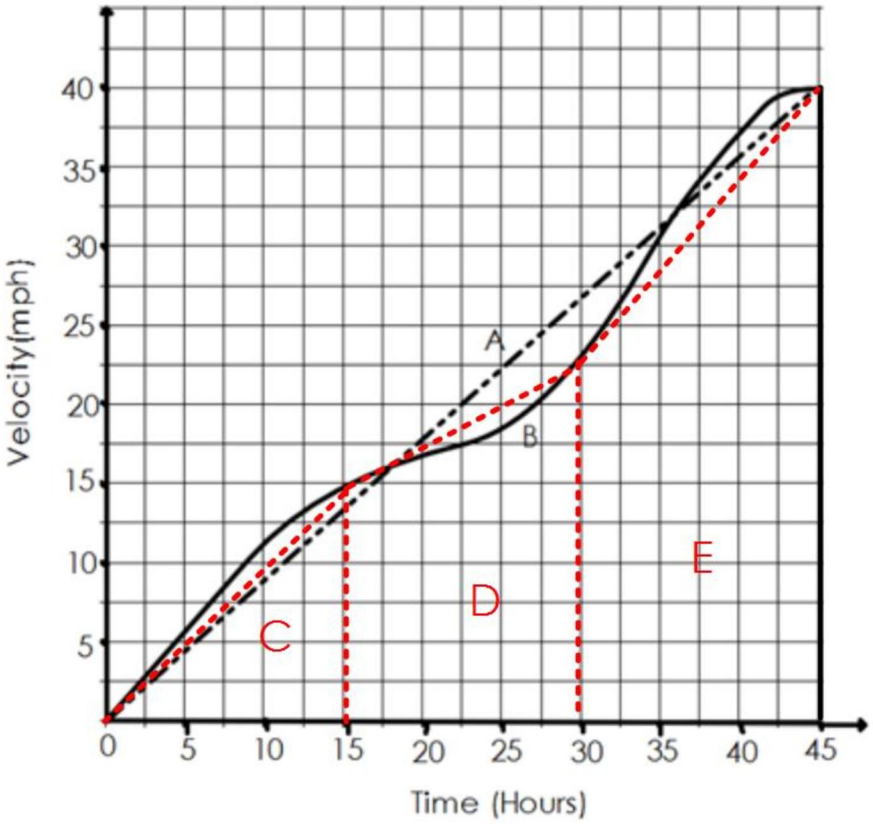
b) By considering the diagram, is your estimate for the distance an overestimate or underestimate? Explain your reasoning.

As each of the trapezia are a smaller area than the actual area, the estimate is an underestimate

(4 marks)

4) Areas under velocity time graph: Medium

2) The graph below shows a velocity time graph for two birds, A and B, over a long distance.



Which bird travels further in the 45 hours? You must show your working. Use 3 equal strips for your estimate for bird B. Comment on the reliability of your answer.

Distance travelled by bird A

Area of triangle $A = \frac{40 \times 45}{2} = 900$

Distance travelled by bird B

$$\text{Triangle C} = \frac{15 \times 15}{2} = 112.5$$

$$\text{Trapezium D} = \frac{1}{2}(15 + 22.5)(15) = 281.25$$

$$\text{Trapezium E} = \frac{1}{2}(22.5 + 40)(15) = 468.75$$

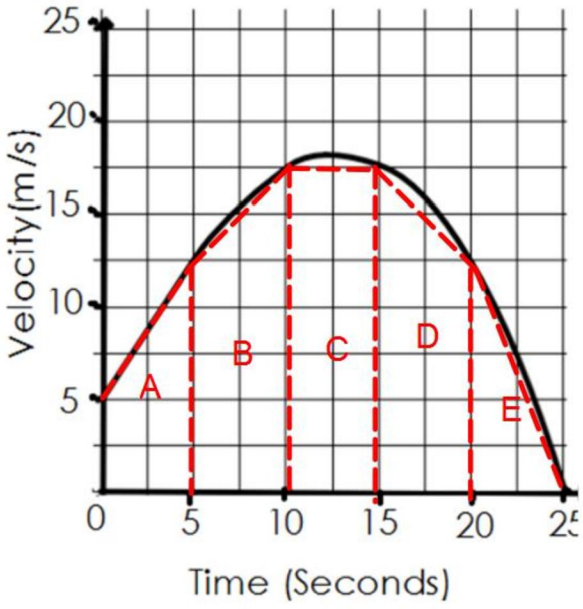
Total area under curve B is 862.5, so bird A travelled further. However, the area under the curve is an estimate and only uses three strips so not very reliable.

(4 marks)

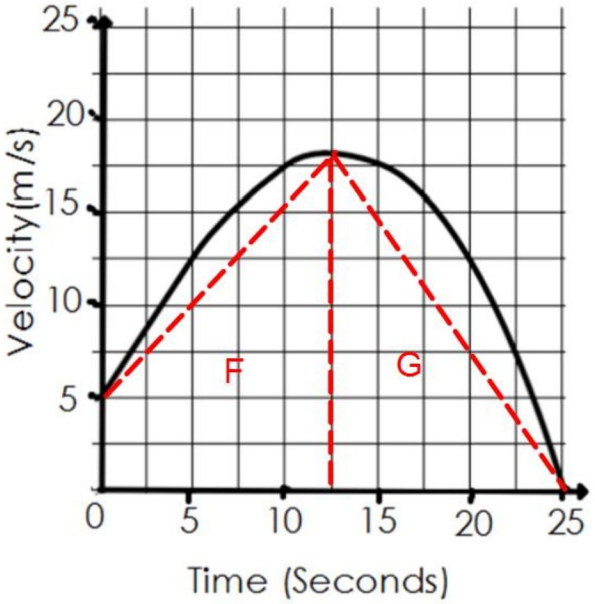
4) Areas under velocity time graph: Harder

3) The graph below shows a velocity-time graph for a drone.

Anna's method



Simone's method



a) Anna works out the distance travelled by using 3 trapezia, a rectangle and a triangle, all of equal width. Simone divides it into a triangle and a trapezium, both of equal width. Find an estimate of the distance using both Anna and Simone's method.

Anna's method :

Area $= \frac{1}{2}(5 + 12.5)(5) + \frac{1}{2}(12.5 + 17.5)(5) + (5 \times 17.5) + \frac{1}{2}(17.5 + 12.5)(5) + \frac{1}{2}(5 \times 12.5)$

Area = 43.75+ 75 + 87.5 + 75+ 31.25

Area = 312.5, distance 312.5 metres

Simone's method:

Area $= \frac{1}{2}(5 + 18)(12.5) + \frac{1}{2}(18 \times 12.5)$

Area = 143.75+ 112.5

Area =256.25 distance 256.25metres

b) Comment on which method you think gives the most reliable results.
Anna's method is more reliable as she has used more strips. we can see from the graph Simone's method is a big underestimate.

(4 marks)

5) Vectors: Easier

1.

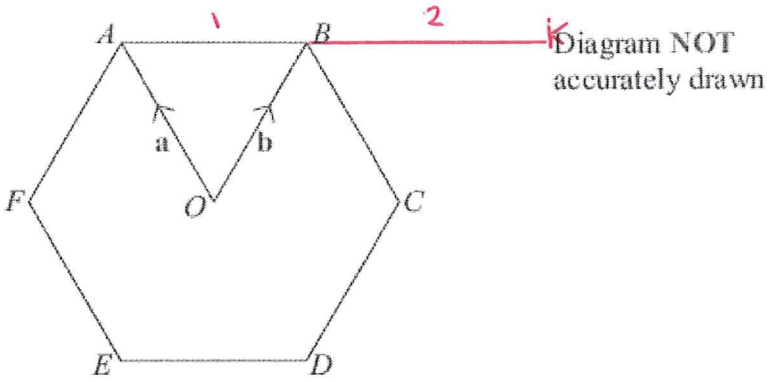


Diagram NOT accurately drawn

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 **a** and **b**.

$-a+b$

.....

(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 **a** and **b**.
Give your answer in its simplest form.

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

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

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

$-a+2b$

.....

(3)

(4 marks)

5) Vectors: Medium

6.

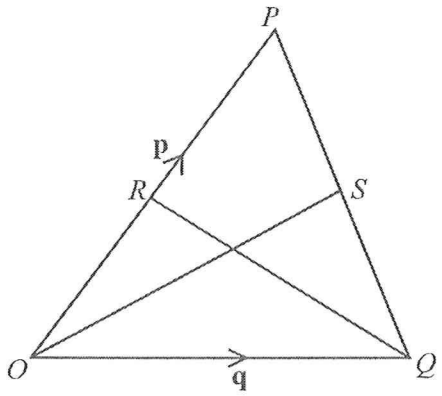


Diagram **NOT** accurately drawn

OPQ is a triangle.

R is the midpoint of OP.

S is the midpoint of PQ.

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

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

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

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

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

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

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

(ii) Show that RS is parallel to OQ.

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

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

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

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

(5 marks)

5) Vectors: Harder

6.

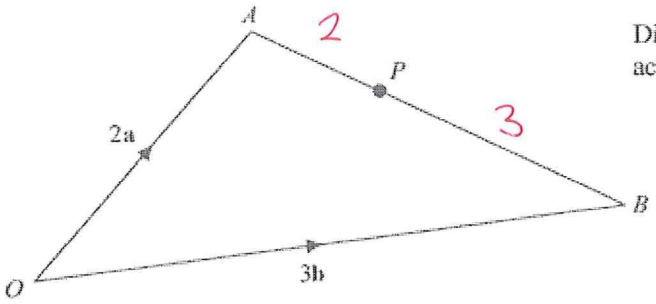


Diagram NOT accurately drawn

OAB is a triangle.

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

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

(*a*) Find *AB* in terms of **a** and **b**.

$\overrightarrow{AB}$ = $-2a+3b$

(1)

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

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

$\overrightarrow{AP} = \frac{2}{5}(-2a+3b)$

$= -\frac{4}{5}a + \frac{6}{5}b$

$\overrightarrow{OP} = 2a - \frac{4}{5}a + \frac{6}{5}b$

$= \frac{6}{5}a + \frac{6}{5}b$

$= \frac{6}{5}(a+b)$

(3)

(4 marks)

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

HATCHELL Charlie

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

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A02 and 3	24 from 52	5 from 12	4 from 9	7 from 13	6 from 16	2 from 2
Total	36 from 80	7 from 15	9 from 29	8 from 14	10 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Simple Bounds. Mathswatch Clip: 132

Topic 2: Expand double brackets. Mathswatch Clip: 134b

Topic 3: Compound Interest and Depreciation. MW: 164

Topic 4: Applied Trig Problems. Mathswatch Clip: 168

Topic 5: Product of Prime Factors, HCF, LCM. MW: 78

1) 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)

1) 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?

Lower bound A+B 4.15 + 12.5 =16.65
Upper bound A+B 4.25 +13.5 = 17.75

$16.65 \leq A + B < 17.75$

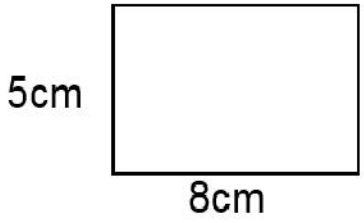
_____ cm

(1)

(4 Marks)

1) 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 $2\times4.5 + 2\times7.5 = 9 + 15 = 24cm$

_____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 $2\times5.5 + 2\times8.5 = 11 + 17 = 28cm$

_____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 $100\times5.5 = 550g$

One kilogram = 1000 grams so

$$550g = 0.55kg$$

_____0.55_____ kg **(3 marks)**

2) Expand double brackets: Easier

Solution for Question 1:

$(x + 3)(x + 2)$
$x^2 + 3x + 2x + 6$
$x^2 + 5x + 6$

Solution for Question 2:

a) $(x + 2)(x + 6)$
$x^2 + 2x + 6x + 12$
$x^2 + 8x + 12$

b) $(x + 2)(x - 6)$
$x^2 + 2x - 6x - 12$
$x^2 - 4x - 12$

c) $(x - 2)(x - 6)$
$x^2 - 2x - 6x + 12$
$x^2 - 8x + 12$

2) Expand double brackets: Medium

Solution for Question 3:

a) $(3x + 1)(x + 2)$
$3x^2 + 6x + x + 2$
$3x^2 + 7x + 2$

b) $(3x - 1)(x + 2)$
$3x^2 + 6x - x - 2$
$3x^2 + 5x - 2$

c) $(3x + 1)(3x + 2)$
$9x^2 + 6x + 3x + 2$
$9x^2 + 9x + 2$

Solution for Question 4:

a) $(3 - x)(2x + 1)$
$6x + 3 - 2x^2 - x$
$-2x^2 + 5x + 3$

b) $(5 - 2x)(3 - x)$
$15 - 5x - 6x + 2x^2$
$2x^2 - 11x + 15$

c) $(2x - 3)(2x + 3)$
$4x^2 + 6x - 6x - 9$
$4x^2 - 9$

2) Expand double brackets: Harder

Solution for Question 5:

$(x+5)(2x+3) - 3(x-2)(6x+5)$
$2x^2 + 3x + 10x + 15 - 3[6x^2 + 5x - 12x - 10]$
$2x^2 + 3x + 10x + 15 - 18x^2 - 15x + 36x + 30$
$-16x^2 + 34x + 45$

Solution for Question 6:

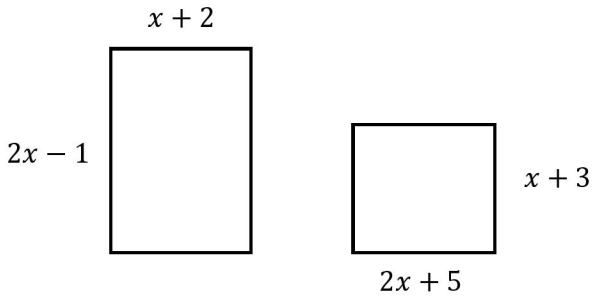
$\times$	$3x$	4
$2x$	$6x^2$	$8x$
-1	$-3x$	-4

$6x^2 + 8x - 3x - 4$
$6x^2 + 5x - 4$

He has added the terms $2x$ and $3x$ instead of multiplying. He has missed of a negative on $3x$

Solution for Question 7:

Split shape into 2



$2x + 5 = 3x + 7 - (x + 2)$

Area:

$(x+2)(2x-1) + (x+3)(2x+5)$

$2x^2 - x + 4x - 2 + 2x^2 + 5x + 6x + 15$

$4x^2 + 14x + 13$

3) Compound Interest and Depreciation: Easier

1. Tom invested £2500 for 3 years into his savings account. The bank paid him 3% per year compound interest. How much did Tom have in his bank account at the end of the 3 years?

$$2500 \times 1.03^3$$

$$= 2731.818$$

£2731.82 **(3)**

2. Dennis invested £1000 for four years into a savings account. He received 5% per annum compound interest. How much did he have in his account at the end of the four years

$$1000 \times 1.05^4$$

$$= 1215.506$$

£1215.51 **(3)**

3. The value of a smartphone depreciates by 55% each year. At the end of 2015, the value of the phone is £350. What is the value of the phone at the end of 2017?

$$350 \times 0.45^2$$

$$=70.875$$

= £70.88 **(3)**

3) Compound Interest and Depreciation: Medium

4. Eddie invests £4000 into a savings account, the bank pays him 4% compound interest per annum. At the end of ***n*** years he has £4679.43 to the nearest penny. What is the value of ***n***?

$$4000 \times 1.04^4 = 4679.43$$

4 Years **(3)**

5. Peter invests £3550 into a savings account at 3.05% per annum. How much will he have in his bank account at the end of 5 years?

$$3550 \times 1.0305^5 = 4125.422$$

£4125.42

…… **(3)**

6. The value of a car depreciates by 22.5% per year. After how many years is the value of the car first less than 40% of its original value?

$$0.775^2 = 0.600625$$

$$0.775^3 = 0.465484$$

$$0.775^4 = 0.36075$$

After 4 years the value of the car is 36% of its original value, so it first less than 40% of its original value after 4 years

…… **(2)**

3) Compound Interest and Depreciation: Harder

*10. Jeremy wants to invest £3000 into a savings account.

TQ Bank	AMC Bank
Compound interest	Compound Interest
6% for the first 2 years	8% for the first year
2% for each extra year	1.5% for each extra year

Jeremy is going to invest his money for 8 years. Which bank will give Jeremy the most money at the end of the eight years?

TQ BANK

$$3000 \times 1.06^2 = £3370.80$$

$$£3370.80 \times 1.02^6 = 3796.068$$

= £3796.07

AMC BANK $3000 \times 1.08 = £3240$

$$3240 \times 1.015^7 = 3595.898$$

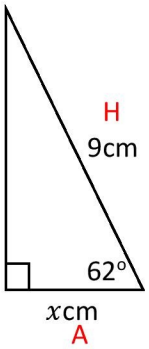
$$= £3595.90$$

So Jeremy would make the most with TQ Bank

…… **(4)**

4) Applied Trig Problems: Easier

1) (a) Find the missing length x to two decimal places.



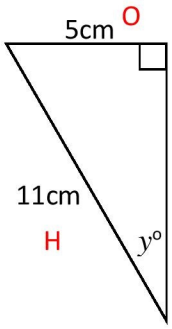
$\cos 62 = \frac{x}{9}$

$9 \cos 62 = x$

$x = 4.22524...$

$x = 4.23$ cm

(b) Find the missing angle y to two decimal places.



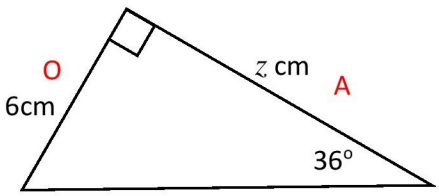
$\sin y = \frac{5}{11}$

$y = \sin^{-1}(\frac{5}{11})$

$y = 27.03569$

$y = 27.04°$

(c) Find the missing length z



$\tan 36 = \frac{6}{z}$

$z \tan 36 = 6$

$z = \frac{6}{\tan 36}$

$z = 8.25829$

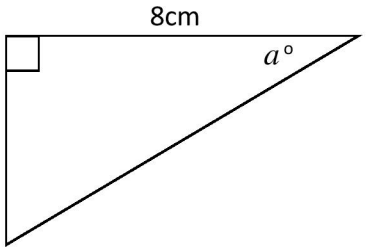
$z = 8.26cm$

(6 Marks)

4) Applied Trig Problems: Medium

2) The area of this triangle is $24cm^2$

Calculate the size of angle a to three significant figures.



Calculating the missing height:

$$Area = \frac{1}{2} \times base \times height$$

$$24 = \frac{1}{2} \times 8 \times height$$

$$24 = 4 \times height$$

$$height = 6cm$$

Calculating the missing angle using trig:

$$\tan a = \frac{6}{8}$$

$$a = \tan^{-1}\left(\frac{6}{8}\right)$$

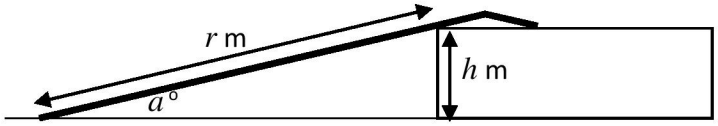
$$a = 36.8698976458$$

$$a = 36.8°$$

(4 Marks)

4) Applied Trig Problems: Harder

3) A wheelchair ramp is placed over a step, as shown.



The step is h meters high, and the ramp is r meters long to where it touches the step.

The angle between the ground and the ramp is a°.

In order to function safely, then ramp has to be 6 times as long, as the height of the step it is covering

(a) Work out the value of a when $r = 6h$, to the nearest degree.

$$\sin a = \frac{h}{r}$$

$$\sin a = \frac{h}{6h}$$

$$\sin a = \frac{1}{6}$$

$$a = \sin^{-1}\left(\frac{1}{6}\right)$$

$$a = 9.59406822686$$

$$a = 10°$$

(b) New safety regulations replace the initial ones, saying that the angle between the ramp and the ground cannot be more than 8°. How does this affect the height of step that the ramp can be used with?

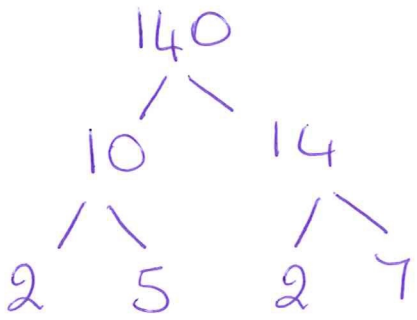
Tick one box

- ☐ It can now be used with higher steps.
- ☐ There is no change to the step height with which the ramp can be used.
- ■ It can now only be used with lower steps.

(4 Marks)

5) Product of Prime Factors, HCF, LCM: Easier

1. Write 140 as the product of its prime factors.



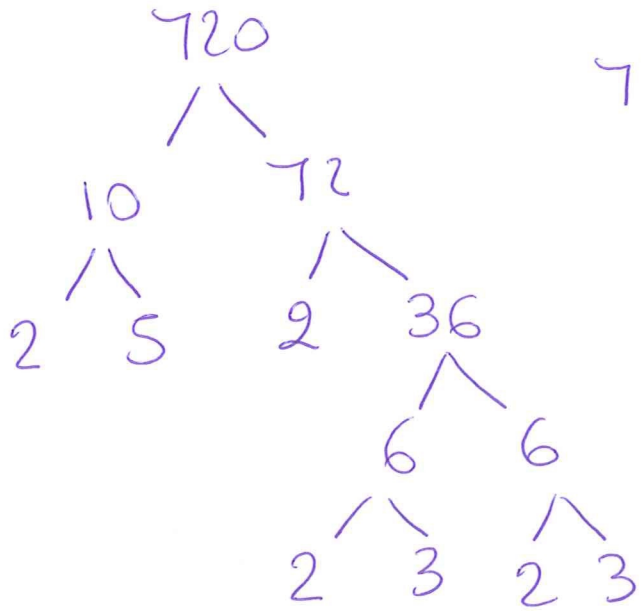
$140 = 2 \times 2 \times 5 \times 7$

$2^2 \times 5 \times 7$

.....

(2 marks)

2. Write 720 as a product of its prime factors.



$720 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$

$2^4 \times 3^2 \times 5$

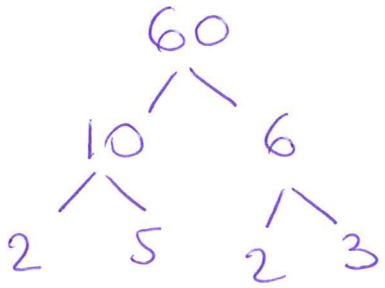
.....

(2 marks)

5) Product of Prime Factors, HCF, LCM: Medium

3. (a) Express the following numbers as products of their prime factors.

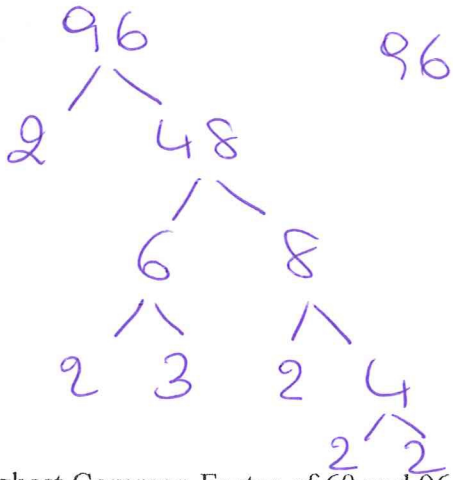
(i) 60.



$60 = 2 \times 2 \times 3 \times 5$

$2^2 \times 3 \times 5$

(ii) 96.

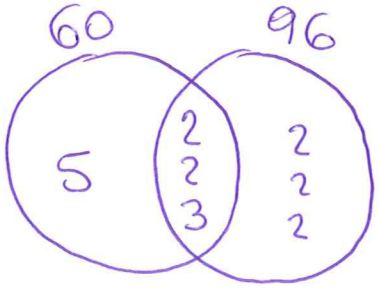


$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$

$2^5 \times 3$

(4)

(b) Find the Highest Common Factor of 60 and 96.



HCF $= 2 \times 2 \times 3 = 12$

12

(1)

(c) Work out the Lowest Common Multiple of 60 and 96.

LCM $= 2^5 \times 3 \times 5 = 480$

60 120 180 240 300 360 420 480

96 192 288 384 480

480

(2)

(7 marks)

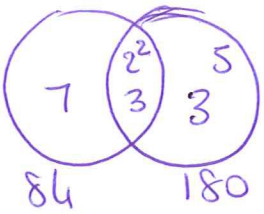
5) Product of Prime Factors, HCF, LCM: Harder

10. Find the Highest Common Factor (HCF) of 84 and 180

$84 = 2^2 \times 3 \times 7$

$180 = 2^2 \times 3^2 \times 5$

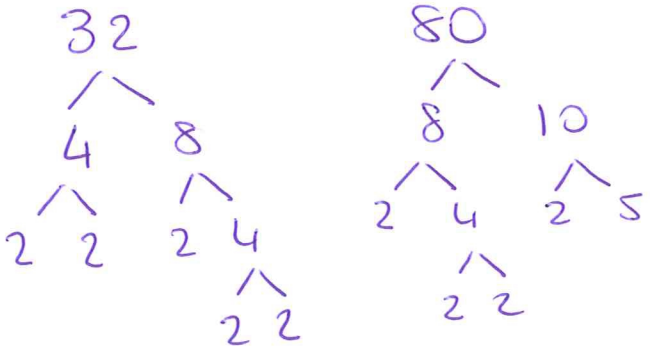
$HCF = 2^2 \times 3 = 12$



12

(3 marks)

11. Find the Highest Common Factor (HCF) of 32 and 80



$HCF = 2^4 = 16$

$32 = 2^5$

$80 = 2^4 \times 5$

$32 = 2 \times 2 \times 2 \times 2 \times 2$

$80 = 2 \times 2 \times 2 \times 2 \times 5$

16

(3 marks)

HAYES Benjamin

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	23 from 28	3 from 3	15 from 20	1 from 1	4 from 4	0 from 0
A02 and 3	46 from 52	12 from 12	8 from 9	10 from 13	14 from 16	2 from 2
Total	69 from 80	15 from 15	23 from 29	11 from 14	18 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Cumulative Frequency. Mathswatch Clip: 186

Topic 2: Inequalities Regions. Mathswatch Clip: 198

Topic 3: Composite functions. Mathswatch Clip: 215

Topic 4: Areas under velocity time graph. MW: 216

Topic 5: Transformations of Functions. Mathswatch Clip: 196

1) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

(a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	12
$20 < A \leq 40$	27
$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

..... 41 ..... years

(2)

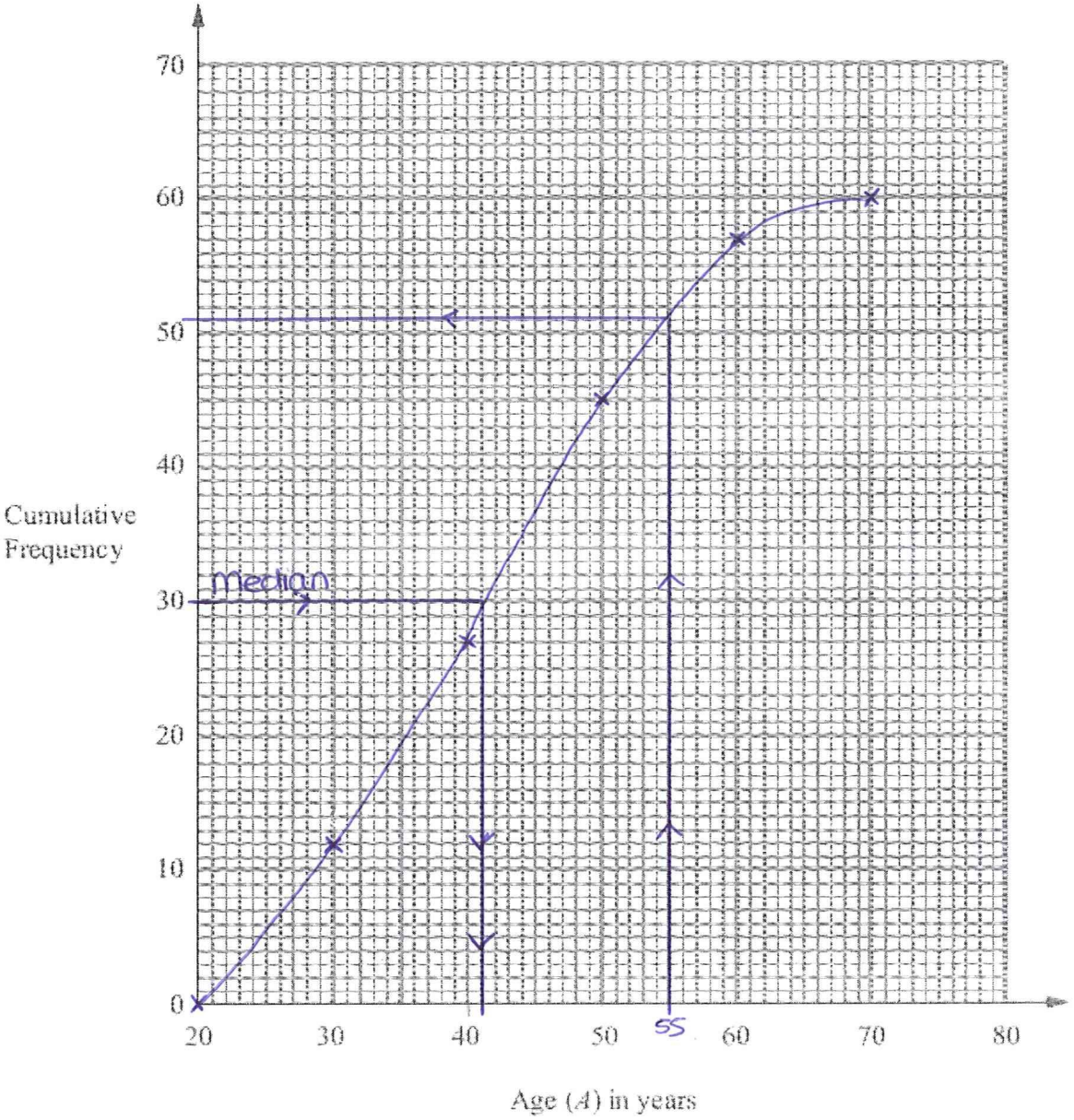
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so $60 - 51 = 9$ are older.

..... 9 .....

(2)

1) Cumulative Frequency: Medium



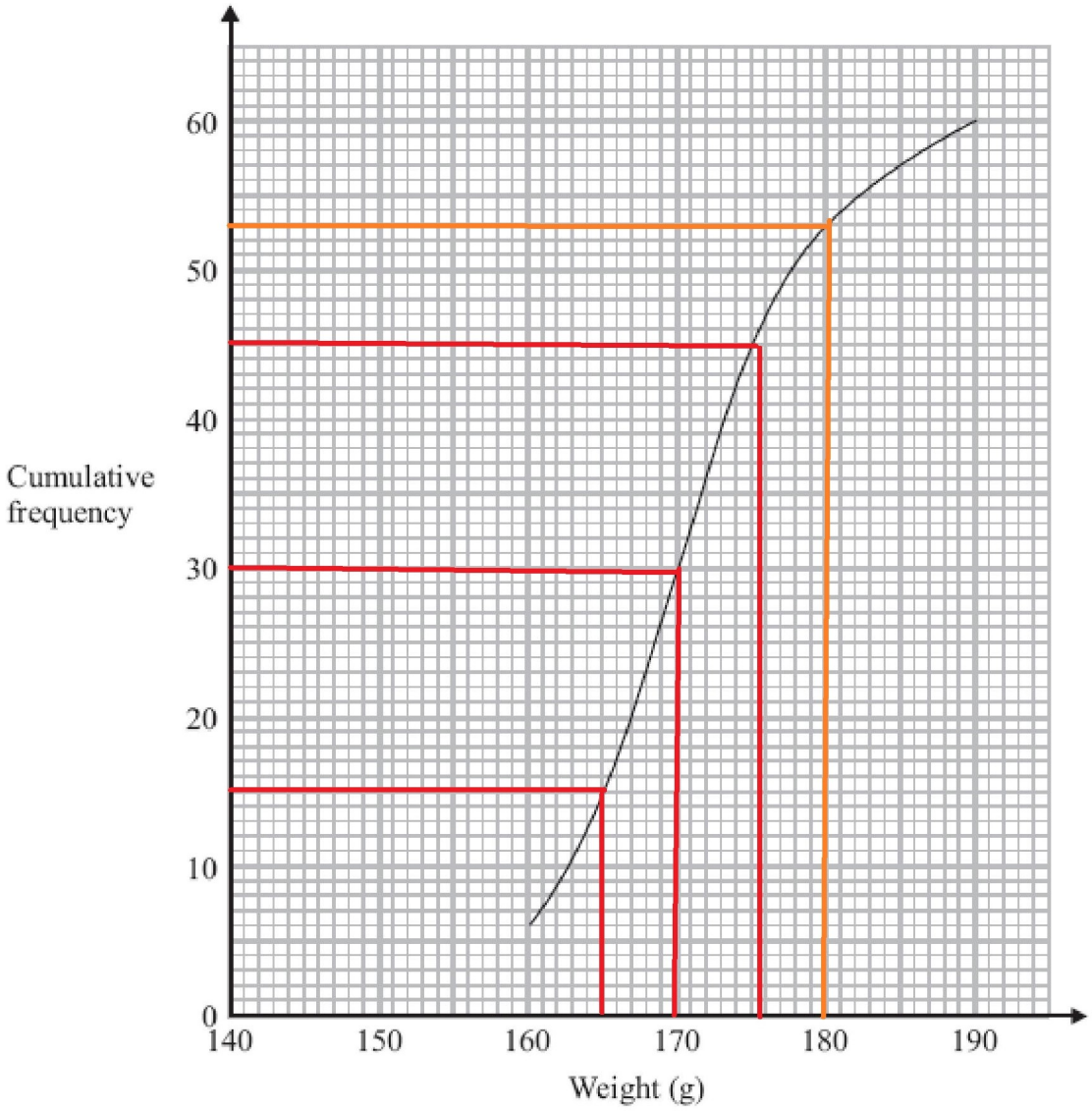
(7 marks)

1) Cumulative Frequency: Harder

4. Harry grows tomatoes.
This year he put his tomato plants into two groups, group A and group B.

Harry gave fertiliser to the tomato plants in group A.
He did not give fertiliser to the tomato plants in group B.

Harry weighed 60 tomatoes from group A.
The cumulative frequency graph shows some information about these weights.



ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

ii) The Upper Quartile 175 .....

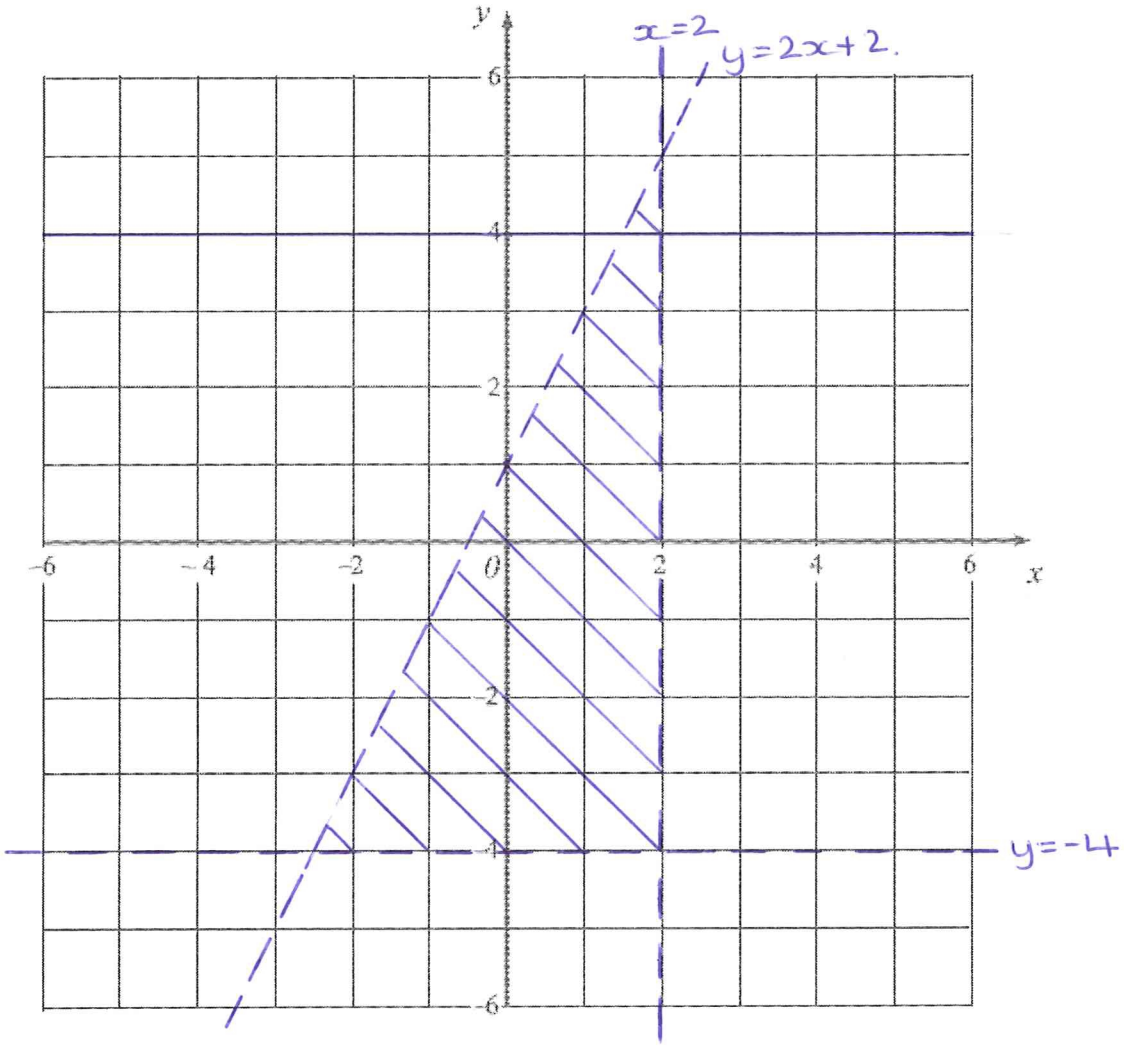
(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

2) Inequalities Regions: Easier

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

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

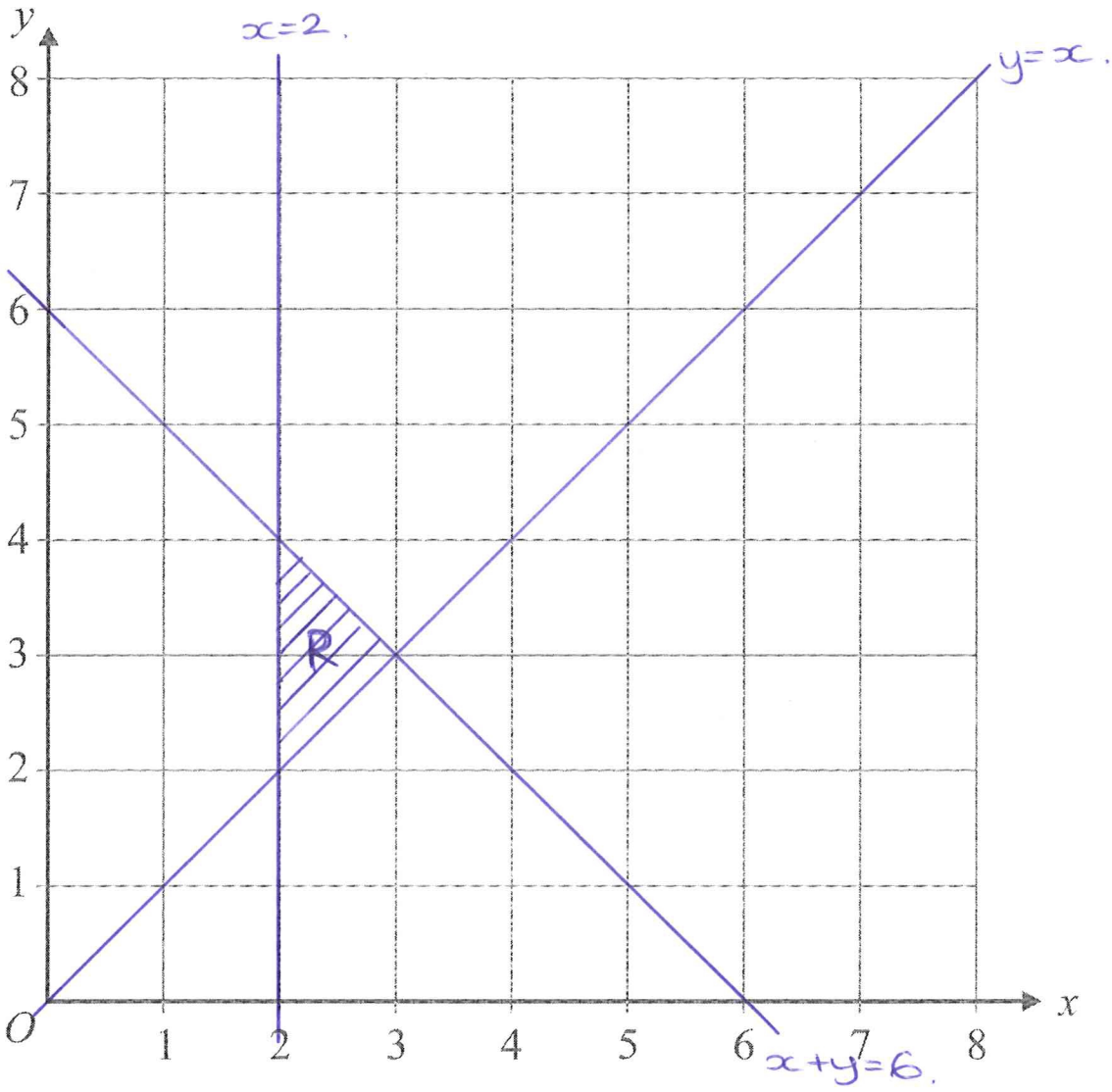


(Total for Question 19 = 4 marks)

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

$$x \geq 2 \qquad y \geq x \qquad x + y \leq 6$$



(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)

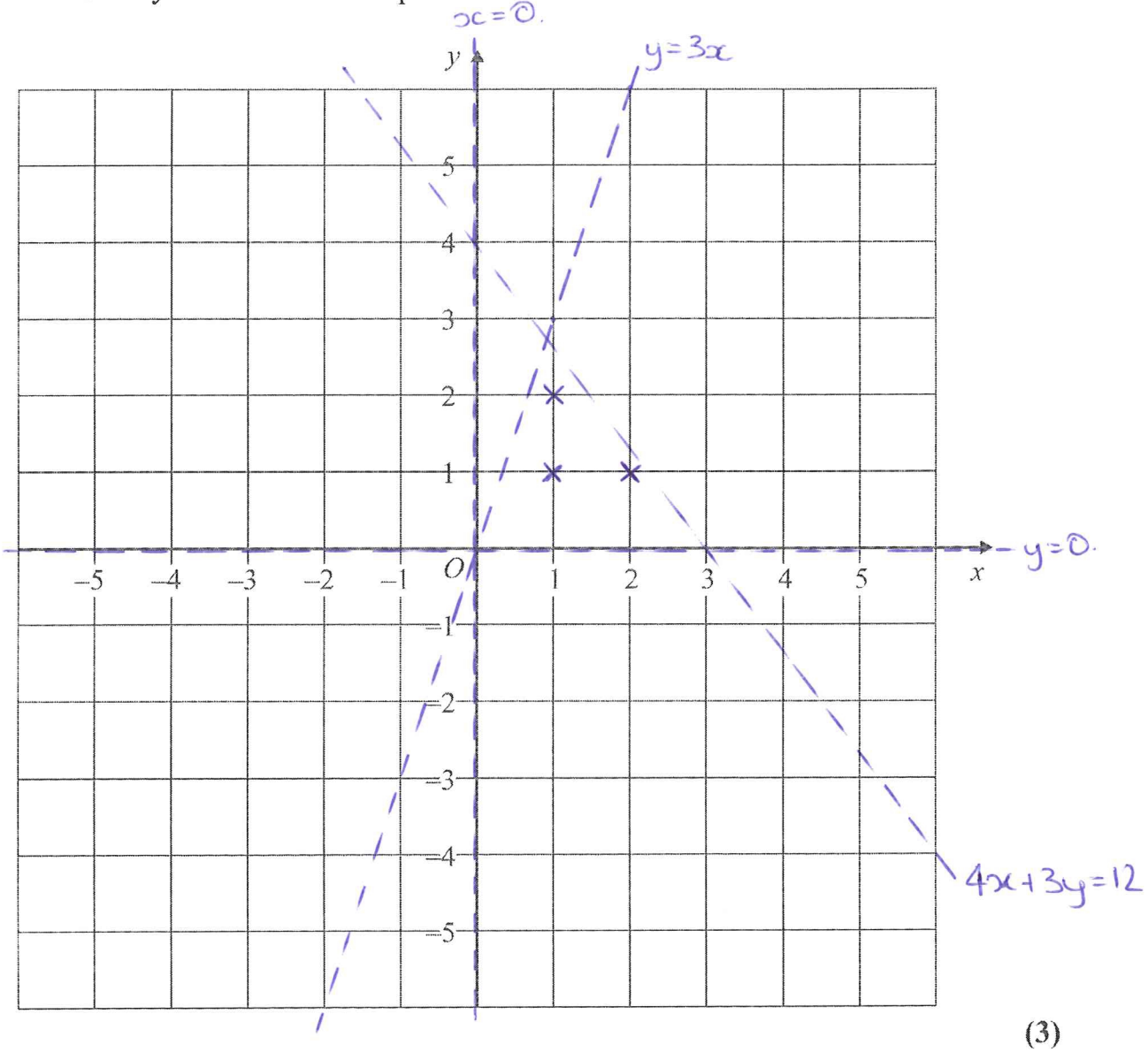
(Total 5 marks)

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 (×), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

3) Composite functions: Easier

Q1. The functions f and g are such that

$$f(x) = 2x + 3 \text{ and } g(x) = \frac{x}{4} - 2$$

(a) Find the value of f(8)

F(8) = 2(8) + 3
=16 + 3
= 19

19

.....

(1)

(b) Find gf(*4*)

f(4) = 2(4) + 3 = 11

$$g(11) = \frac{11}{4} - 2 = \frac{3}{4}$$

$\frac{3}{4}$

.....

(2)

(b) Show that

$$fg(x) = \frac{1}{2}x - 1$$

$$fg(x) = 2\left(\frac{x}{4} - 2\right) + 3$$

$$fg(x) = \frac{2x}{4} - 4 + 3$$

$$fg(x) = \frac{1}{2}x - 1$$

(2)

(Total for question = 5 marks)

3) Composite functions: Medium

2. The functions f and g are such that

$$f(x) = \frac{2}{x+3} \text{ and } g(x) = 3(x-2)$$

a) Show that $gf(5) = -\frac{21}{4}$

$$f(5) = \frac{2}{5+3} = \frac{1}{4}$$

$$g\left(\frac{1}{4}\right) = 3\left(\frac{1}{4} - 2\right)$$

$$g\left(\frac{1}{4}\right) = \frac{3}{4} - 6$$

$$g\left(\frac{1}{4}\right) = -\frac{21}{4}$$

.....

(2)

b) Show that fg(x) can be written in the form

$$\frac{2}{k(x-1)}$$

where k is an integer to be found.

$$fg(x) = \frac{2}{3(x-2)+3}$$

$$fg(x) = \frac{2}{3x-6+3}$$

$$fg(x) = \frac{2}{3x-3}$$

$$fg(x) = \frac{2}{3(x-1)} \quad , \quad k = 3$$

(3)

c) Find an expression for gg(x)

$$gg(x) = 3(3x-6) - 6$$

$$gg(x) = 9x - 24$$

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

(Total for question = 7 marks)

3) Composite functions: Harder

3. The functions f, g and h are such that

$$f(x) = 2x + 2 \quad , \quad g(x) = \frac{a}{x} \text{ and } h(x) = 3x^2 \quad for\ x > 0$$

a) Find hgf(3) in terms of a

$$f(3) = 2(3) + 2 = 8$$
$$g(8) = \frac{a}{8}$$
$$h\left(\frac{a}{8}\right) = 3\left(\frac{a}{8}\right)^2 = \frac{3a^2}{64}$$

$$hgf(3) = \frac{3a^2}{64}$$

.....

(2)

b) Given that $fg(10) = \frac{14}{5}$ find the value of a

$$2\left(\frac{a}{10}\right) + 2 = \frac{14}{5}$$

$$\frac{2a}{10} = \frac{4}{5}$$

$$a = 4$$

.....

(2)

(Total for question = 4 marks)

4. The functions f, g are such that

$$f(x) = 3x + a \text{ and } g(x) = 6x - b$$

Given that fg(2) = 19 and gf(3) = 48, find the values of a and b.

From fg(2) =19

$3(6(2) - b) + a = 19$

$36 - 3b + a = 19$

$a - 3b = -17$

From gf(3) =54

$6(3(3) + a) - b = 54$

$54 + 6a - b = 54$

$6a - b = 0$

Solving simutaneously

$6a - 18b = -102$

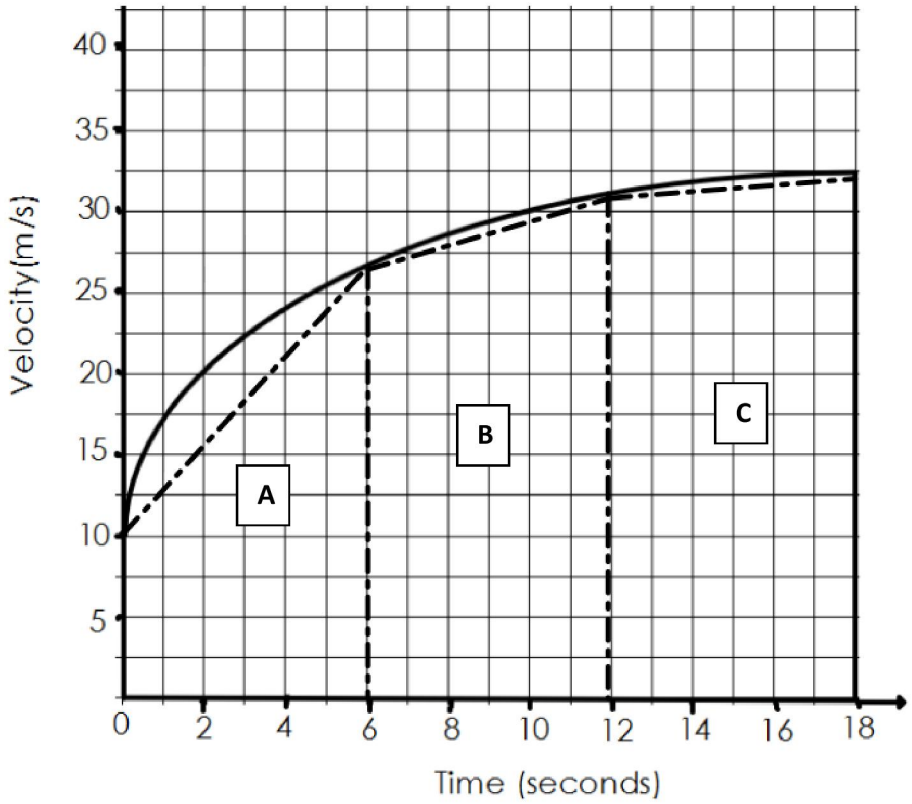
-17b = -102

b= -6, a =1

.....(5) **(Total for question = 5 marks)**

4) Areas under velocity time graph: Easier

1) The graph below shows a velocity time graph



1) a) By estimating the area under the graph using the three trapezia shown by dashed lines, work out the distance travelled in the 18 seconds.

Area of trapezium $= \frac{1}{2}(a + b)h$

Area of trapezium A $= \frac{1}{2}(10 + 27)(6) = 111$

Area of trapezium B $= \frac{1}{2}(27 + 31)(6) = 174$

Area of trapezium A $= \frac{1}{2}(31 + 32.5)(6) = 190.5$

Total Area under graph $= 111 + 174 + 190.5 = 475.5$

475.5metres travelled in 18 seconds

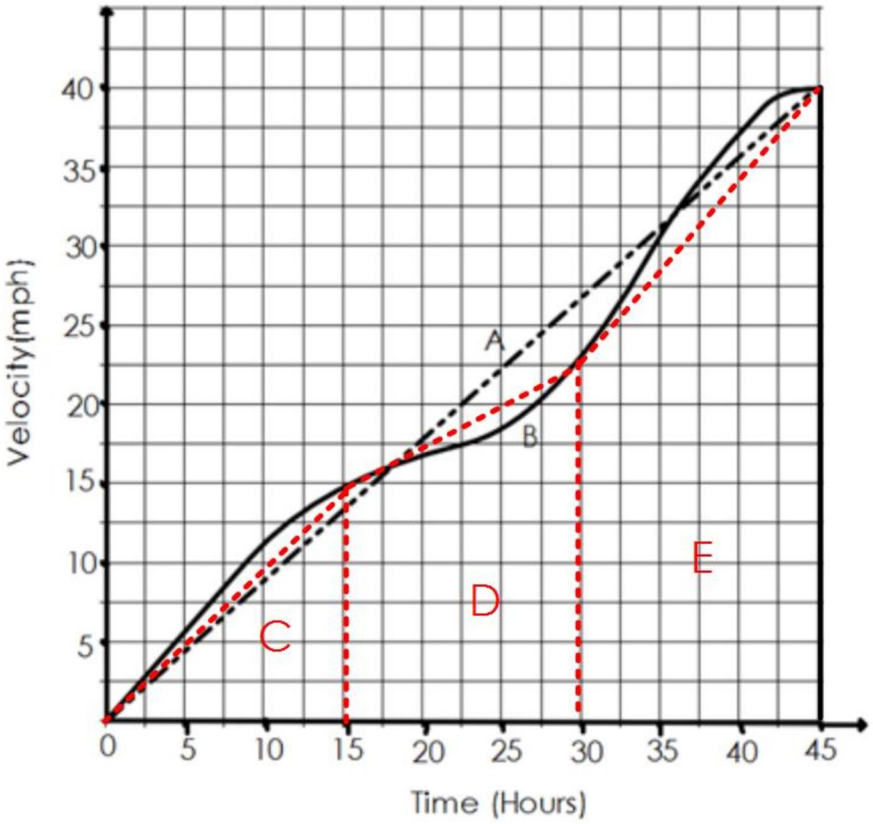
b) By considering the diagram, is your estimate for the distance an overestimate or underestimate? Explain your reasoning.

As each of the trapezia are a smaller area than the actual area, the estimate is an underestimate

(4 marks)

4) Areas under velocity time graph: Medium

2) The graph below shows a velocity time graph for two birds, A and B, over a long distance.



Which bird travels further in the 45 hours? You must show your working. Use 3 equal strips for your estimate for bird B. Comment on the reliability of your answer.

Distance travelled by bird A

Area of triangle $A = \frac{40 \times 45}{2} = 900$

Distance travelled by bird B

$$\text{Triangle C} = \frac{15 \times 15}{2} = 112.5$$

$$\text{Trapezium D} = \frac{1}{2}(15 + 22.5)(15) = 281.25$$

$$\text{Trapezium E} = \frac{1}{2}(22.5 + 40)(15) = 468.75$$

Total area under curve B is 862.5, so bird A travelled further. However, the area under the curve is an estimate and only uses three strips so not very reliable.

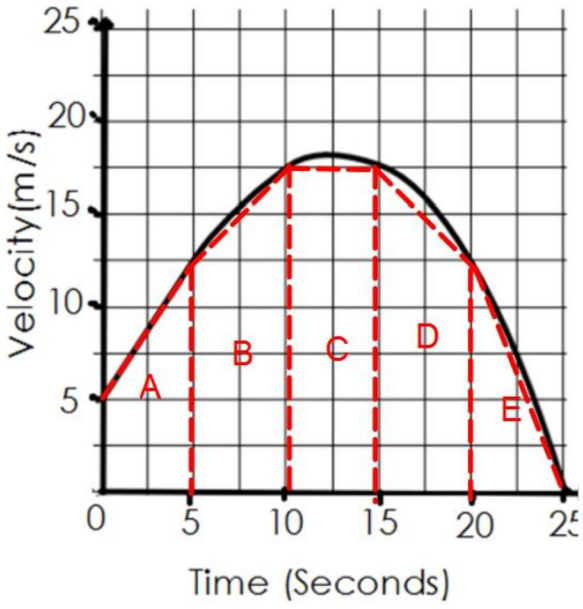
_____

(4 marks)

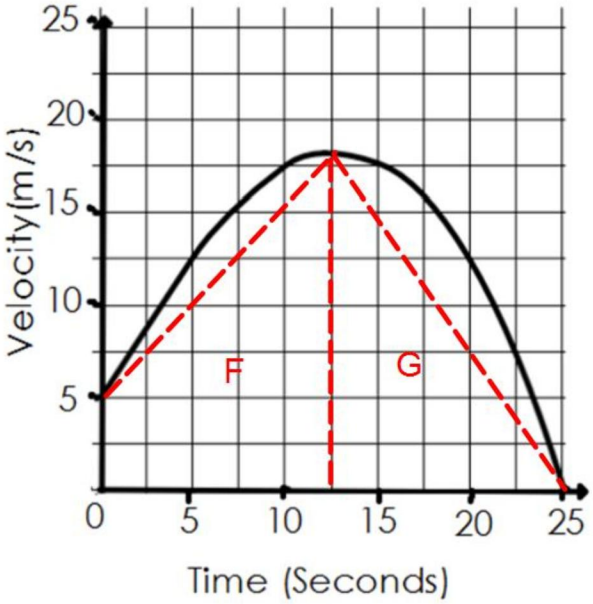
4) Areas under velocity time graph: Harder

3) The graph below shows a velocity-time graph for a drone.

Anna's method



Simone's method



a) Anna works out the distance travelled by using 3 trapezia, a rectangle and a triangle, all of equal width. Simone divides it into a triangle and a trapezium, both of equal width. Find an estimate of the distance using both Anna and Simone's method.

Anna's method :

Area $= \frac{1}{2}(5 + 12.5)(5) + \frac{1}{2}(12.5 + 17.5)(5) + (5 \times 17.5) + \frac{1}{2}(17.5 + 12.5)(5) + \frac{1}{2}(5 \times 12.5)$

Area = 43.75+ 75 + 87.5 + 75+ 31.25

Area = 312.5, distance 312.5 metres

Simone's method:

Area $= \frac{1}{2}(5 + 18)(12.5) + \frac{1}{2}(18 \times 12.5)$

Area = 143.75+ 112.5

Area =256.25 distance 256.25metres

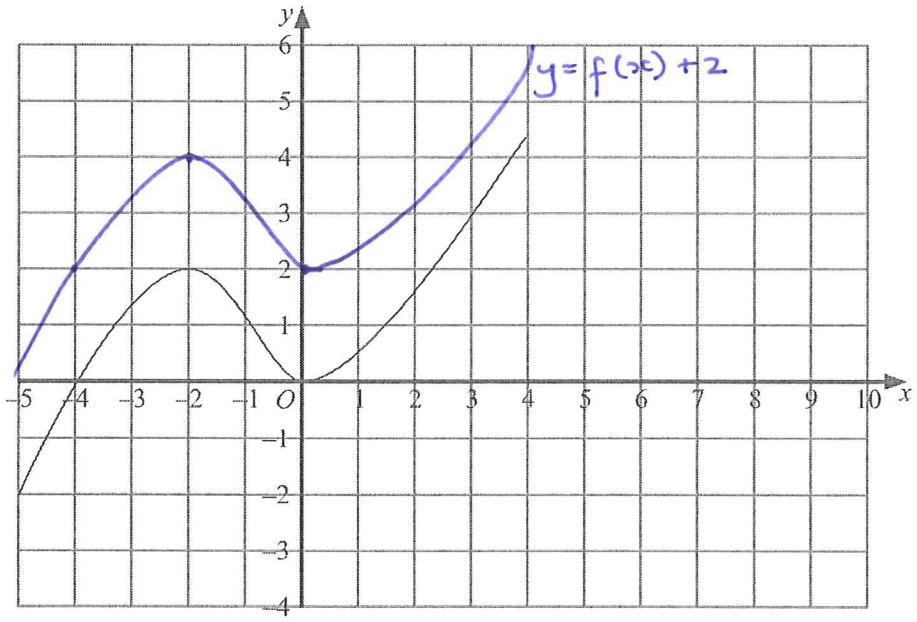
b) Comment on which method you think gives the most reliable results.
Anna's method is more reliable as she has used more strips. we can see from the graph Simone's method is a big underestimate.

(4 marks)

5) Transformations of Functions: Easier

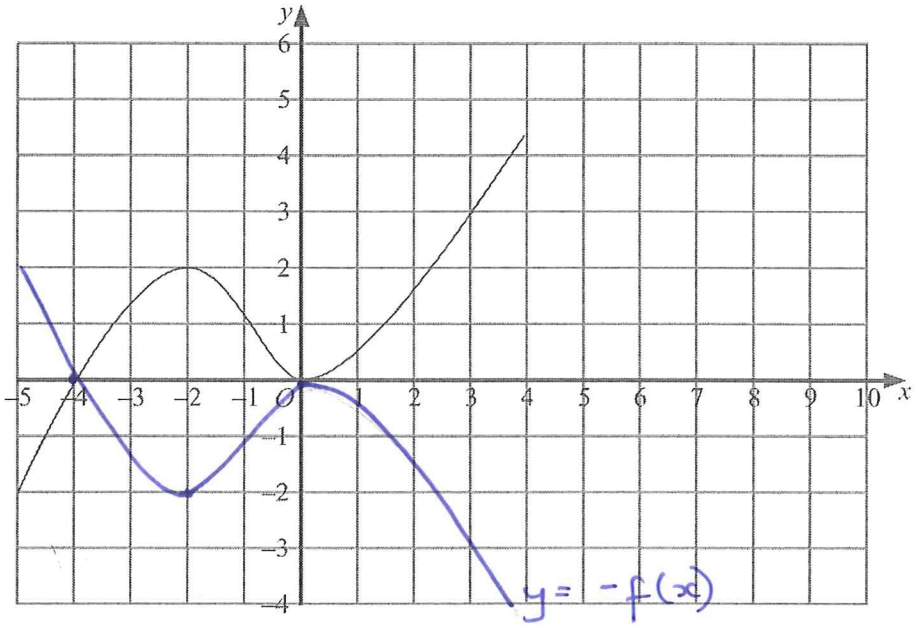
1. The graph of $y = f(x)$ is shown on the grids.

(a) On this grid, sketch the graph of $y = f(x) + 2$



(2)

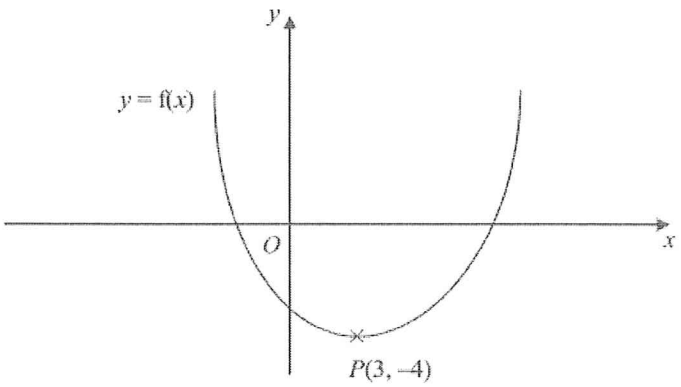
(b) On this grid, sketch the graph of $y = -f(x)$



(2)
(4 marks)

5) Transformations of Functions: Medium

9. This is a sketch of the curve with the equation $y = f(x)$.
The only minimum point of the curve is at $P(3, -4)$.



(a) Write down the coordinates of the minimum point of the curve with the equation $y = f(x - 2)$.

(5 , -4)
(2)

(b) Write down the coordinates of the minimum point of the curve with the equation $y = f(x + 5) + 6$

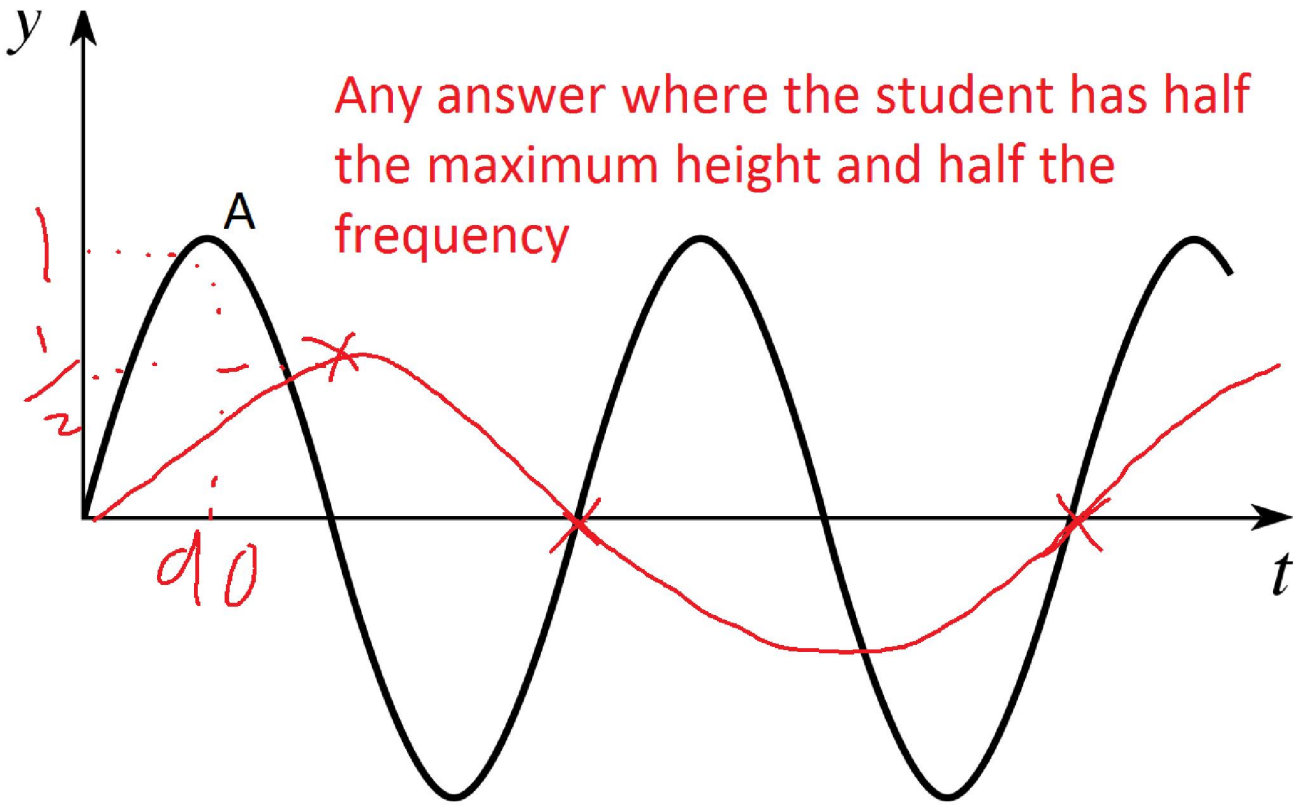
(-2 , 2)
(2)

(4 marks)

5) Transformations of Functions: Harder

2) a) State the co-ordinates of A (90^o, 1) (2 marks)

b)



HOWELL Zulekha

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	18 from 28	3 from 3	12 from 20	1 from 1	2 from 4	0 from 0
A02 and 3	39 from 52	12 from 12	4 from 9	11 from 13	12 from 16	0 from 2
Total	57 from 80	15 from 15	16 from 29	12 from 14	14 from 20	0 from 2

Your Pinpoint Topics

Topic 1: Expand double brackets. Mathswatch Clip: 134b

Topic 2: Finding volume, then mass and density. MW: NA

Topic 3: Dividing into a ratio. Mathswatch Clip: 106

Topic 4: Cumulative Frequency. Mathswatch Clip: 186

Topic 5: Inequalities Regions. Mathswatch Clip: 198

1) Expand double brackets: Easier

Solution for Question 1:

$(x + 3)(x + 2)$
$x^2 + 3x + 2x + 6$
$x^2 + 5x + 6$

Solution for Question 2:

a) $(x + 2)(x + 6)$
$x^2 + 2x + 6x + 12$
$x^2 + 8x + 12$

b) $(x + 2)(x - 6)$
$x^2 + 2x - 6x - 12$
$x^2 - 4x - 12$

c) $(x - 2)(x - 6)$
$x^2 - 2x - 6x + 12$
$x^2 - 8x + 12$

1) Expand double brackets: Medium

Solution for Question 3:

a) $(3x + 1)(x + 2)$
$3x^2 + 6x + x + 2$
$3x^2 + 7x + 2$

b) $(3x - 1)(x + 2)$
$3x^2 + 6x - x - 2$
$3x^2 + 5x - 2$

c) $(3x + 1)(3x + 2)$
$9x^2 + 6x + 3x + 2$
$9x^2 + 9x + 2$

Solution for Question 4:

a) $(3 - x)(2x + 1)$
$6x + 3 - 2x^2 - x$
$-2x^2 + 5x + 3$

b) $(5 - 2x)(3 - x)$
$15 - 5x - 6x + 2x^2$
$2x^2 - 11x + 15$

c) $(2x - 3)(2x + 3)$
$4x^2 + 6x - 6x - 9$
$4x^2 - 9$

1) Expand double brackets: Harder

Solution for Question 5:

$(x+5)(2x+3) - 3(x-2)(6x+5)$
$2x^2 + 3x + 10x + 15 - 3[6x^2 + 5x - 12x - 10]$
$2x^2 + 3x + 10x + 15 - 18x^2 - 15x + 36x + 30$
$-16x^2 + 34x + 45$

Solution for Question 6:

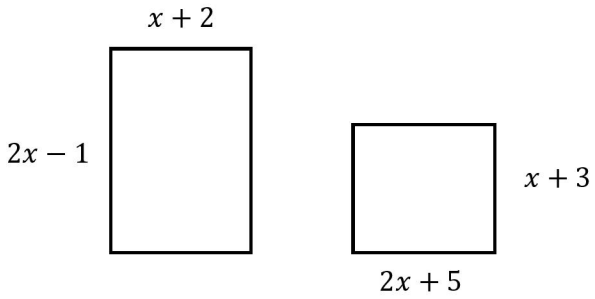
$\times$	$3x$	4
$2x$	$6x^2$	$8x$
-1	$-3x$	-4

$6x^2 + 8x - 3x - 4$
$6x^2 + 5x - 4$

He has added the terms $2x$ and $3x$ instead of multiplying. He has missed of a negative on $3x$

Solution for Question 7:

Split shape into 2



$2x + 5 = 3x + 7 - (x + 2)$

Area:

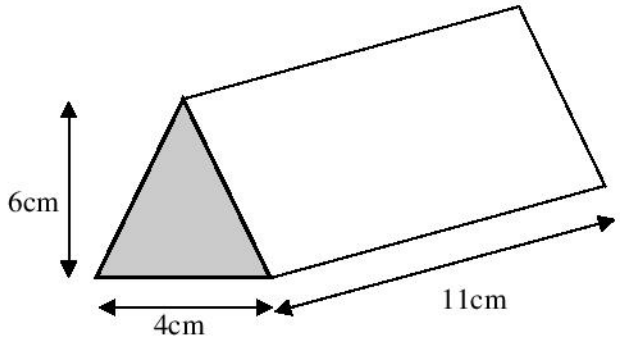
$(x+2)(2x-1) + (x+3)(2x+5)$

$2x^2 - x + 4x - 2 + 2x^2 + 5x + 6x + 15$

$4x^2 + 14x + 13$

2) Finding volume, then mass and density: Easier

1) A metal triangular prism is shown.



(a) What is the **volume** of the prism?

Prism volume = x-section area × length

$$= \frac{6 \times 4}{2} \times 11$$

$$= 132$$

132cm^3

(b) The **density** of the metal is 4.8g/cm^3.

What is the mass of the prism to the nearest gram?

Mass = volume × density

$= 132 \times 4.8$

$= 633.6$

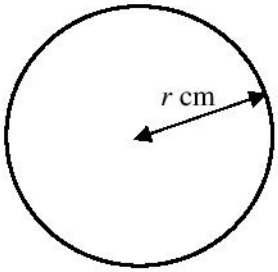
634g

(4 Marks)

2) Finding volume, then mass and density: Medium

3) A solid sphere is shown.

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



The mass of the sphere is 200g and its density 5.2g/m^3

(a) What is the **volume** of the sphere to three significant figures?

Volume = mass ÷ density

= 200 ÷ 5.2

= 38.46

38.5m^3

(b) What is the **radius** of the sphere to three significant figures?

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

$38.5 = \frac{4\times\pi\times r^3}{3}$

$38.5 \times 3 \div 4 \div \pi = r^3$

$r = \sqrt[3]{9.191\ldots} = 2.09$

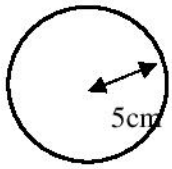
2.09cm

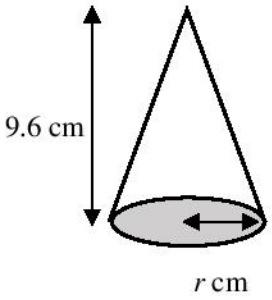
(5 Marks)

2) Finding volume, then mass and density: Harder

4) A solid sphere and cone are shown.

Volume of a sphere $= \frac{4\pi r^3}{3}$ Volume of a cone $= \frac{\pi r^2 h}{3}$





(a) What is the **volume** of the sphere to the nearest cubic centimetre?

Volume of the sphere $= \frac{4\times\pi\times5^3}{3} = 523.6$

524cm^3

The cone has the **same** volume as the sphere to the nearest cubic centimetre.

(b) What is the **radius** of the cone to one decimal place?

$524 = \frac{\pi\times r^2\times9.6}{3}$

$524 \times 3 \div 9.6 \div \pi = r^2$

$r = \sqrt{52.12} = 7.22$

7.2cm

The cone is made of a material with a density of 6.2g/cm^3.

(c) What is the **mass** of the cone to one decimal place?

Mass = volume × density

= 524 × 6.2

= 3248.8 3248.8g

The mass of the sphere is also the same as the mass of the cone.

(d) What can you say about the density of the sphere?

The density of the sphere is the same as the cone. Ie. 6.2g/cm^3

(7 Marks)

3) Dividing into a ratio: Easier

Solution for Question 1:

Ratio 1:3 total 1+3= 4

$£40 \div 4 = 10$

Multiply each part of ratio 1:3 by 10:

10:30

Solution for Question 2:

Ratio total 8:9 8+9= 17

$153kg \div 17 = 9$

Multiply ratio 8:9 by 9

72:81

$81 - 72 = 9$

Patrick is 9kg heavier than Connor

Solution for Question 3:

Ratio 1:2

x:50

$50 \div 2 = 25$

$1 \times 25 = 25$

Tim gets 25 sweets

Solution for Question 4:

Ratio Holly to Wei-Kong to Wilfred: 6:3:1

6:3:1 = 10

$£850 \div 10 = 85$

Holly receives $6 \times 85 = £510$

3) Dividing into a ratio: Medium

Solution for Question 5:

Ratio 5:2

Difference in ratio parts 5-2 = 3

$28.5 \div 3 = 9.5$

Multiply ratio 5:2 by 9.5

47.5:19

47.5 km + 19km = 66.5km

Solution for Question 6:

Ratio 5:2:3

x:22:y

$22 \div 2 = 11$

Therefore x, Carbohydrates, = $5 \times 11 = 55$g

3) Dividing into a ratio: Harder

Solution for Question 7:

Ratio Red to Blue = 3:7

3+7 = 10

30 litres÷ 10 = 3

Multiply ratio 3:7 by 3

9:21 litres needed.

$£20 \times \frac{9}{3\ (litre\ tin)} + £30 \times \frac{21}{3\ (litre\ tin)}$

$£20 \times 3 + £30 \times 7 = £270$

Solution for Question 8:

Superheroes to princesses = 5:4

Princesses to Celebrities = 3:1

Multiply ratio 5:4 by 3 = 15:12

Multiply ratio 3:1 by 4 = 12:4

Therefore ratio as a whole = 15:12:4

15:12:1 = 31

$\frac{93(Costumes)}{31} = 3$

Multiply ratio 15:12:4 by 3

45:36:12

36 people dressed as princesses

4) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

(a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	12
$20 < A \leq 40$	27
$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

..... 41 ..... years

(2)

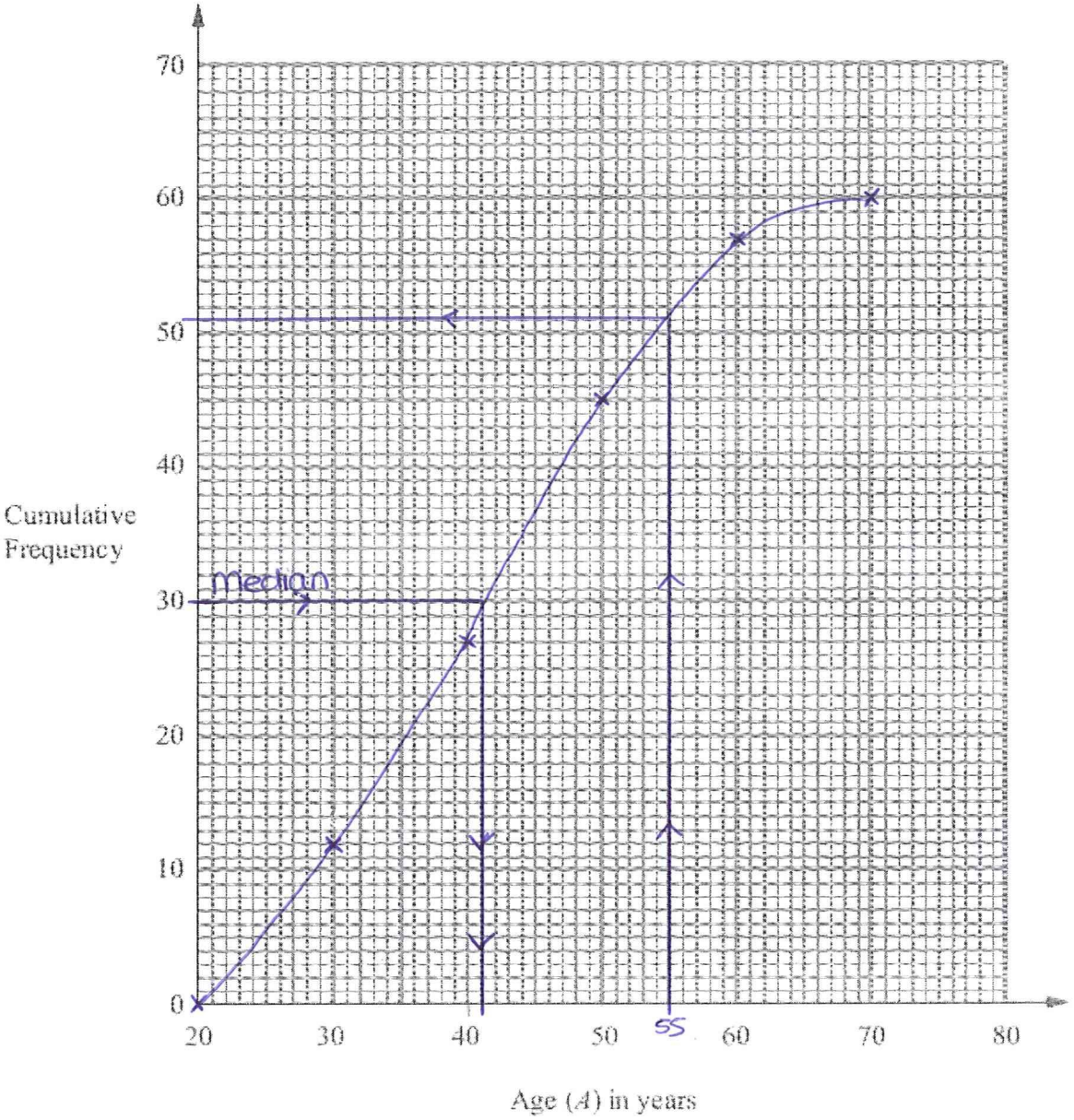
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so $60 - 51 = 9$ are older.

..... 9 .....

(2)

4) Cumulative Frequency: Medium



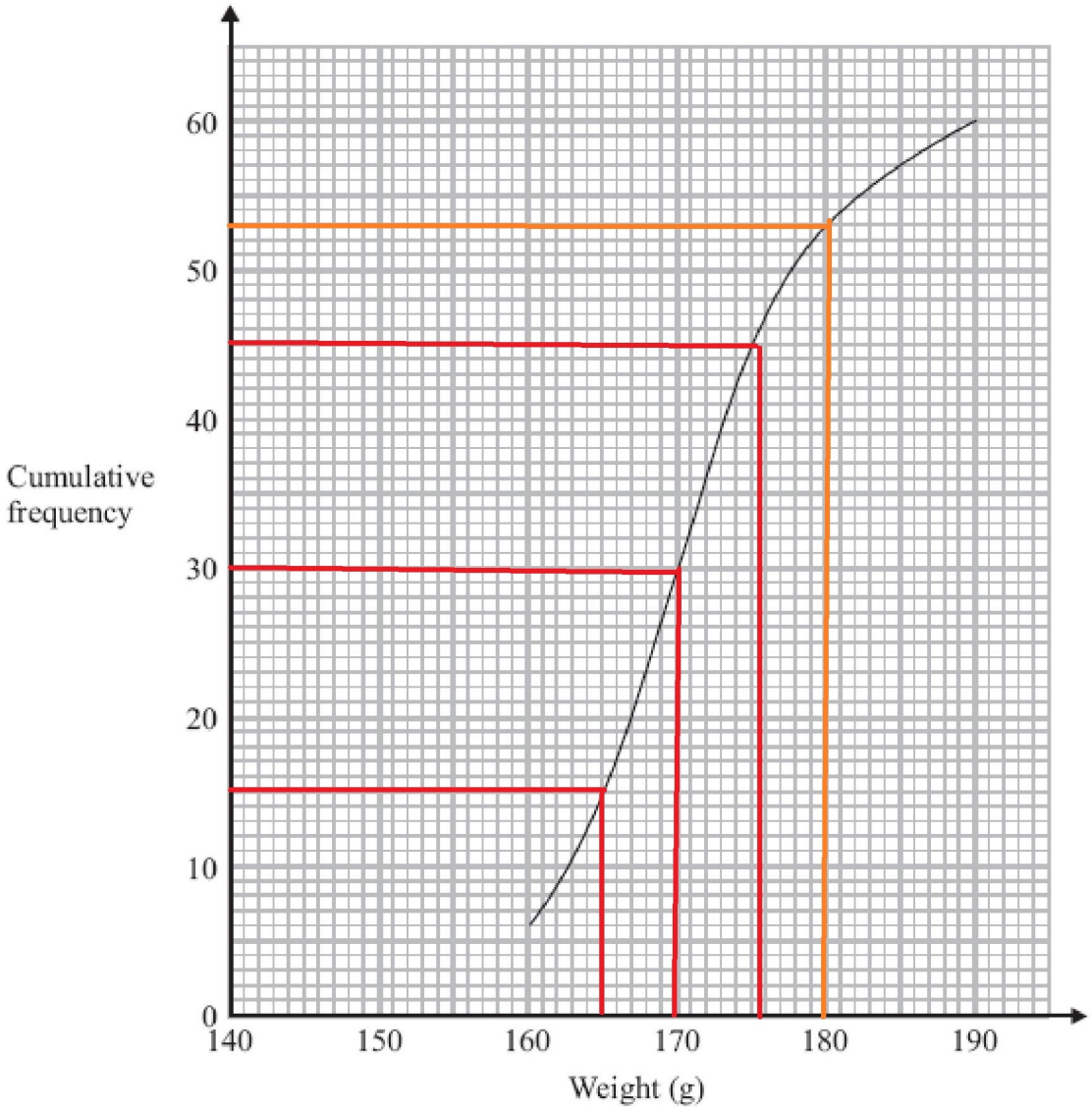
(7 marks)

4) Cumulative Frequency: Harder

4. Harry grows tomatoes.
This year he put his tomato plants into two groups, group A and group B.

Harry gave fertiliser to the tomato plants in group A.
He did not give fertiliser to the tomato plants in group B.

Harry weighed 60 tomatoes from group A.
The cumulative frequency graph shows some information about these weights.



ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

ii) The Upper Quartile 175 .....

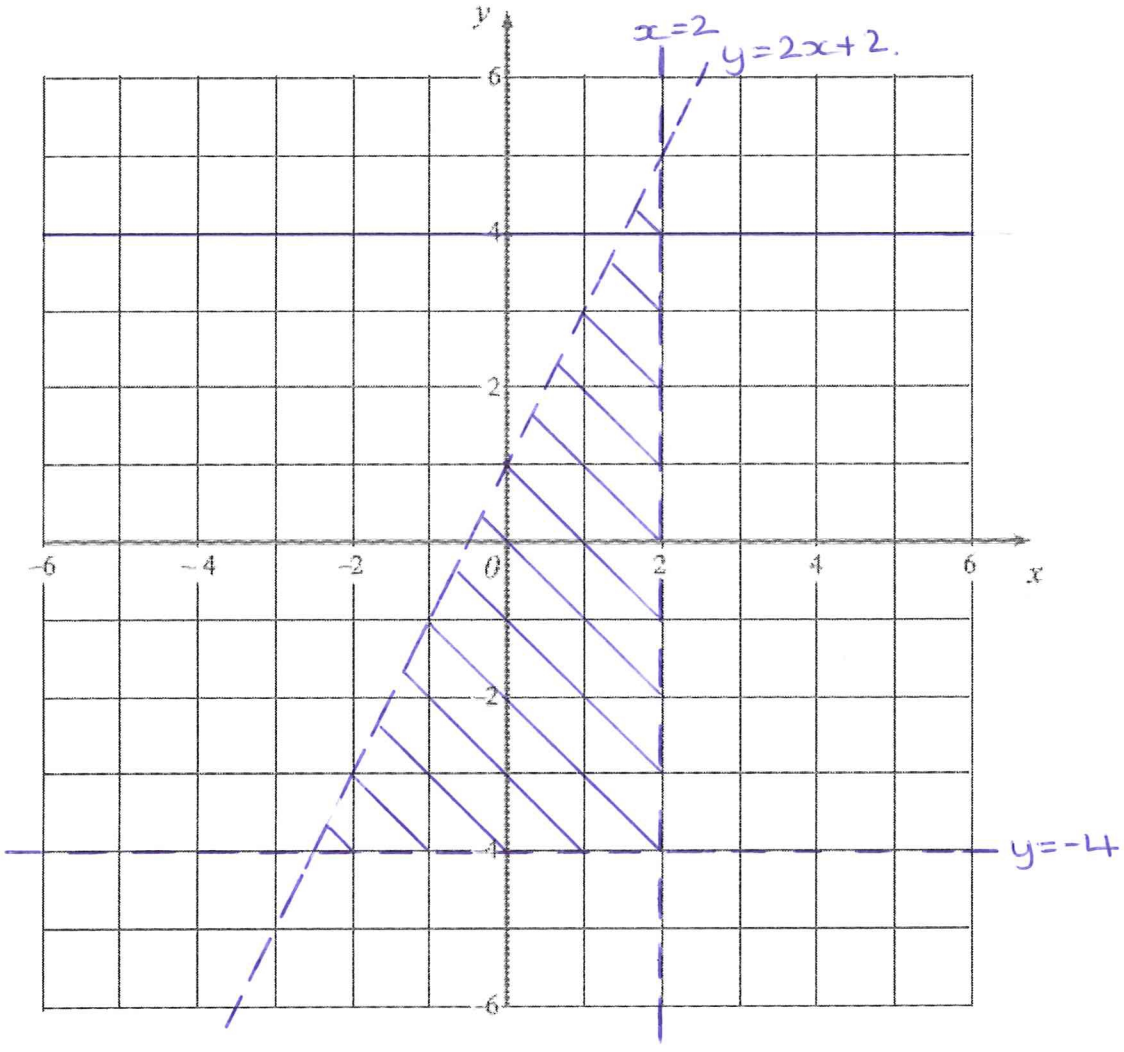
(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

5) Inequalities Regions: Easier

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

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

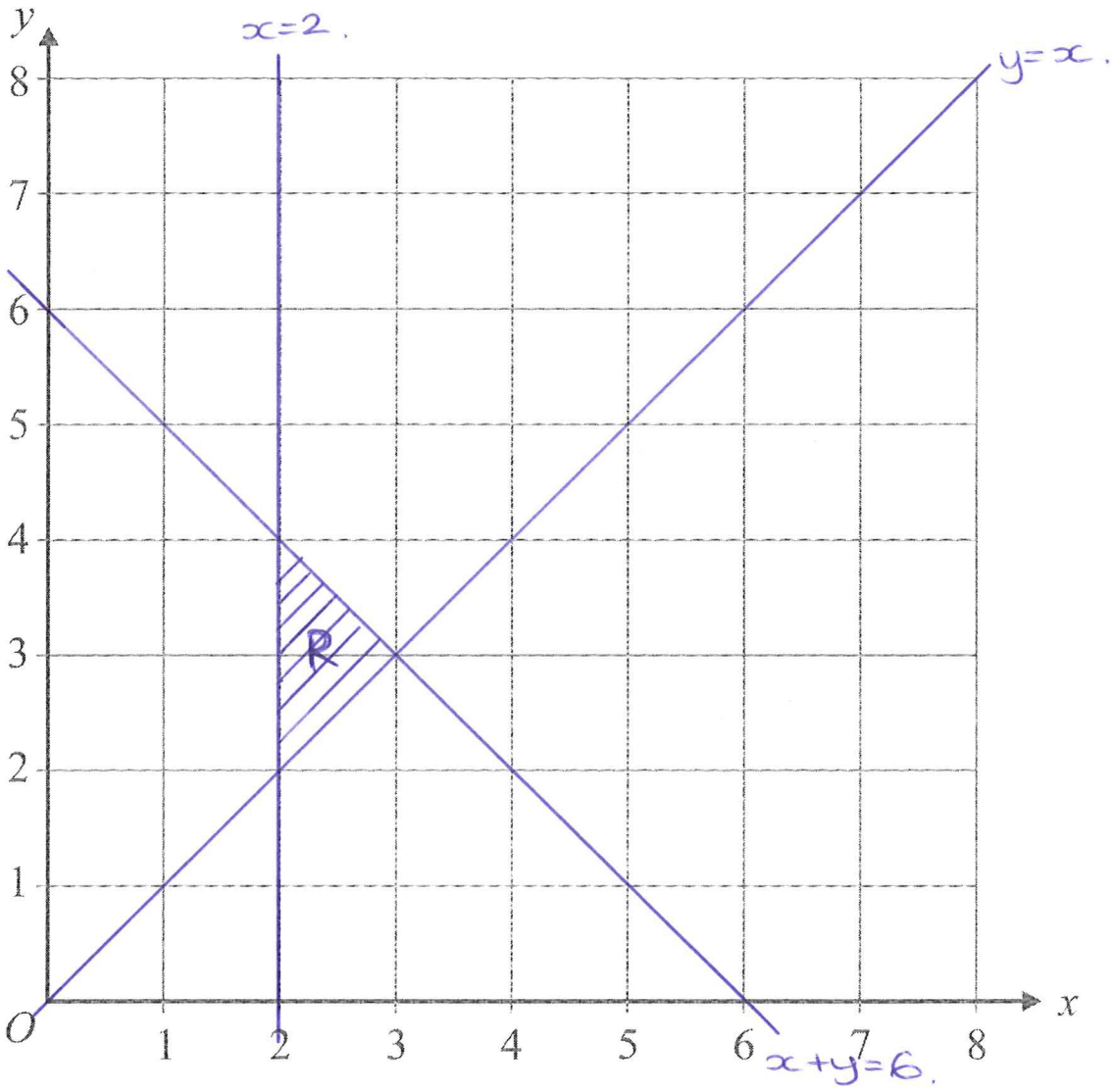


(Total for Question 19 = 4 marks)

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

$$x \geq 2 \qquad y \geq x \qquad x + y \leq 6$$



(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)

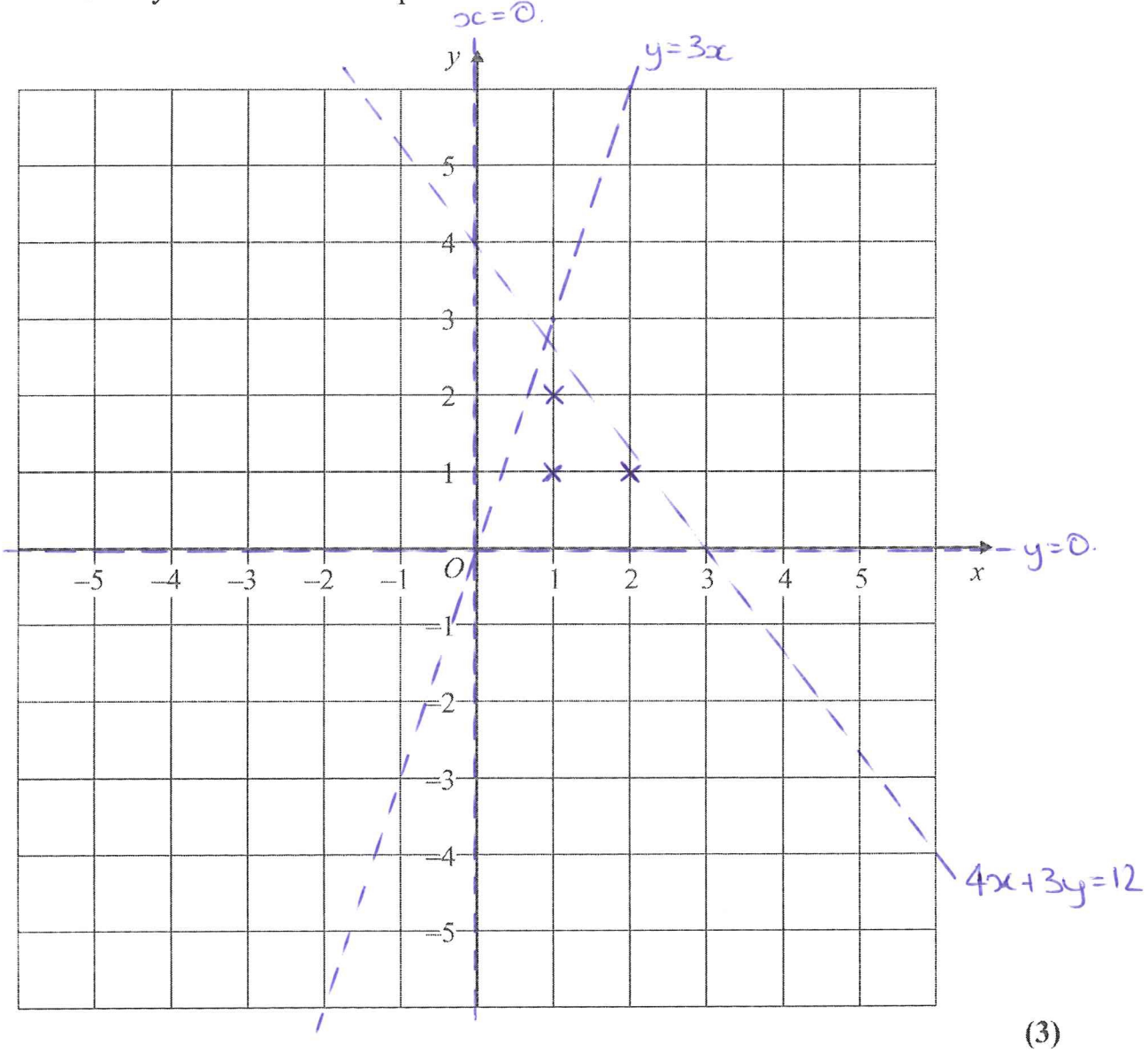
(Total 5 marks)

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 (×), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

HUGHES Mia

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Your Exam Statistics

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A02 and 3	45 from 52	11 from 12	6 from 9	13 from 13	13 from 16	2 from 2
Total	67 from 80	14 from 15	21 from 29	13 from 14	17 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Reverse Percentage. Mathswatch Clip: 110

Topic 2: Inequalities Regions. Mathswatch Clip: 198

Topic 3: Composite functions. Mathswatch Clip: 215

Topic 4: Areas under velocity time graph. MW: 216

Topic 5: Vectors. Mathswatch Clip: 219

1) Reverse Percentage: Easier

1. A shop offers 25% discount on its products in the January Sale. A Sofa costs £450 in the sale. How much did it cost originally?

$$450 \div 0.75 = 600$$

£600

…… **(3)**

2. A low fat yoghurt claims to have 20% less fat than its full fat equivalent. The low fat yoghurt has 12g of fat. How much does the full fat equivalent have?

$$12g \div 0.8 = 15g$$

$15g$

…… **(3)**

3. A telephone company comes up with a strategy that reduces their customers wait time by 30%. After they have implemented the strategy a customer waits for 14 minutes. How long would they have waited for before the strategy was implemented?

$$14 \div 0.7 = 20\ mins$$

$20\ mins$

…… **(3)**

1) Reverse Percentage: Medium

4. A tax on sugary products at 5% is implemented by a new government. After the tax a chocolate bar costs 84p. How much has is increased by in pence?4

$84 \div 1.05 = 80p$

$80p$

…..…… **(3)**

5. A smartphone depreciates in value every year by 25%. After 2 years the value of the smartphone is £236.25. What was its value when new?

£236.25÷ 0.75^2

= £420

…..…… **(3)**

1) Reverse Percentage: Harder

*6. Two cities have different population growths

CITY A	CITY B
Growth 2% per year	Growth 5% Per year

At the end of 2015 the population of City A was 20400, and the population of City B was 20475. By how much did the populations differ at the end of 2014?

CITY A

$$20400 \div 1.02 = 20000$$

CITY B

$$20475 \div 1.05 = 19500$$

$$20000 - 19500 = 500$$

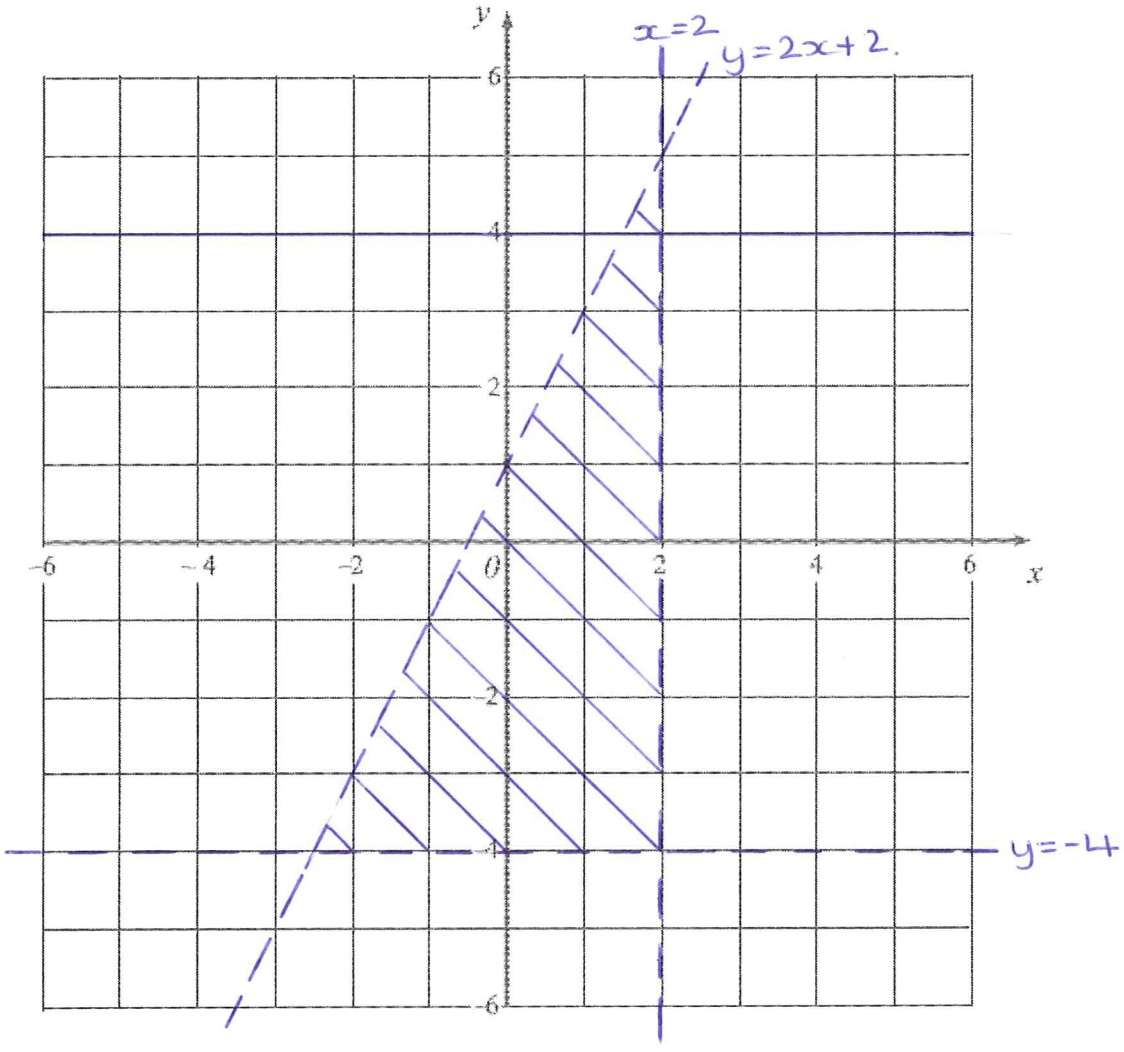
There was a difference of 500 people at the end of 2014

…… **(4)**

2) Inequalities Regions: Easier

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

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

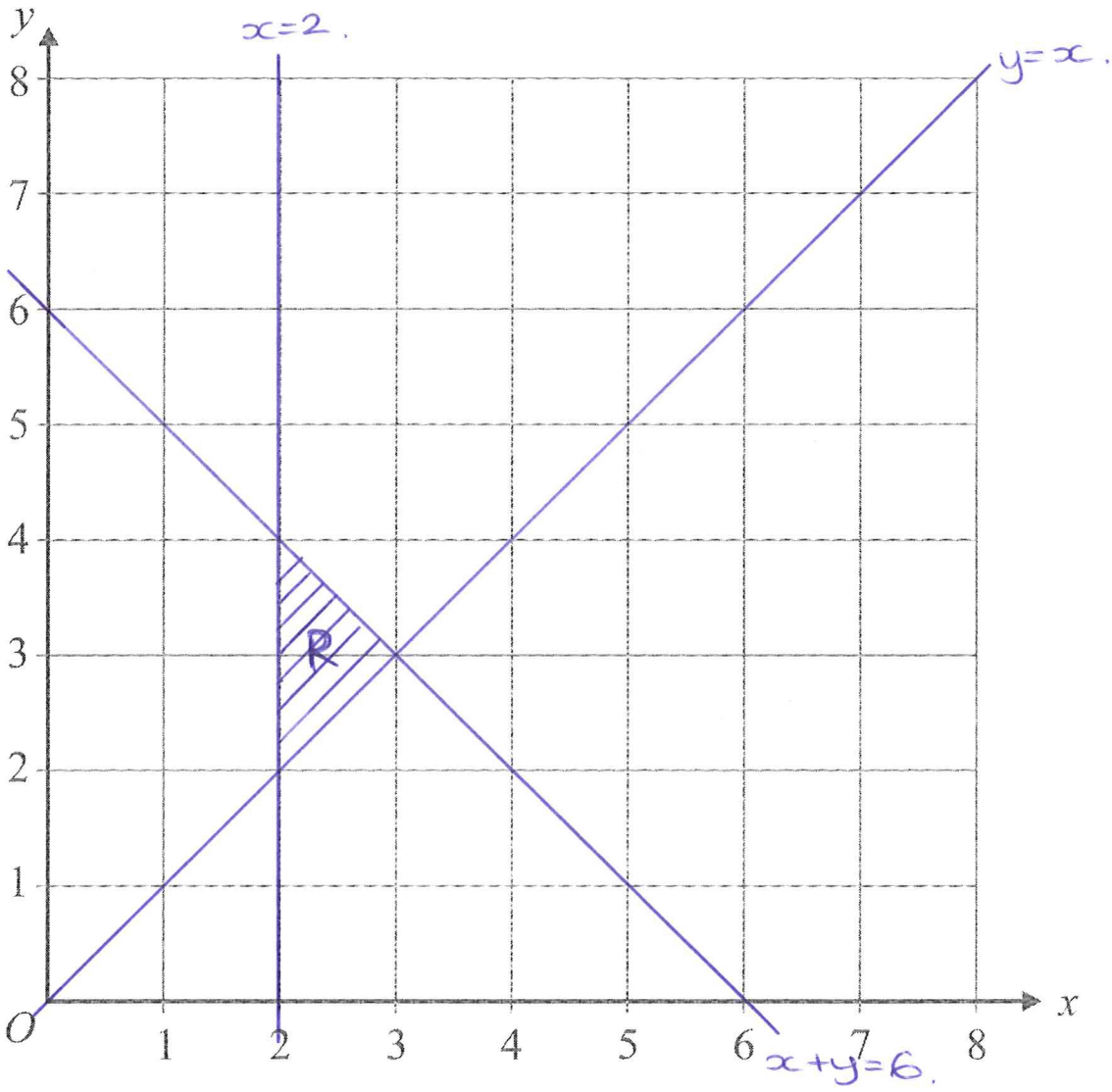


(Total for Question 19 = 4 marks)

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

$$x \geq 2 \qquad y \geq x \qquad x + y \leq 6$$



(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)

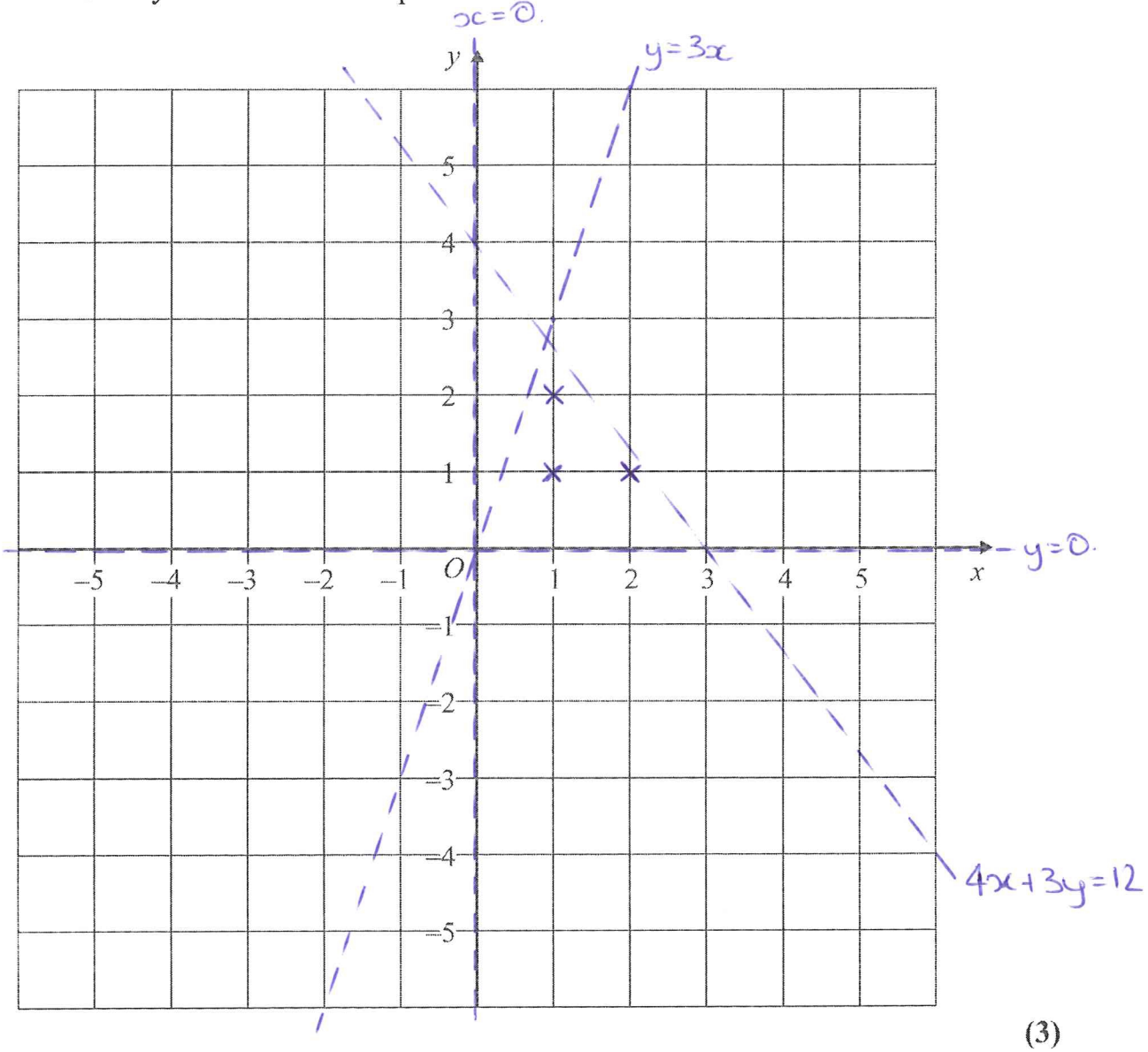
(Total 5 marks)

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 (×), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

3) Composite functions: Easier

Q1. The functions f and g are such that

$$f(x) = 2x + 3 \text{ and } g(x) = \frac{x}{4} - 2$$

(a) Find the value of f(8)

F(8) = 2(8) + 3
=16 + 3
= 19

19

.....

(1)

(b) Find gf(*4*)

f(4) = 2(4) + 3 = 11

$$g(11) = \frac{11}{4} - 2 = \frac{3}{4}$$

$\frac{3}{4}$

.....

(2)

(b) Show that

$$fg(x) = \frac{1}{2}x - 1$$

$$fg(x) = 2\left(\frac{x}{4} - 2\right) + 3$$

$$fg(x) = \frac{2x}{4} - 4 + 3$$

$$fg(x) = \frac{1}{2}x - 1$$

(2)

(Total for question = 5 marks)

3) Composite functions: Medium

2. The functions f and g are such that

$$f(x) = \frac{2}{x+3} \text{ and } g(x) = 3(x-2)$$

a) Show that $gf(5) = -\frac{21}{4}$

$$f(5) = \frac{2}{5+3} = \frac{1}{4}$$

$$g\left(\frac{1}{4}\right) = 3\left(\frac{1}{4} - 2\right)$$

$$g\left(\frac{1}{4}\right) = \frac{3}{4} - 6$$

$$g\left(\frac{1}{4}\right) = -\frac{21}{4}$$

.....

(2)

b) Show that fg(x) can be written in the form

$$\frac{2}{k(x-1)}$$

where k is an integer to be found.

$$fg(x) = \frac{2}{3(x-2)+3}$$

$$fg(x) = \frac{2}{3x-6+3}$$

$$fg(x) = \frac{2}{3x-3}$$

$$fg(x) = \frac{2}{3(x-1)} \quad , \quad k = 3$$

(3)

c) Find an expression for gg(x)

$$gg(x) = 3(3x-6) - 6$$

$$gg(x) = 9x - 24$$

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

(Total for question = 7 marks)

3) Composite functions: Harder

3. The functions f, g and h are such that

$$f(x) = 2x + 2 \quad , \quad g(x) = \frac{a}{x} \text{ and } h(x) = 3x^2 \quad for\ x > 0$$

a) Find hgf(3) in terms of a

$$f(3) = 2(3) + 2 = 8$$
$$g(8) = \frac{a}{8}$$
$$h\left(\frac{a}{8}\right) = 3\left(\frac{a}{8}\right)^2 = \frac{3a^2}{64}$$

$$hgf(3) = \frac{3a^2}{64}$$

.....

(2)

b) Given that $fg(10) = \frac{14}{5}$ find the value of a

$$2\left(\frac{a}{10}\right) + 2 = \frac{14}{5}$$

$$\frac{2a}{10} = \frac{4}{5}$$

$$a = 4$$

.....

(2)

(Total for question = 4 marks)

4. The functions f, g are such that

$$f(x) = 3x + a \text{ and } g(x) = 6x - b$$

Given that fg(2) = 19 and gf(3) = 48, find the values of a and b.

From fg(2) =19

$3(6(2) - b) + a = 19$

$36 - 3b + a = 19$

$a - 3b = -17$

From gf(3) =54

$6(3(3) + a) - b = 54$

$54 + 6a - b = 54$

$6a - b = 0$

Solving simutaneously

$6a - 18b = -102$

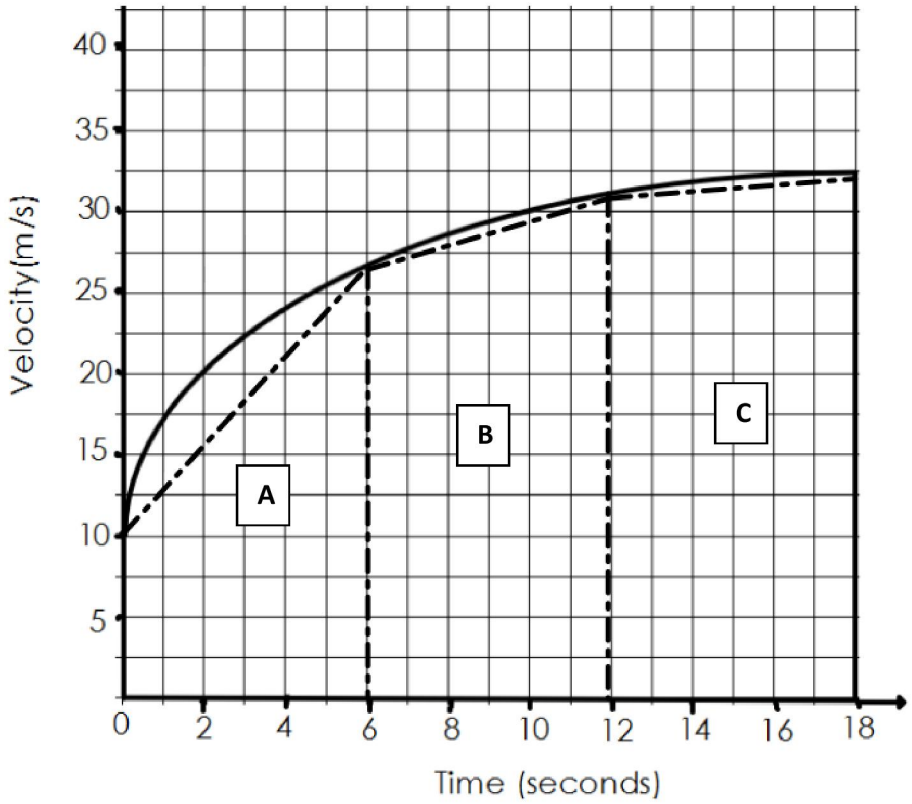
-17b = -102

b= -6, a =1

.....(5) **(Total for question = 5 marks)**

4) Areas under velocity time graph: Easier

1) The graph below shows a velocity time graph



1) a) By estimating the area under the graph using the three trapezia shown by dashed lines, work out the distance travelled in the 18 seconds.

Area of trapezium $= \frac{1}{2}(a + b)h$

Area of trapezium A $= \frac{1}{2}(10 + 27)(6) = 111$

Area of trapezium B $= \frac{1}{2}(27 + 31)(6) = 174$

Area of trapezium A $= \frac{1}{2}(31 + 32.5)(6) = 190.5$

Total Area under graph $= 111 + 174 + 190.5 = 475.5$

475.5metres travelled in 18 seconds

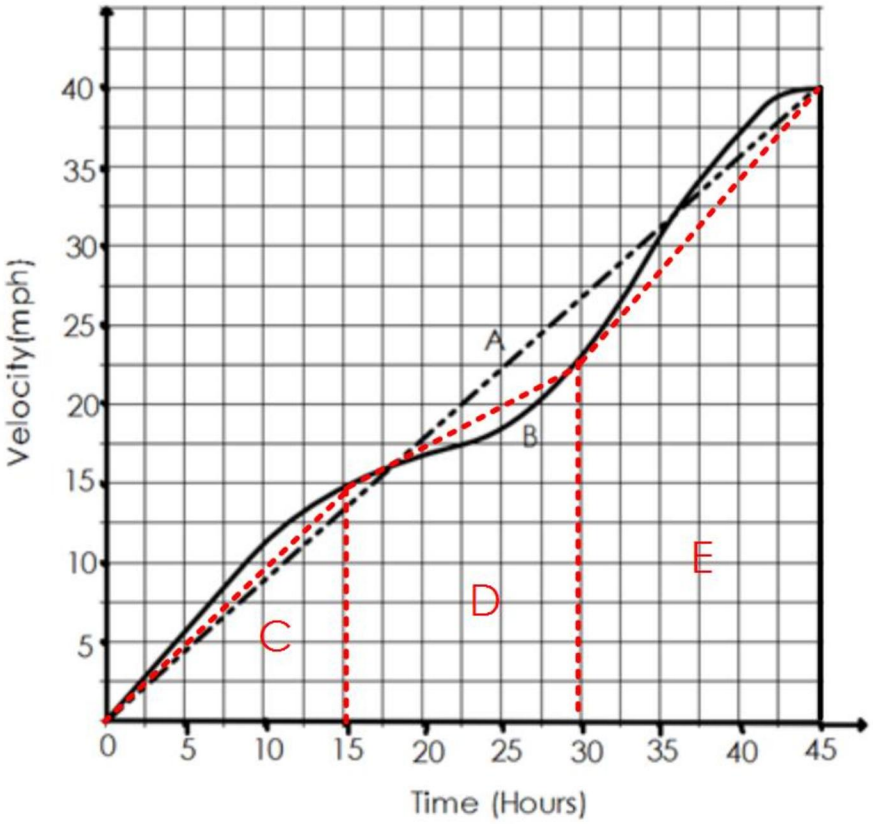
b) By considering the diagram, is your estimate for the distance an overestimate or underestimate? Explain your reasoning.

As each of the trapezia are a smaller area than the actual area, the estimate is an underestimate

(4 marks)

4) Areas under velocity time graph: Medium

2) The graph below shows a velocity time graph for two birds, A and B, over a long distance.



Which bird travels further in the 45 hours? You must show your working. Use 3 equal strips for your estimate for bird B. Comment on the reliability of your answer.

Distance travelled by bird A

Area of triangle $A = \frac{40 \times 45}{2} = 900$

Distance travelled by bird B

$$\text{Triangle C} = \frac{15 \times 15}{2} = 112.5$$

$$\text{Trapezium D} = \frac{1}{2}(15 + 22.5)(15) = 281.25$$

$$\text{Trapezium E} = \frac{1}{2}(22.5 + 40)(15) = 468.75$$

Total area under curve B is 862.5, so bird A travelled further. However, the area under the curve is an estimate and only uses three strips so not very reliable.

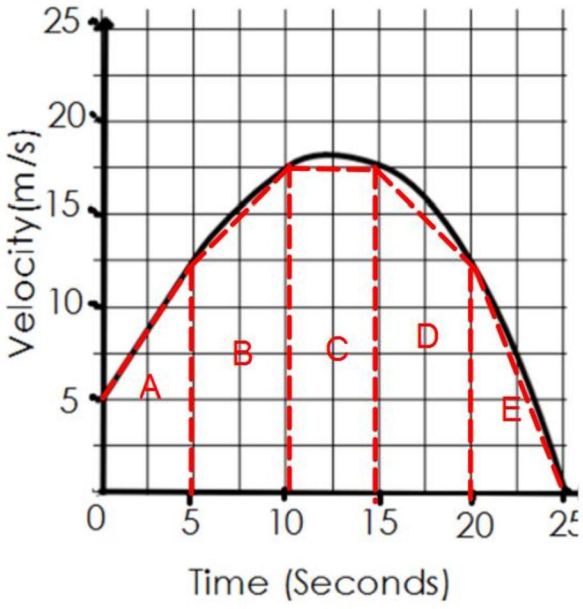
_____

(4 marks)

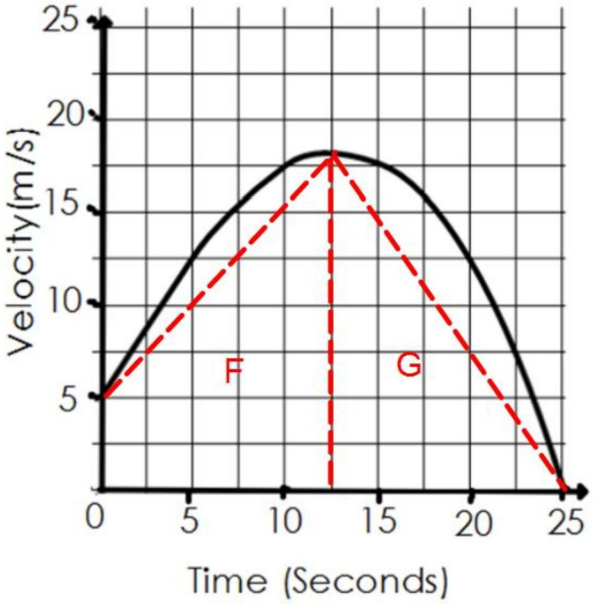
4) Areas under velocity time graph: Harder

3) The graph below shows a velocity-time graph for a drone.

Anna's method



Simone's method



a) Anna works out the distance travelled by using 3 trapezia, a rectangle and a triangle, all of equal width. Simone divides it into a triangle and a trapezium, both of equal width. Find an estimate of the distance using both Anna and Simone's method.

Anna's method :

Area $= \frac{1}{2}(5 + 12.5)(5) + \frac{1}{2}(12.5 + 17.5)(5) + (5 \times 17.5) + \frac{1}{2}(17.5 + 12.5)(5) + \frac{1}{2}(5 \times 12.5)$

Area = 43.75+ 75 + 87.5 + 75+ 31.25

Area = 312.5, distance 312.5 metres

Simone's method:

Area $= \frac{1}{2}(5 + 18)(12.5) + \frac{1}{2}(18 \times 12.5)$

Area = 143.75+ 112.5

Area =256.25 distance 256.25metres

b) Comment on which method you think gives the most reliable results.
Anna's method is more reliable as she has used more strips. we can see from the graph Simone's method is a big underestimate.

(4 marks)

5) Vectors: Easier

1.

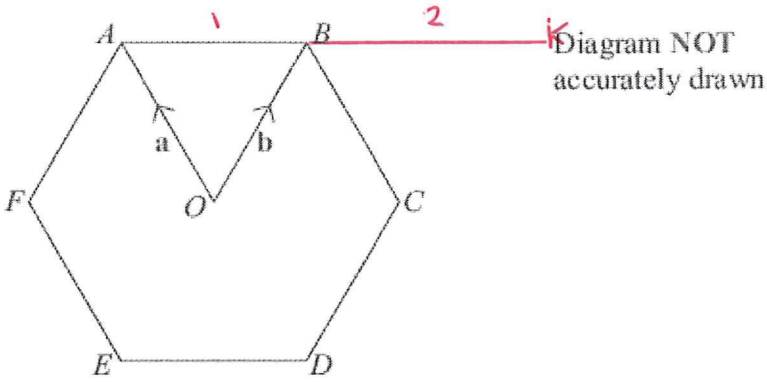


Diagram NOT accurately drawn

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 **a** and **b**.

$-a+b$

.....

(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 **a** and **b**.
Give your answer in its simplest form.

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

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

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

$-a+2b$

.....

(3)

(4 marks)

5) Vectors: Medium

6.

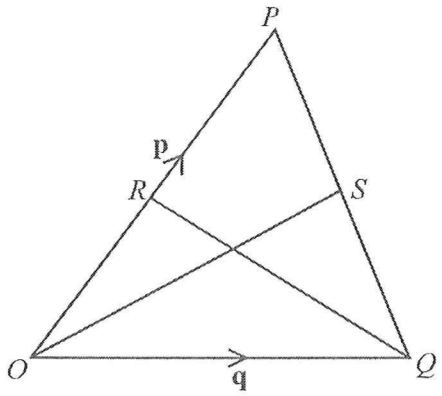


Diagram **NOT** accurately drawn

OPQ is a triangle.

R is the midpoint of OP.

S is the midpoint of PQ.

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

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

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

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

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

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

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

(ii) Show that RS is parallel to OQ.

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

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

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

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

(5 marks)

5) Vectors: Harder

6.

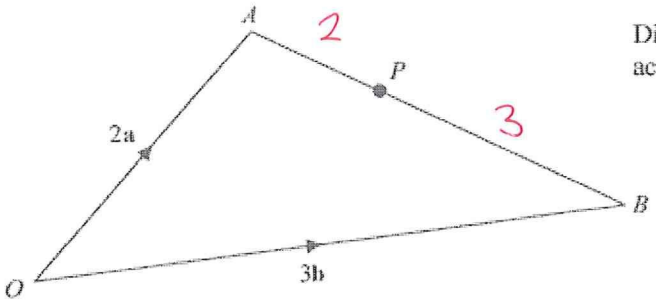


Diagram NOT accurately drawn

OAB is a triangle.

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

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

(*a*) Find *AB* in terms of **a** and **b**.

$\overrightarrow{AB}$ = $-2a+3b$

(1)

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

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

$\overrightarrow{AP} = \frac{2}{5}(-2a+3b)$

$= -\frac{4}{5}a + \frac{6}{5}b$

$\overrightarrow{OP} = 2a - \frac{4}{5}a + \frac{6}{5}b$

$= \frac{6}{5}a + \frac{6}{5}b$

$= \frac{6}{5}(a+b)$

(3)

(4 marks)

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

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	17 from 28	3 from 3	10 from 20	0 from 1	4 from 4	0 from 0
A02 and 3	38 from 52	12 from 12	5 from 9	9 from 13	10 from 16	2 from 2
Total	55 from 80	15 from 15	15 from 29	9 from 14	14 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Expand double brackets. Mathswatch Clip: 134b

Topic 2: Applied Trig Problems. Mathswatch Clip: 168

Topic 3: Venn diagrams.. Mathswatch Clip: 127

Topic 4: Cumulative Frequency. Mathswatch Clip: 186

Topic 5: Inequalities Regions. Mathswatch Clip: 198

1) Expand double brackets: Easier

Solution for Question 1:

$(x + 3)(x + 2)$
$x^2 + 3x + 2x + 6$
$x^2 + 5x + 6$

Solution for Question 2:

a) $(x + 2)(x + 6)$
$x^2 + 2x + 6x + 12$
$x^2 + 8x + 12$

b) $(x + 2)(x - 6)$
$x^2 + 2x - 6x - 12$
$x^2 - 4x - 12$

c) $(x - 2)(x - 6)$
$x^2 - 2x - 6x + 12$
$x^2 - 8x + 12$

1) Expand double brackets: Medium

Solution for Question 3:

a) $(3x + 1)(x + 2)$
$3x^2 + 6x + x + 2$
$3x^2 + 7x + 2$

b) $(3x - 1)(x + 2)$
$3x^2 + 6x - x - 2$
$3x^2 + 5x - 2$

c) $(3x + 1)(3x + 2)$
$9x^2 + 6x + 3x + 2$
$9x^2 + 9x + 2$

Solution for Question 4:

a) $(3 - x)(2x + 1)$
$6x + 3 - 2x^2 - x$
$-2x^2 + 5x + 3$

b) $(5 - 2x)(3 - x)$
$15 - 5x - 6x + 2x^2$
$2x^2 - 11x + 15$

c) $(2x - 3)(2x + 3)$
$4x^2 + 6x - 6x - 9$
$4x^2 - 9$

1) Expand double brackets: Harder

Solution for Question 5:

$(x+5)(2x+3) - 3(x-2)(6x+5)$
$2x^2 + 3x + 10x + 15 - 3[6x^2 + 5x - 12x - 10]$
$2x^2 + 3x + 10x + 15 - 18x^2 - 15x + 36x + 30$
$-16x^2 + 34x + 45$

Solution for Question 6:

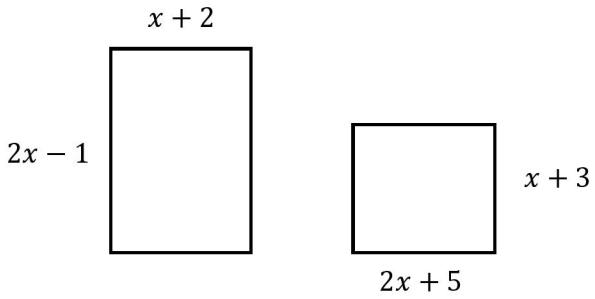
$\times$	$3x$	4
$2x$	$6x^2$	$8x$
-1	$-3x$	-4

$6x^2 + 8x - 3x - 4$
$6x^2 + 5x - 4$

He has added the terms $2x$ and $3x$ instead of multiplying. He has missed of a negative on $3x$

Solution for Question 7:

Split shape into 2



$2x + 5 = 3x + 7 - (x + 2)$

Area:

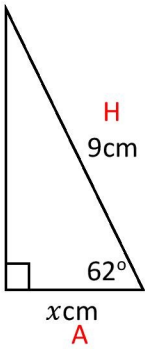
$(x+2)(2x-1) + (x+3)(2x+5)$

$2x^2 - x + 4x - 2 + 2x^2 + 5x + 6x + 15$

$4x^2 + 14x + 13$

2) Applied Trig Problems: Easier

1) (a) Find the missing length x to two decimal places.



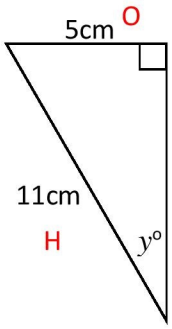
$\cos 62 = \frac{x}{9}$

$9 \cos 62 = x$

$x = 4.22524...$

$x = 4.23$ cm

(b) Find the missing angle y to two decimal places.



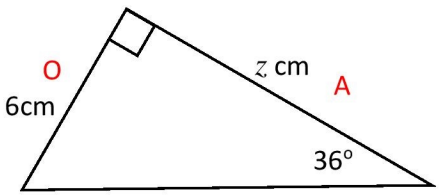
$\sin y = \frac{5}{11}$

$y = \sin^{-1}(\frac{5}{11})$

$y = 27.03569$

$y = 27.04°$

(c) Find the missing length z



$\tan 36 = \frac{6}{z}$

$z \tan 36 = 6$

$z = \frac{6}{\tan 36}$

$z = 8.25829$

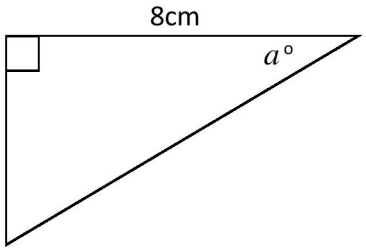
$z = 8.26cm$

(6 Marks)

2) Applied Trig Problems: Medium

2) The area of this triangle is $24cm^2$

Calculate the size of angle a to three significant figures.



Calculating the missing height:

$$Area = \frac{1}{2} \times base \times height$$

$$24 = \frac{1}{2} \times 8 \times height$$

$$24 = 4 \times height$$

$$height = 6cm$$

Calculating the missing angle using trig:

$$\tan a = \frac{6}{8}$$

$$a = \tan^{-1}\left(\frac{6}{8}\right)$$

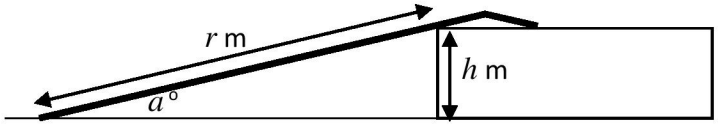
$$a = 36.8698976458$$

$$a = 36.8°$$

(4 Marks)

2) Applied Trig Problems: Harder

3) A wheelchair ramp is placed over a step, as shown.



The step is h meters high, and the ramp is r meters long to where it touches the step.

The angle between the ground and the ramp is a^o.

In order to function safely, then ramp has to be 6 times as long, as the height of the step it is covering

(a) Work out the value of a when $r = 6h$, to the nearest degree.

$$\sin a = \frac{h}{r}$$

$$\sin a = \frac{h}{6h}$$

$$\sin a = \frac{1}{6}$$

$$a = \sin^{-1}\left(\frac{1}{6}\right)$$

$$a = 9.59406822686$$

$$a = 10°$$

(b) New safety regulations replace the initial ones, saying that the angle between the ramp and the ground cannot be more than 8^o. How does this affect the height of step that the ramp can be used with?

Tick one box

☐ It can now be used with higher steps.

☐ There is no change to the step height with which the ramp can be used.

☒ It can now only be used with lower steps.

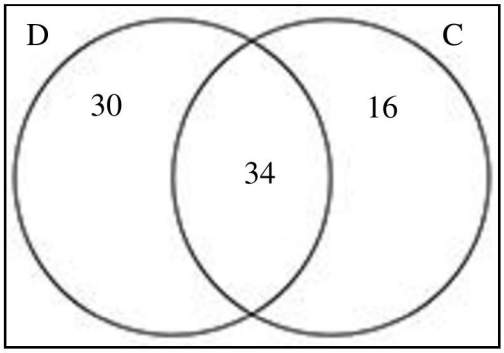
(4 Marks)

3) Venn diagrams.: Easier

Solution for Question 1:

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

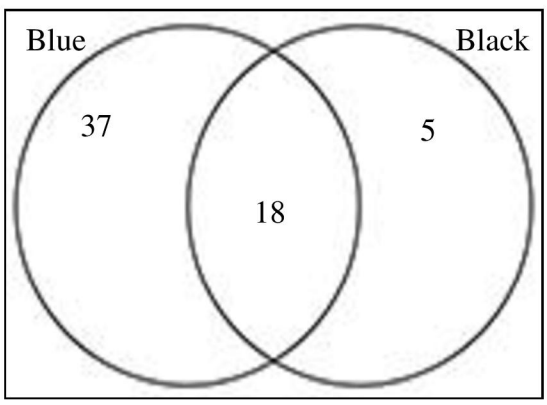
Number of people that owned cats only: $80 - 34 - 30 = 16$



Solution for Question 2:

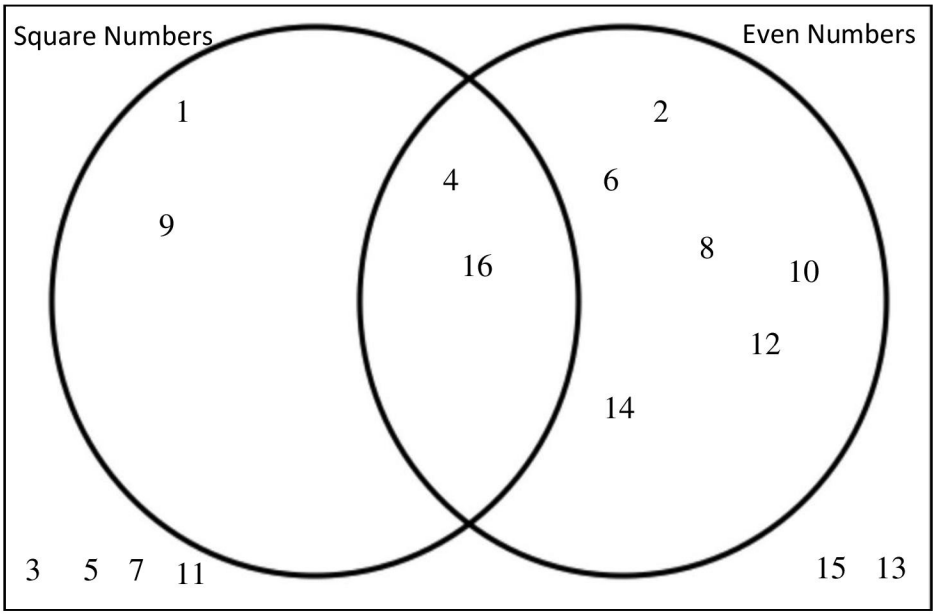
a) Number of people that only had a black pen:
$60 - 37 - 18 = 5$

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 $B = \{9,15\}$

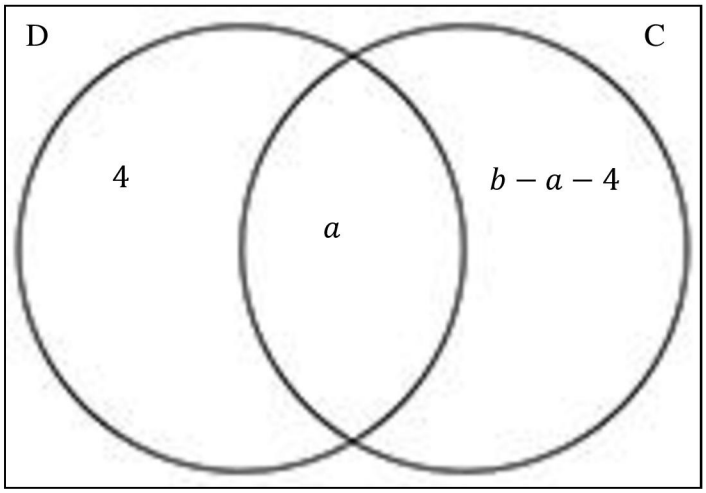
ii) $A \cup B = A$ or $B = \{3,5,6,12,18\}$

3) Venn diagrams.: Harder

Solution for Question 6:

Number of people who replied with cats only:

$b - a - 4$



4) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

(a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	12
$20 < A \leq 40$	27
$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

41 years

(2)

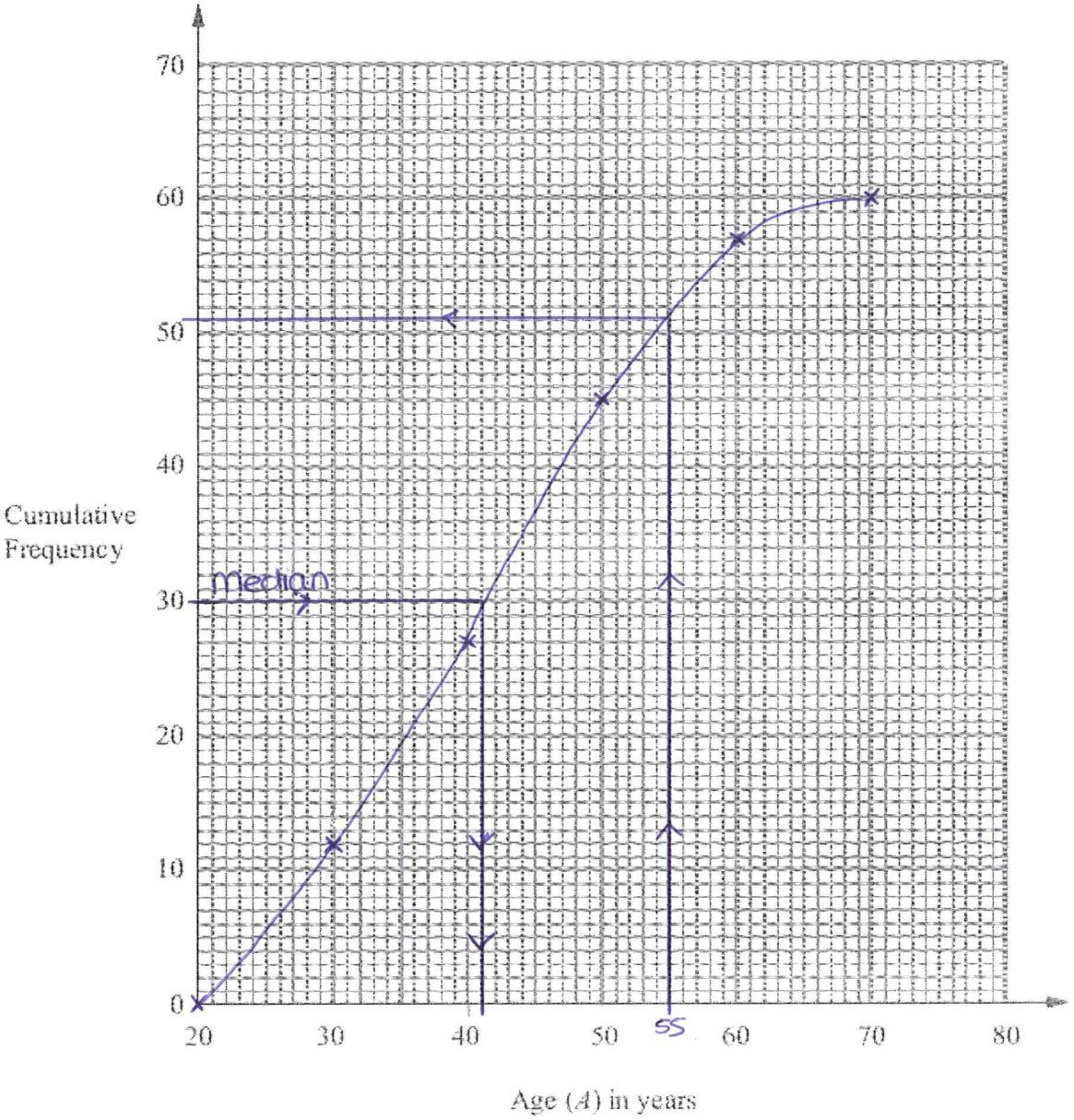
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so $60 - 51 = 9$ are older.

9

(2)

4) Cumulative Frequency: Medium



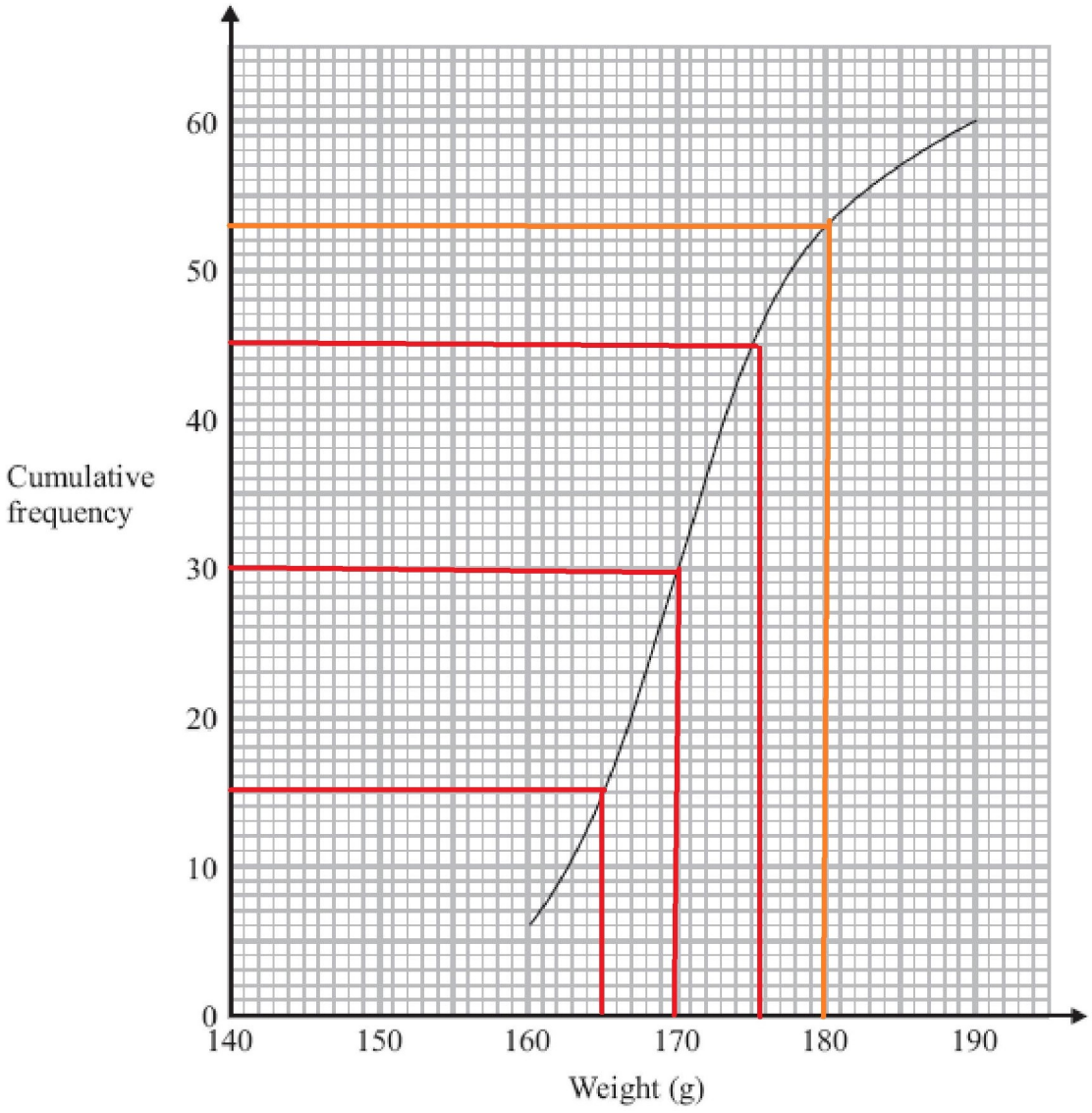
(7 marks)

4) Cumulative Frequency: Harder

4. Harry grows tomatoes.
This year he put his tomato plants into two groups, group A and group B.

Harry gave fertiliser to the tomato plants in group A.
He did not give fertiliser to the tomato plants in group B.

Harry weighed 60 tomatoes from group A.
The cumulative frequency graph shows some information about these weights.



ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

ii) The Upper Quartile 175 .....

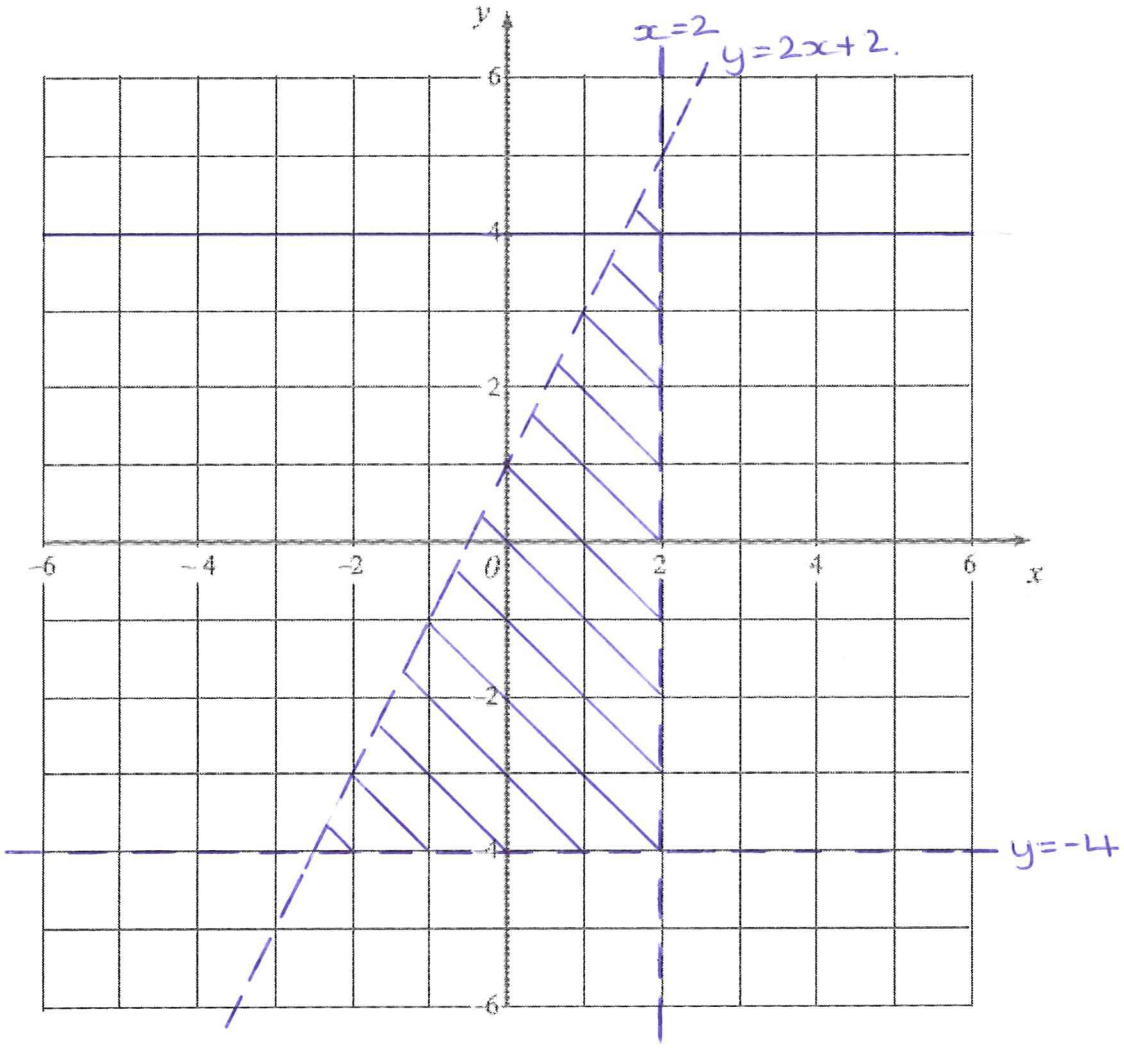
(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

5) Inequalities Regions: Easier

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

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

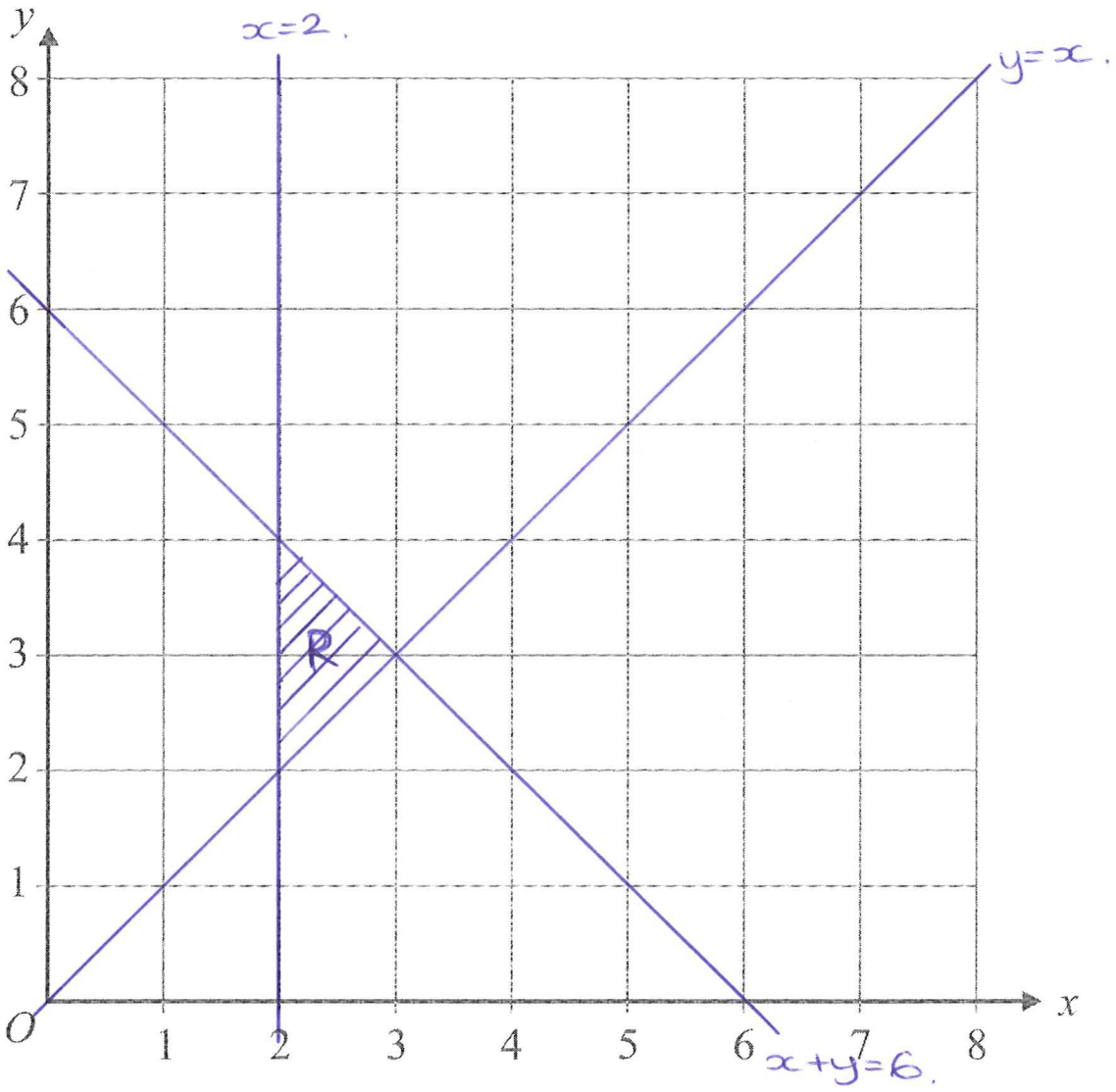


(Total for Question 19 = 4 marks)

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

$$x \geq 2 \qquad y \geq x \qquad x + y \leq 6$$



(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)

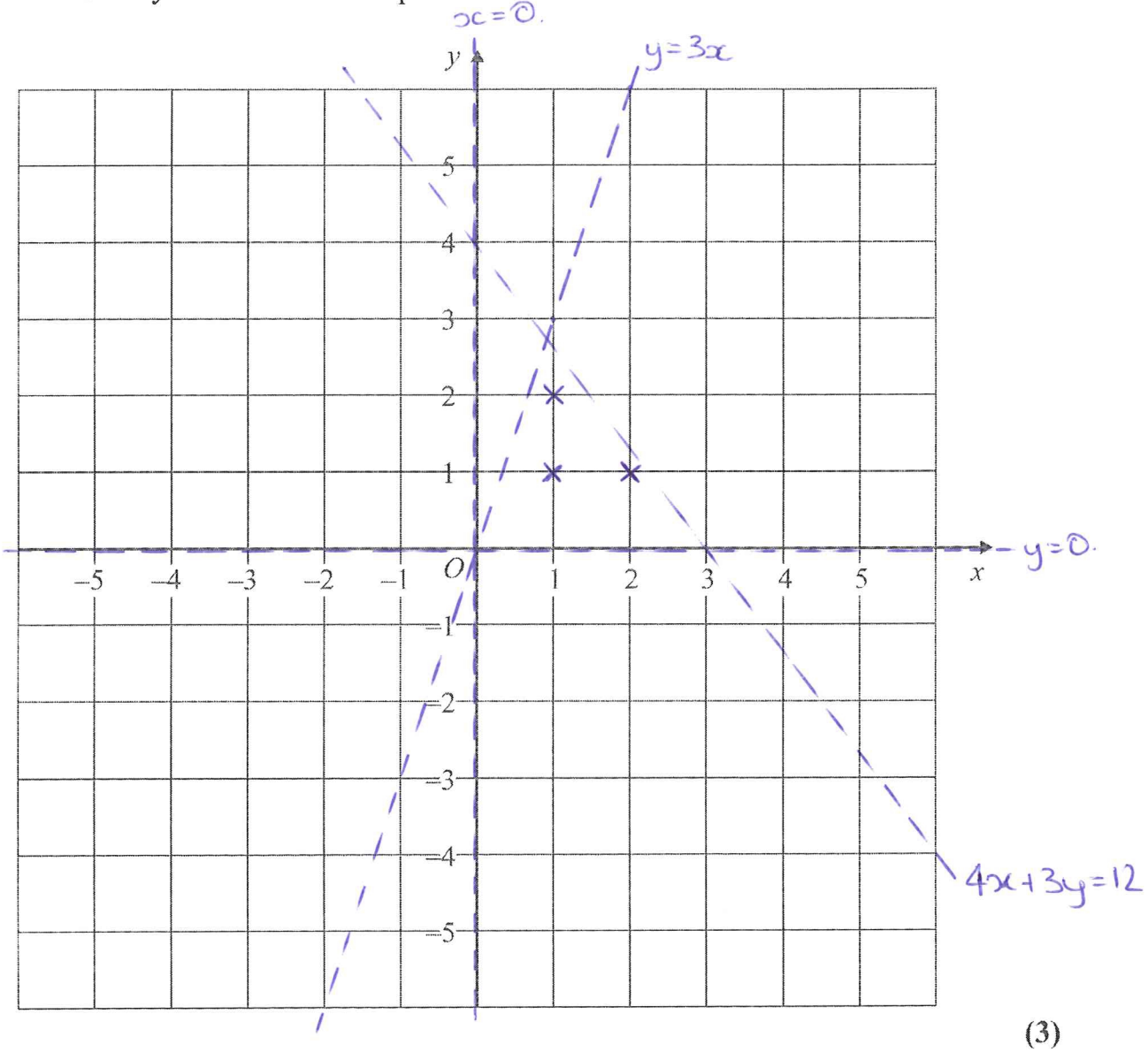
(Total 5 marks)

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 (×), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

JANSON Eleanor

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	13 from 28	2 from 3	8 from 20	1 from 1	2 from 4	0 from 0
A02 and 3	24 from 52	9 from 12	2 from 9	4 from 13	7 from 16	2 from 2
Total	37 from 80	11 from 15	10 from 29	5 from 14	9 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Simple Bounds. Mathswatch Clip: 132

Topic 2: Averages from Frequency Tables. Mathswatch Clip: 130

Topic 3: Venn diagrams.. Mathswatch Clip: 127

Topic 4: Product of Prime Factors, HCF, LCM. MW: 78

Topic 5: Inequalities Regions. Mathswatch Clip: 198

1) 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)

1) 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?

Lower bound A+B 4.15 + 12.5 =16.65
Upper bound A+B 4.25 +13.5 = 17.75

$16.65 \leq A + B < 17.75$

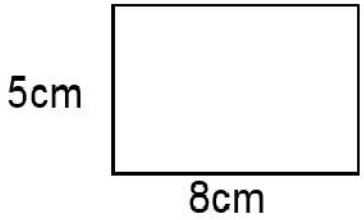
_____ cm

(1)

(4 Marks)

1) 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 $2\times4.5 + 2\times7.5 = 9 + 15 = 24cm$

$24cm$

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 $2\times5.5 + 2\times8.5 = 11 + 17 = 28cm$

$28cm$

(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 $100\times5.5 = 550g$

One kilogram = 1000 grams so

$$550g = 0.55kg$$

0.55 kg **(3 marks)**

2) Averages from Frequency Tables: Easier

1. Amanda collected 20 leaves and wrote down their lengths, in cm.

Here are her results.

5 6 5 2 4 5 8 7 5 4

7 6 4 3 5 7 6 4 8 5

(a) Complete the frequency table to show Amanda's results.

Length in cm	Tally	Frequency
2	|	1
3	|	1
4	||||	4
5	𝍸 |	6
6	|||	3
7	|||	3
8	||	2

(2)

(b) Write down the modal length → highest frequency 5 .....cm **(1)**

(c) Work out the range. 6 .....cm **(1)**

8 − 2

(4 marks)

2. Rosie had 10 boxes of drawing pins.

She counted the number of drawing pins in each box.

The table gives information about her results.

Number of drawing pins	Frequency	Number × freq
29	2	58
30	5	150
31	2	62
32	1	32
	10	302

TOTAL NUMBER OF PINS

Work out the mean number of drawing pins in a box.

302 ÷ 10 30·2 .....

(3 marks)

2) Averages from Frequency Tables: Medium

3. Andy did a survey of the number of cups of coffee some pupils in his school had drunk yesterday.

The frequency table shows his results.

Number of cups of coffee	Frequency	No. x FREQ
2	1	2
3	3	9
4	5	20
5	8	40
6	5	30

TOTAL 101

(a) Work out the number of pupils that Andy asked.

TOTAL FREQUENCY

22

(2)

(b) Work out the mean number of cups of coffee drunk.

DRAW 3rd COLUMN

4·59 (2dp)

(3)

(5 marks)

4. 20 students scored goals for the school hockey team last month.
The table gives information about the number of goals they scored.

Goals scored	Number of students	Goals x students
1	9	9
2	3	6
3	5	15
4	3	12

42 TOTAL

(a) Write down the modal number of goals scored.

GROUP WITH HIGHEST FREQ.

1

(1)

(b) Work out the range of the number of goals scored.

4 − 1

3

(1)

(c) Work out the mean number of goals scored.

42 ÷ 20

2·1

(3)

(5 marks)

2) Averages from Frequency Tables: Harder

9. Marcus collected some pebbles.
He weighed each pebble.

The grouped frequency table gives some information about weights.

Weight (w grams)	Frequency	Midpoint	f × m
$50 \leq w < 60$	5	55	275
$60 \leq w < 70$	9	65	585
$70 \leq w < 80$	22	75	1650
$80 \leq w < 90$	27	85	2295
$90 \leq w < 100$	17	95	1615
	80		6420

(a) Work out an estimate for the mean weight of the pebbles.

6420 ÷ 80

80.25g
(3)

(b) Write down the modal class interval.

group with highest freq

80≤w<90
(1)

(c) Find the class interval that contains the median.

80 → median between 40 and 41

5+9=16
16+22=38
38+27=65 (median in here)

80≤w<90
(2)

(d) Why is your answer to part (a) and estimate?

Data is grouped and so we don't know actual values

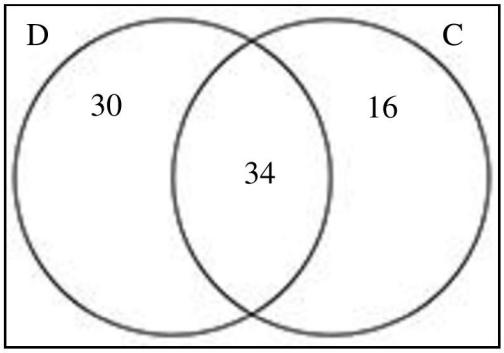
(1)
(7 marks)

3) Venn diagrams.: Easier

Solution for Question 1:

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

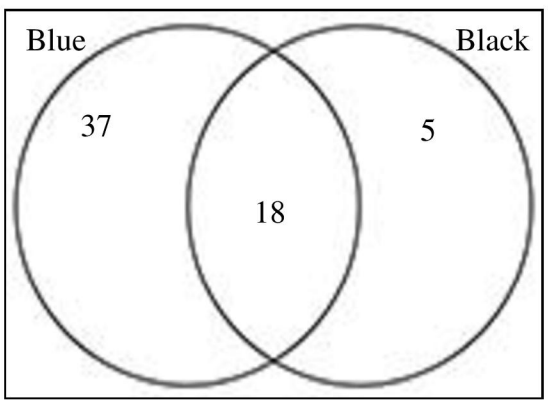
Number of people that owned cats only: $80 - 34 - 30 = 16$



Solution for Question 2:

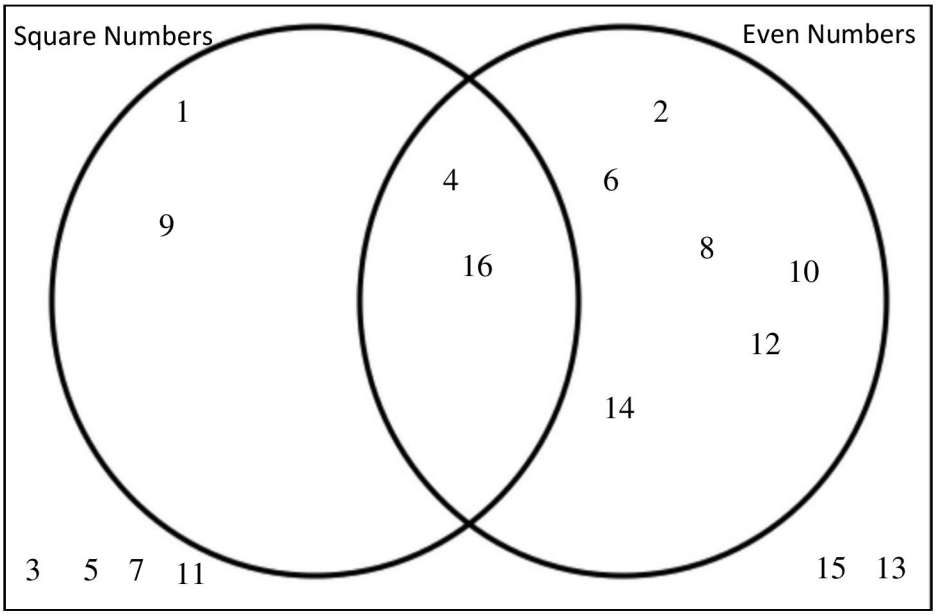
a) Number of people that only had a black pen:
$60 - 37 - 18 = 5$

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 $B = \{9,15\}$

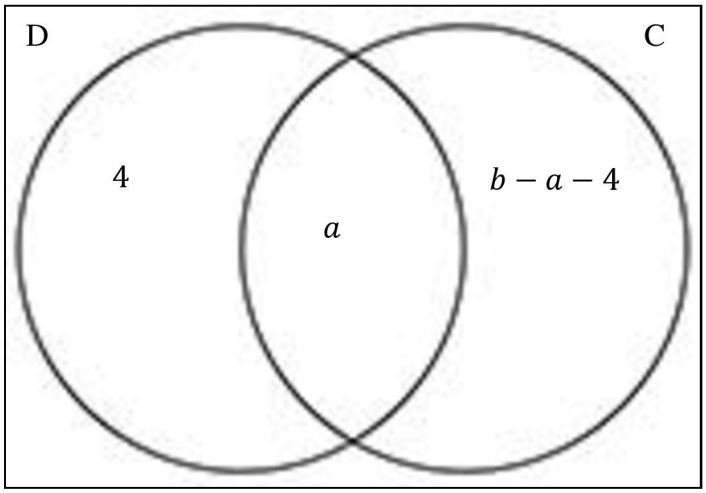
ii) $A \cup B = A$ or $B = \{3,5,6,12,18\}$

3) Venn diagrams.: Harder

Solution for Question 6:

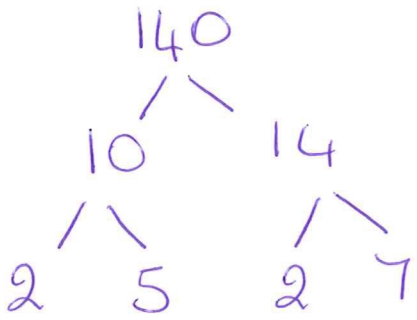
Number of people who replied with cats only:

$b - a - 4$



4) Product of Prime Factors, HCF, LCM: Easier

1. Write 140 as the product of its prime factors.



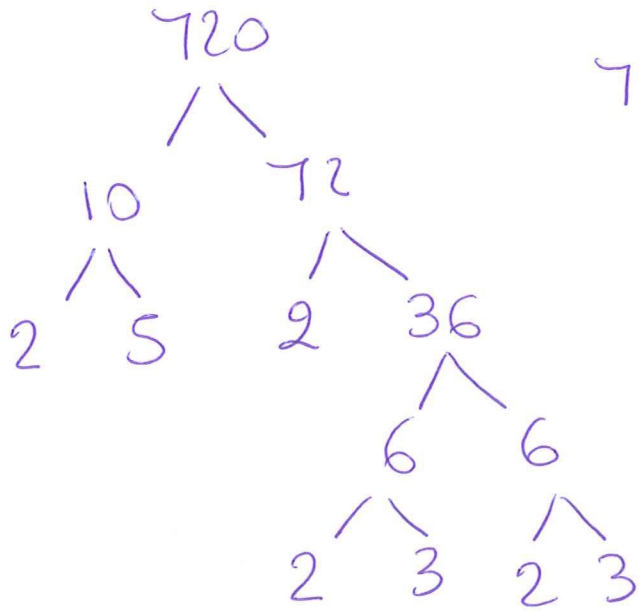
$140 = 2 \times 2 \times 5 \times 7$

$2^2 \times 5 \times 7$

.....

(2 marks)

2. Write 720 as a product of its prime factors.



$720 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$

$2^4 \times 3^2 \times 5$

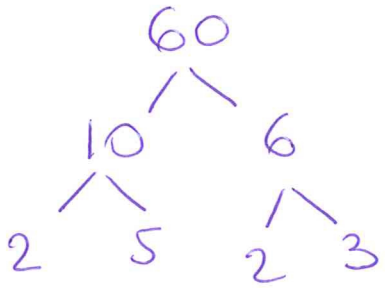
.....

(2 marks)

4) Product of Prime Factors, HCF, LCM: Medium

3. (a) Express the following numbers as products of their prime factors.

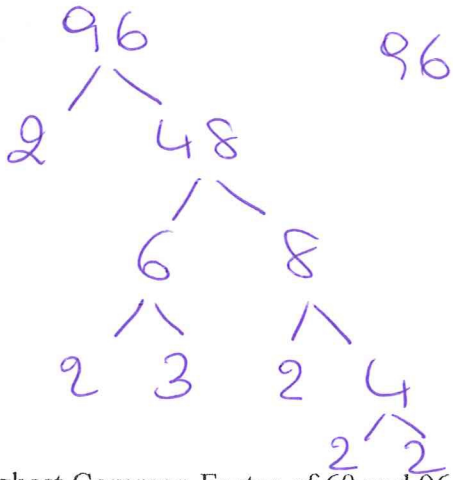
(i) 60.



$60 = 2 \times 2 \times 3 \times 5$

$2^2 \times 3 \times 5$

(ii) 96.

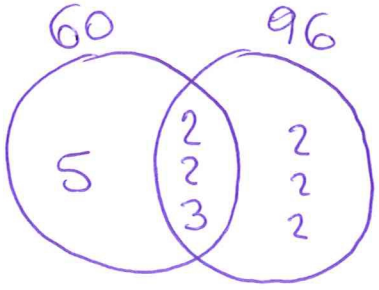


$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$

$2^5 \times 3$

(4)

(b) Find the Highest Common Factor of 60 and 96.



HCF $= 2 \times 2 \times 3 = 12$

12

(1)

(c) Work out the Lowest Common Multiple of 60 and 96.

LCM $= 2^5 \times 3 \times 5 = 480$

60 120 180 240 300 360 420 480

96 192 288 384 480

480

(2)

(7 marks)

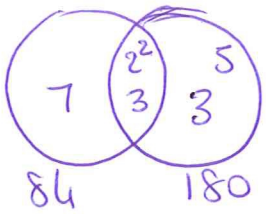
4) Product of Prime Factors, HCF, LCM: Harder

10. Find the Highest Common Factor (HCF) of 84 and 180

$84 = 2^2 \times 3 \times 7$

$180 = 2^2 \times 3^2 \times 5$

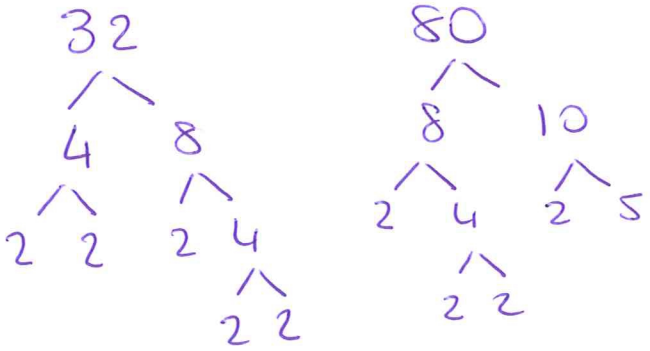
$HCF = 2^2 \times 3 = 12$



12

(3 marks)

11. Find the Highest Common Factor (HCF) of 32 and 80



$HCF = 2^4 = 16$

$32 = 2^5$

$80 = 2^4 \times 5$

$32 = 2 \times 2 \times 2 \times 2 \times 2$

$80 = 2 \times 2 \times 2 \times 2 \times 5$

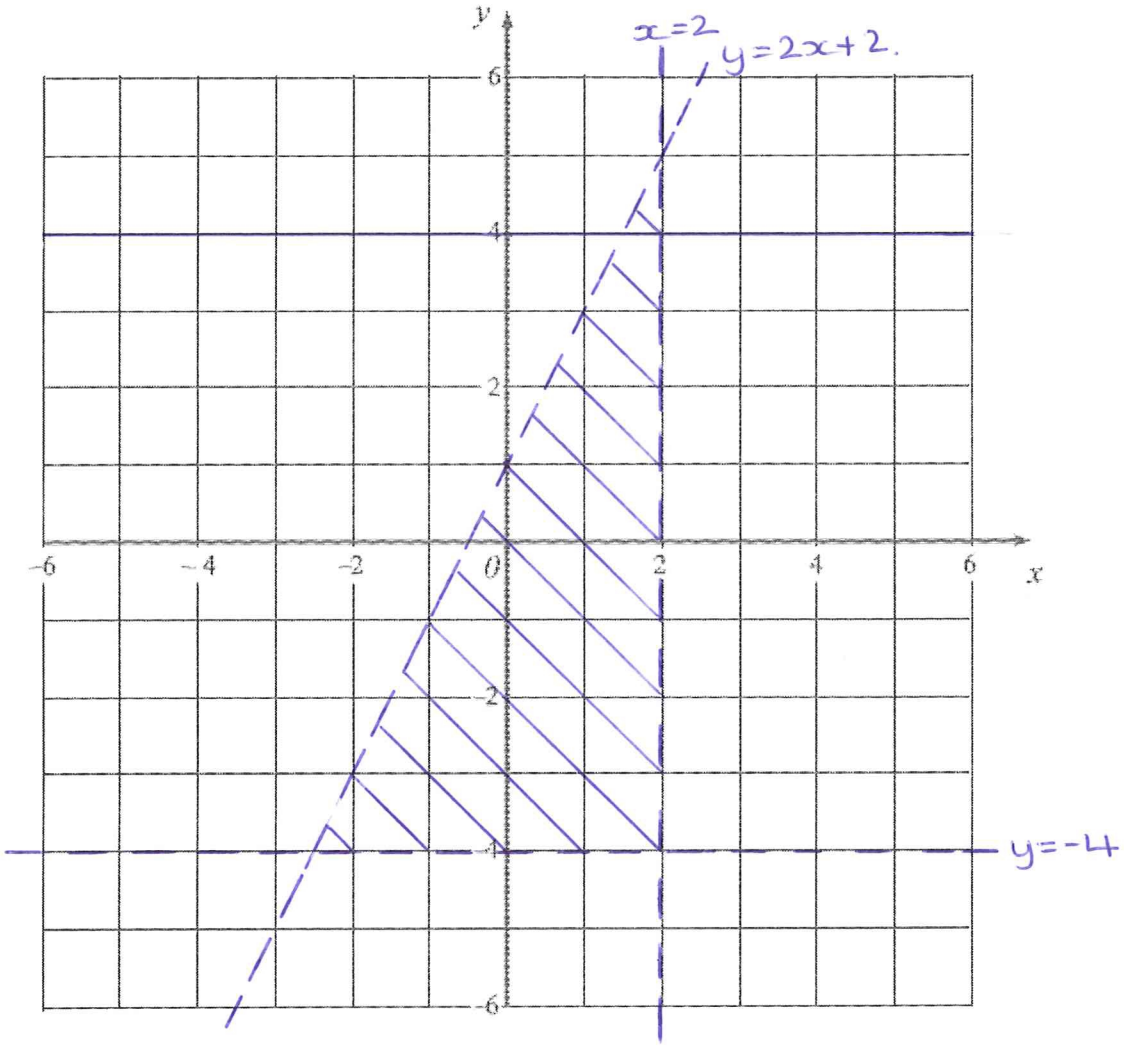
16

(3 marks)

5) Inequalities Regions: Easier

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

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



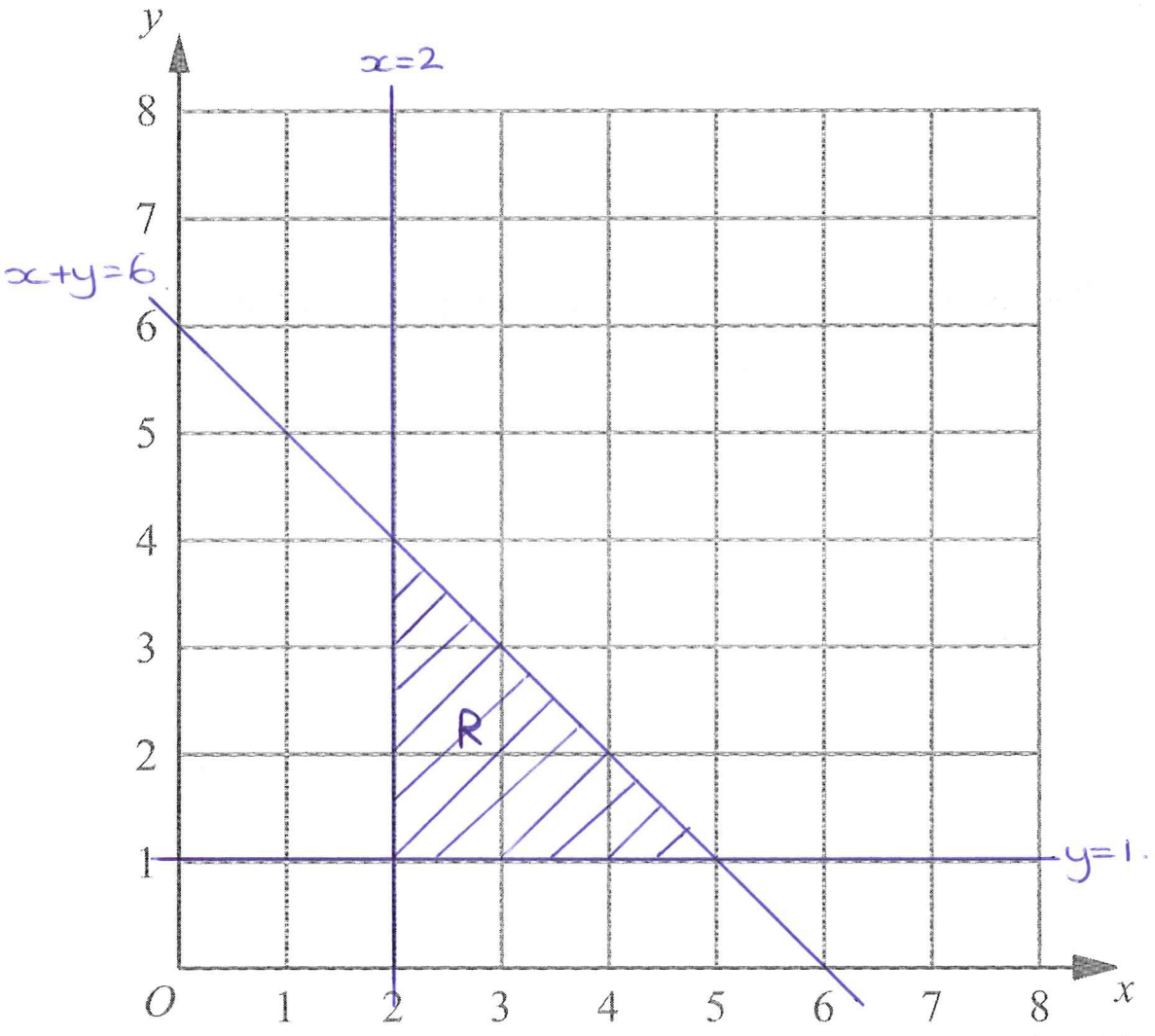
(Total for Question 19 = 4 marks)

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**.



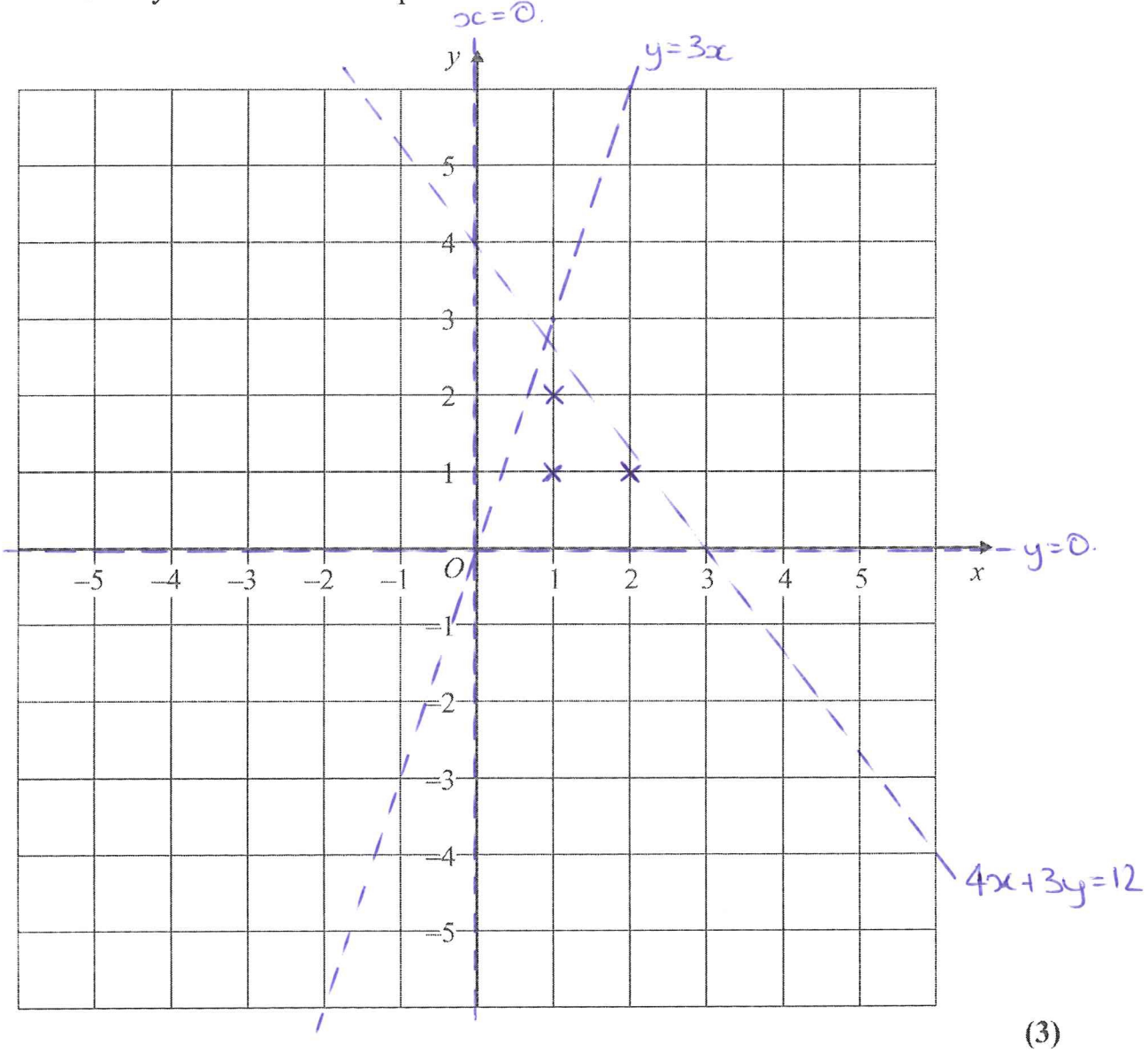
(Total 3 marks)

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 (×), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

KANE Emily

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	17 from 28	3 from 3	9 from 20	1 from 1	4 from 4	0 from 0
A02 and 3	25 from 52	9 from 12	1 from 9	8 from 13	7 from 16	0 from 2
Total	42 from 80	12 from 15	10 from 29	9 from 14	11 from 20	0 from 2

Your Pinpoint Topics

Topic 1: Applied Trig Problems. Mathswatch Clip: 168

Topic 2: Dividing into a ratio. Mathswatch Clip: 106

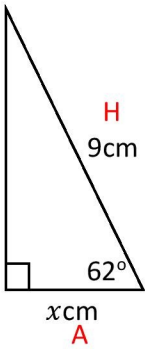
Topic 3: Cumulative Frequency. Mathswatch Clip: 186

Topic 4: Inequalities Regions. Mathswatch Clip: 198

Topic 5: Composite functions. Mathswatch Clip: 215

1) Applied Trig Problems: Easier

1) (a) Find the missing length x to two decimal places.



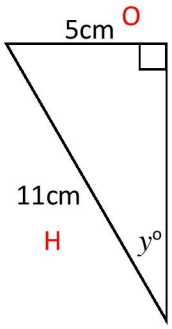
$\cos 62 = \frac{x}{9}$

$9 \cos 62 = x$

$x = 4.22524...$

$x = 4.23$ cm

(b) Find the missing angle y to two decimal places.



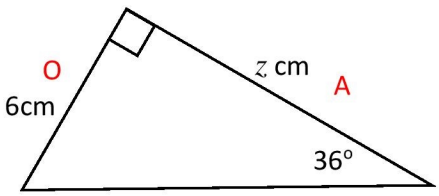
$\sin y = \frac{5}{11}$

$y = \sin^{-1}(\frac{5}{11})$

$y = 27.03569$

$y = 27.04°$

(c) Find the missing length z



$\tan 36 = \frac{6}{z}$

$z \tan 36 = 6$

$z = \frac{6}{\tan 36}$

$z = 8.25829$

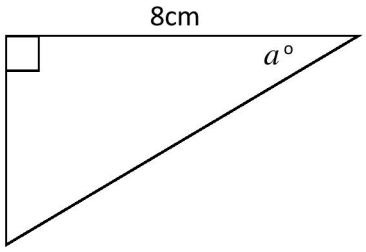
$z = 8.26cm$

(6 Marks)

1) Applied Trig Problems: Medium

2) The area of this triangle is $24cm^2$

Calculate the size of angle a to three significant figures.



Calculating the missing height:

$$Area = \frac{1}{2} \times base \times height$$

$$24 = \frac{1}{2} \times 8 \times height$$

$$24 = 4 \times height$$

$$height = 6cm$$

Calculating the missing angle using trig:

$$\tan a = \frac{6}{8}$$

$$a = \tan^{-1}\left(\frac{6}{8}\right)$$

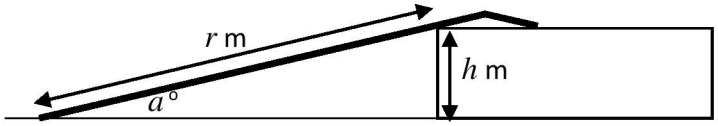
$$a = 36.8698976458$$

$$a = 36.8°$$

(4 Marks)

1) Applied Trig Problems: Harder

3) A wheelchair ramp is placed over a step, as shown.



The step is h meters high, and the ramp is r meters long to where it touches the step.

The angle between the ground and the ramp is a^o.

In order to function safely, then ramp has to be 6 times as long, as the height of the step it is covering

(a) Work out the value of a when $r = 6h$, to the nearest degree.

$$\sin a = \frac{h}{r}$$

$$\sin a = \frac{h}{6h}$$

$$\sin a = \frac{1}{6}$$

$$a = \sin^{-1}\left(\frac{1}{6}\right)$$

$$a = 9.59406822686$$

$$a = 10°$$

(b) New safety regulations replace the initial ones, saying that the angle between the ramp and the ground cannot be more than 8^o. How does this affect the height of step that the ramp can be used with?

Tick one box

- ☐ It can now be used with higher steps.
- ☐ There is no change to the step height with which the ramp can be used.
- ■ It can now only be used with lower steps.

(4 Marks)

2) Dividing into a ratio: Easier

Solution for Question 1:

Ratio 1:3 total 1+3= 4

$£40 \div 4 = 10$

Multiply each part of ratio 1:3 by 10:

10:30

Solution for Question 2:

Ratio total 8:9 8+9= 17

$153kg \div 17 = 9$

Multiply ratio 8:9 by 9

72:81

$81 - 72 = 9$

Patrick is 9kg heavier than Connor

Solution for Question 3:

Ratio 1:2

x:50

$50 \div 2 = 25$

$1 \times 25 = 25$

Tim gets 25 sweets

Solution for Question 4:

Ratio Holly to Wei-Kong to Wilfred: 6:3:1

6:3:1 = 10

$£850 \div 10 = 85$

Holly receives $6 \times 85 = £510$

2) Dividing into a ratio: Medium

Solution for Question 5:

Ratio 5:2

Difference in ratio parts 5-2 = 3

$28.5 \div 3 = 9.5$

Multiply ratio 5:2 by 9.5

47.5:19

47.5 km + 19km = 66.5km

Solution for Question 6:

Ratio 5:2:3

x:22:y

$22 \div 2 = 11$

Therefore x, Carbohydrates, = $5 \times 11 = 55$g

2) Dividing into a ratio: Harder

Solution for Question 7:

Ratio Red to Blue = 3:7

3+7 = 10

30 litres÷ 10 = 3

Multiply ratio 3:7 by 3

9:21 litres needed.

$£20 \times \frac{9}{3\ (litre\ tin)} + £30 \times \frac{21}{3\ (litre\ tin)}$

$£20 \times 3 + £30 \times 7 = £270$

Solution for Question 8:

Superheroes to princesses = 5:4

Princesses to Celebrities = 3:1

Multiply ratio 5:4 by 3 = 15:12

Multiply ratio 3:1 by 4 = 12:4

Therefore ratio as a whole = 15:12:4

15:12:1 = 31

$\frac{93(Costumes)}{31} = 3$

Multiply ratio 15:12:4 by 3

45:36:12

36 people dressed as princesses

3) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

(a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	12
$20 < A \leq 40$	27
$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

..... 41 ..... years

(2)

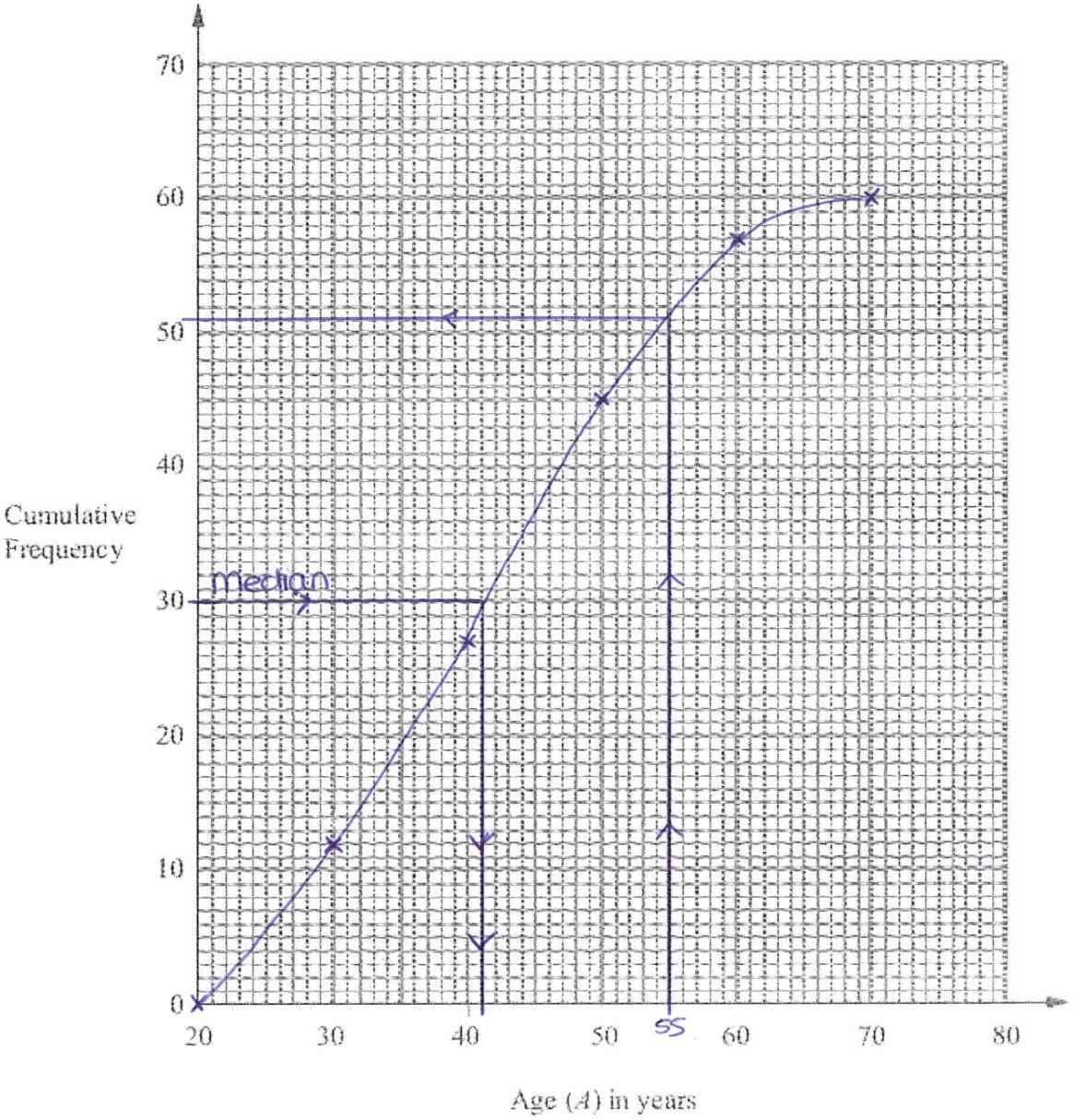
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so $60 - 51 = 9$ are older.

..... 9 .....

(2)

3) Cumulative Frequency: Medium



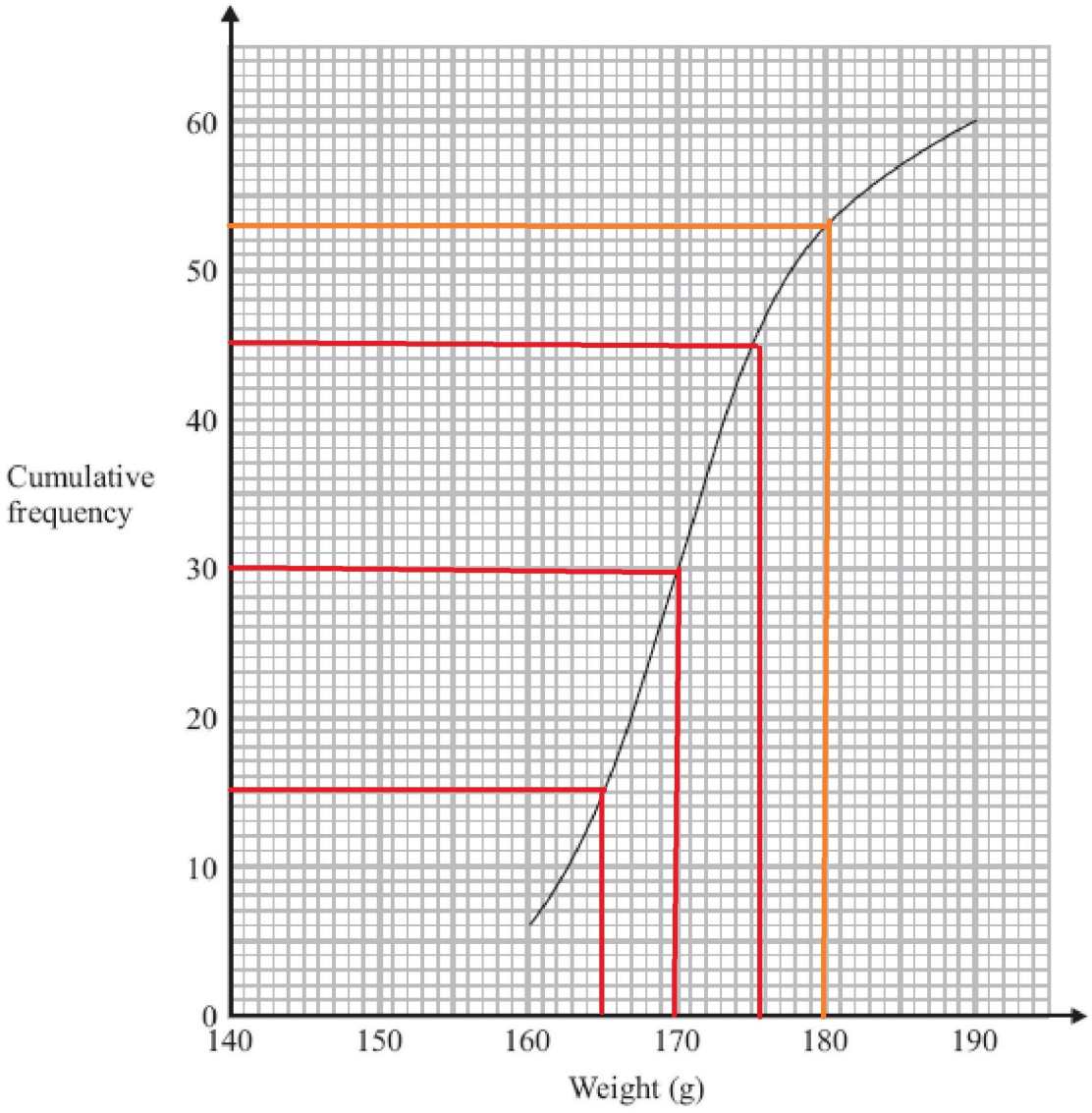
(7 marks)

3) Cumulative Frequency: Harder

4. Harry grows tomatoes.
This year he put his tomato plants into two groups, group A and group B.

Harry gave fertiliser to the tomato plants in group A.
He did not give fertiliser to the tomato plants in group B.

Harry weighed 60 tomatoes from group A.
The cumulative frequency graph shows some information about these weights.



ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

ii) The Upper Quartile 175 .....

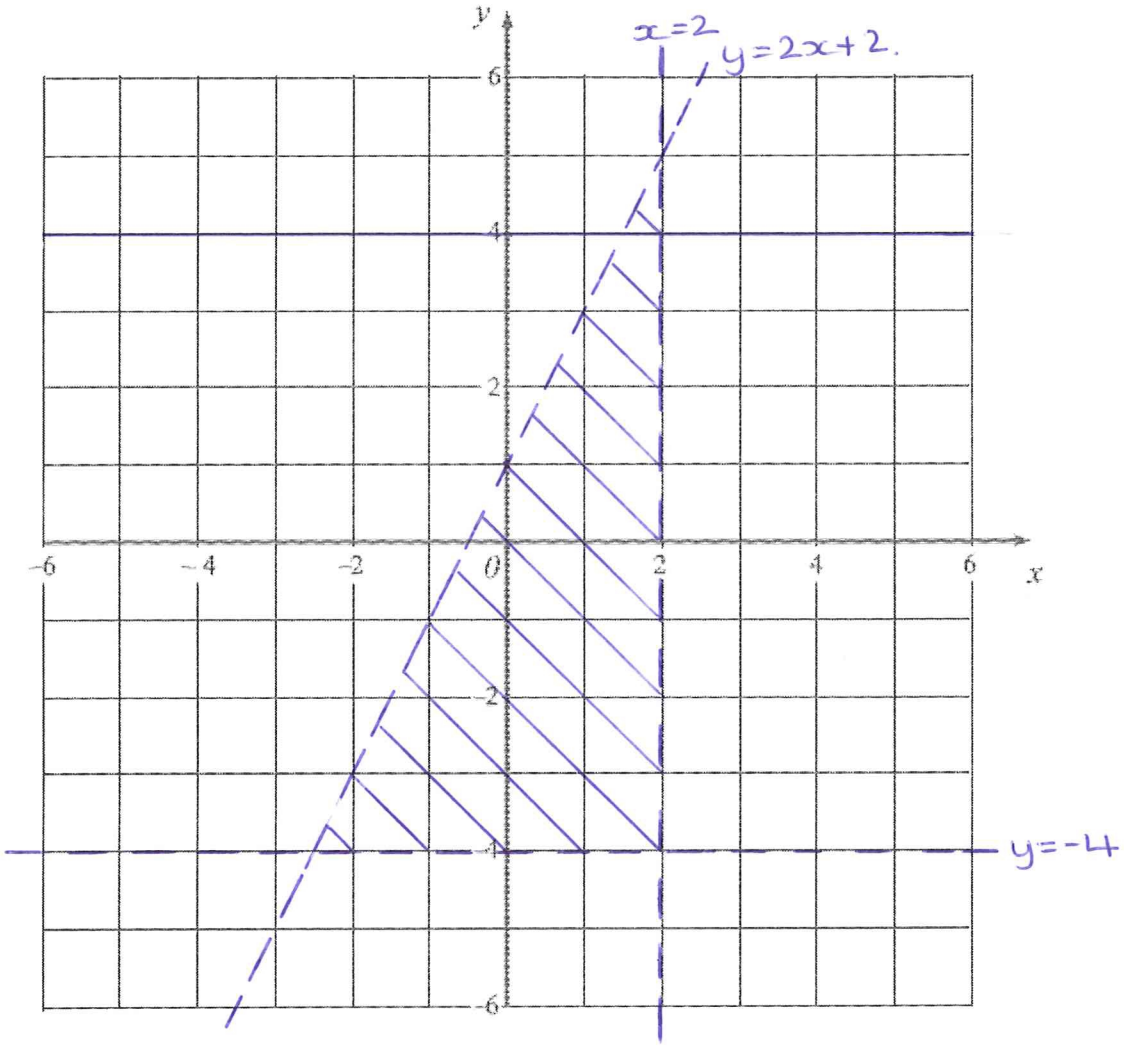
(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

4) Inequalities Regions: Easier

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

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



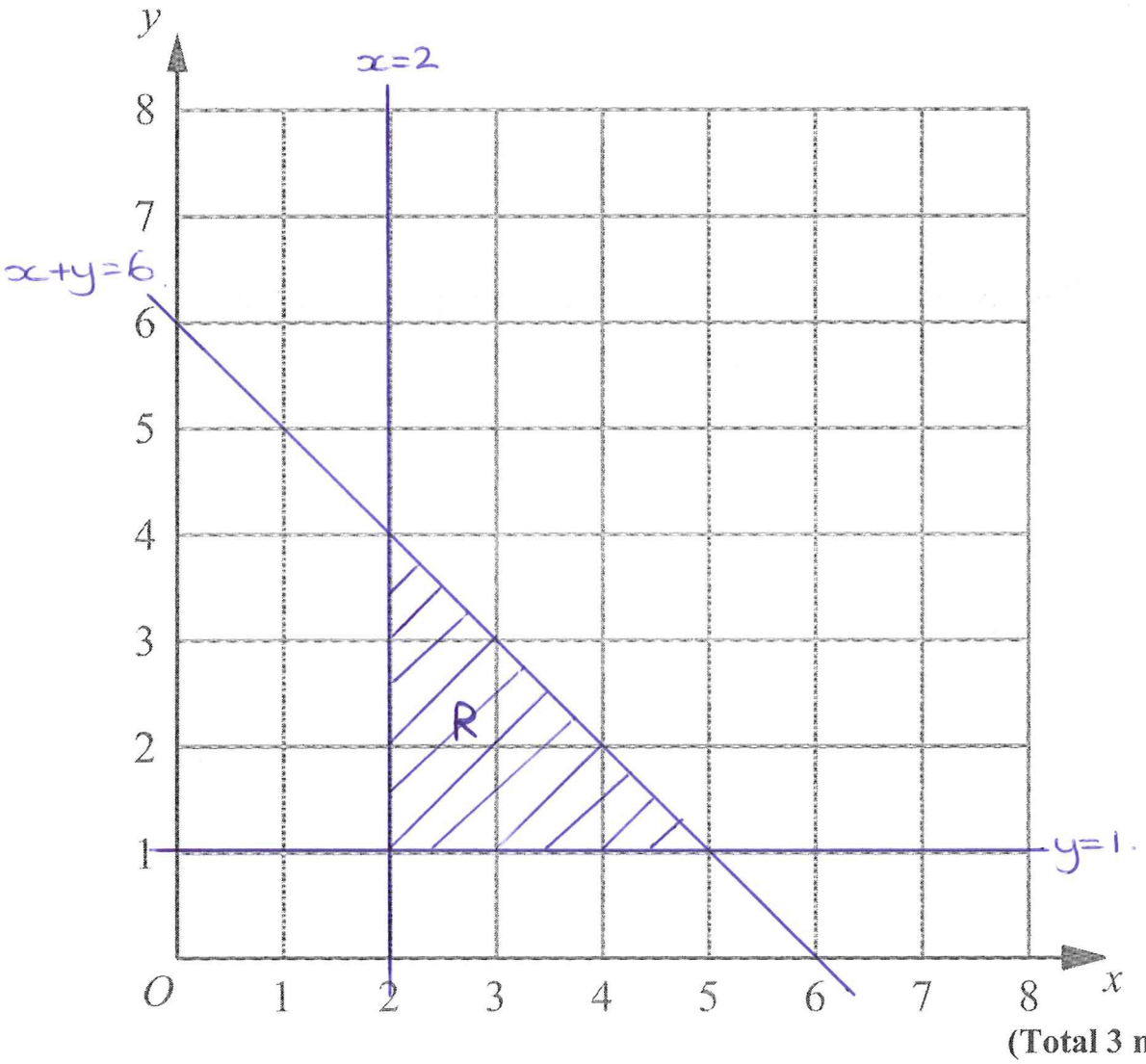
(Total for Question 19 = 4 marks)

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**.



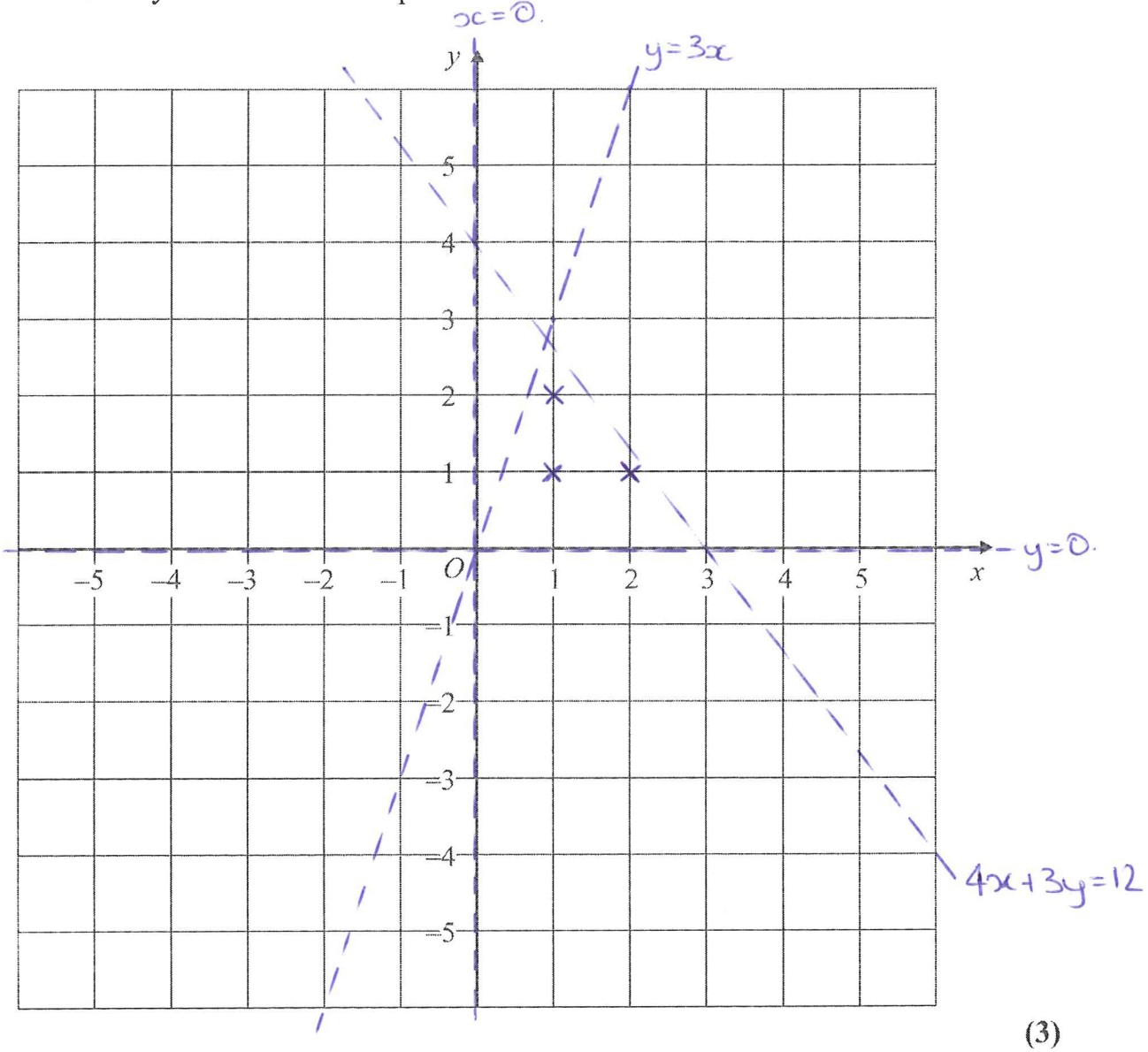
(Total 3 marks)

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 (×), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

5) Composite functions: Easier

Q1. The functions f and g are such that

$$f(x) = 2x + 3 \text{ and } g(x) = \frac{x}{4} - 2$$

(a) Find the value of f(8)

F(8) = 2(8) + 3
=16 + 3
= 19

19

.....

(1)

(b) Find gf(*4*)

f(4) = 2(4) + 3 = 11

$$g(11) = \frac{11}{4} - 2 = \frac{3}{4}$$

$\frac{3}{4}$

.....

(2)

(b) Show that

$$fg(x) = \frac{1}{2}x - 1$$

$$fg(x) = 2\left(\frac{x}{4} - 2\right) + 3$$

$$fg(x) = \frac{2x}{4} - 4 + 3$$

$$fg(x) = \frac{1}{2}x - 1$$

(2)

(Total for question = 5 marks)

5) Composite functions: Medium

2. The functions f and g are such that

$$f(x) = \frac{2}{x+3} \text{ and } g(x) = 3(x-2)$$

a) Show that $gf(5) = -\frac{21}{4}$

$$f(5) = \frac{2}{5+3} = \frac{1}{4}$$

$$g\left(\frac{1}{4}\right) = 3\left(\frac{1}{4} - 2\right)$$

$$g\left(\frac{1}{4}\right) = \frac{3}{4} - 6$$

$$g\left(\frac{1}{4}\right) = -\frac{21}{4}$$

.....

(2)

b) Show that fg(x) can be written in the form

$$\frac{2}{k(x-1)}$$

where k is an integer to be found.

$$fg(x) = \frac{2}{3(x-2)+3}$$

$$fg(x) = \frac{2}{3x-6+3}$$

$$fg(x) = \frac{2}{3x-3}$$

$$fg(x) = \frac{2}{3(x-1)} \quad , \quad k = 3$$

(3)

c) Find an expression for gg(x)

$$gg(x) = 3(3x-6) - 6$$

$$gg(x) = 9x - 24$$

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

(Total for question = 7 marks)

5) Composite functions: Harder

3. The functions f, g and h are such that

$$f(x) = 2x + 2 \quad , \quad g(x) = \frac{a}{x} \text{ and } h(x) = 3x^2 \quad for\ x > 0$$

a) Find hgf(3) in terms of a

$$f(3) = 2(3) + 2 = 8$$
$$g(8) = \frac{a}{8}$$
$$h\left(\frac{a}{8}\right) = 3\left(\frac{a}{8}\right)^2 = \frac{3a^2}{64}$$

$$hgf(3) = \frac{3a^2}{64}$$

.....

(2)

b) Given that $fg(10) = \frac{14}{5}$ find the value of a

$$2\left(\frac{a}{10}\right) + 2 = \frac{14}{5}$$

$$\frac{2a}{10} = \frac{4}{5}$$

$$a = 4$$

.....

(2)

(Total for question = 4 marks)

4. The functions f, g are such that

$$f(x) = 3x + a \text{ and } g(x) = 6x - b$$

Given that fg(2) = 19 and gf(3) = 48, find the values of a and b.

From fg(2) =19

$3(6(2) - b) + a = 19$

$36 - 3b + a = 19$

$a - 3b = -17$

From gf(3) =54

$6(3(3) + a) - b = 54$

$54 + 6a - b = 54$

$6a - b = 0$

Solving simutaneously

$6a - 18b = -102$

-17b = -102

b= -6, a =1

.....(5) **(Total for question = 5 marks)**

LEE Yasmin

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	24 from 28	3 from 3	16 from 20	1 from 1	4 from 4	0 from 0
A02 and 3	44 from 52	12 from 12	5 from 9	11 from 13	14 from 16	2 from 2
Total	68 from 80	15 from 15	21 from 29	12 from 14	18 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Cumulative Frequency. Mathswatch Clip: 186

Topic 2: Inequalities Regions. Mathswatch Clip: 198

Topic 3: Areas under velocity time graph. MW: 216

Topic 4: Vectors. Mathswatch Clip: 219

Topic 5: Transformations of Functions. Mathswatch Clip: 196

1) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

(a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	12
$20 < A \leq 40$	27
$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

..... 41 ..... years

(2)

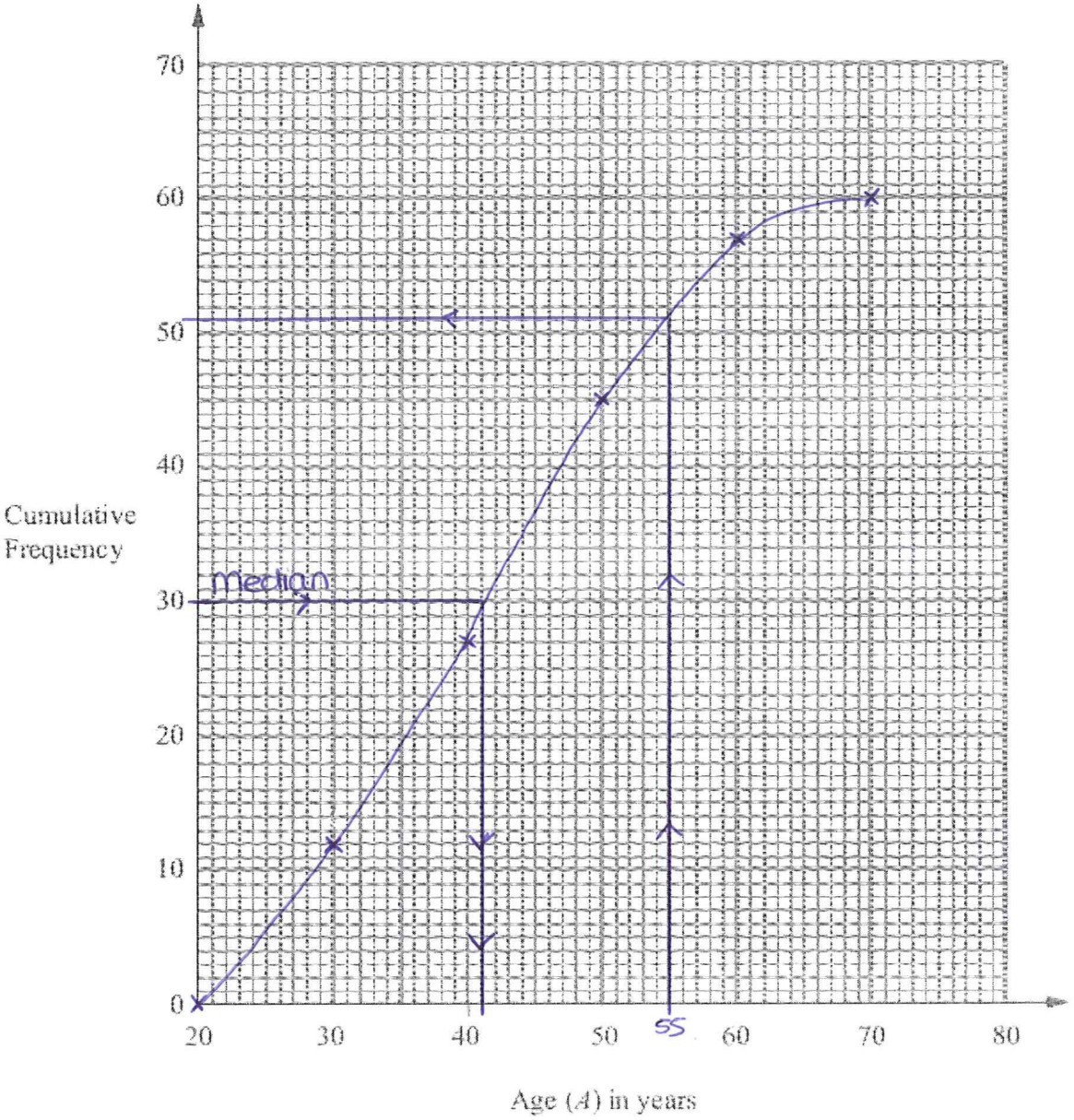
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so $60 - 51 = 9$ are older.

..... 9 .....

(2)

1) Cumulative Frequency: Medium



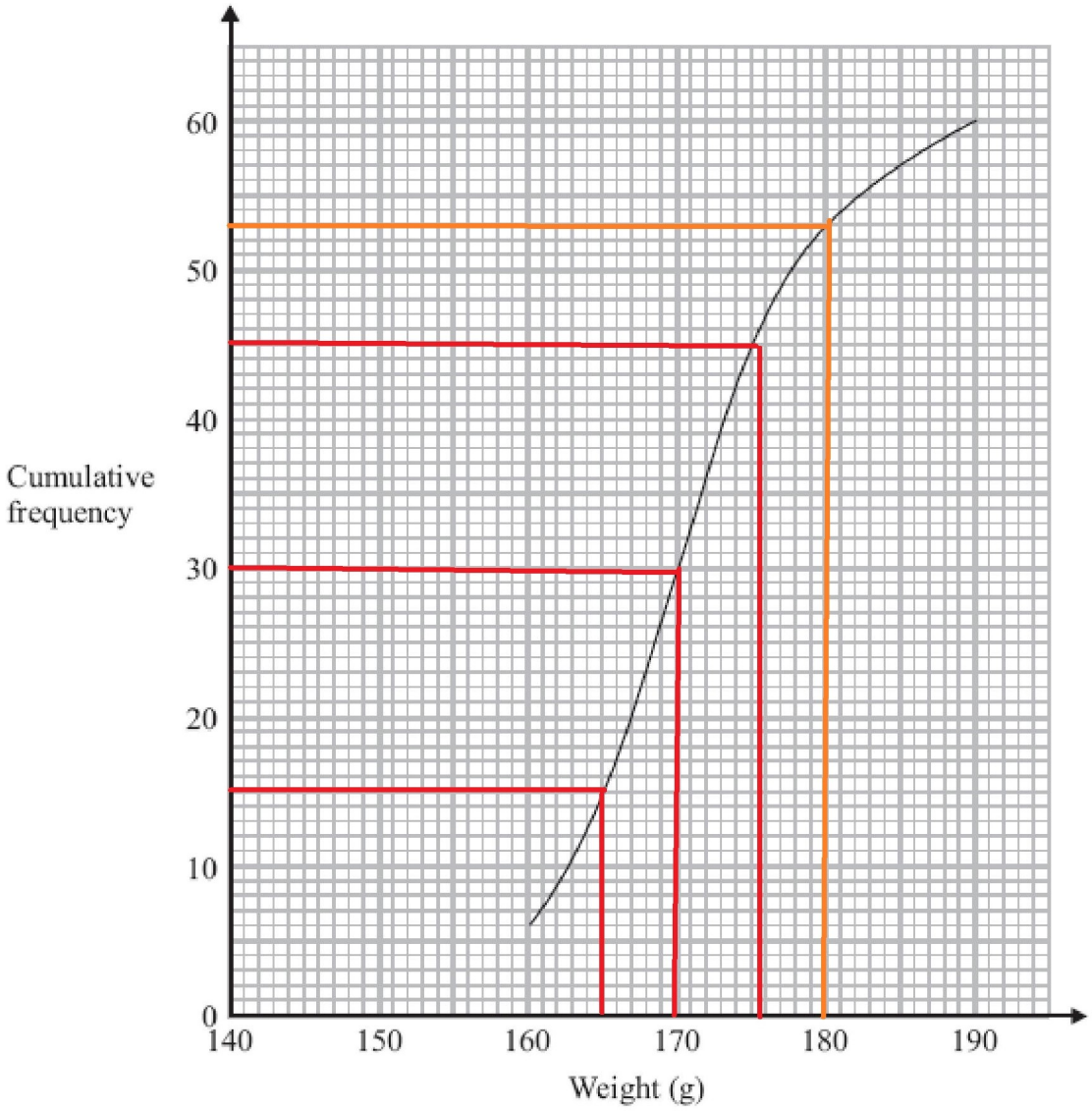
(7 marks)

1) Cumulative Frequency: Harder

4. Harry grows tomatoes.
This year he put his tomato plants into two groups, group A and group B.

Harry gave fertiliser to the tomato plants in group A.
He did not give fertiliser to the tomato plants in group B.

Harry weighed 60 tomatoes from group A.
The cumulative frequency graph shows some information about these weights.



ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

ii) The Upper Quartile 175 .....

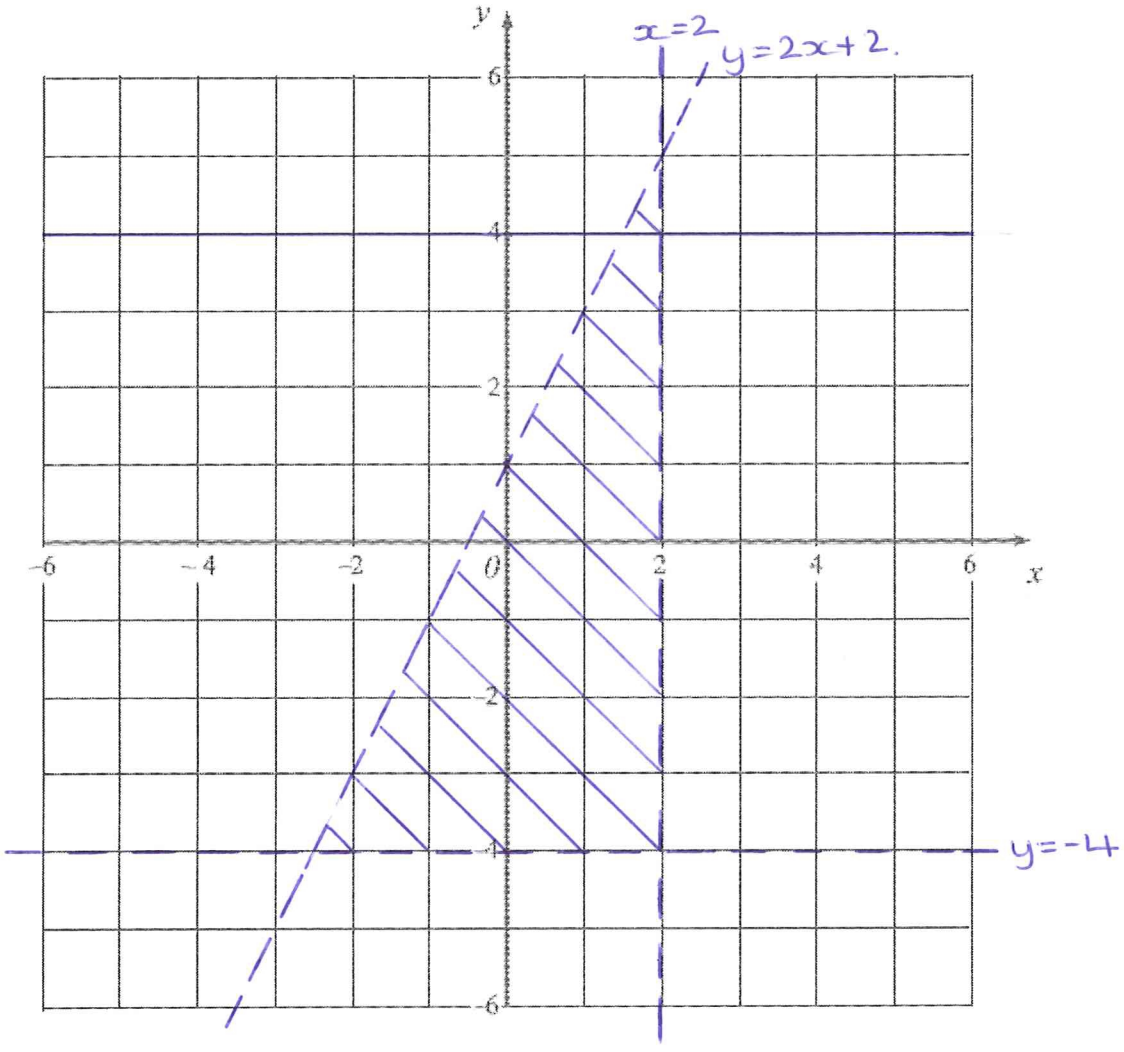
(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

2) Inequalities Regions: Easier

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

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

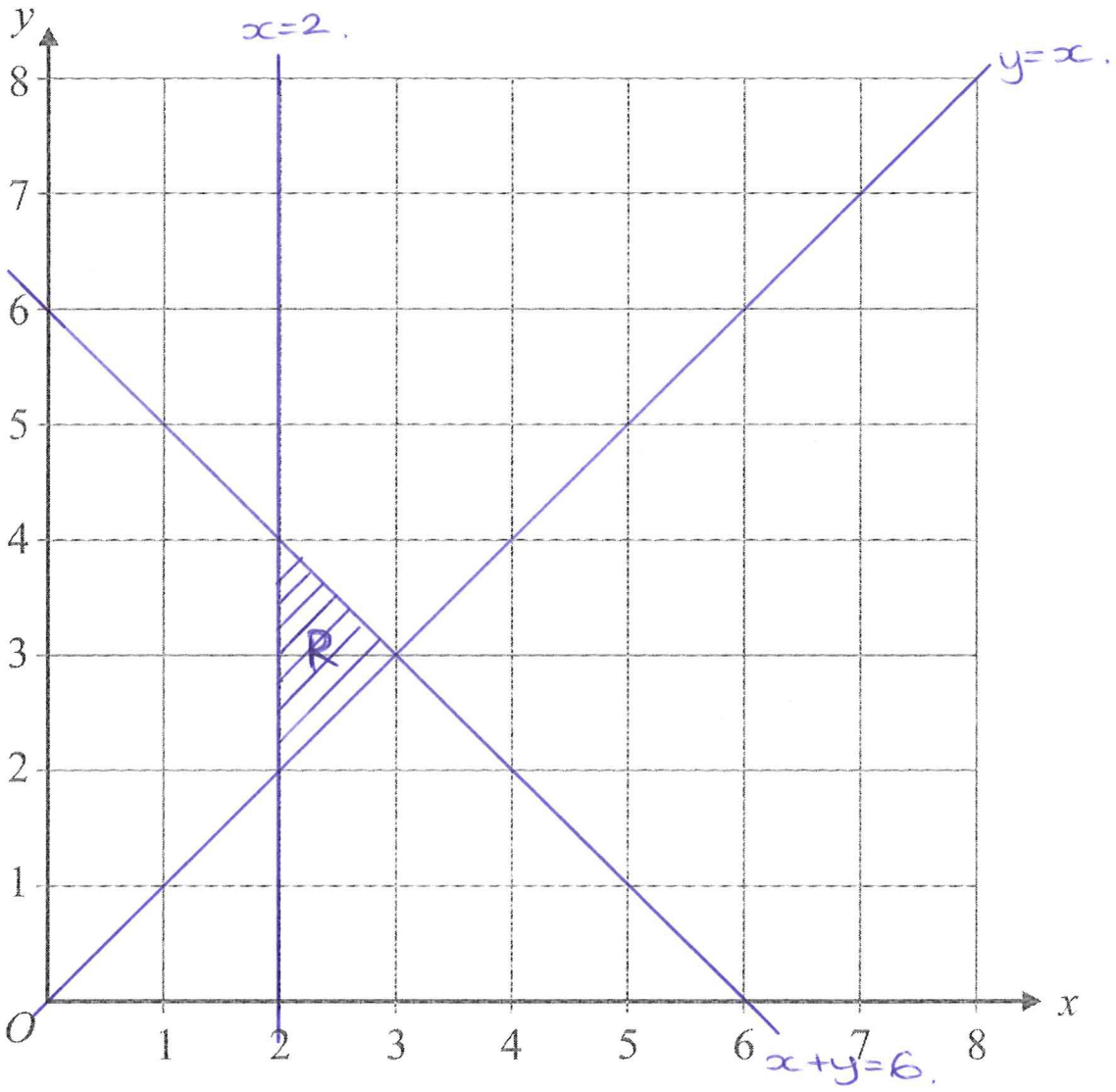


(Total for Question 19 = 4 marks)

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

$$x \geq 2 \qquad y \geq x \qquad x + y \leq 6$$



(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)

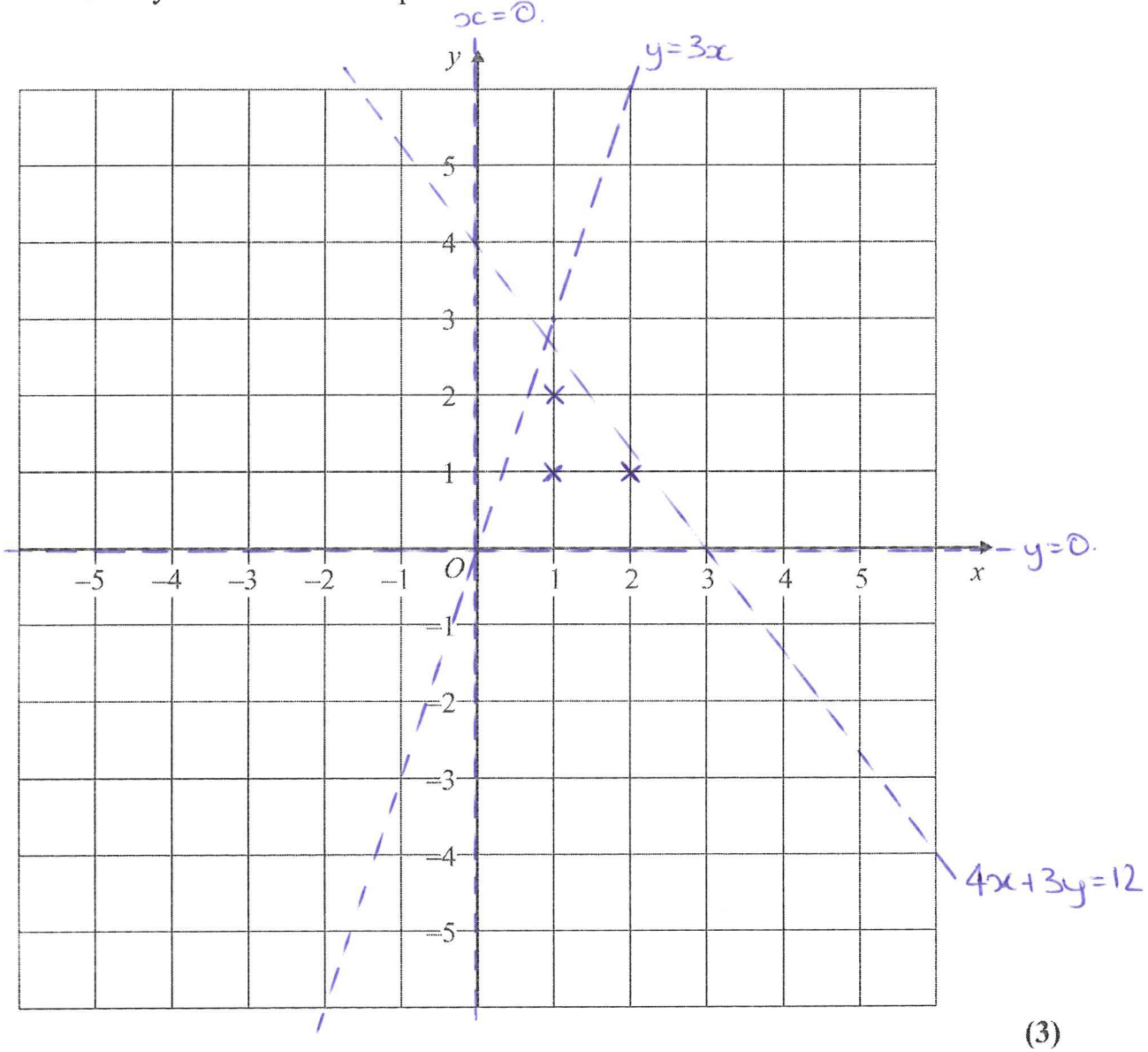
(Total 5 marks)

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 (×), each of the **three** points which satisfy **all** these four inequalities.

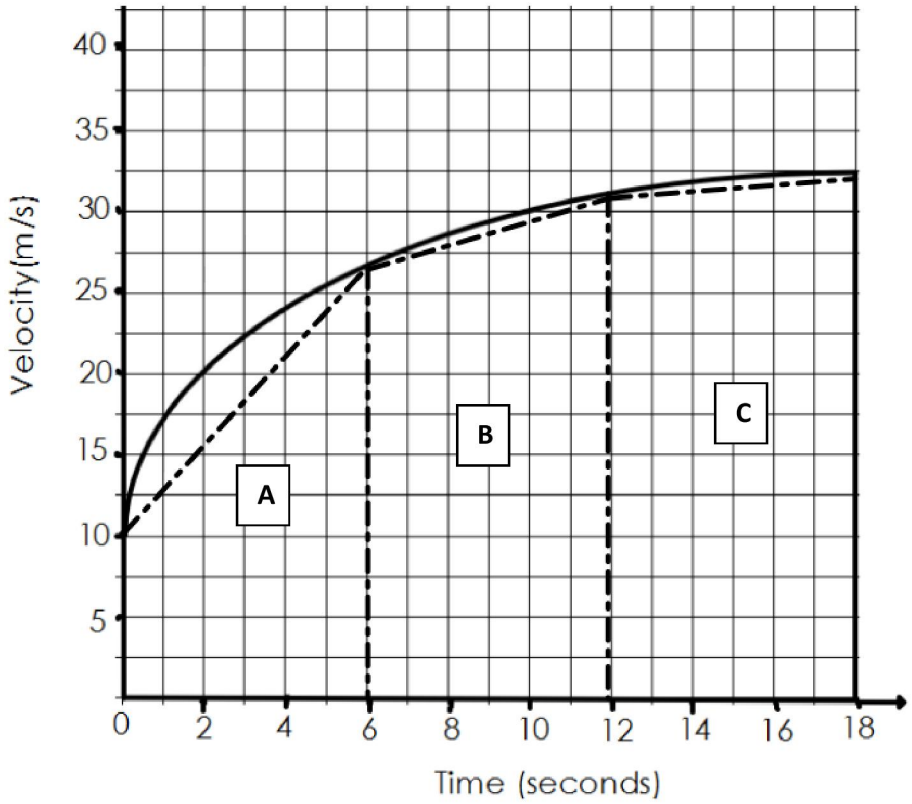


(3)

(Total 5 marks)

3) Areas under velocity time graph: Easier

1) The graph below shows a velocity time graph



1) a) By estimating the area under the graph using the three trapezia shown by dashed lines, work out the distance travelled in the 18 seconds.

Area of trapezium $= \frac{1}{2}(a + b)h$

Area of trapezium A $= \frac{1}{2}(10 + 27)(6) = 111$

Area of trapezium B $= \frac{1}{2}(27 + 31)(6) = 174$

Area of trapezium A $= \frac{1}{2}(31 + 32.5)(6) = 190.5$

Total Area under graph $= 111 + 174 + 190.5 = 475.5$

475.5metres travelled in 18 seconds

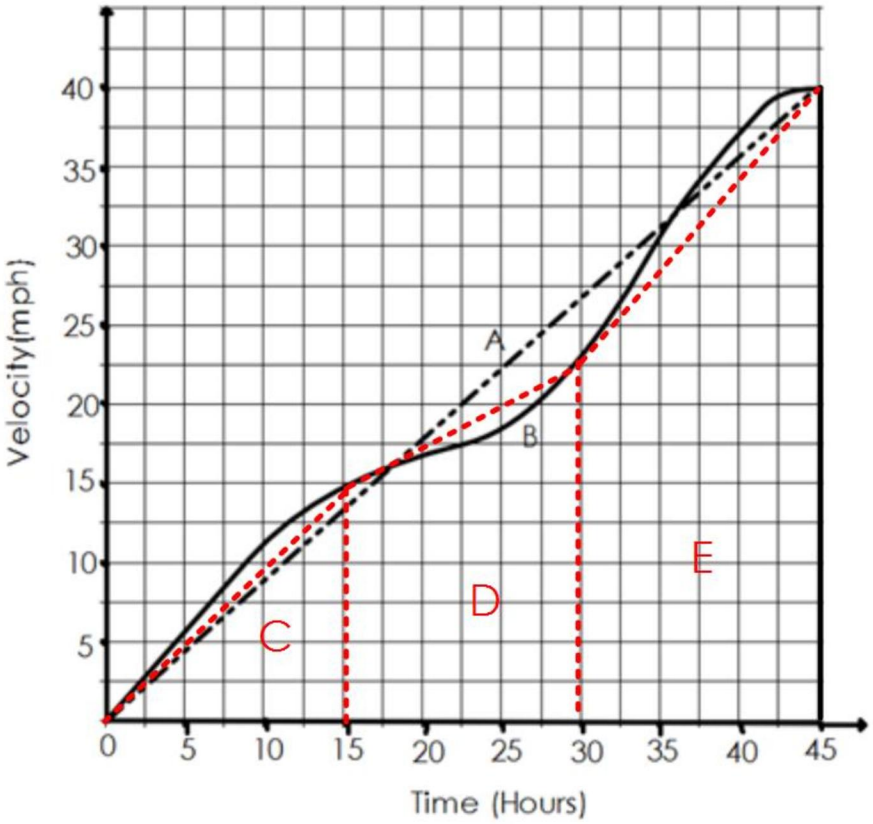
b) By considering the diagram, is your estimate for the distance an overestimate or underestimate? Explain your reasoning.

As each of the trapezia are a smaller area than the actual area, the estimate is an underestimate

(4 marks)

3) Areas under velocity time graph: Medium

2) The graph below shows a velocity time graph for two birds, A and B, over a long distance.



Which bird travels further in the 45 hours? You must show your working. Use 3 equal strips for your estimate for bird B. Comment on the reliability of your answer.

Distance travelled by bird A

Area of triangle $A = \frac{40 \times 45}{2} = 900$

Distance travelled by bird B

$$\text{Triangle C} = \frac{15 \times 15}{2} = 112.5$$

$$\text{Trapezium D} = \frac{1}{2}(15 + 22.5)(15) = 281.25$$

$$\text{Trapezium E} = \frac{1}{2}(22.5 + 40)(15) = 468.75$$

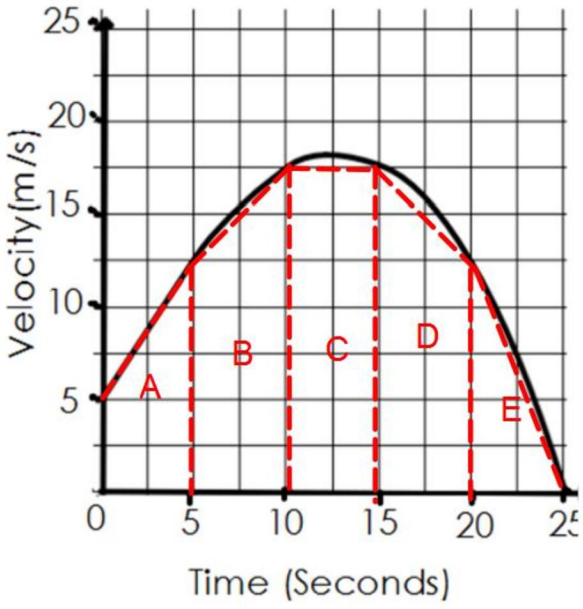
Total area under curve B is 862.5, so bird A travelled further. However, the area under the curve is an estimate and only uses three strips so not very reliable.

(4 marks)

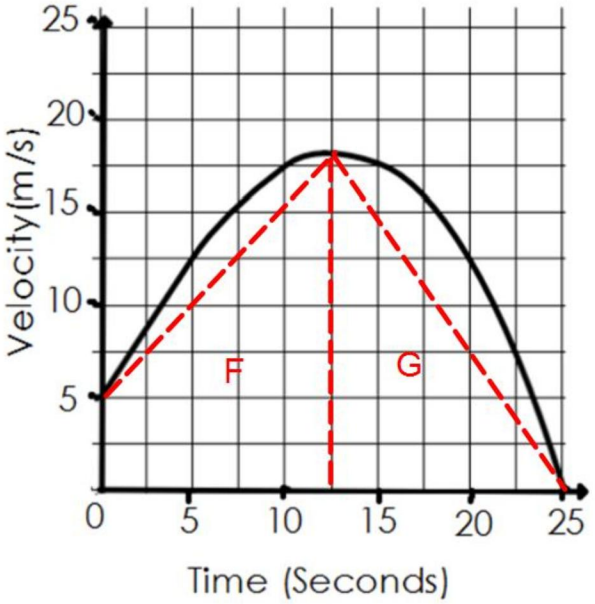
3) Areas under velocity time graph: Harder

3) The graph below shows a velocity-time graph for a drone.

Anna's method



Simone's method



a) Anna works out the distance travelled by using 3 trapezia, a rectangle and a triangle, all of equal width. Simone divides it into a triangle and a trapezium, both of equal width. Find an estimate of the distance using both Anna and Simone's method.

Anna's method :

Area $= \frac{1}{2}(5 + 12.5)(5) + \frac{1}{2}(12.5 + 17.5)(5) + (5 \times 17.5) + \frac{1}{2}(17.5 + 12.5)(5) + \frac{1}{2}(5 \times 12.5)$

Area = 43.75+ 75 + 87.5 + 75+ 31.25

Area = 312.5, distance 312.5 metres

Simone's method:

Area $= \frac{1}{2}(5 + 18)(12.5) + \frac{1}{2}(18 \times 12.5)$

Area = 143.75+ 112.5

Area =256.25 distance 256.25metres

b) Comment on which method you think gives the most reliable results.
Anna's method is more reliable as she has used more strips. we can see from the graph Simone's method is a big underestimate.

(4 marks)

4) Vectors: Easier

1.

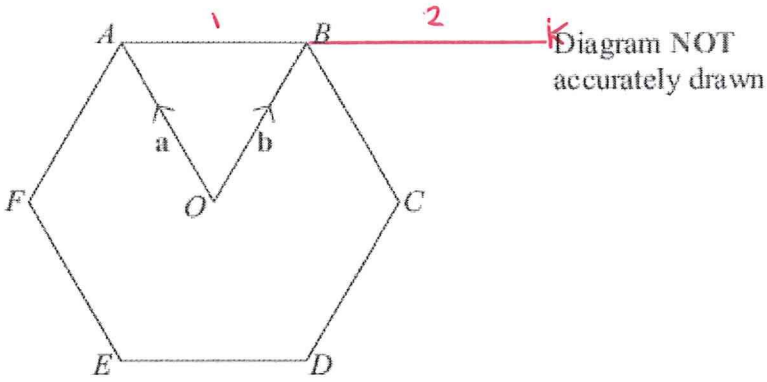


Diagram NOT accurately drawn

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 **a** and **b**.

$-a+b$

.....

(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 **a** and **b**.
Give your answer in its simplest form.

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

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

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

$-a+2b$

.....

(3)

(4 marks)

4) Vectors: Medium

6.

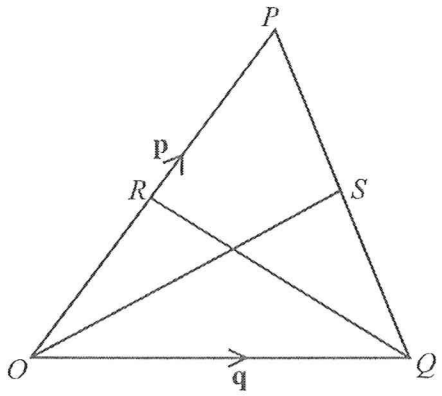


Diagram **NOT** accurately drawn

OPQ is a triangle.

R is the midpoint of OP.

S is the midpoint of PQ.

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

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

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

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

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

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

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

(ii) Show that RS is parallel to OQ.

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

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

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

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

(5 marks)

4) Vectors: Harder

6.

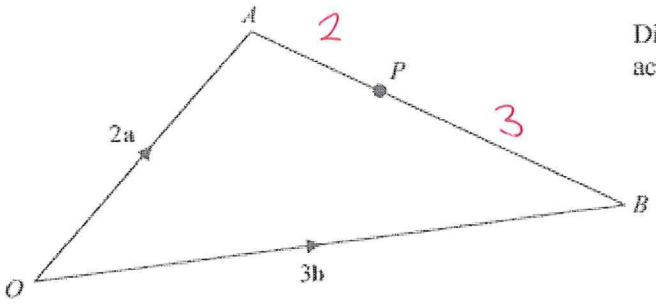


Diagram NOT accurately drawn

OAB is a triangle.

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

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

(*a*) Find *AB* in terms of **a** and **b**.

$\overrightarrow{AB}$ = $-2a+3b$

(1)

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

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

$\overrightarrow{AP} = \frac{2}{5}(-2a+3b)$

$= -\frac{4}{5}a + \frac{6}{5}b$

$\overrightarrow{OP} = 2a - \frac{4}{5}a + \frac{6}{5}b$

$= \frac{6}{5}a + \frac{6}{5}b$

$= \frac{6}{5}(a+b)$

(3)

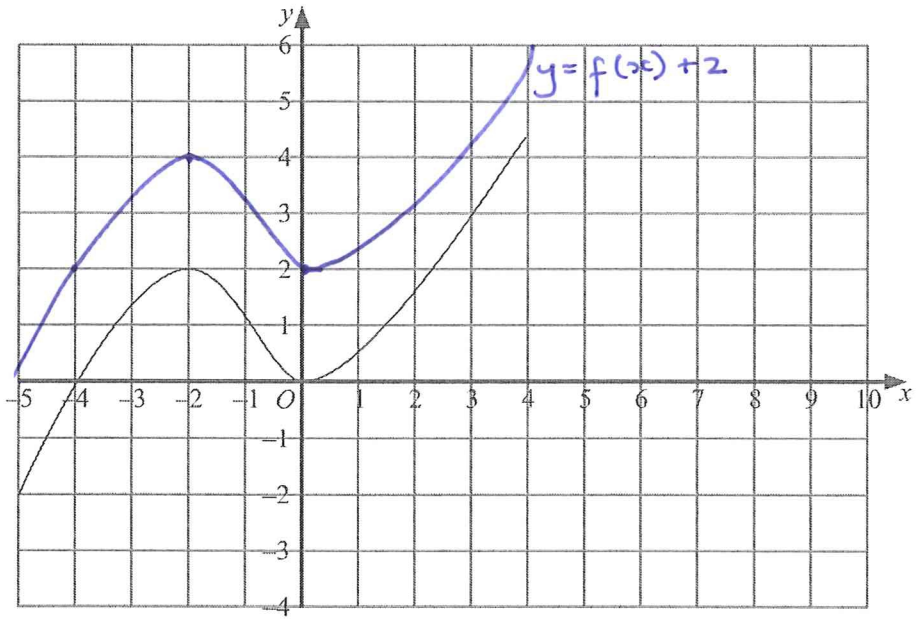
(4 marks)

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

5) Transformations of Functions: Easier

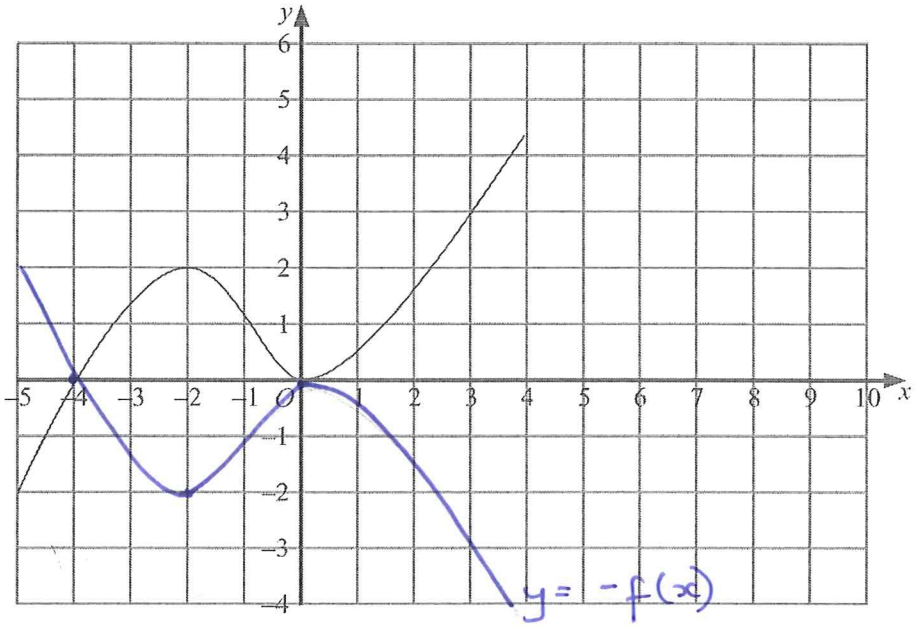
1. The graph of $y = f(x)$ is shown on the grids.

(a) On this grid, sketch the graph of $y = f(x) + 2$



(2)

(b) On this grid, sketch the graph of $y = -f(x)$

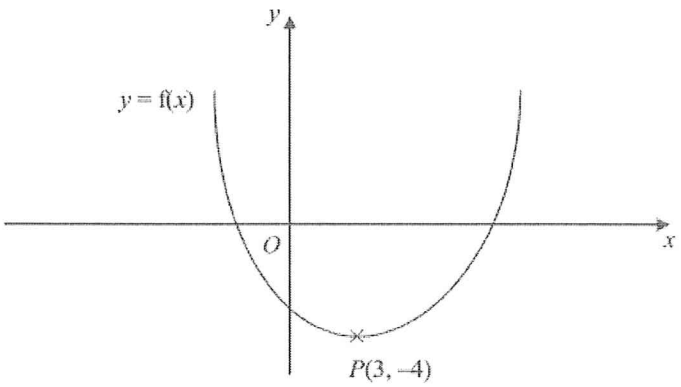


(2)

(4 marks)

5) Transformations of Functions: Medium

9. This is a sketch of the curve with the equation $y = f(x)$.
The only minimum point of the curve is at $P(3, -4)$.



(a) Write down the coordinates of the minimum point of the curve with the equation $y = f(x - 2)$.

(5 , -4)
(2)

(b) Write down the coordinates of the minimum point of the curve with the equation $y = f(x + 5) + 6$

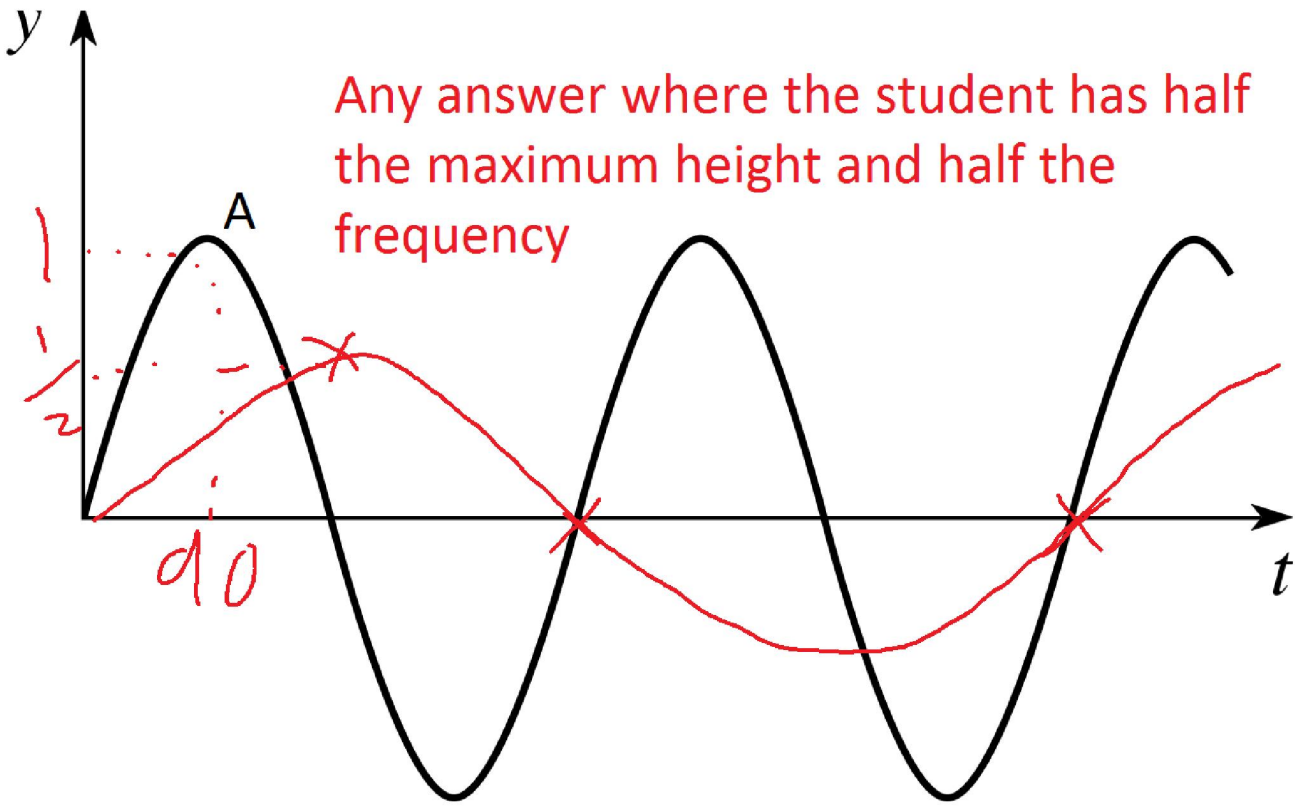
(-2 , 2)
(2)

(4 marks)

5) Transformations of Functions: Harder

2) a) State the co-ordinates of A (90^o, 1) (2 marks)

b)



LEIGH-VALERO Nadia

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	21 from 28	3 from 3	14 from 20	0 from 1	4 from 4	0 from 0
A02 and 3	33 from 52	12 from 12	2 from 9	5 from 13	12 from 16	2 from 2
Total	54 from 80	15 from 15	16 from 29	5 from 14	16 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Averages from Frequency Tables. Mathswatch Clip: 130

Topic 2: Venn diagrams.. Mathswatch Clip: 127

Topic 3: Cumulative Frequency. Mathswatch Clip: 186

Topic 4: Composite functions. Mathswatch Clip: 215

Topic 5: Areas under velocity time graph. MW: 216

1) Averages from Frequency Tables: Easier

1. Amanda collected 20 leaves and wrote down their lengths, in cm.

Here are her results.

5 6 5 2 4 5 8 7 5 4

7 6 4 3 5 7 6 4 8 5

(a) Complete the frequency table to show Amanda's results.

Length in cm	Tally	Frequency
2	|	1
3	|	1
4	||||	4
5	𝍸 |	6
6	|||	3
7	|||	3
8	||	2

(2)

(b) Write down the modal length → highest frequency 5 .....cm **(1)**

(c) Work out the range. 6 .....cm **(1)**

8 − 2

(4 marks)

2. Rosie had 10 boxes of drawing pins.

She counted the number of drawing pins in each box.

The table gives information about her results.

Number of drawing pins	Frequency	Number × freq
29	2	58
30	5	150
31	2	62
32	1	32
	10	302

TOTAL NUMBER OF PINS

Work out the mean number of drawing pins in a box.

302 ÷ 10 30·2 .....

(3 marks)

1) Averages from Frequency Tables: Medium

8. Caleb measured the heights of 30 plants.
The table gives some information about the heights, h cm, of the plants.

Height (h cm) of plants	Frequency	Midpoint	f × m
$0 < h \leq 10$	2	5	10
$10 < h \leq 20$	8	15	120
$20 < h \leq 30$	9	25	225
$30 < h \leq 40$	7	35	245
$40 < h \leq 50$	4	45	180
	30		780

(a) Work out an estimate for the mean height of a plant.

780 ÷ 30

26

(3)

(b) Write down the modal class interval.

group with highest freq

$20 < h \leq 30$

(1)

(c) Find the class interval that contains the median.

30 plants → median between 15 and 16

2 + 8 = 10
10 + 9 = 19 (median in here)

$20 < h \leq 30$

(2)

(d) Why is your answer to part (a) and estimate?

We don't know actual plant heights as data is grouped

(1)
(7 marks)

1) Averages from Frequency Tables: Harder

9. Marcus collected some pebbles.
He weighed each pebble.

The grouped frequency table gives some information about weights.

Weight (w grams)	Frequency	Midpoint	f × m
$50 \leq w < 60$	5	55	275
$60 \leq w < 70$	9	65	585
$70 \leq w < 80$	22	75	1650
$80 \leq w < 90$	27	85	2295
$90 \leq w < 100$	17	95	1615
	80		6420

(a) Work out an estimate for the mean weight of the pebbles.

6420 ÷ 80

80.25g

(3)

(b) Write down the modal class interval.

group with highest freq

$80 \leq w < 90$

(1)

(c) Find the class interval that contains the median.

80 → median between 40 and 41

5 + 9 = 16
16 + 22 = 38
38 + 27 = 65 (median in here)

$80 \leq w < 90$

(2)

(d) Why is your answer to part (a) and estimate?

Data is grouped and so we don't know actual values

(1)

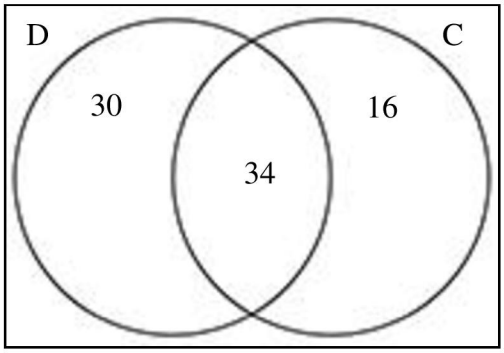
(7 marks)

2) Venn diagrams.: Easier

Solution for Question 1:

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

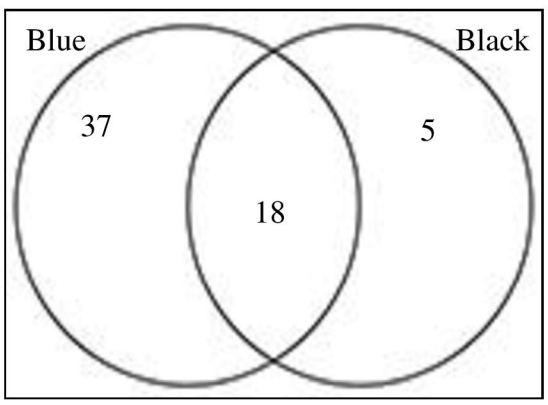
Number of people that owned cats only: $80 - 34 - 30 = 16$



Solution for Question 2:

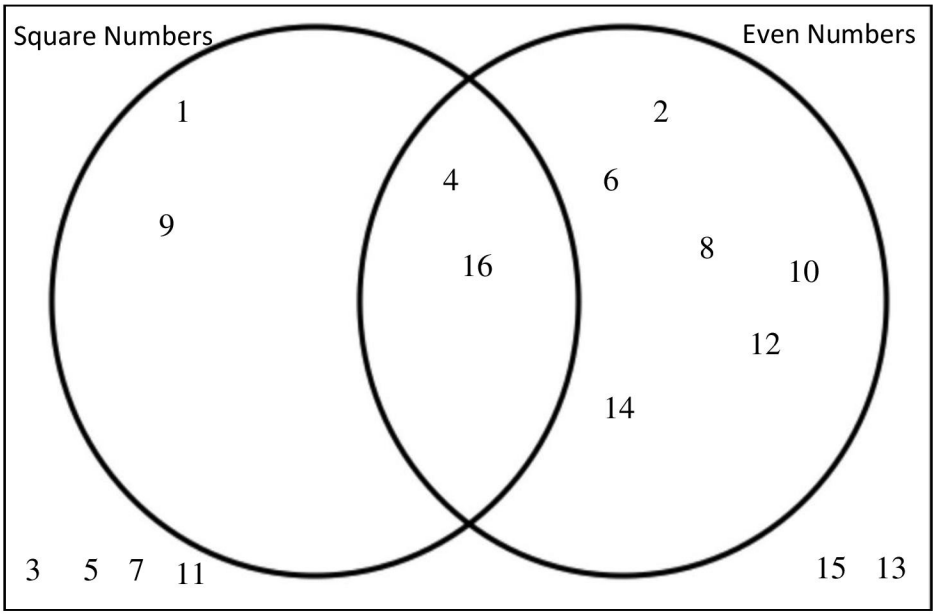
a) Number of people that only had a black pen:
$60 - 37 - 18 = 5$

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 $B = \{9,15\}$

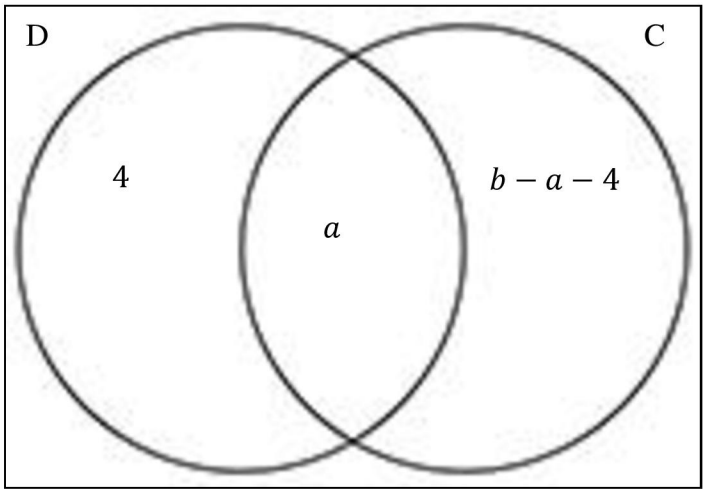
ii) $A \cup B = A$ or $B = \{3,5,6,12,18\}$

2) Venn diagrams.: Harder

Solution for Question 6:

Number of people who replied with cats only:

$b - a - 4$



3) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

(a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	12
$20 < A \leq 40$	27
$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

..... 41 ..... years

(2)

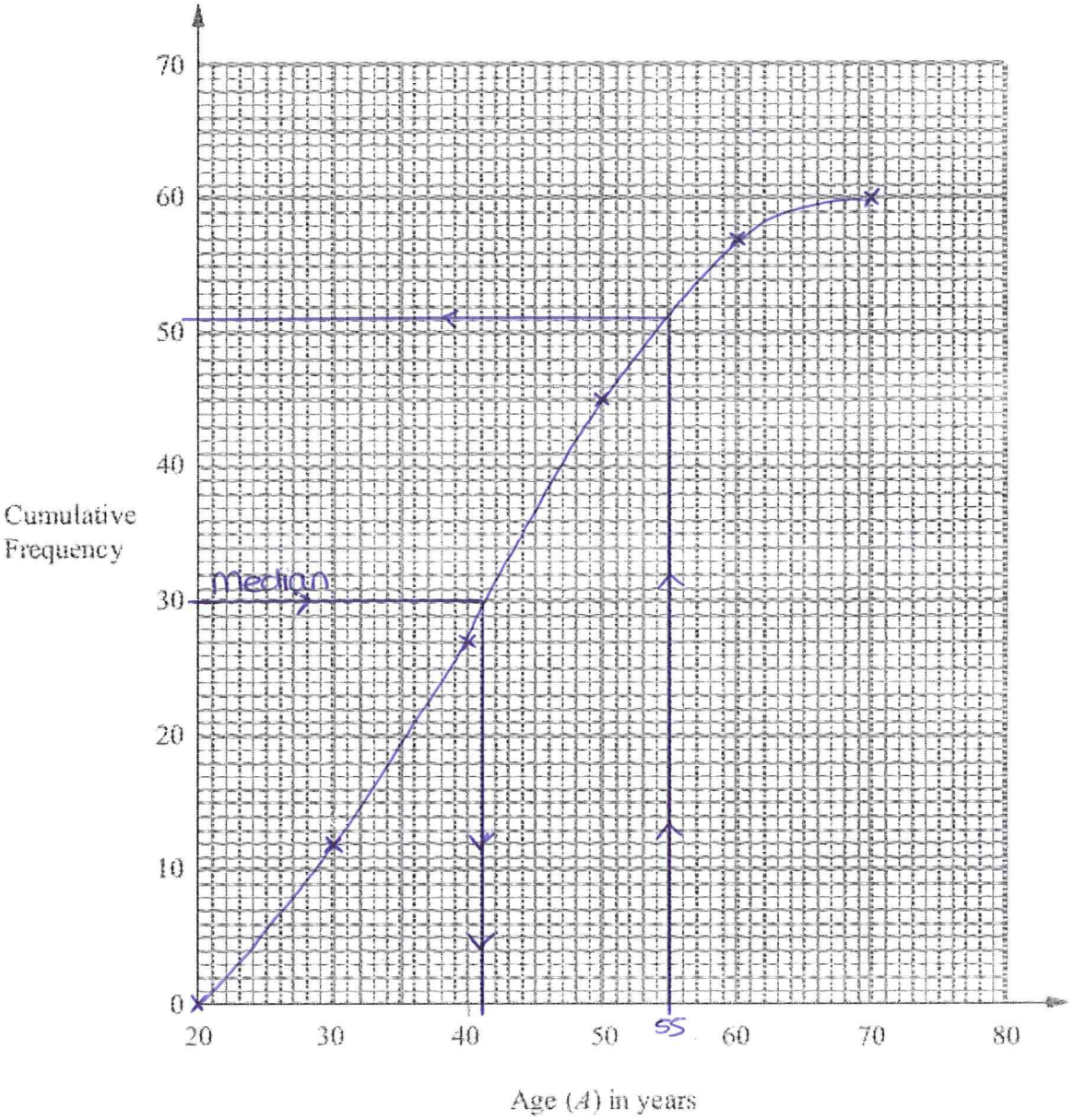
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so $60 - 51 = 9$ are older.

..... 9 .....

(2)

3) Cumulative Frequency: Medium



(7 marks)

3) Cumulative Frequency: Harder

4. Harry grows tomatoes.
This year he put his tomato plants into two groups, group A and group B.

Harry gave fertiliser to the tomato plants in group A.
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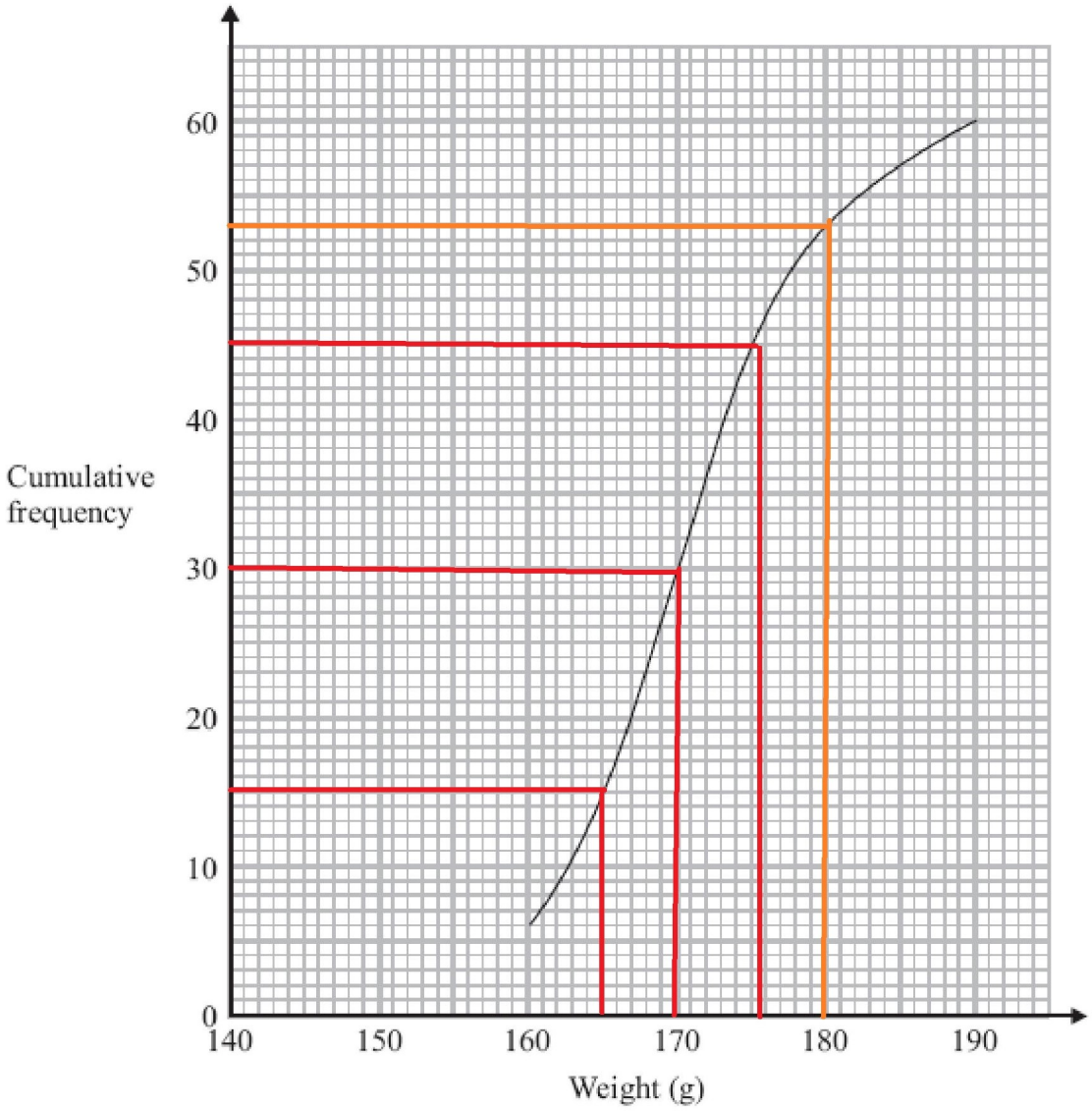
Harry weighed 60 tomatoes from group A.
The cumulative frequency graph shows some information about these weights.



ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

ii) The Upper Quartile 175 .....

(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

4) Composite functions: Easier

Q1. The functions f and g are such that

$$f(x) = 2x + 3 \text{ and } g(x) = \frac{x}{4} - 2$$

(a) Find the value of f(8)

F(8) = 2(8) + 3
=16 + 3
= 19

19

.....

(1)

(b) Find gf(*4*)

f(4) = 2(4) + 3 = 11

$$g(11) = \frac{11}{4} - 2 = \frac{3}{4}$$

$\frac{3}{4}$

.....

(2)

(b) Show that

$$fg(x) = \frac{1}{2}x - 1$$

$$fg(x) = 2\left(\frac{x}{4} - 2\right) + 3$$

$$fg(x) = \frac{2x}{4} - 4 + 3$$

$$fg(x) = \frac{1}{2}x - 1$$

(2)

(Total for question = 5 marks)

4) Composite functions: Medium

2. The functions f and g are such that

$$f(x) = \frac{2}{x+3} \text{ and } g(x) = 3(x-2)$$

a) Show that $gf(5) = -\frac{21}{4}$

$$f(5) = \frac{2}{5+3} = \frac{1}{4}$$

$$g\left(\frac{1}{4}\right) = 3\left(\frac{1}{4} - 2\right)$$

$$g\left(\frac{1}{4}\right) = \frac{3}{4} - 6$$

$$g\left(\frac{1}{4}\right) = -\frac{21}{4}$$

.....

(2)

b) Show that fg(x) can be written in the form

$$\frac{2}{k(x-1)}$$

where k is an integer to be found.

$$fg(x) = \frac{2}{3(x-2)+3}$$

$$fg(x) = \frac{2}{3x-6+3}$$

$$fg(x) = \frac{2}{3x-3}$$

$$fg(x) = \frac{2}{3(x-1)} \quad , \quad k = 3$$

(3)

c) Find an expression for gg(x)

$$gg(x) = 3(3x-6) - 6$$

$$gg(x) = 9x - 24$$

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

(Total for question = 7 marks)

4) Composite functions: Harder

3. The functions f, g and h are such that

$$f(x) = 2x + 2 \quad , \quad g(x) = \frac{a}{x} \text{ and } h(x) = 3x^2 \quad for\ x > 0$$

a) Find hgf(3) in terms of a

$$f(3) = 2(3) + 2 = 8$$
$$g(8) = \frac{a}{8}$$
$$h\left(\frac{a}{8}\right) = 3\left(\frac{a}{8}\right)^2 = \frac{3a^2}{64}$$

$$hgf(3) = \frac{3a^2}{64}$$

.....

(2)

b) Given that $fg(10) = \frac{14}{5}$ find the value of a

$$2\left(\frac{a}{10}\right) + 2 = \frac{14}{5}$$

$$\frac{2a}{10} = \frac{4}{5}$$

$$a = 4$$

.....

(2)

(Total for question = 4 marks)

4. The functions f, g are such that

$$f(x) = 3x + a \text{ and } g(x) = 6x - b$$

Given that fg(2) = 19 and gf(3) = 48, find the values of a and b.

From fg(2) =19

$3(6(2) - b) + a = 19$

$36 - 3b + a = 19$

$a - 3b = -17$

From gf(3) =54

$6(3(3) + a) - b = 54$

$54 + 6a - b = 54$

$6a - b = 0$

Solving simutaneously

$6a - 18b = -102$

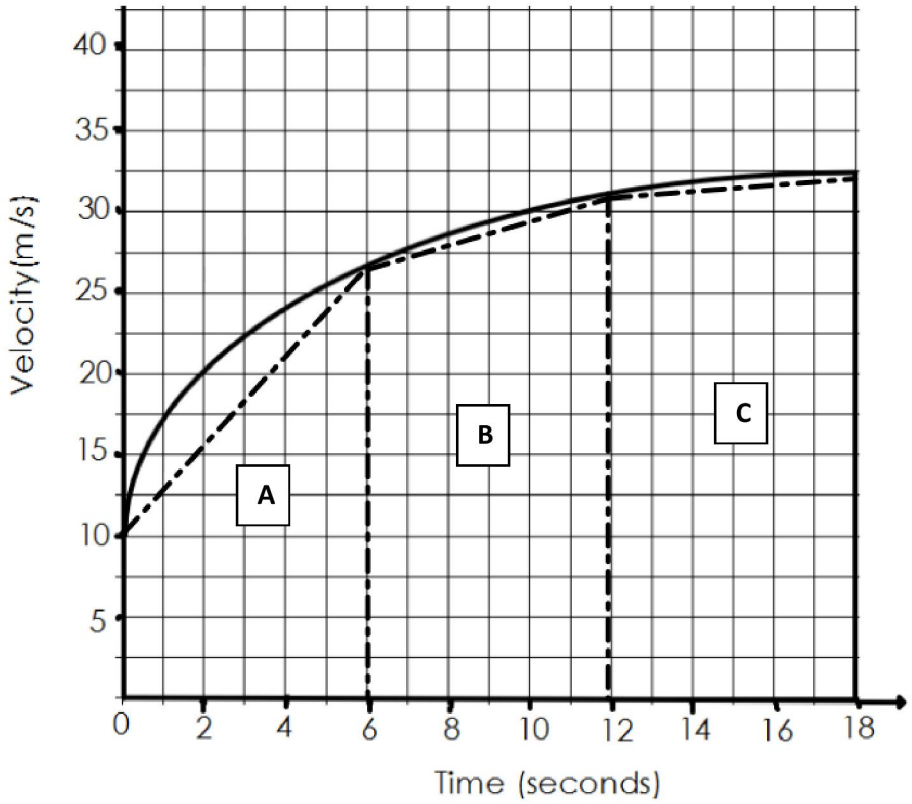
-17b = -102

b= -6, a =1

.....(5) **(Total for question = 5 marks)**

5) Areas under velocity time graph: Easier

1) The graph below shows a velocity time graph



1) a) By estimating the area under the graph using the three trapezia shown by dashed lines, work out the distance travelled in the 18 seconds.

Area of trapezium $= \frac{1}{2}(a + b)h$

Area of trapezium A $= \frac{1}{2}(10 + 27)(6) = 111$

Area of trapezium B $= \frac{1}{2}(27 + 31)(6) = 174$

Area of trapezium A $= \frac{1}{2}(31 + 32.5)(6) = 190.5$

Total Area under graph $= 111 + 174 + 190.5 = 475.5$

475.5metres travelled in 18 seconds

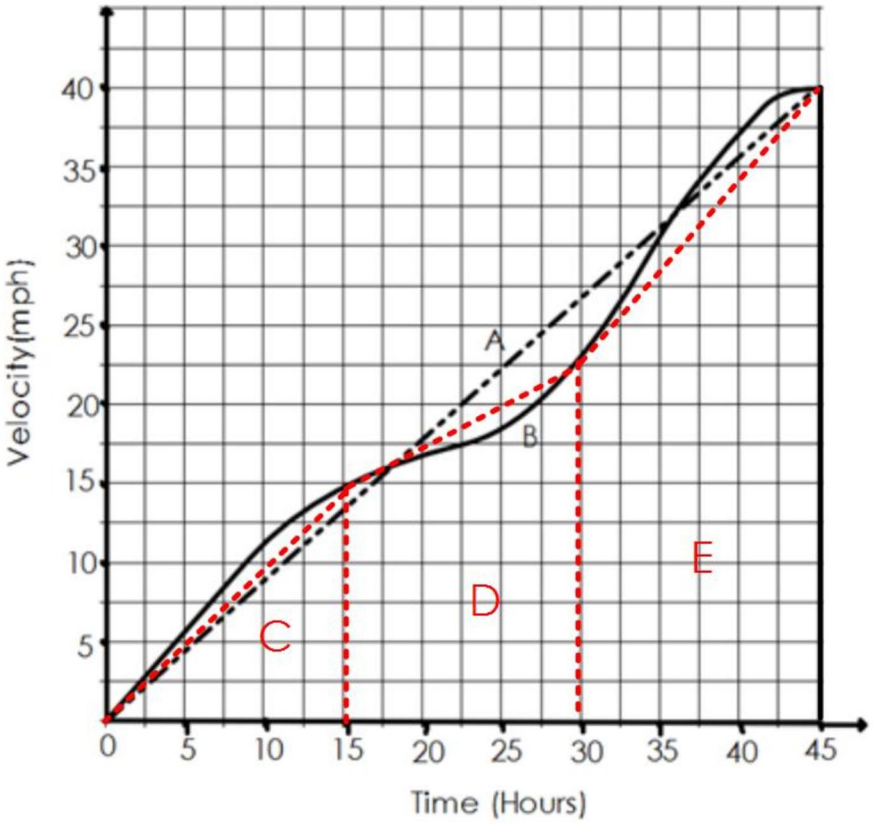
b) By considering the diagram, is your estimate for the distance an overestimate or underestimate? Explain your reasoning.

As each of the trapezia are a smaller area than the actual area, the estimate is an underestimate

(4 marks)

5) Areas under velocity time graph: Medium

2) The graph below shows a velocity time graph for two birds, A and B, over a long distance.



Which bird travels further in the 45 hours? You must show your working. Use 3 equal strips for your estimate for bird B. Comment on the reliability of your answer.

Distance travelled by bird A

Area of triangle $A = \frac{40 \times 45}{2} = 900$

Distance travelled by bird B

$$\text{Triangle C} = \frac{15 \times 15}{2} = 112.5$$

$$\text{Trapezium D} = \frac{1}{2}(15 + 22.5)(15) = 281.25$$

$$\text{Trapezium E} = \frac{1}{2}(22.5 + 40)(15) = 468.75$$

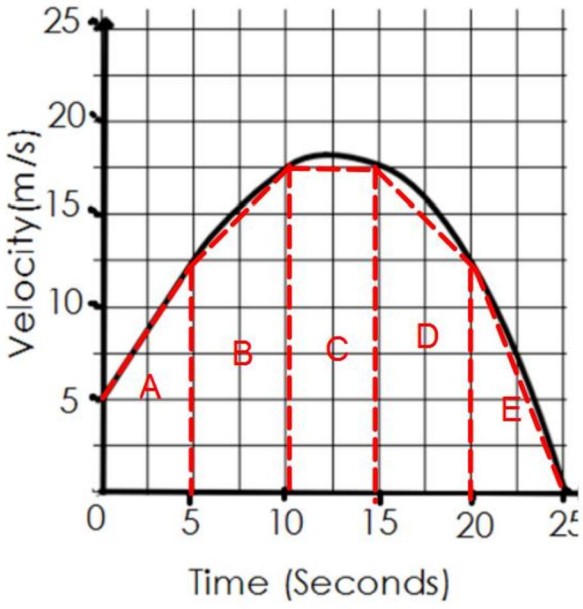
Total area under curve B is 862.5, so bird A travelled further. However, the area under the curve is an estimate and only uses three strips so not very reliable.

(4 marks)

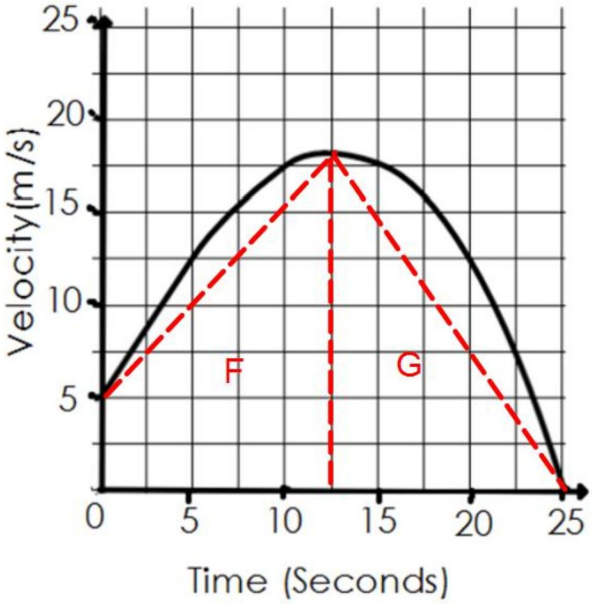
5) Areas under velocity time graph: Harder

3) The graph below shows a velocity-time graph for a drone.

Anna's method



Simone's method



a) Anna works out the distance travelled by using 3 trapezia, a rectangle and a triangle, all of equal width. Simone divides it into a triangle and a trapezium, both of equal width. Find an estimate of the distance using both Anna and Simone's method.

Anna's method :

Area $= \frac{1}{2}(5 + 12.5)(5) + \frac{1}{2}(12.5 + 17.5)(5) + (5 \times 17.5) + \frac{1}{2}(17.5 + 12.5)(5) + \frac{1}{2}(5 \times 12.5)$

Area = 43.75+ 75 + 87.5 + 75+ 31.25

Area = 312.5, distance 312.5 metres

Simone's method:

Area $= \frac{1}{2}(5 + 18)(12.5) + \frac{1}{2}(18 \times 12.5)$

Area = 143.75+ 112.5

Area =256.25 distance 256.25metres

b) Comment on which method you think gives the most reliable results.
Anna's method is more reliable as she has used more strips. we can see from the graph Simone's method is a big underestimate.

(4 marks)

LEIGH-VALERO Tori

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	25 from 28	3 from 3	17 from 20	1 from 1	4 from 4	0 from 0
A02 and 3	43 from 52	12 from 12	8 from 9	9 from 13	12 from 16	2 from 2
Total	68 from 80	15 from 15	25 from 29	10 from 14	16 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Cumulative Frequency. Mathswatch Clip: 186

Topic 2: Composite functions. Mathswatch Clip: 215

Topic 3: Areas under velocity time graph. MW: 216

Topic 4: Vectors. Mathswatch Clip: 219

Topic 5: Extention1. Mathswatch Clip:

1) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

(a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	12
$20 < A \leq 40$	27
$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

..... 41 ..... years

(2)

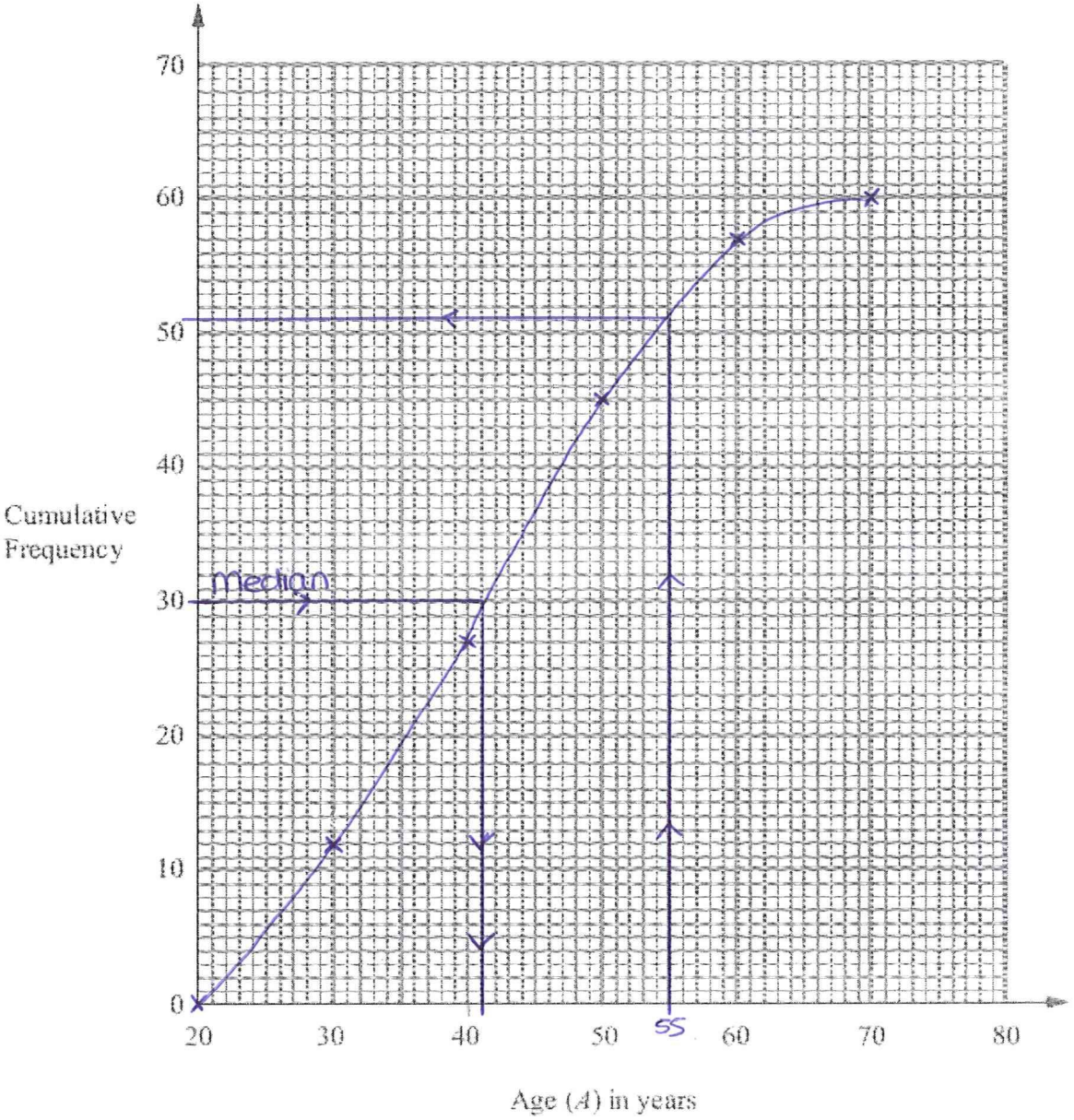
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so 60 - 51 = 9 are older.

..... 9 .....

(2)

1) Cumulative Frequency: Medium



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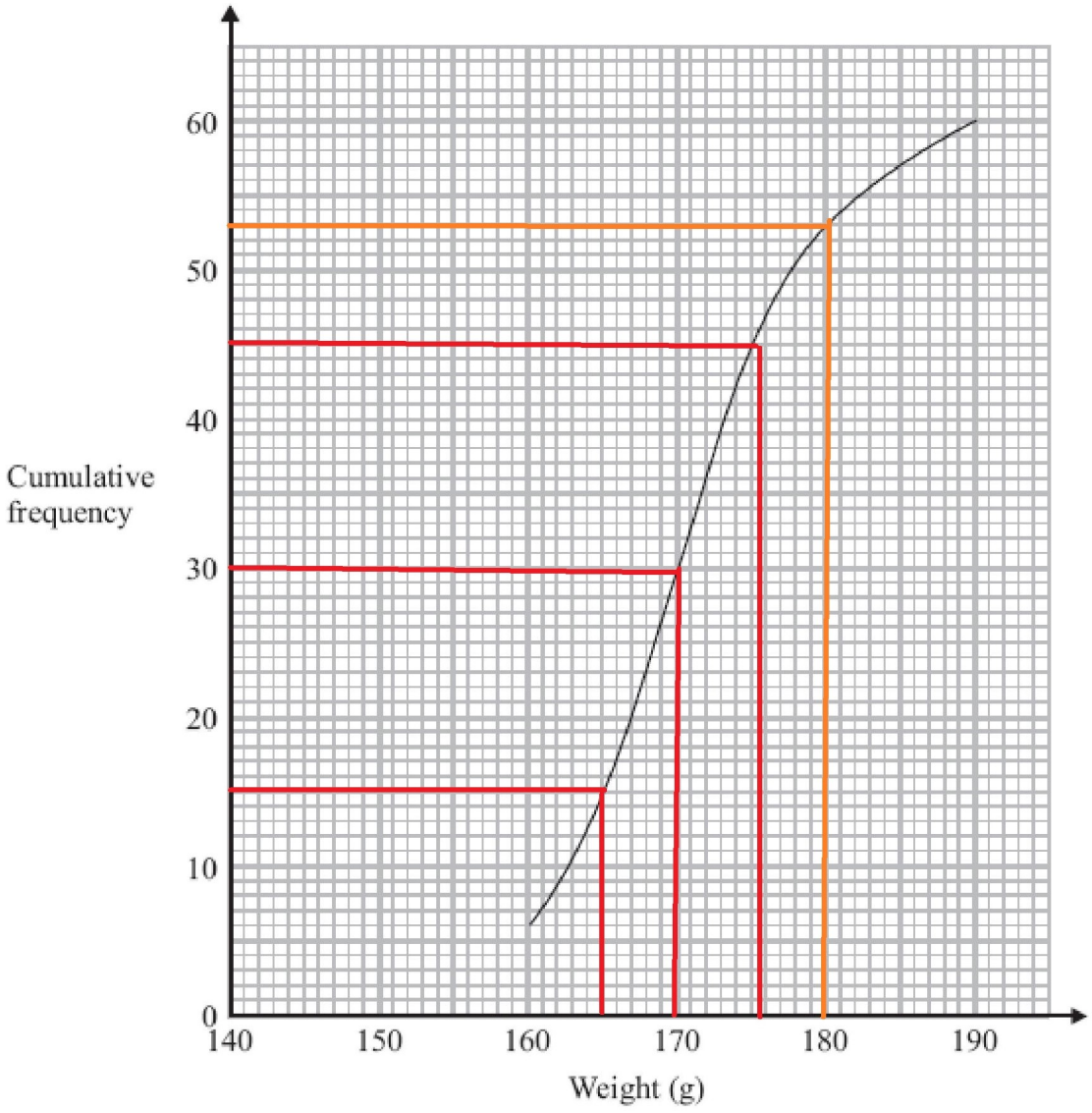

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.....

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$$fg(x) = \frac{2x}{4} - 4 + 3$$

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(2)

(Total for question = 5 marks)

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(3)

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.....

(2)

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.....

(2)

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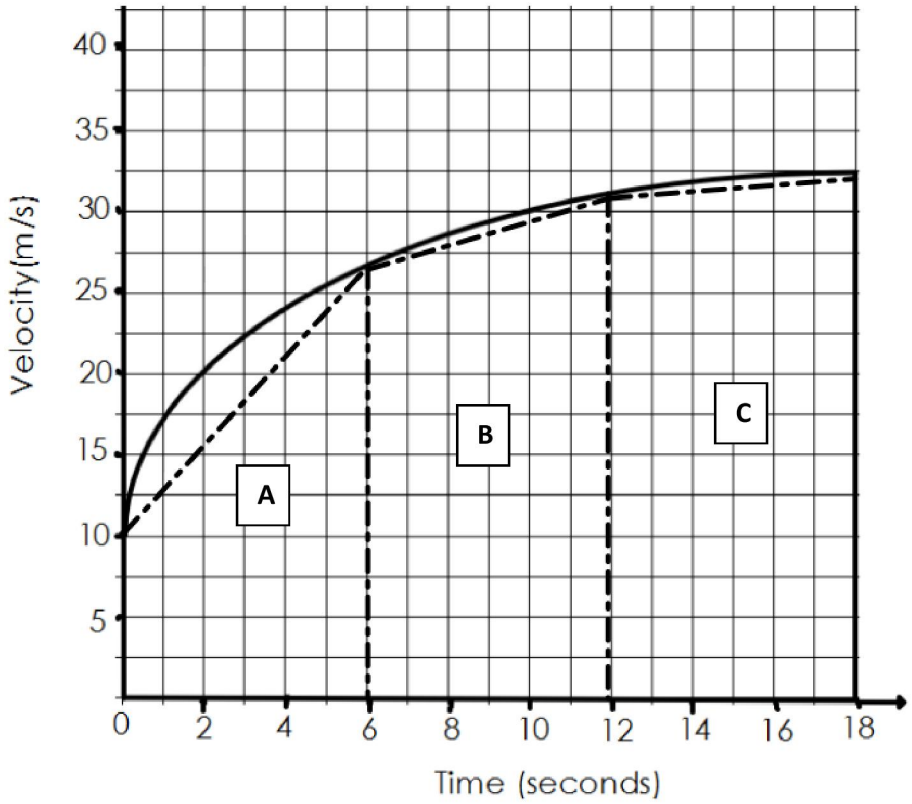

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(4 marks)

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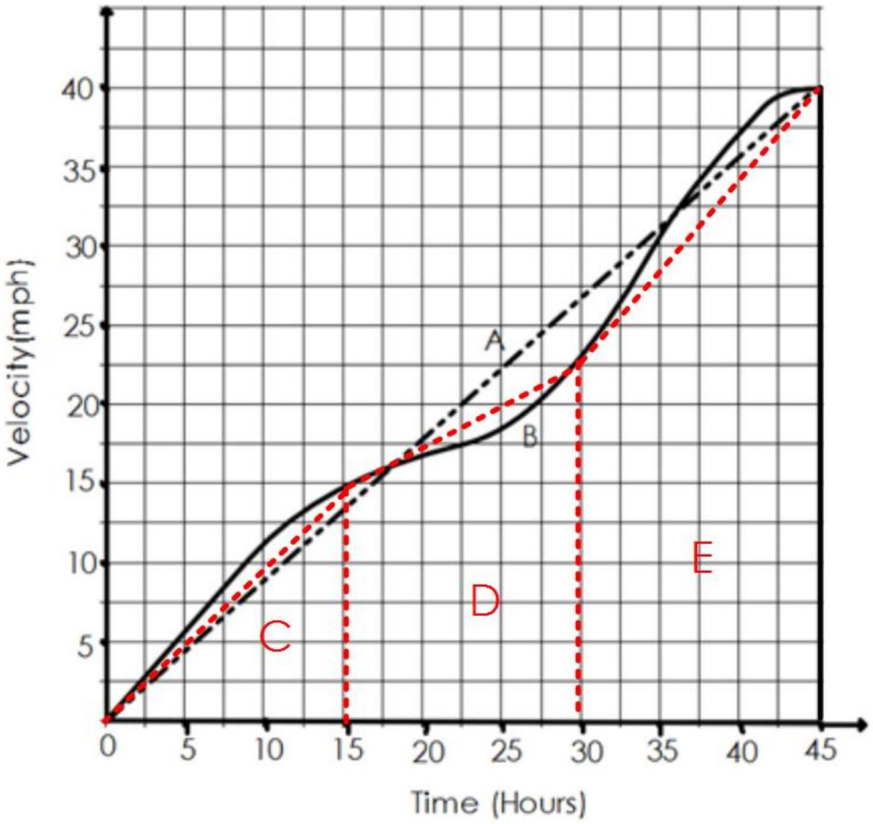

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(4 marks)

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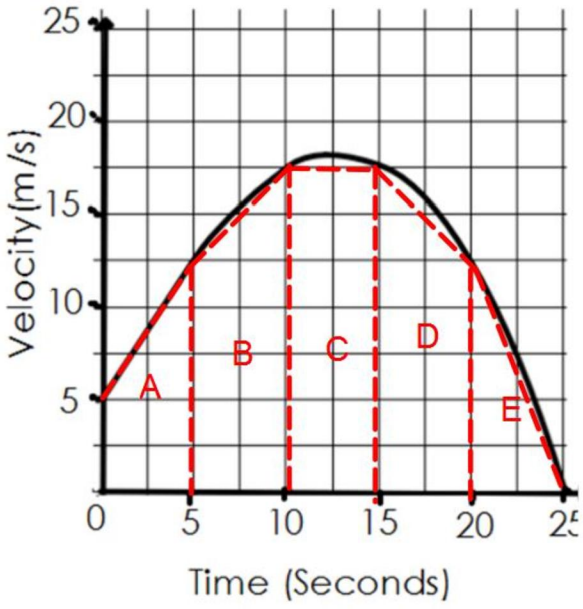
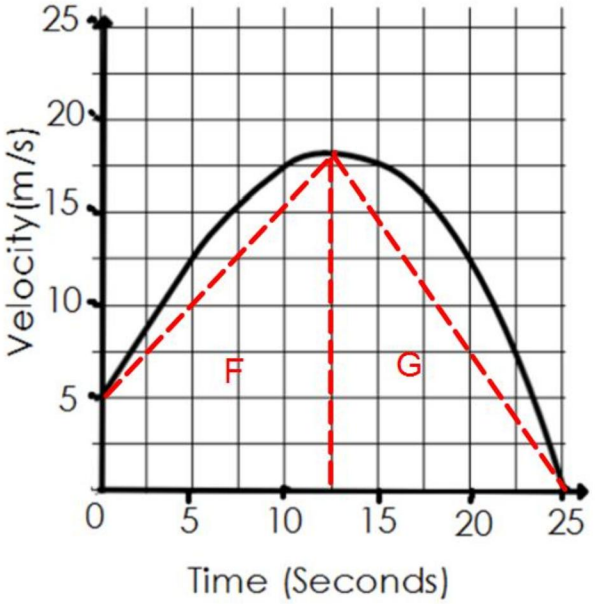
Anna's method



Simone's method



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Area =256.25 distance 256.25metres

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Anna's method is more reliable as she has used more strips. we can see from the graph Simone's method is a big underestimate.

(4 marks)

4) Vectors: Easier

1.

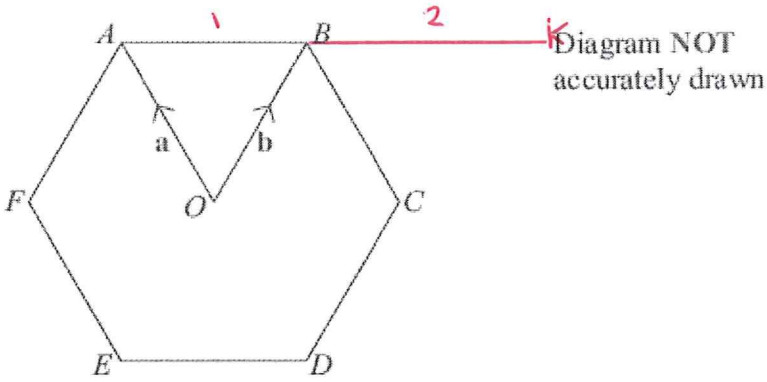


Diagram NOT accurately drawn

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 **a** and **b**.

$-a+b$

.....

(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 **a** and **b**.
Give your answer in its simplest form.

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

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

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

$-a+2b$

.....

(3)

(4 marks)

4) Vectors: Medium

6.

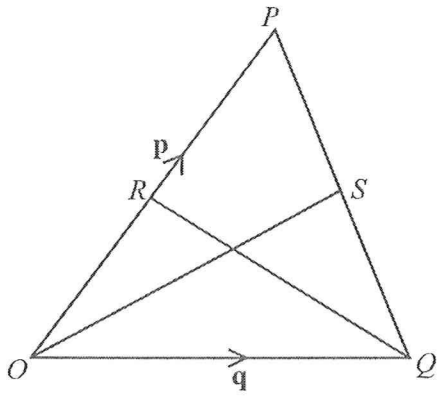


Diagram **NOT** accurately drawn

OPQ is a triangle.

R is the midpoint of OP.

S is the midpoint of PQ.

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

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

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

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

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

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

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

(ii) Show that RS is parallel to OQ.

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

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

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

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

(5 marks)

4) Vectors: Harder

6.

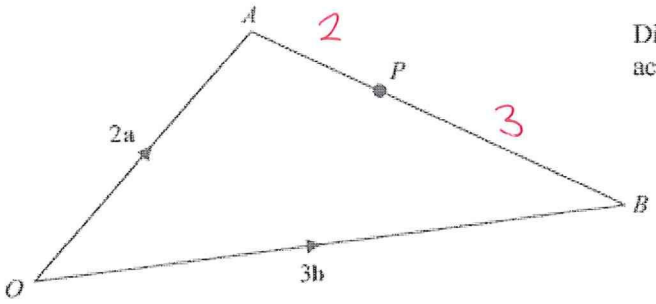


Diagram NOT accurately drawn

OAB is a triangle.

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

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

(*a*) Find *AB* in terms of **a** and **b**.

$\overrightarrow{AB}$ = $-2a+3b$

(1)

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

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

$\overrightarrow{AP} = \frac{2}{5}(-2a+3b)$

$= -\frac{4}{5}a + \frac{6}{5}b$

$\overrightarrow{OP} = 2a - \frac{4}{5}a + \frac{6}{5}b$

$= \frac{6}{5}a + \frac{6}{5}b$

$= \frac{6}{5}(a+b)$

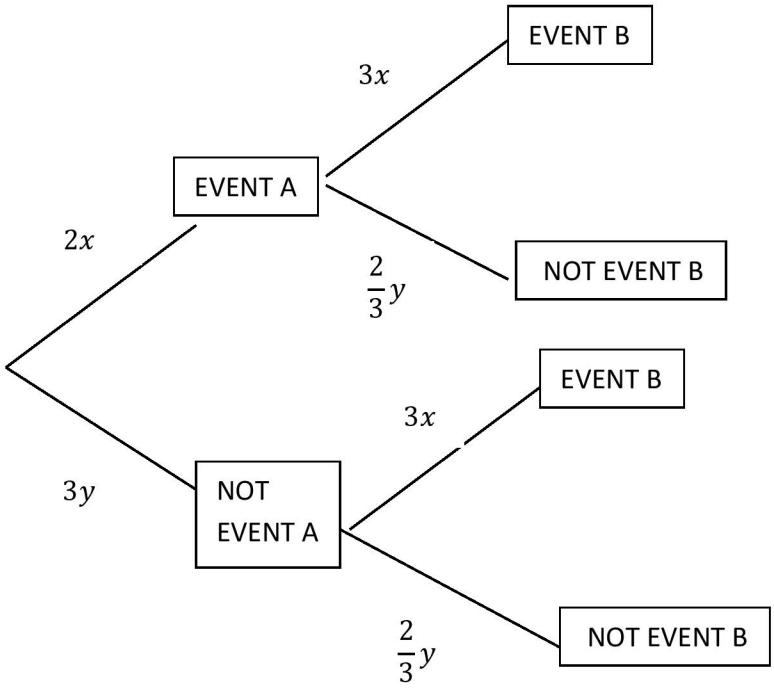
(3)

(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

$$6x + 9y = 3$$

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

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

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

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

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

(4 marks)

5) Extention1: Medium

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

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

$$a = -b$$

$$a + b = 0$$

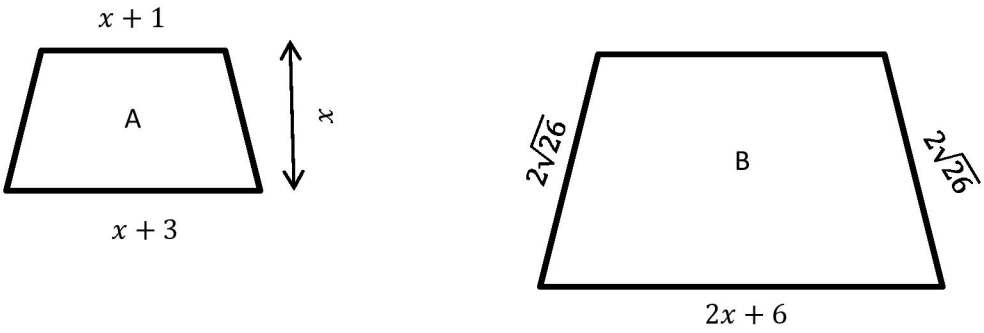
$$2(a + b) = 0$$

$$2a + 2b = 0$$

(3 marks)

5) Extention1: 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 $\frac{1}{2}(x+1+x+3)\times x$

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

$$x^2+2x = 35cm^2$$

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

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

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

The perimeter of Trapezium A is

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

When $x=5$ $\quad 4(5)+8+4\sqrt{26}$

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

(4 marks)

LUNT Aoife

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	22 from 28	2 from 3	15 from 20	1 from 1	4 from 4	0 from 0
A02 and 3	33 from 52	10 from 12	3 from 9	8 from 13	10 from 16	2 from 2
Total	55 from 80	12 from 15	18 from 29	9 from 14	14 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Simple Bounds. Mathswatch Clip: 132

Topic 2: Venn diagrams.. Mathswatch Clip: 127

Topic 3: Product of Prime Factors, HCF, LCM. MW: 78

Topic 4: Cumulative Frequency. Mathswatch Clip: 186

Topic 5: Composite functions. Mathswatch Clip: 215

1) 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)

1) 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?

Lower bound A+B 4.15 + 12.5 =16.65
Upper bound A+B 4.25 +13.5 = 17.75

$16.65 \leq A + B < 17.75$

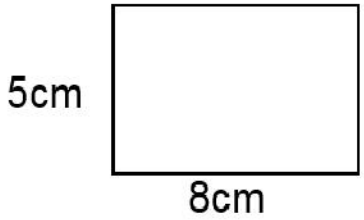
_____ cm

(1)

(4 Marks)

1) 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 $2\times4.5 + 2\times7.5 = 9 + 15 = 24cm$

$24cm$

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 $2\times5.5 + 2\times8.5 = 11 + 17 = 28cm$

$28cm$

(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 $100\times5.5 = 550g$

One kilogram = 1000 grams so

$$550g = 0.55kg$$

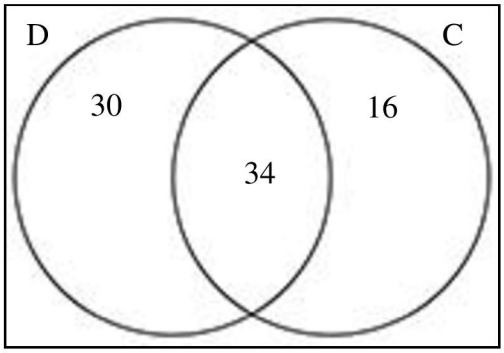
0.55 kg **(3 marks)**

2) Venn diagrams.: Easier

Solution for Question 1:

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

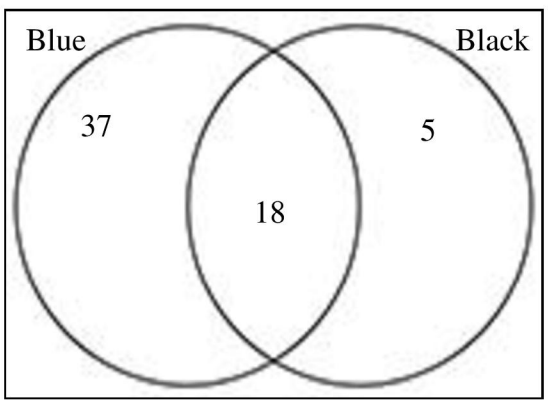
Number of people that owned cats only: $80 - 34 - 30 = 16$



Solution for Question 2:

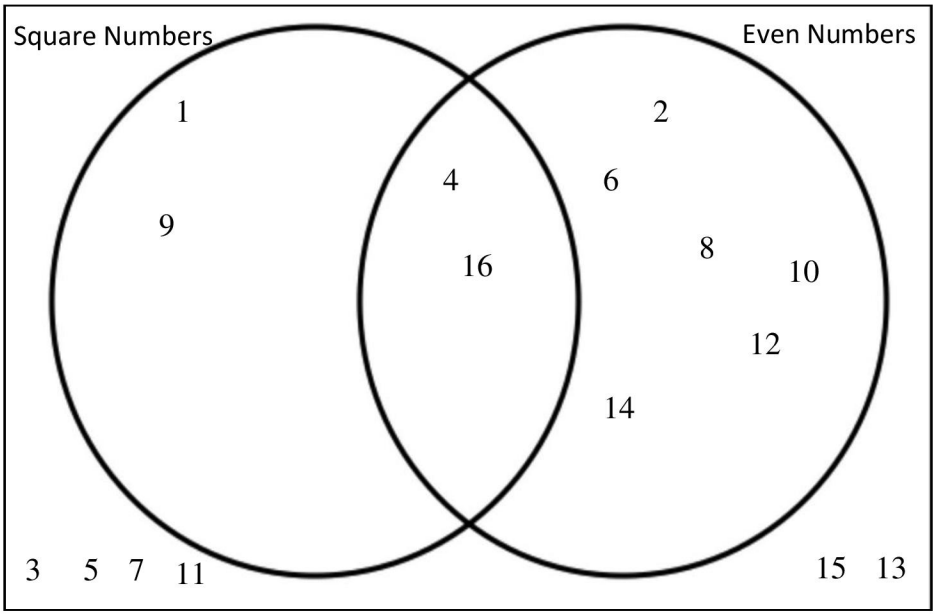
a) Number of people that only had a black pen:
$60 - 37 - 18 = 5$

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 $B = \{9,15\}$

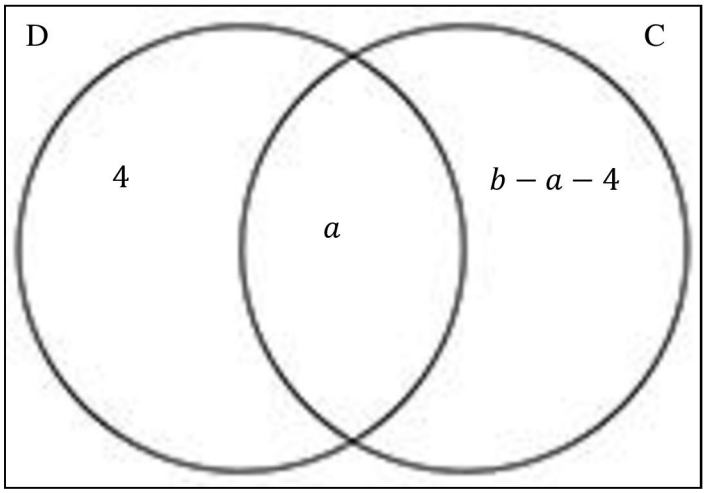
ii) $A \cup B = A$ or $B = \{3,5,6,12,18\}$

2) Venn diagrams.: Harder

Solution for Question 6:

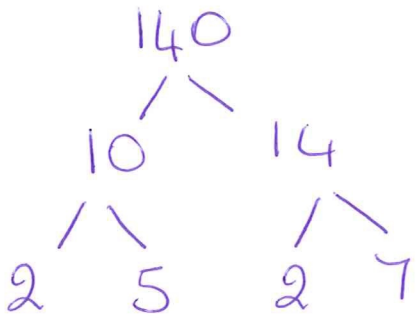
Number of people who replied with cats only:

$b - a - 4$



3) Product of Prime Factors, HCF, LCM: Easier

1. Write 140 as the product of its prime factors.



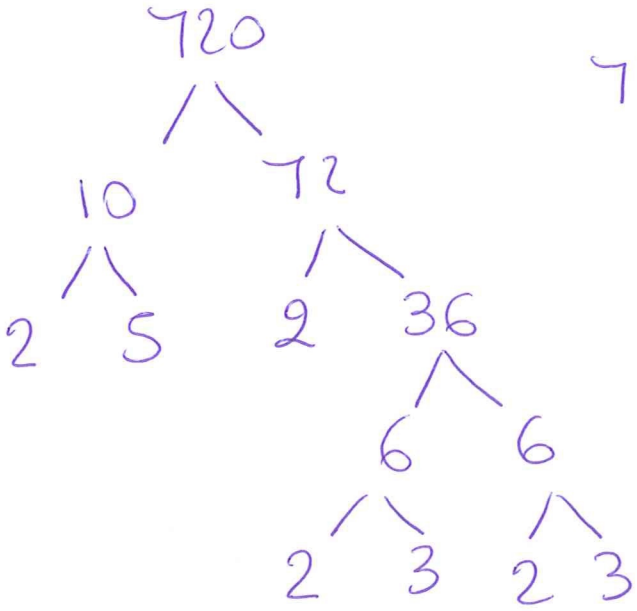
$140 = 2 \times 2 \times 5 \times 7$

$2^2 \times 5 \times 7$

.....

(2 marks)

2. Write 720 as a product of its prime factors.



$720 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$

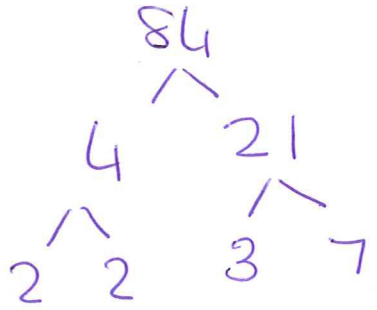
$2^4 \times 3^2 \times 5$

.....

(2 marks)

3) Product of Prime Factors, HCF, LCM: Medium

8. (a) Express 84 as a product of its prime factors.



$2^2 \times 3 \times 7$

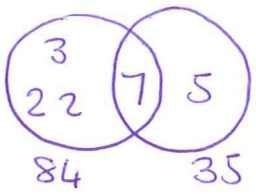
(3)

(b) Find the Highest Common Factor (HCF) of 84 and 35

$84 = 2^2 \times 3 \times 7$

$35 = \quad \times 7$

HCF



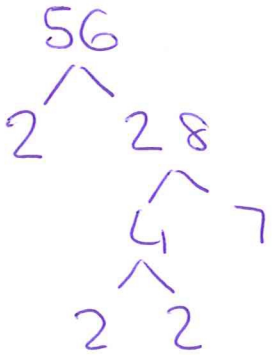
7

(2)

(5 marks)

---

9. (a) Express 56 as the product of its prime factors.



$56 = 2 \times 2 \times 2 \times 7$

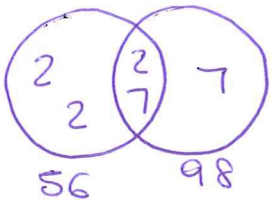
$2^3 \times 7$

(2)

(b) Find the Lowest Common Multiple of 56 and 98

$56 = 2^3 \times 7$

$98 = 2 \times 7 \times 7$



LCM $= 2 \times 2 \times 2 \times 7 \times 7$

$= 392$

392

(2)

(4 marks)

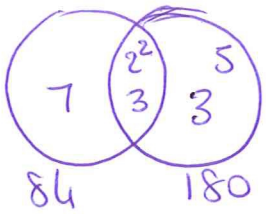
3) Product of Prime Factors, HCF, LCM: Harder

10. Find the Highest Common Factor (HCF) of 84 and 180

$84 = 2^2 \times 3 \times 7$

$180 = 2^2 \times 3^2 \times 5$

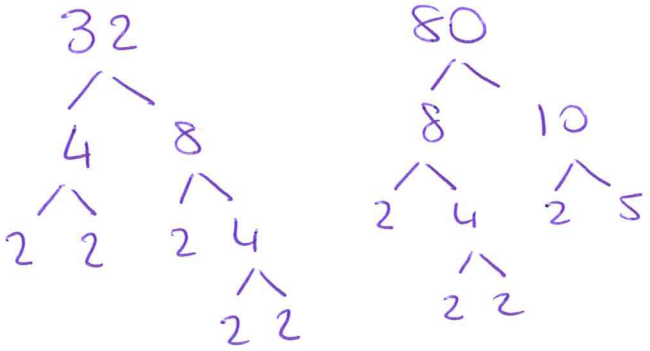
$HCF = 2^2 \times 3 = 12$



12

(3 marks)

11. Find the Highest Common Factor (HCF) of 32 and 80



$HCF = 2^4 = 16$

$32 = 2^5$

$80 = 2^4 \times 5$

$32 = 2 \times 2 \times 2 \times 2 \times 2$

$80 = 2 \times 2 \times 2 \times 2 \times 5$

16

(3 marks)

4) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

(a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	12
$20 < A \leq 40$	27
$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

..... 41 ..... years

(2)

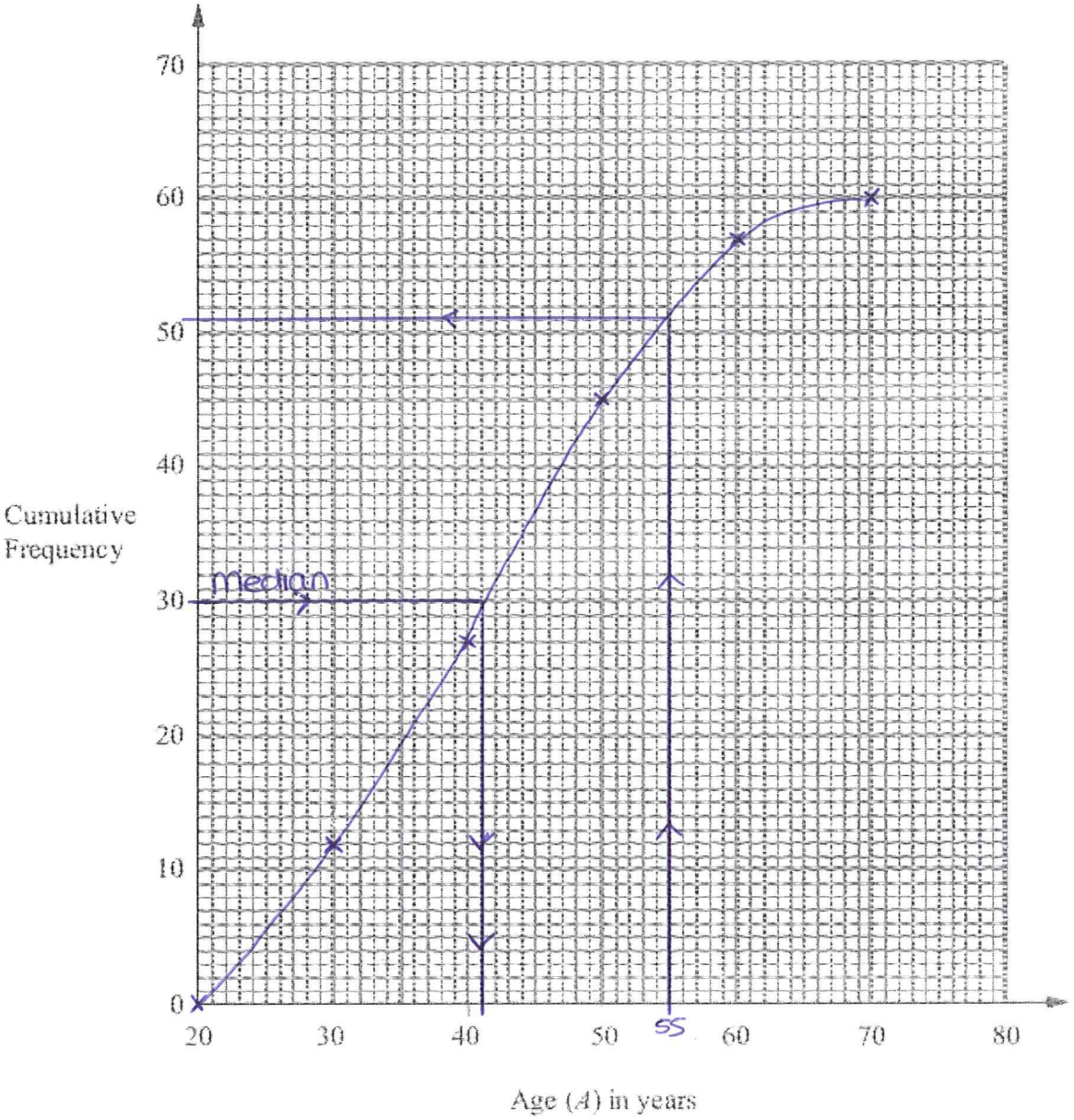
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so $60 - 51 = 9$ are older.

..... 9 .....

(2)

4) Cumulative Frequency: Medium



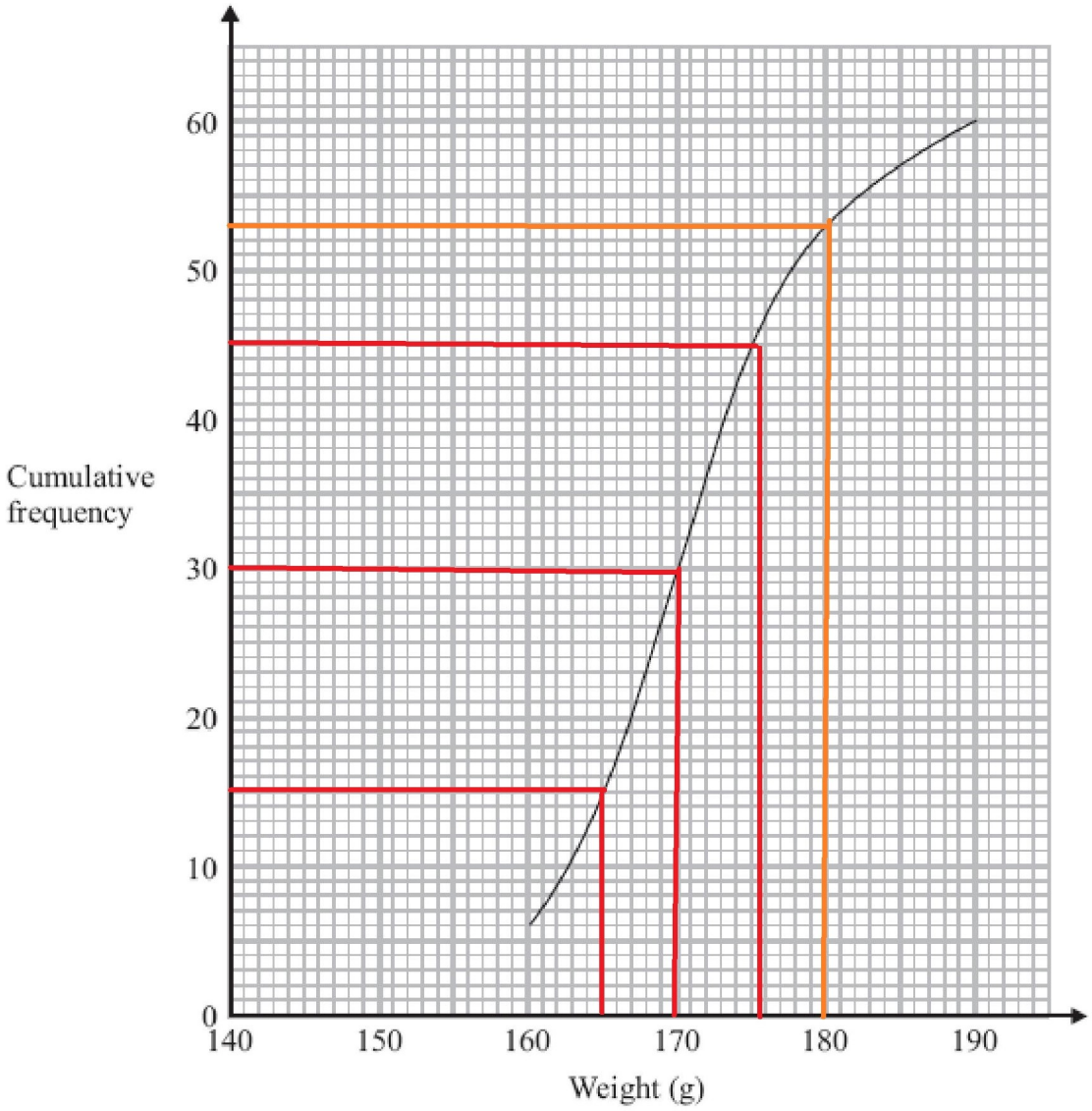
(7 marks)

4) Cumulative Frequency: Harder

4. Harry grows tomatoes.
This year he put his tomato plants into two groups, group A and group B.

Harry gave fertiliser to the tomato plants in group A.
He did not give fertiliser to the tomato plants in group B.

Harry weighed 60 tomatoes from group A.
The cumulative frequency graph shows some information about these weights.



ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

ii) The Upper Quartile 175 .....

(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

5) Composite functions: Easier

Q1. The functions f and g are such that

$$f(x) = 2x + 3 \text{ and } g(x) = \frac{x}{4} - 2$$

(a) Find the value of f(8)

F(8) = 2(8) + 3
=16 + 3
= 19

19

.....

(1)

(b) Find gf(*4*)

f(4) = 2(4) + 3 = 11

$$g(11) = \frac{11}{4} - 2 = \frac{3}{4}$$

$\frac{3}{4}$

.....

(2)

(b) Show that

$$fg(x) = \frac{1}{2}x - 1$$

$$fg(x) = 2\left(\frac{x}{4} - 2\right) + 3$$

$$fg(x) = \frac{2x}{4} - 4 + 3$$

$$fg(x) = \frac{1}{2}x - 1$$

(2)

(Total for question = 5 marks)

5) Composite functions: Medium

2. The functions f and g are such that

$$f(x) = \frac{2}{x+3} \text{ and } g(x) = 3(x-2)$$

a) Show that $gf(5) = -\frac{21}{4}$

$$f(5) = \frac{2}{5+3} = \frac{1}{4}$$

$$g\left(\frac{1}{4}\right) = 3\left(\frac{1}{4} - 2\right)$$

$$g\left(\frac{1}{4}\right) = \frac{3}{4} - 6$$

$$g\left(\frac{1}{4}\right) = -\frac{21}{4}$$

.....

(2)

b) Show that fg(x) can be written in the form

$$\frac{2}{k(x-1)}$$

where k is an integer to be found.

$$fg(x) = \frac{2}{3(x-2)+3}$$

$$fg(x) = \frac{2}{3x-6+3}$$

$$fg(x) = \frac{2}{3x-3}$$

$$fg(x) = \frac{2}{3(x-1)} \quad , \quad k = 3$$

(3)

c) Find an expression for gg(x)

$$gg(x) = 3(3x-6) - 6$$

$$gg(x) = 9x - 24$$

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

(Total for question = 7 marks)

5) Composite functions: Harder

3. The functions f, g and h are such that

$$f(x) = 2x + 2 \quad , \quad g(x) = \frac{a}{x} \text{ and } h(x) = 3x^2 \quad for\ x > 0$$

a) Find hgf(3) in terms of a

$$f(3) = 2(3) + 2 = 8$$
$$g(8) = \frac{a}{8}$$
$$h\left(\frac{a}{8}\right) = 3\left(\frac{a}{8}\right)^2 = \frac{3a^2}{64}$$

$$hgf(3) = \frac{3a^2}{64}$$

.....

(2)

b) Given that $fg(10) = \frac{14}{5}$ find the value of a

$$2\left(\frac{a}{10}\right) + 2 = \frac{14}{5}$$

$$\frac{2a}{10} = \frac{4}{5}$$

$$a = 4$$

.....

(2)

(Total for question = 4 marks)

4. The functions f, g are such that

$$f(x) = 3x + a \text{ and } g(x) = 6x - b$$

Given that fg(2) = 19 and gf(3) = 48, find the values of a and b.

From fg(2) =19

$3(6(2) - b) + a = 19$

$36 - 3b + a = 19$

$a - 3b = -17$

From gf(3) =54

$6(3(3) + a) - b = 54$

$54 + 6a - b = 54$

$6a - b = 0$

Solving simutaneously

$6a - 18b = -102$

-17b = -102

b= -6, a =1

.....(5) **(Total for question = 5 marks)**

MACKENZIE Jed

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
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A02 and 3	26 from 52	9 from 12	5 from 9	8 from 13	2 from 16	2 from 2
Total	42 from 80	11 from 15	14 from 29	9 from 14	6 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Expand double brackets. Mathswatch Clip: 134b

Topic 2: Applied Trig Problems. Mathswatch Clip: 168

Topic 3: Equivalence of ratio and fractions. MW: NA

Topic 4: Product of Prime Factors, HCF, LCM. MW: 78

Topic 5: Cumulative Frequency. Mathswatch Clip: 186

1) Expand double brackets: Easier

Solution for Question 1:

$(x + 3)(x + 2)$
$x^2 + 3x + 2x + 6$
$x^2 + 5x + 6$

Solution for Question 2:

a) $(x + 2)(x + 6)$
$x^2 + 2x + 6x + 12$
$x^2 + 8x + 12$

b) $(x + 2)(x - 6)$
$x^2 + 2x - 6x - 12$
$x^2 - 4x - 12$

c) $(x - 2)(x - 6)$
$x^2 - 2x - 6x + 12$
$x^2 - 8x + 12$

1) Expand double brackets: Medium

Solution for Question 3:

a) $(3x + 1)(x + 2)$
$3x^2 + 6x + x + 2$
$3x^2 + 7x + 2$

b) $(3x - 1)(x + 2)$
$3x^2 + 6x - x - 2$
$3x^2 + 5x - 2$

c) $(3x + 1)(3x + 2)$
$9x^2 + 6x + 3x + 2$
$9x^2 + 9x + 2$

Solution for Question 4:

a) $(3 - x)(2x + 1)$
$6x + 3 - 2x^2 - x$
$-2x^2 + 5x + 3$

b) $(5 - 2x)(3 - x)$
$15 - 5x - 6x + 2x^2$
$2x^2 - 11x + 15$

c) $(2x - 3)(2x + 3)$
$4x^2 + 6x - 6x - 9$
$4x^2 - 9$

1) Expand double brackets: Harder

Solution for Question 5:

$(x+5)(2x+3) - 3(x-2)(6x+5)$
$2x^2 + 3x + 10x + 15 - 3[6x^2 + 5x - 12x - 10]$
$2x^2 + 3x + 10x + 15 - 18x^2 - 15x + 36x + 30$
$-16x^2 + 34x + 45$

Solution for Question 6:

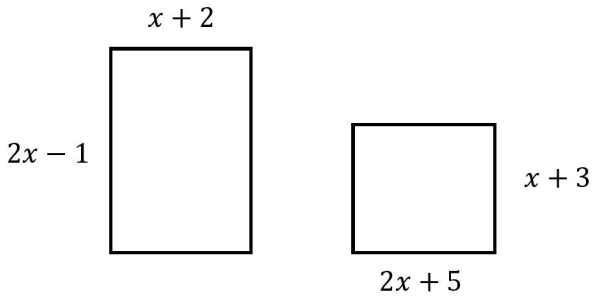
×	$3x$	4
$2x$	$6x^2$	$8x$
-1	$-3x$	-4

$6x^2 + 8x - 3x - 4$
$6x^2 + 5x - 4$

He has added the terms $2x$ and $3x$ instead of multiplying. He has missed of a negative on $3x$

Solution for Question 7:

Split shape into 2



$2x + 5 = 3x + 7 - (x + 2)$

Area:

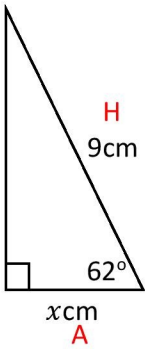
$(x+2)(2x-1) + (x+3)(2x+5)$

$2x^2 - x + 4x - 2 + 2x^2 + 5x + 6x + 15$

$4x^2 + 14x + 13$

2) Applied Trig Problems: Easier

1) (a) Find the missing length x to two decimal places.



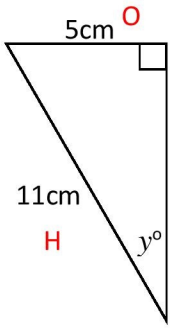
$\cos 62 = \frac{x}{9}$

$9 \cos 62 = x$

$x = 4.22524...$

$x = 4.23$ cm

(b) Find the missing angle y to two decimal places.



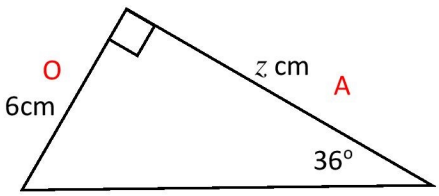
$\sin y = \frac{5}{11}$

$y = \sin^{-1}(\frac{5}{11})$

$y = 27.03569$

$y = 27.04°$

(c) Find the missing length z



$\tan 36 = \frac{6}{z}$

$z \tan 36 = 6$

$z = \frac{6}{\tan 36}$

$z = 8.25829$

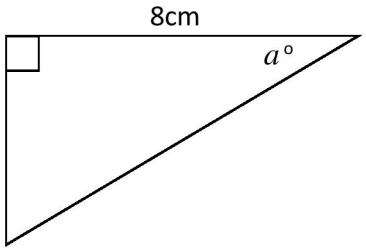
$z = 8.26cm$

(6 Marks)

2) Applied Trig Problems: Medium

2) The area of this triangle is $24cm^2$

Calculate the size of angle a to three significant figures.



Calculating the missing height:

$$Area = \frac{1}{2} \times base \times height$$

$$24 = \frac{1}{2} \times 8 \times height$$

$$24 = 4 \times height$$

$$height = 6cm$$

Calculating the missing angle using trig:

$$\tan a = \frac{6}{8}$$

$$a = \tan^{-1}\left(\frac{6}{8}\right)$$

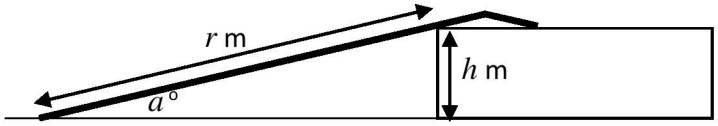
$$a = 36.8698976458$$

$$a = 36.8°$$

(4 Marks)

2) Applied Trig Problems: Harder

3) A wheelchair ramp is placed over a step, as shown.



The step is h meters high, and the ramp is r meters long to where it touches the step.

The angle between the ground and the ramp is a^o.

In order to function safely, then ramp has to be 6 times as long, as the height of the step it is covering

(a) Work out the value of a when $r = 6h$, to the nearest degree.

$$\sin a = \frac{h}{r}$$

$$\sin a = \frac{h}{6h}$$

$$\sin a = \frac{1}{6}$$

$$a = \sin^{-1}\left(\frac{1}{6}\right)$$

$$a = 9.59406822686$$

$$a = 10°$$

(b) New safety regulations replace the initial ones, saying that the angle between the ramp and the ground cannot be more than 8^o. How does this affect the height of step that the ramp can be used with?

Tick one box

☐ It can now be used with higher steps.

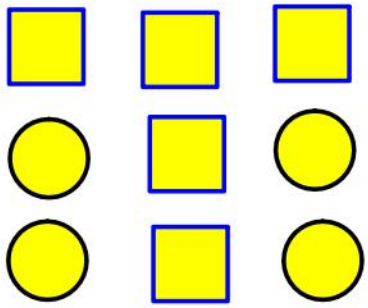
☐ There is no change to the step height with which the ramp can be used.

☒ It can now only be used with lower steps.

(4 Marks)

3) Equivalence of ratio and fractions: Easier

1) The diagram below shows some squares and some circles



a) What is the ratio of squares to circles?

5: 4

_____

(1 Mark)

b) What is the total amount of shapes?

9

_____

(1 Mark)

c) What is fraction of the total amount of shapes are squares?

$\frac{5}{9}$

_____

(1 Mark)

d) A different picture has squares and circles in the ratio 1:2
What fraction of the shapes are squares?

$\frac{1}{3}$

_____

(1 Mark)

3) Equivalence of ratio and fractions: Medium

2) There are 20 sweets in a packet. The sweets are either red or blue. 12 of the sweets are red.

a) What fraction of sweets are red?

$\frac{12}{20} = \frac{3}{5}$

_____

(1 Mark)

b) What is the ratio of red sweets to blue sweets. Give your answer in simplest form

12:8 3:2

_____

(1 Mark)

---

3) Simone has a selection of green and red pens. $\frac{3}{5}$ of the pens are red.
Write down the ratio of green to red pens.

2:3

_____

(1 Mark)

3) Equivalence of ratio and fractions: Harder

4) Alex has a set of toy cars, the cars come in three colours, blue, red and green. The ratio of blue to red to green cars is 2:3:4. What fraction of the cars are blue?

$2+3+4=9$

$\frac{2}{9}$

_____

1 Mark

5) A company sells t-shirts in medium or large sizes. One month the ratio of medium to large sold was $a:b$.

What fraction of T shirts sold were medium?

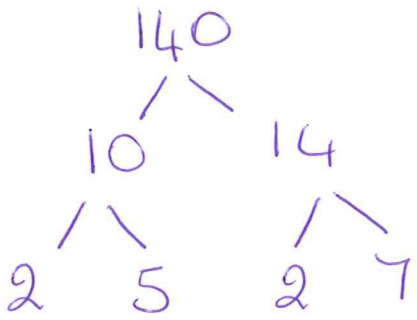
$\frac{a}{a+b}$

_____

1 Mark

4) Product of Prime Factors, HCF, LCM: Easier

1. Write 140 as the product of its prime factors.



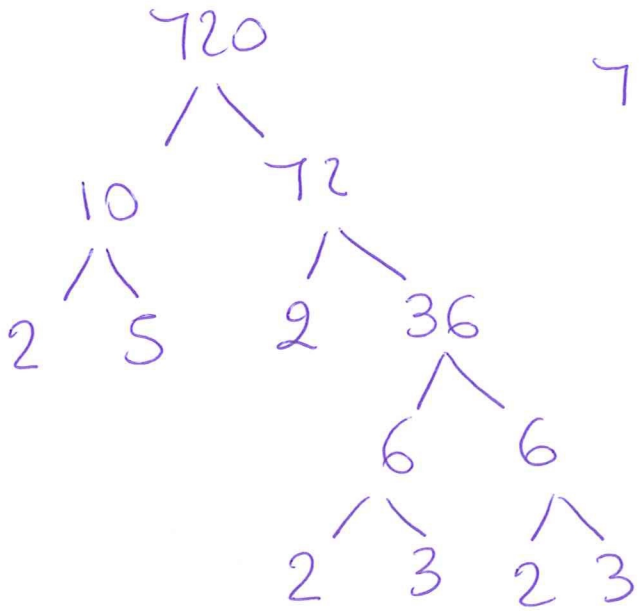
$140 = 2 \times 2 \times 5 \times 7$

$2^2 \times 5 \times 7$

.....

(2 marks)

2. Write 720 as a product of its prime factors.



$720 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$

$2^4 \times 3^2 \times 5$

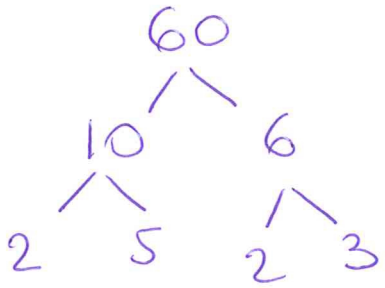
.....

(2 marks)

4) Product of Prime Factors, HCF, LCM: Medium

3. (a) Express the following numbers as products of their prime factors.

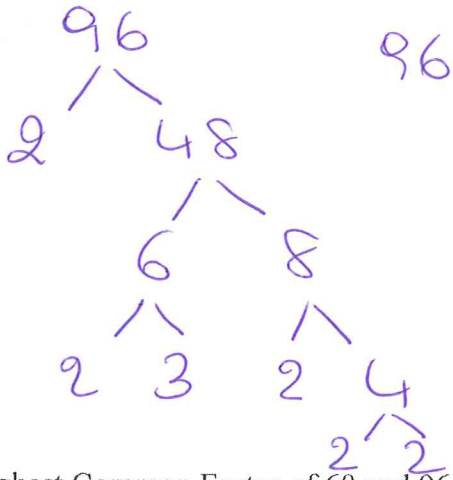
(i) 60.



$60 = 2 \times 2 \times 3 \times 5$

$2^2 \times 3 \times 5$

(ii) 96.

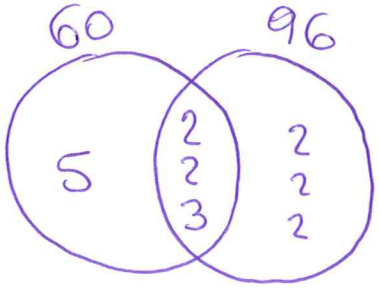


$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$

$2^5 \times 3$

(4)

(b) Find the Highest Common Factor of 60 and 96.



HCF $= 2 \times 2 \times 3 = 12$

12

(1)

(c) Work out the Lowest Common Multiple of 60 and 96.

LCM $= 2^5 \times 3 \times 5 = 480$

60 120 180 240 300 360 420 480

96 192 288 384 480

480

(2)

(7 marks)

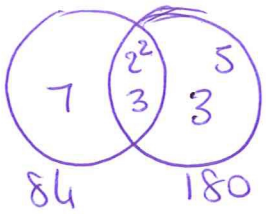
4) Product of Prime Factors, HCF, LCM: Harder

10. Find the Highest Common Factor (HCF) of 84 and 180

$84 = 2^2 \times 3 \times 7$

$180 = 2^2 \times 3^2 \times 5$

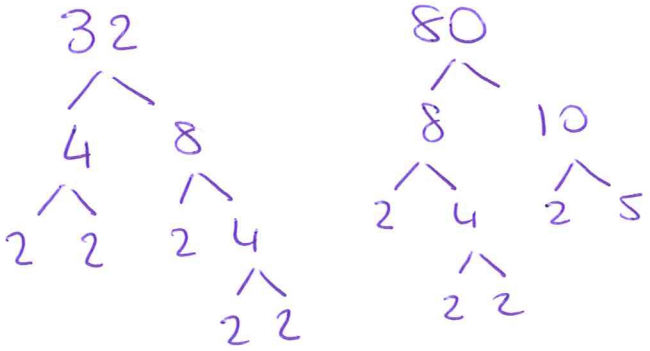
$HCF = 2^2 \times 3 = 12$



12

(3 marks)

11. Find the Highest Common Factor (HCF) of 32 and 80



$HCF = 2^4 = 16$

$32 = 2^5$

$80 = 2^4 \times 5$

$32 = 2 \times 2 \times 2 \times 2 \times 2$

$80 = 2 \times 2 \times 2 \times 2 \times 5$

16

(3 marks)

5) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

(a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	12
$20 < A \leq 40$	27
$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

..... 41 ..... years

(2)

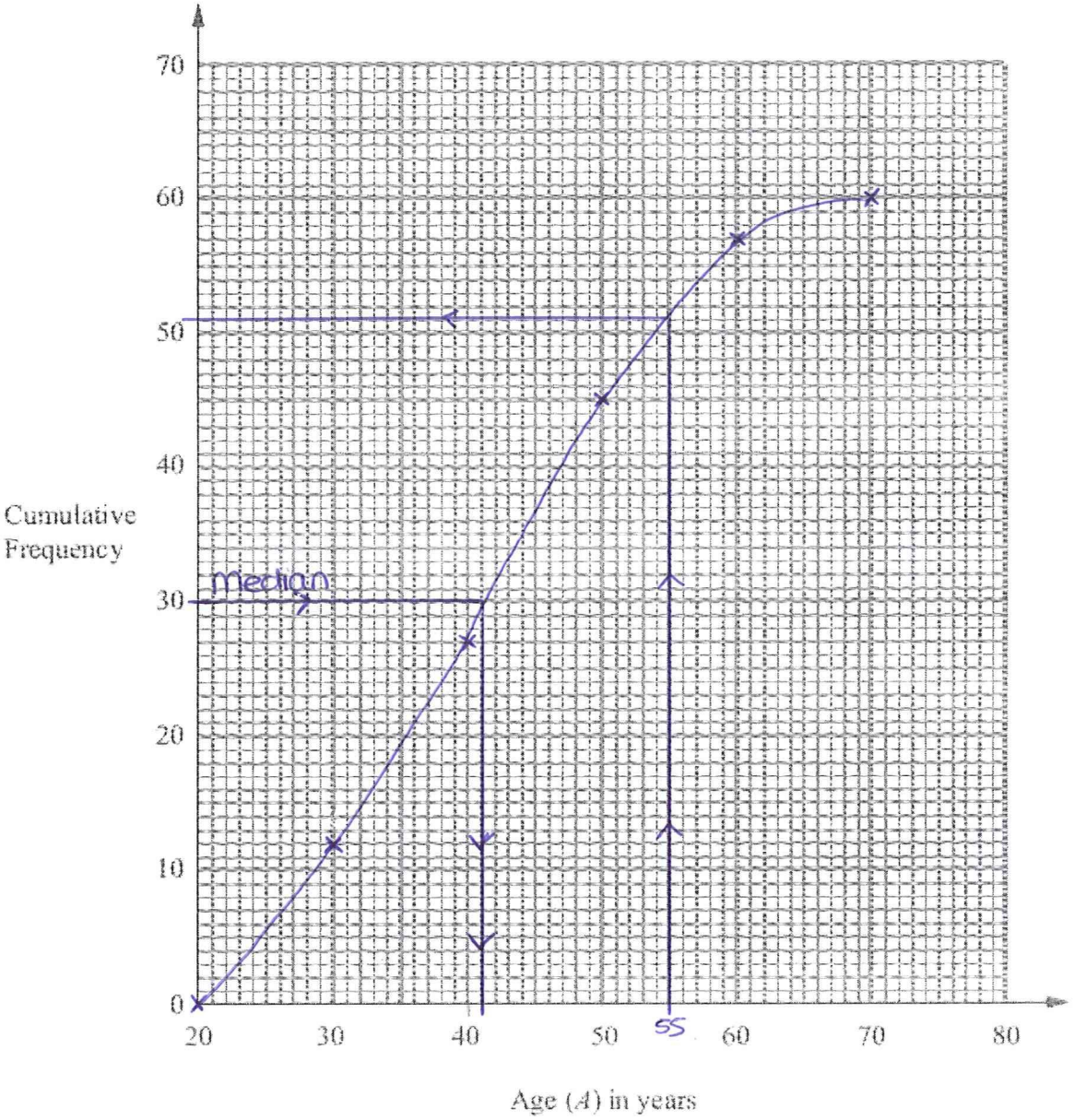
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so $60 - 51 = 9$ are older.

..... 9 .....

(2)

5) Cumulative Frequency: Medium



(7 marks)

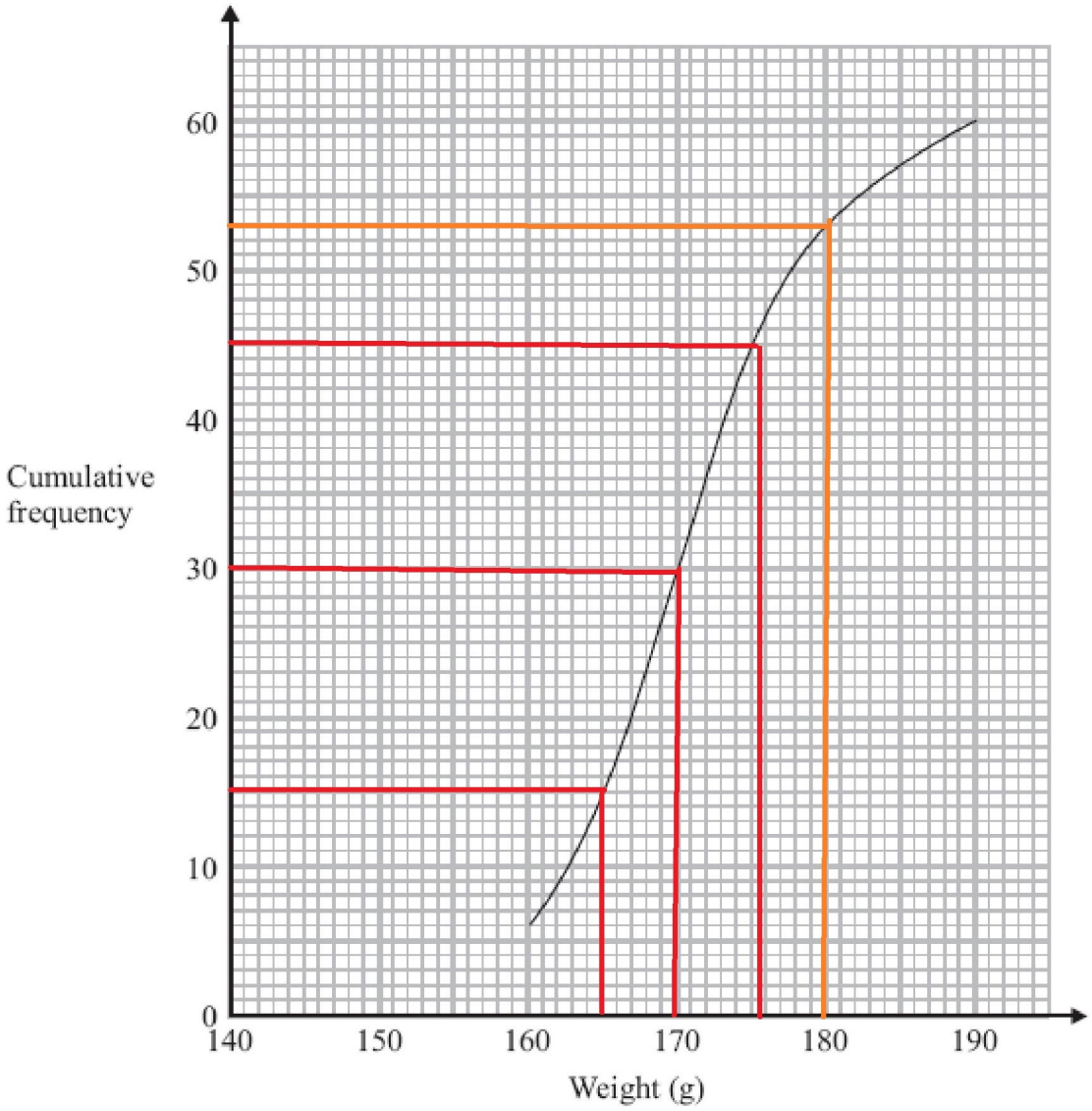
---

5) Cumulative Frequency: Harder

4. Harry grows tomatoes.
This year he put his tomato plants into two groups, group A and group B.

Harry gave fertiliser to the tomato plants in group A.
He did not give fertiliser to the tomato plants in group B.

Harry weighed 60 tomatoes from group A.
The cumulative frequency graph shows some information about these weights.



ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

ii) The Upper Quartile 175 .....

(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

MCLAUGHLIN Laura

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	16 from 28	3 from 3	9 from 20	1 from 1	3 from 4	0 from 0
A02 and 3	30 from 52	9 from 12	1 from 9	8 from 13	11 from 16	1 from 2
Total	46 from 80	12 from 15	10 from 29	9 from 14	14 from 20	1 from 2

Your Pinpoint Topics

Topic 1: Reverse Percentage. Mathswatch Clip: 110

Topic 2: Cumulative Frequency. Mathswatch Clip: 186

Topic 3: Inequalities Regions. Mathswatch Clip: 198

Topic 4: Areas under velocity time graph. MW: 216

Topic 5: Vectors. Mathswatch Clip: 219

1) Reverse Percentage: Easier

1. A shop offers 25% discount on its products in the January Sale. A Sofa costs £450 in the sale. How much did it cost originally?

$$450 \div 0.75 = 600$$

£600

…… **(3)**

2. A low fat yoghurt claims to have 20% less fat than its full fat equivalent. The low fat yoghurt has 12g of fat. How much does the full fat equivalent have?

$$12g \div 0.8 = 15g$$

$15g$

…… **(3)**

3. A telephone company comes up with a strategy that reduces their customers wait time by 30%. After they have implemented the strategy a customer waits for 14 minutes. How long would they have waited for before the strategy was implemented?

$$14 \div 0.7 = 20\ mins$$

$20\ mins$

…… **(3)**

1) Reverse Percentage: Medium

4. A tax on sugary products at 5% is implemented by a new government. After the tax a chocolate bar costs 84p. How much has is increased by in pence?4

$84 \div 1.05 = 80p$

$80p$

…..…… **(3)**

5. A smartphone depreciates in value every year by 25%. After 2 years the value of the smartphone is £236.25. What was its value when new?

£236.25÷ 0.75^2

= £420

…..…… **(3)**

1) Reverse Percentage: Harder

*6. Two cities have different population growths

CITY A	CITY B
Growth 2% per year	Growth 5% Per year

At the end of 2015 the population of City A was 20400, and the population of City B was 20475. By how much did the populations differ at the end of 2014?

CITY A

$$20400 \div 1.02 = 20000$$

CITY B

$$20475 \div 1.05 = 19500$$

$$20000 - 19500 = 500$$

There was a difference of 500 people at the end of 2014

…… **(4)**

2) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
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(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

..... 41 ..... years

(2)

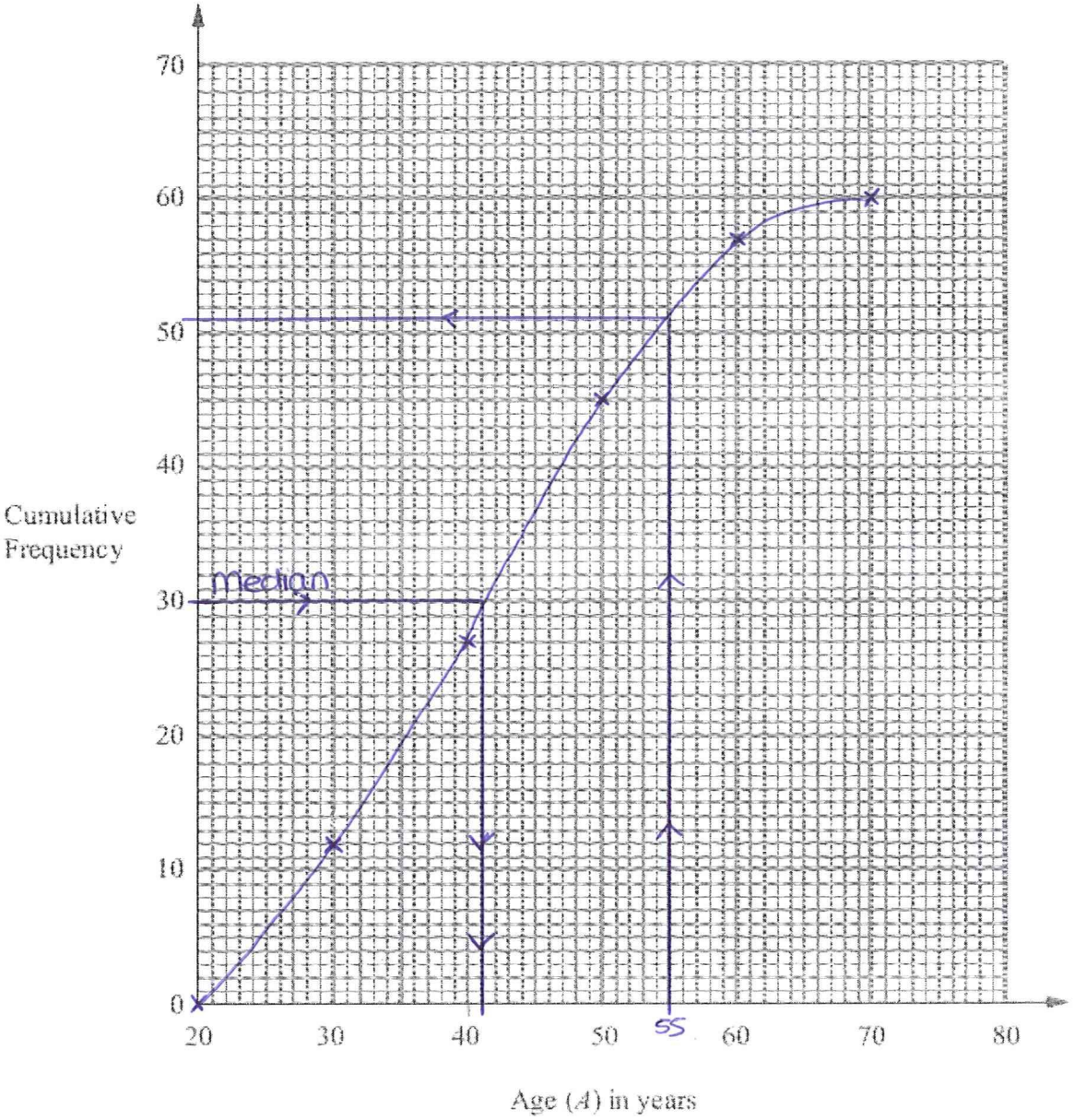
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so $60 - 51 = 9$ are older.

..... 9 .....

(2)

2) Cumulative Frequency: Medium



(7 marks)

2) Cumulative Frequency: Harder

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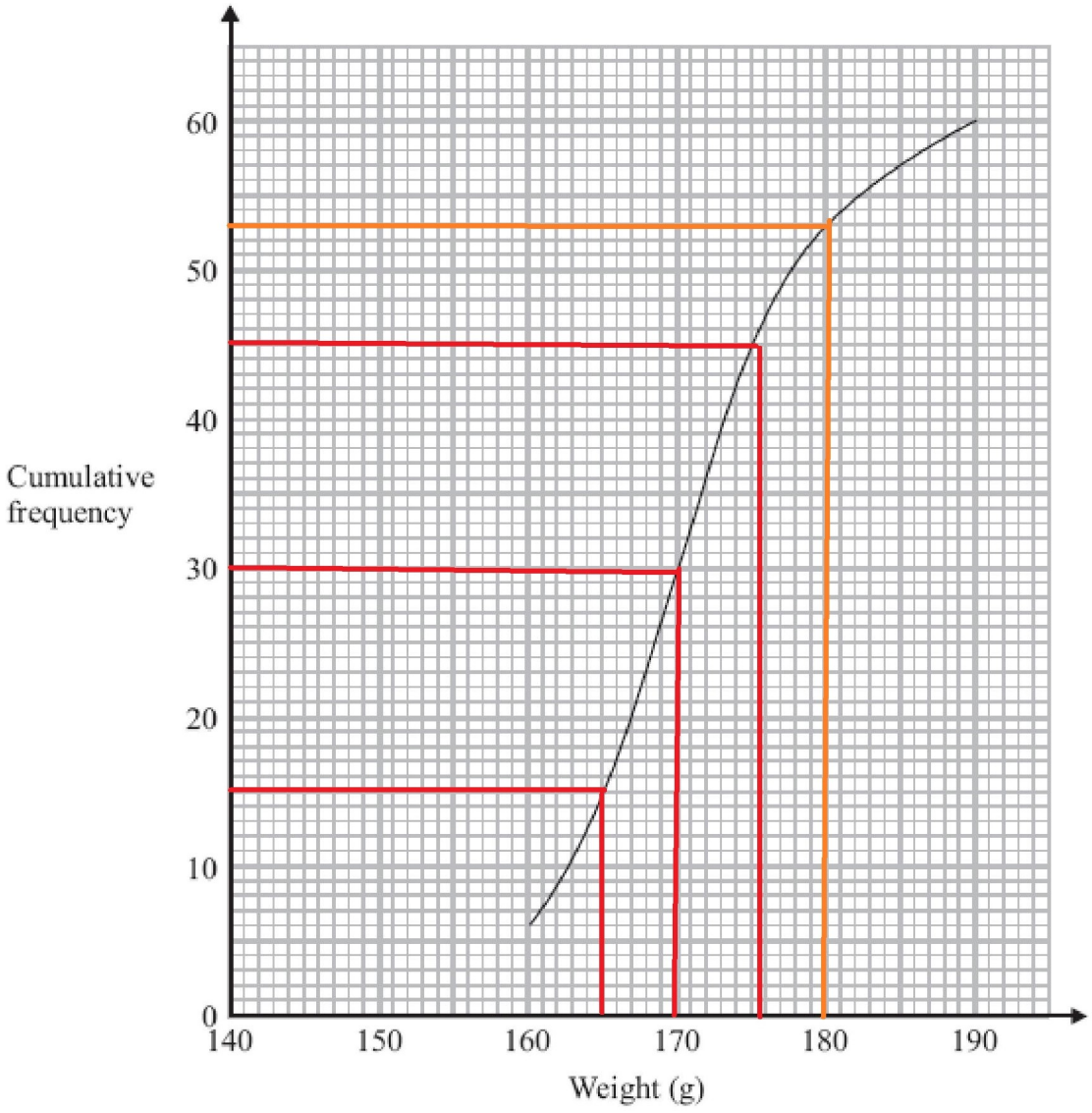


ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

ii) The Upper Quartile 175 .....

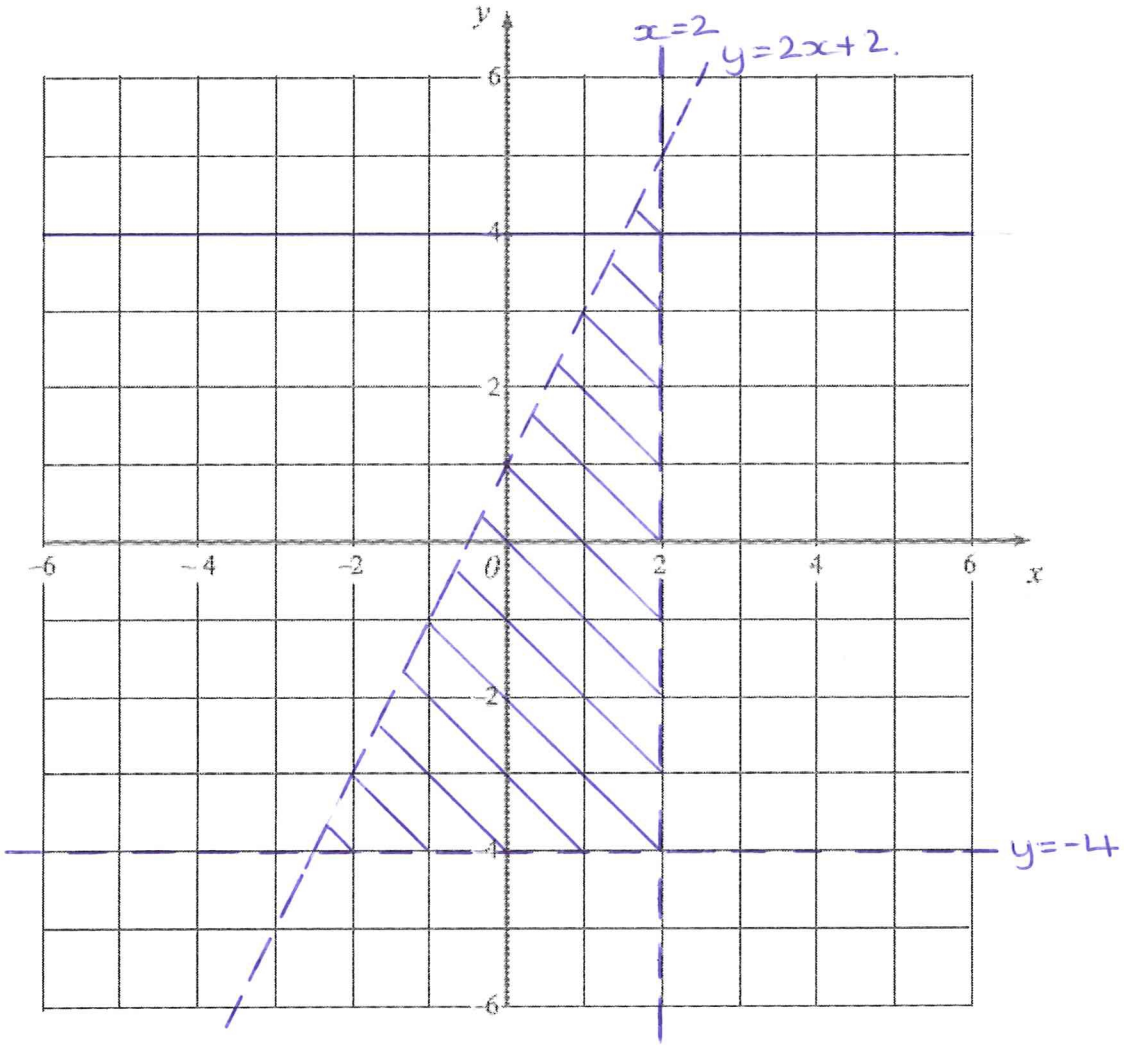
(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

3) Inequalities Regions: Easier

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

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



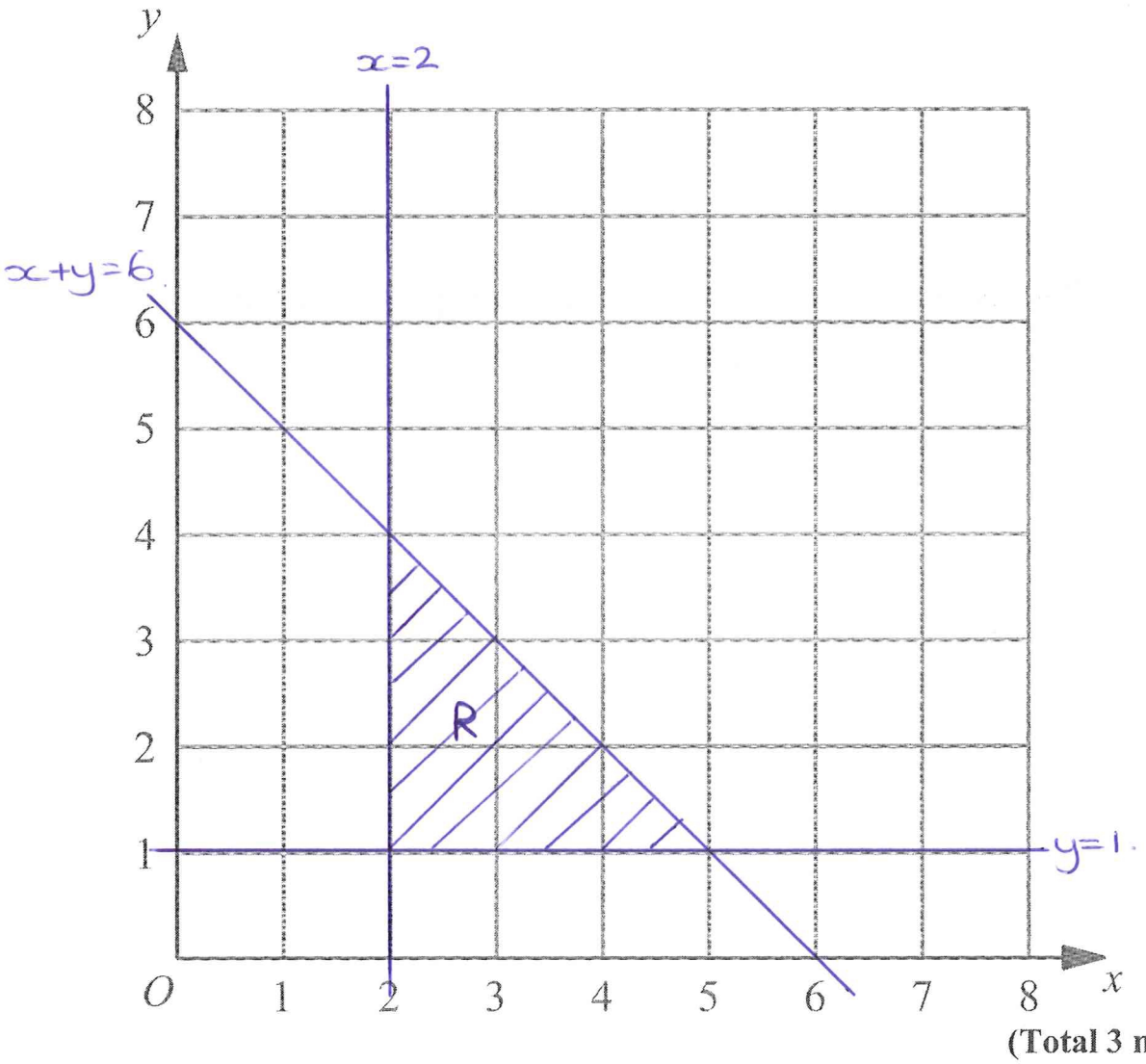
(Total for Question 19 = 4 marks)

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**.



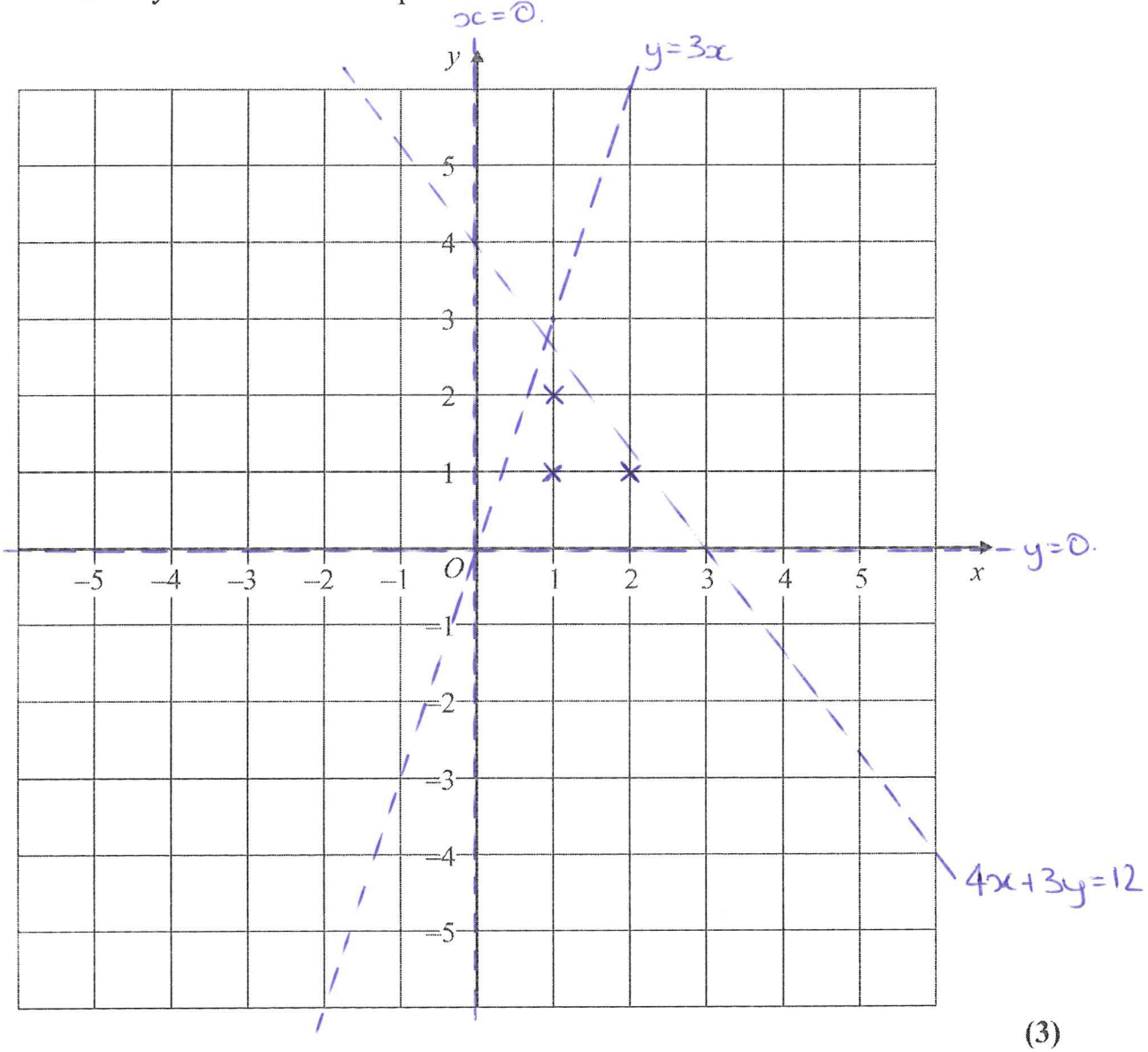
(Total 3 marks)

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 (×), each of the **three** points which satisfy **all** these four inequalities.

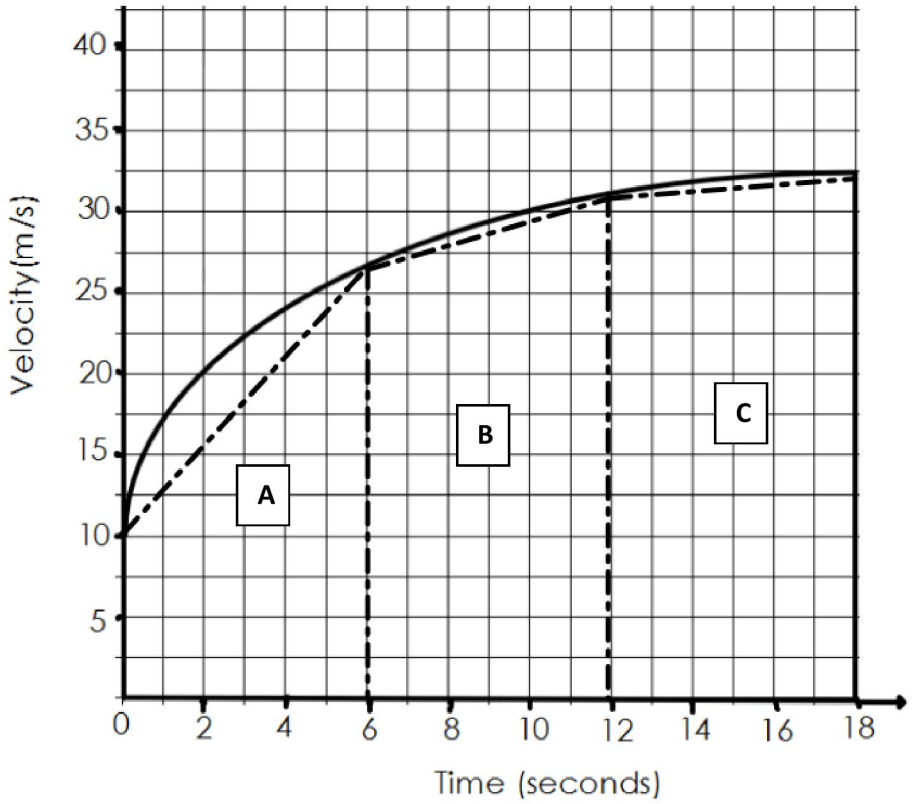


(3)

(Total 5 marks)

4) Areas under velocity time graph: Easier

1) The graph below shows a velocity time graph



1) a) By estimating the area under the graph using the three trapezia shown by dashed lines, work out the distance travelled in the 18 seconds.

Area of trapezium $= \frac{1}{2}(a + b)h$

Area of trapezium A $= \frac{1}{2}(10 + 27)(6) = 111$

Area of trapezium B $= \frac{1}{2}(27 + 31)(6) = 174$

Area of trapezium A $= \frac{1}{2}(31 + 32.5)(6) = 190.5$

Total Area under graph $= 111 + 174 + 190.5 = 475.5$

475.5metres travelled in 18 seconds

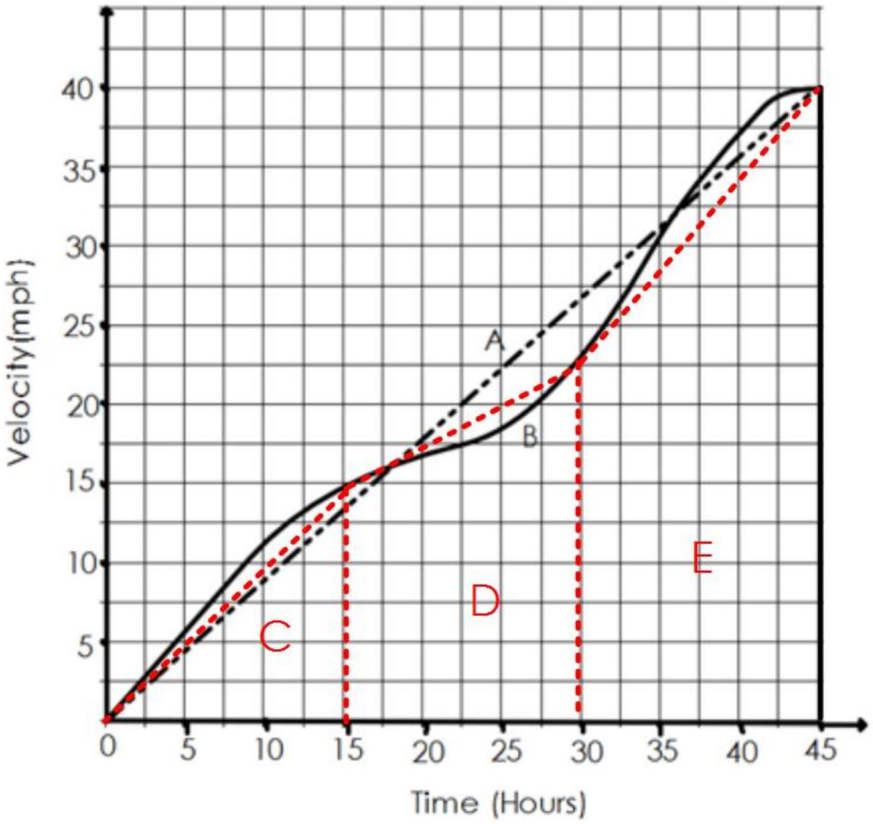
b) By considering the diagram, is your estimate for the distance an overestimate or underestimate? Explain your reasoning.

As each of the trapezia are a smaller area than the actual area, the estimate is an underestimate

(4 marks)

4) Areas under velocity time graph: Medium

2) The graph below shows a velocity time graph for two birds, A and B, over a long distance.



Which bird travels further in the 45 hours? You must show your working. Use 3 equal strips for your estimate for bird B. Comment on the reliability of your answer.

Distance travelled by bird A

Area of triangle $A = \frac{40 \times 45}{2} = 900$

Distance travelled by bird B

$$\text{Triangle C} = \frac{15 \times 15}{2} = 112.5$$

$$\text{Trapezium D} = \frac{1}{2}(15 + 22.5)(15) = 281.25$$

$$\text{Trapezium E} = \frac{1}{2}(22.5 + 40)(15) = 468.75$$

Total area under curve B is 862.5, so bird A travelled further. However, the area under the curve is an estimate and only uses three strips so not very reliable.

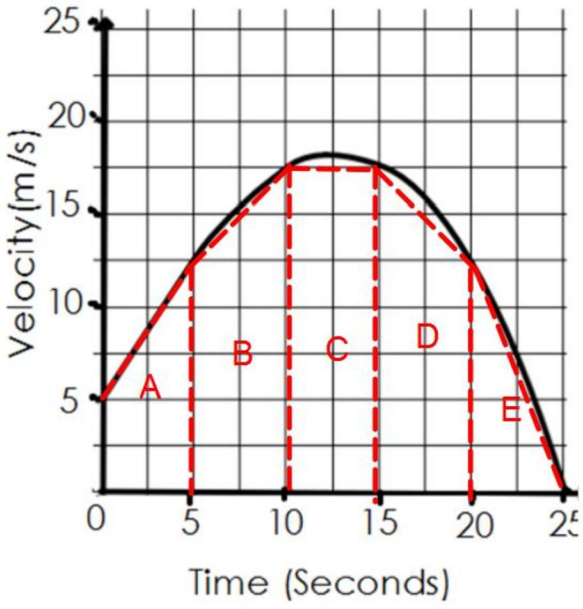
_____

(4 marks)

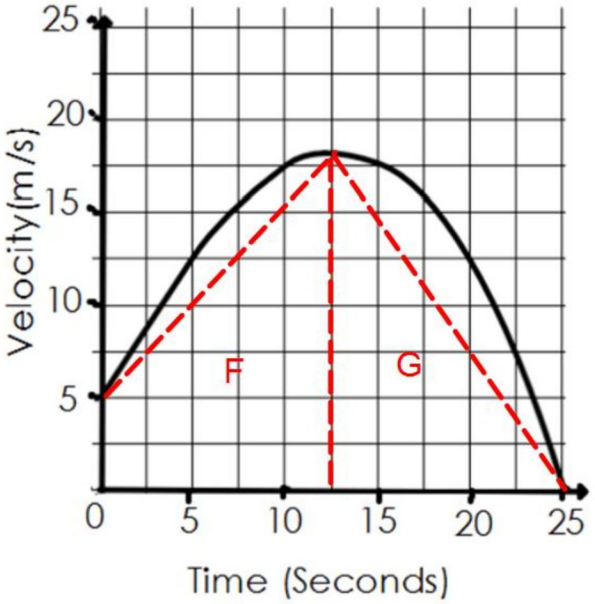
4) Areas under velocity time graph: Harder

3) The graph below shows a velocity-time graph for a drone.

Anna's method



Simone's method



a) Anna works out the distance travelled by using 3 trapezia, a rectangle and a triangle, all of equal width. Simone divides it into a triangle and a trapezium, both of equal width. Find an estimate of the distance using both Anna and Simone's method.

Anna's method :

Area $= \frac{1}{2}(5 + 12.5)(5) + \frac{1}{2}(12.5 + 17.5)(5) + (5 \times 17.5) + \frac{1}{2}(17.5 + 12.5)(5) + \frac{1}{2}(5 \times 12.5)$

Area = 43.75+ 75 + 87.5 + 75+ 31.25

Area = 312.5, distance 312.5 metres

Simone's method:

Area $= \frac{1}{2}(5 + 18)(12.5) + \frac{1}{2}(18 \times 12.5)$

Area = 143.75+ 112.5

Area =256.25 distance 256.25metres

b) Comment on which method you think gives the most reliable results.
Anna's method is more reliable as she has used more strips. we can see from the graph Simone's method is a big underestimate.

(4 marks)

5) Vectors: Easier

1.

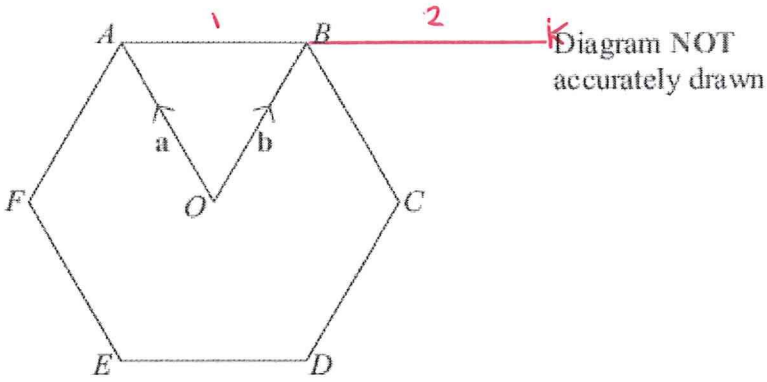


Diagram NOT accurately drawn

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 **a** and **b**.

$-a+b$

(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 **a** and **b**.
Give your answer in its simplest form.

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

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

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

$-a+2b$

(3)

(4 marks)

5) Vectors: Medium

2.

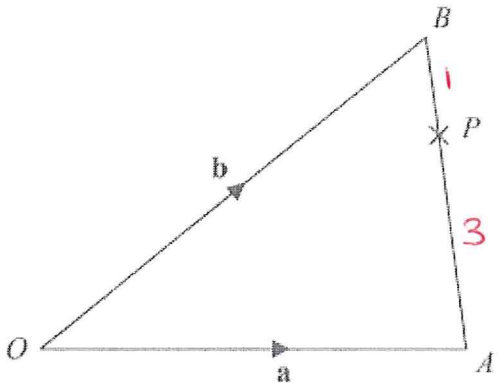


Diagram NOT accurately drawn

OAB is a triangle.

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

(a) Find $\overrightarrow{AB}$ in terms of **a** and **b**.

$-a+b$

(1)

P is the point on AB such that $AP : PB = 3 : 1$

(b) Find $\overrightarrow{OP}$ in terms of **a** and **b**.
Give your answer in its simplest form.

$\overrightarrow{AP} = \frac{3}{4}(-a+b)$

$\overrightarrow{AP} = -\frac{3}{4}a + \frac{3}{4}b$

$\overrightarrow{OP} = a - \frac{3}{4}a + \frac{3}{4}b$

$= \frac{1}{4}a + \frac{3}{4}b$

$\frac{1}{4}a + \frac{3}{4}b$

(3)

(4 marks)

5) Vectors: Harder

6.

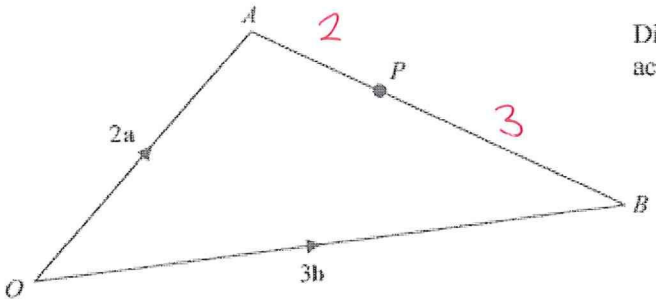


Diagram NOT accurately drawn

OAB is a triangle.

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

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

(*a*) Find *AB* in terms of **a** and **b**.

$\overrightarrow{AB}$ = $-2a+3b$

(1)

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

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

$\overrightarrow{AP} = \frac{2}{5}(-2a+3b)$

$= -\frac{4}{5}a + \frac{6}{5}b$

$\overrightarrow{OP} = 2a - \frac{4}{5}a + \frac{6}{5}b$

$= \frac{6}{5}a + \frac{6}{5}b$

$= \frac{6}{5}(a+b)$

(3)

(4 marks)

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

MELLISH Aaron

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
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A02 and 3	34 from 52	9 from 12	3 from 9	9 from 13	11 from 16	2 from 2
Total	57 from 80	12 from 15	18 from 29	10 from 14	15 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Reverse Percentage. Mathswatch Clip: 110

Topic 2: Product of Prime Factors, HCF, LCM. MW: 78

Topic 3: Cumulative Frequency. Mathswatch Clip: 186

Topic 4: Inequalities Regions. Mathswatch Clip: 198

Topic 5: Composite functions. Mathswatch Clip: 215

1) Reverse Percentage: Easier

1. A shop offers 25% discount on its products in the January Sale. A Sofa costs £450 in the sale. How much did it cost originally?

$$450 \div 0.75 = 600$$

£600

…… **(3)**

2. A low fat yoghurt claims to have 20% less fat than its full fat equivalent. The low fat yoghurt has 12g of fat. How much does the full fat equivalent have?

$$12g \div 0.8 = 15g$$

$15g$

…… **(3)**

3. A telephone company comes up with a strategy that reduces their customers wait time by 30%. After they have implemented the strategy a customer waits for 14 minutes. How long would they have waited for before the strategy was implemented?

$$14 \div 0.7 = 20\ mins$$

$20\ mins$

…… **(3)**

1) Reverse Percentage: Medium

4. A tax on sugary products at 5% is implemented by a new government. After the tax a chocolate bar costs 84p. How much has is increased by in pence?4

$84 \div 1.05 = 80p$

$80p$

…..…… **(3)**

5. A smartphone depreciates in value every year by 25%. After 2 years the value of the smartphone is £236.25. What was its value when new?

£236.25÷ 0.75^2

= £420

…..…… **(3)**

1) Reverse Percentage: Harder

*6. Two cities have different population growths

CITY A	CITY B
Growth 2% per year	Growth 5% Per year

At the end of 2015 the population of City A was 20400, and the population of City B was 20475. By how much did the populations differ at the end of 2014?

CITY A

$$20400 \div 1.02 = 20000$$

CITY B

$$20475 \div 1.05 = 19500$$

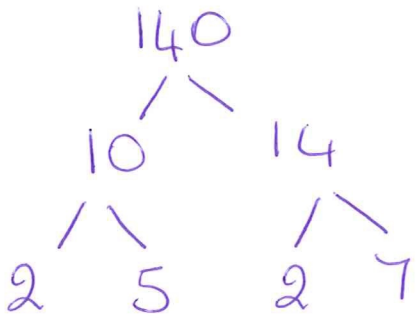
$$20000 - 19500 = 500$$

There was a difference of 500 people at the end of 2014

…… **(4)**

2) Product of Prime Factors, HCF, LCM: Easier

1. Write 140 as the product of its prime factors.



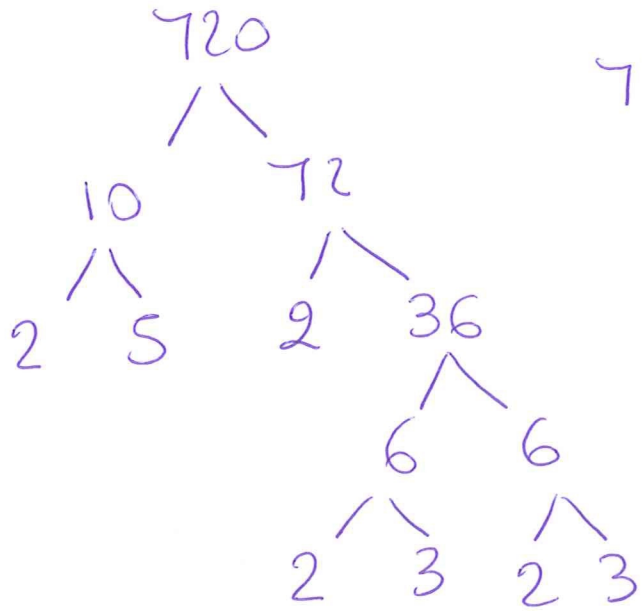
$140 = 2 \times 2 \times 5 \times 7$

$2^2 \times 5 \times 7$

.....

(2 marks)

2. Write 720 as a product of its prime factors.



$720 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$

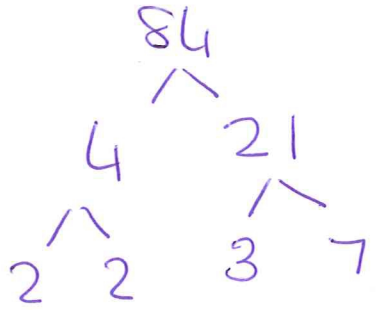
$2^4 \times 3^2 \times 5$

.....

(2 marks)

2) Product of Prime Factors, HCF, LCM: Medium

8. (a) Express 84 as a product of its prime factors.



$2^2 \times 3 \times 7$

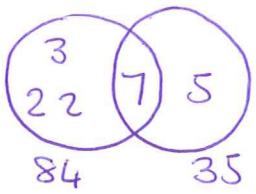
(3)

(b) Find the Highest Common Factor (HCF) of 84 and 35

$84 = 2^2 \times 3 \times 7$

$35 = \quad \times 7$

HCF



7

(2)

(5 marks)

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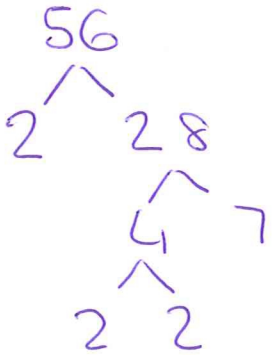
9. (a) Express 56 as the product of its prime factors.



$56 = 2 \times 2 \times 2 \times 7$

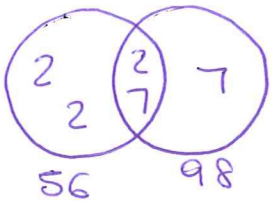
$2^3 \times 7$

(2)

(b) Find the Lowest Common Multiple of 56 and 98

$56 = 2^3 \times 7$

$98 = 2 \times 7 \times 7$



LCM $= 2 \times 2 \times 2 \times 7 \times 7$

$= 392$

392

(2)

(4 marks)

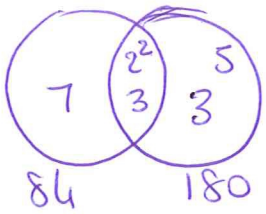
2) Product of Prime Factors, HCF, LCM: Harder

10. Find the Highest Common Factor (HCF) of 84 and 180

$84 = 2^2 \times 3 \times 7$

$180 = 2^2 \times 3^2 \times 5$

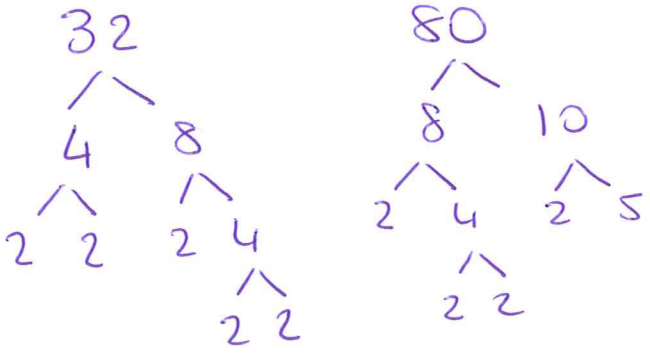
$HCF = 2^2 \times 3 = 12$



12

(3 marks)

11. Find the Highest Common Factor (HCF) of 32 and 80



$HCF = 2^4 = 16$

$32 = 2^5$

$80 = 2^4 \times 5$

$32 = 2 \times 2 \times 2 \times 2 \times 2$

$80 = 2 \times 2 \times 2 \times 2 \times 5$

16

(3 marks)

3) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

(a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	12
$20 < A \leq 40$	27
$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

..... 41 ..... years

(2)

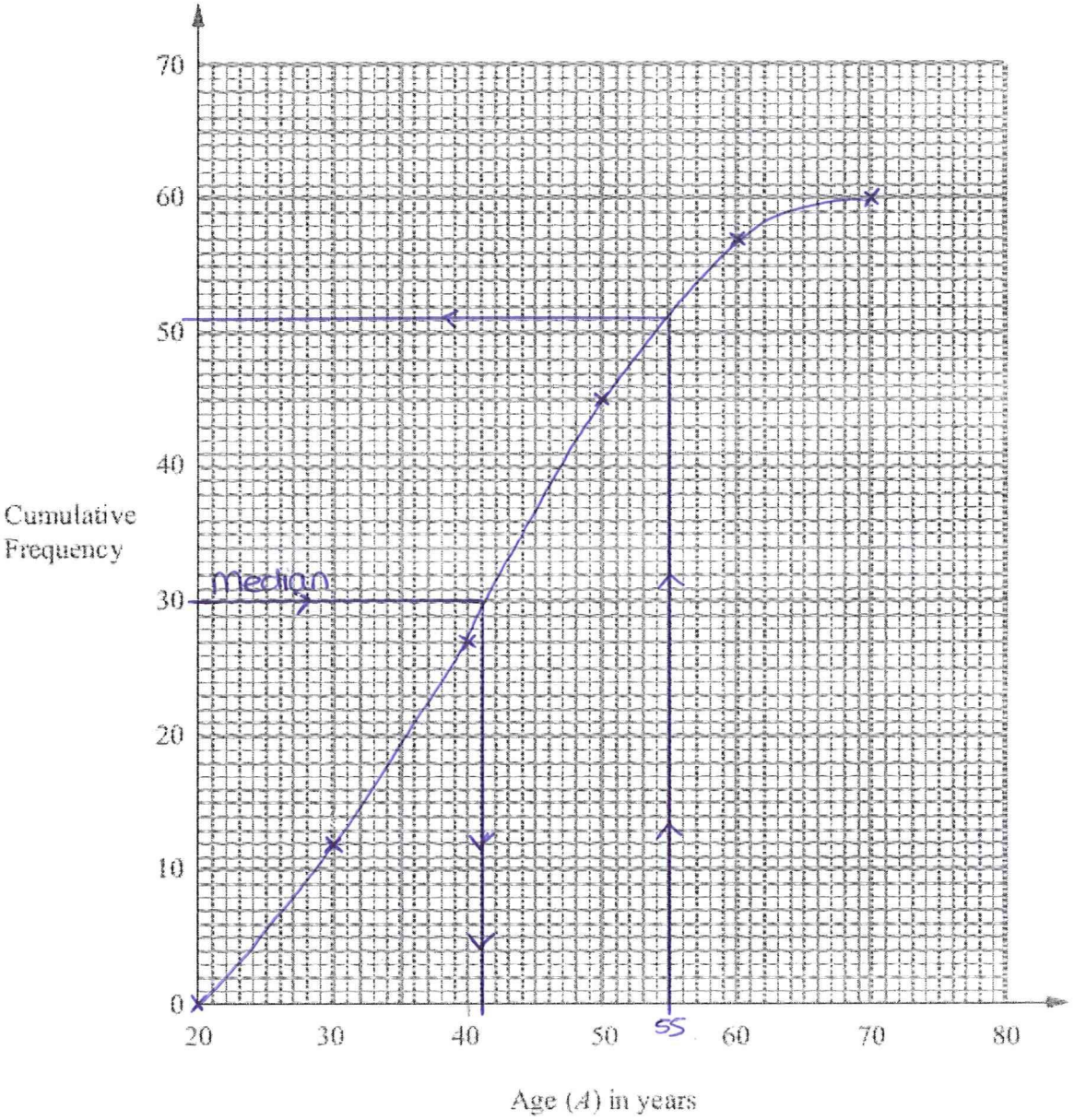
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so $60 - 51 = 9$ are older.

..... 9 .....

(2)

3) Cumulative Frequency: Medium



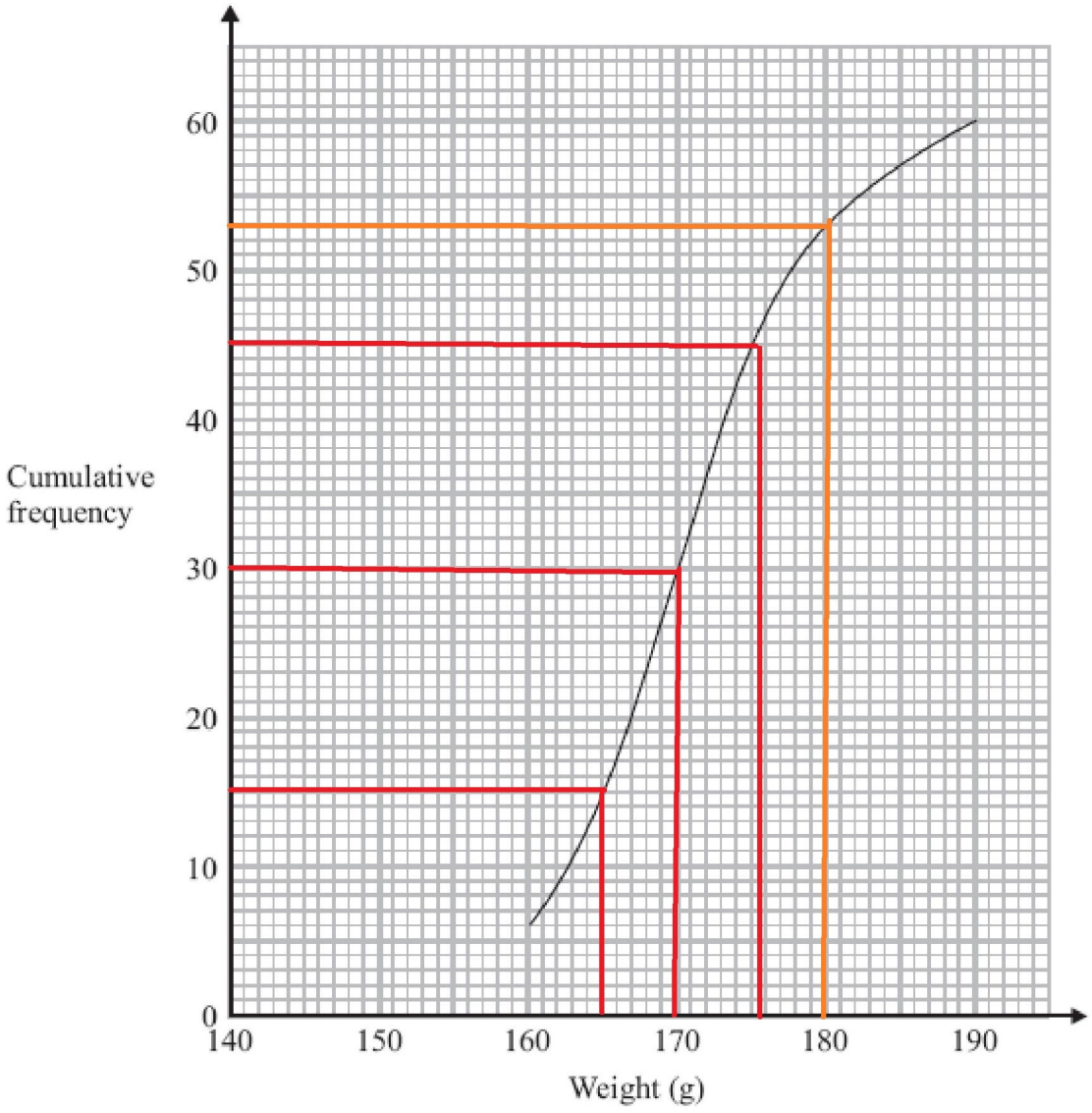
(7 marks)

3) Cumulative Frequency: Harder

4. Harry grows tomatoes.
This year he put his tomato plants into two groups, group A and group B.

Harry gave fertiliser to the tomato plants in group A.
He did not give fertiliser to the tomato plants in group B.

Harry weighed 60 tomatoes from group A.
The cumulative frequency graph shows some information about these weights.



ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

ii) The Upper Quartile 175 .....

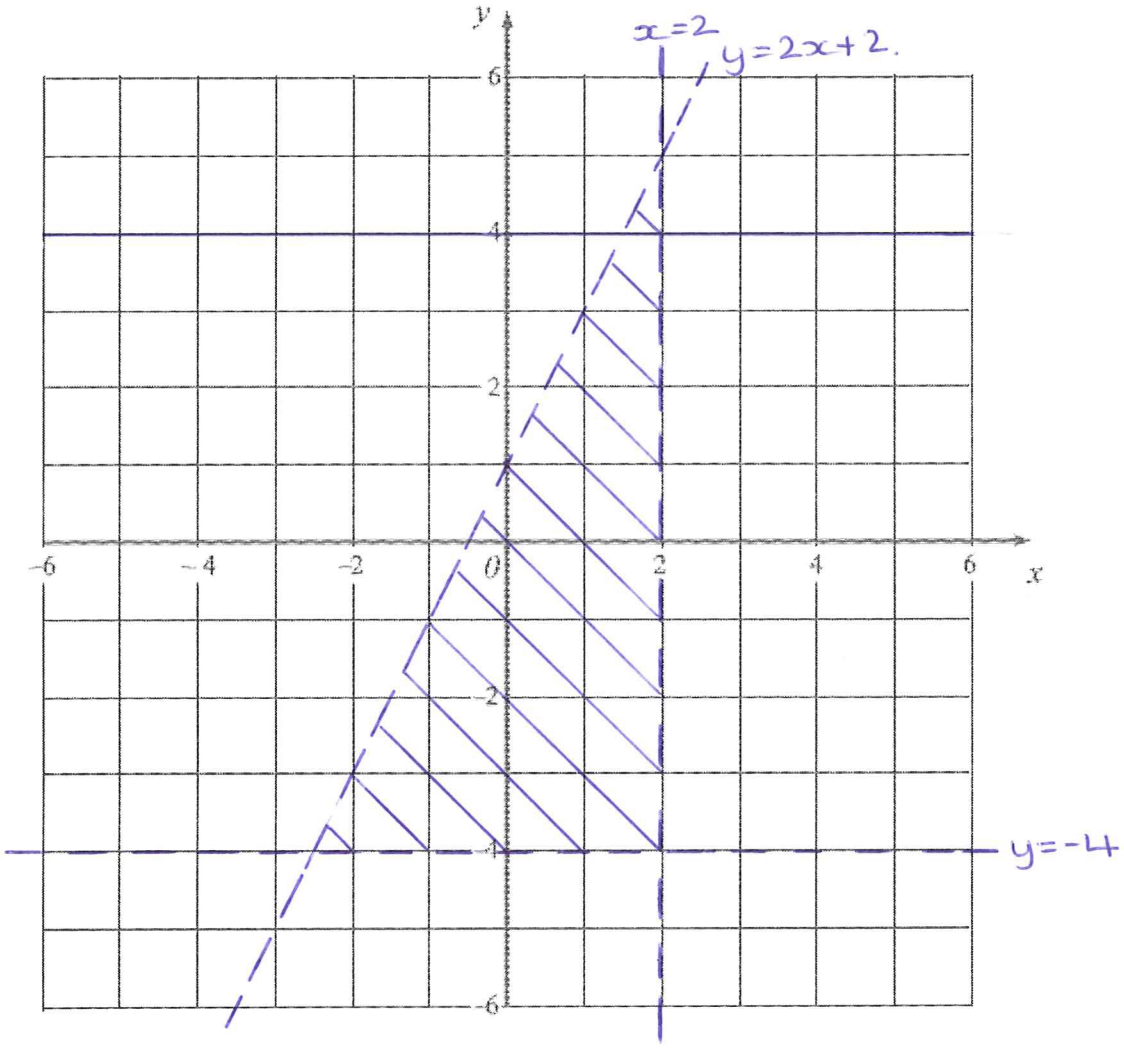
(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

4) Inequalities Regions: Easier

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

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

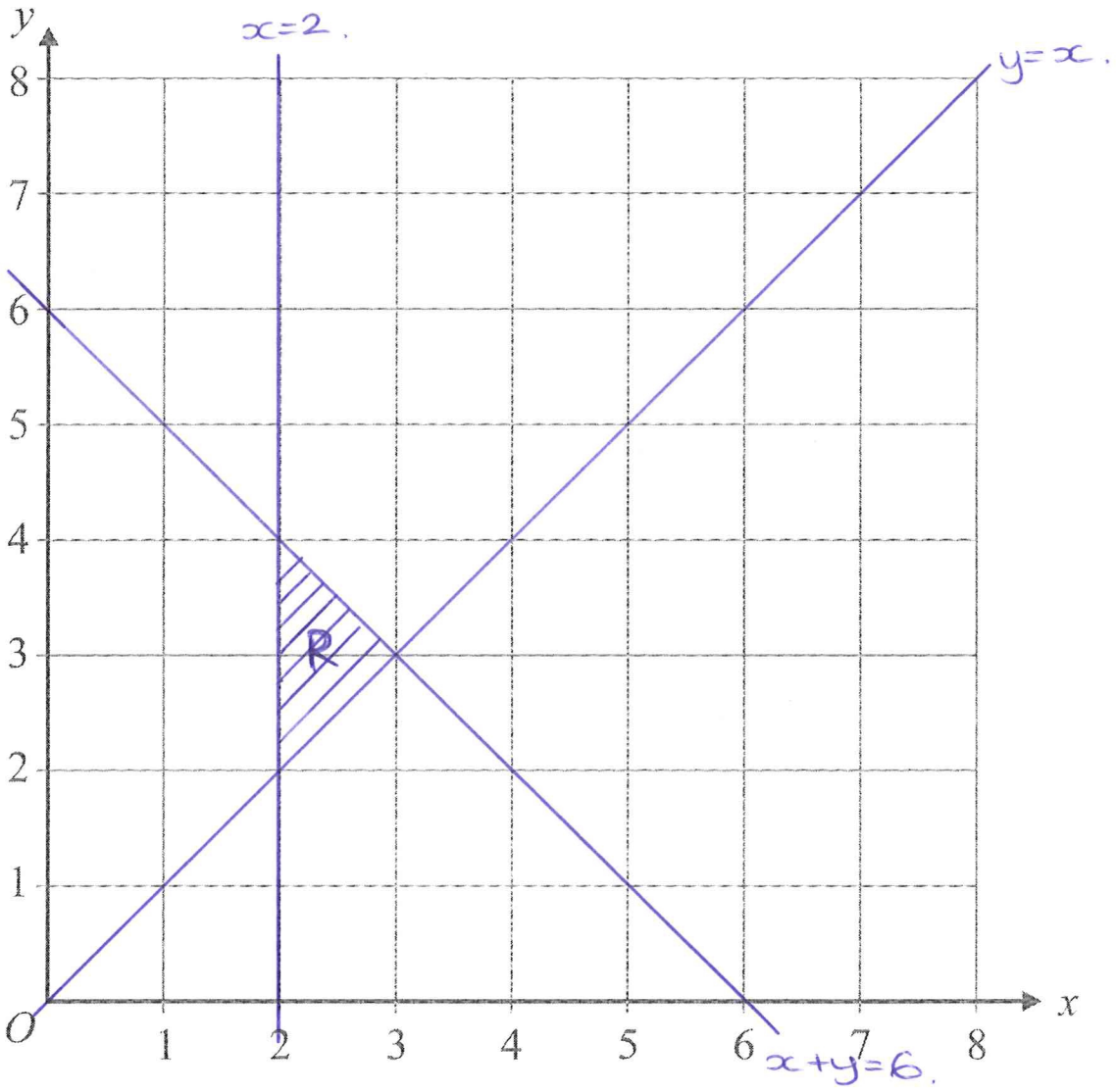


(Total for Question 19 = 4 marks)

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

$$x \geq 2 \qquad y \geq x \qquad x + y \leq 6$$



(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)

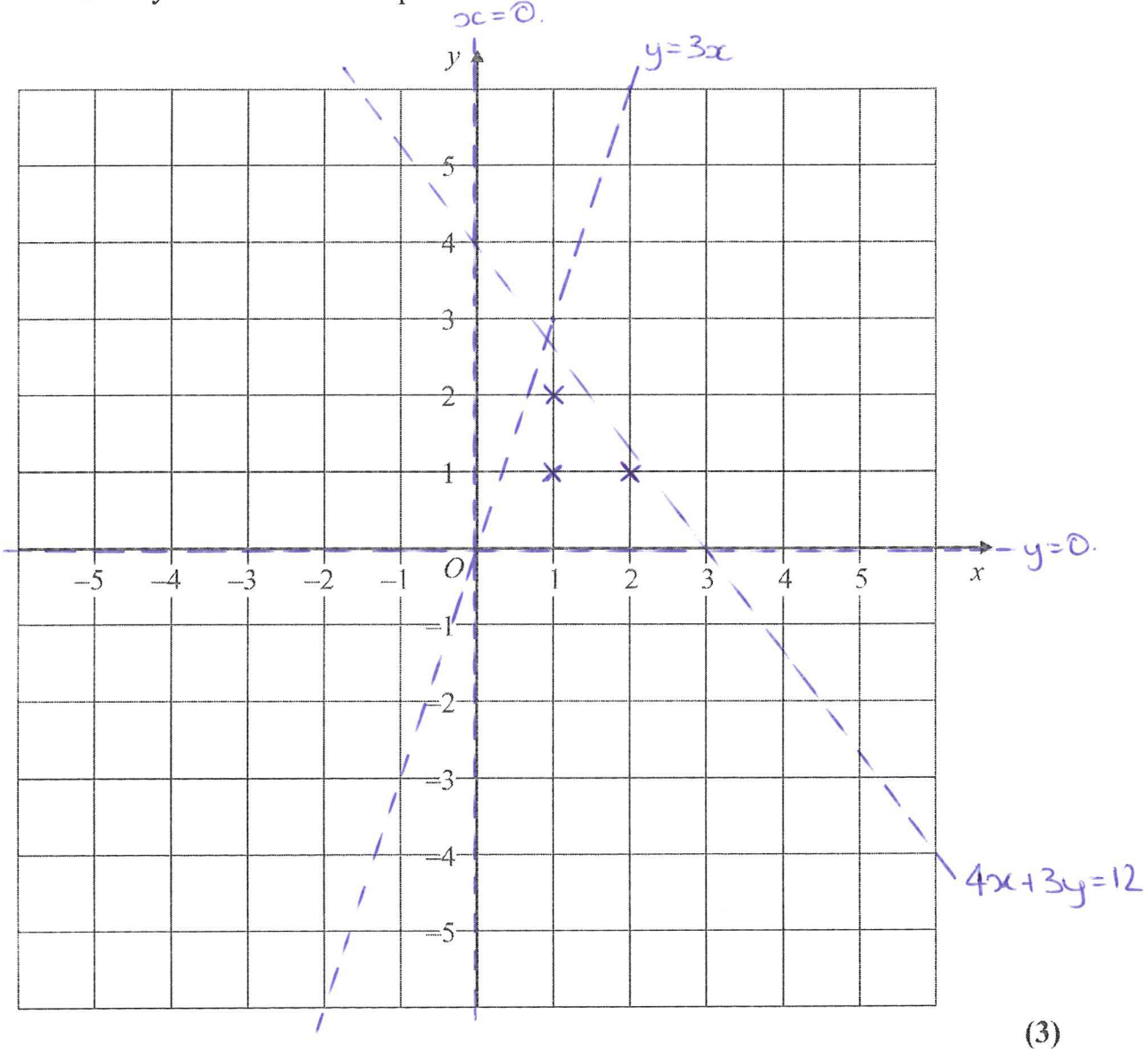
(Total 5 marks)

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 (×), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

5) Composite functions: Easier

Q1. The functions f and g are such that

$$f(x) = 2x + 3 \text{ and } g(x) = \frac{x}{4} - 2$$

(a) Find the value of f(8)

F(8) = 2(8) + 3
=16 + 3
= 19

19

.....

(1)

(b) Find gf(*4*)

f(4) = 2(4) + 3 = 11

$$g(11) = \frac{11}{4} - 2 = \frac{3}{4}$$

$\frac{3}{4}$

.....

(2)

(b) Show that

$$fg(x) = \frac{1}{2}x - 1$$

$$fg(x) = 2\left(\frac{x}{4} - 2\right) + 3$$

$$fg(x) = \frac{2x}{4} - 4 + 3$$

$$fg(x) = \frac{1}{2}x - 1$$

(2)

(Total for question = 5 marks)

5) Composite functions: Medium

2. The functions f and g are such that

$$f(x) = \frac{2}{x+3} \text{ and } g(x) = 3(x-2)$$

a) Show that $gf(5) = -\frac{21}{4}$

$$f(5) = \frac{2}{5+3} = \frac{1}{4}$$

$$g\left(\frac{1}{4}\right) = 3\left(\frac{1}{4} - 2\right)$$

$$g\left(\frac{1}{4}\right) = \frac{3}{4} - 6$$

$$g\left(\frac{1}{4}\right) = -\frac{21}{4}$$

.....

(2)

b) Show that fg(x) can be written in the form

$$\frac{2}{k(x-1)}$$

where k is an integer to be found.

$$fg(x) = \frac{2}{3(x-2)+3}$$

$$fg(x) = \frac{2}{3x-6+3}$$

$$fg(x) = \frac{2}{3x-3}$$

$$fg(x) = \frac{2}{3(x-1)} \quad , \quad k = 3$$

(3)

c) Find an expression for gg(x)

$$gg(x) = 3(3x-6) - 6$$

$$gg(x) = 9x - 24$$

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

(Total for question = 7 marks)

5) Composite functions: Harder

3. The functions f, g and h are such that

$$f(x) = 2x + 2 \quad , \quad g(x) = \frac{a}{x} \text{ and } h(x) = 3x^2 \quad for\ x > 0$$

a) Find hgf(3) in terms of a

$$f(3) = 2(3) + 2 = 8$$
$$g(8) = \frac{a}{8}$$
$$h\left(\frac{a}{8}\right) = 3\left(\frac{a}{8}\right)^2 = \frac{3a^2}{64}$$

$$hgf(3) = \frac{3a^2}{64}$$

.....

(2)

b) Given that $fg(10) = \frac{14}{5}$ find the value of a

$$2\left(\frac{a}{10}\right) + 2 = \frac{14}{5}$$

$$\frac{2a}{10} = \frac{4}{5}$$

$$a = 4$$

.....

(2)

(Total for question = 4 marks)

4. The functions f, g are such that

$$f(x) = 3x + a \text{ and } g(x) = 6x - b$$

Given that fg(2) = 19 and gf(3) = 48, find the values of a and b.

From fg(2) =19

$3(6(2) - b) + a = 19$

$36 - 3b + a = 19$

$a - 3b = -17$

From gf(3) =54

$6(3(3) + a) - b = 54$

$54 + 6a - b = 54$

$6a - b = 0$

Solving simutaneously

$6a - 18b = -102$

-17b = -102

b= -6, a =1

.....(5) **(Total for question = 5 marks)**

PAVEY Samuel

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	20 from 28	3 from 3	12 from 20	1 from 1	4 from 4	0 from 0
A02 and 3	32 from 52	7 from 12	5 from 9	9 from 13	10 from 16	1 from 2
Total	52 from 80	10 from 15	17 from 29	10 from 14	14 from 20	1 from 2

Your Pinpoint Topics

Topic 1: Dividing into a ratio. Mathswatch Clip: 106

Topic 2: Reverse Percentage. Mathswatch Clip: 110

Topic 3: Venn diagrams.. Mathswatch Clip: 127

Topic 4: Product of Prime Factors, HCF, LCM. MW: 78

Topic 5: Inequalities Regions. Mathswatch Clip: 198

1) Dividing into a ratio: Easier

Solution for Question 1:

Ratio 1:3 total 1+3= 4

$£40 \div 4 = 10$

Multiply each part of ratio 1:3 by 10:

10:30

Solution for Question 2:

Ratio total 8:9 8+9= 17

$153kg \div 17 = 9$

Multiply ratio 8:9 by 9

72:81

$81 - 72 = 9$

Patrick is 9kg heavier than Connor

Solution for Question 3:

Ratio 1:2

x:50

$50 \div 2 = 25$

$1 \times 25 = 25$

Tim gets 25 sweets

Solution for Question 4:

Ratio Holly to Wei-Kong to Wilfred: 6:3:1

6:3:1 = 10

$£850 \div 10 = 85$

Holly receives $6 \times 85 = £510$

1) Dividing into a ratio: Medium

Solution for Question 5:

Ratio 5:2

Difference in ratio parts 5-2 = 3

$28.5 \div 3 = 9.5$

Multiply ratio 5:2 by 9.5

47.5:19

47.5 km + 19km = 66.5km

Solution for Question 6:

Ratio 5:2:3

x:22:y

$22 \div 2 = 11$

Therefore x, Carbohydrates, = $5 \times 11 = 55$g

1) Dividing into a ratio: Harder

Solution for Question 7:

Ratio Red to Blue = 3:7

3+7 = 10

30 litres÷ 10 = 3

Multiply ratio 3:7 by 3

9:21 litres needed.

$£20 \times \frac{9}{3\ (litre\ tin)} + £30 \times \frac{21}{3\ (litre\ tin)}$

$£20 \times 3 + £30 \times 7 = £270$

Solution for Question 8:

Superheroes to princesses = 5:4

Princesses to Celebrities = 3:1

Multiply ratio 5:4 by 3 = 15:12

Multiply ratio 3:1 by 4 = 12:4

Therefore ratio as a whole = 15:12:4

15:12:1 = 31

$\frac{93(Costumes)}{31} = 3$

Multiply ratio 15:12:4 by 3

45:36:12

36 people dressed as princesses

2) Reverse Percentage: Easier

1. A shop offers 25% discount on its products in the January Sale. A Sofa costs £450 in the sale. How much did it cost originally?

$$450 \div 0.75 = 600$$

£600

…… **(3)**

2. A low fat yoghurt claims to have 20% less fat than its full fat equivalent. The low fat yoghurt has 12g of fat. How much does the full fat equivalent have?

$$12g \div 0.8 = 15g$$

$15g$

…… **(3)**

3. A telephone company comes up with a strategy that reduces their customers wait time by 30%. After they have implemented the strategy a customer waits for 14 minutes. How long would they have waited for before the strategy was implemented?

$$14 \div 0.7 = 20\ mins$$

$20\ mins$

…… **(3)**

2) Reverse Percentage: Medium

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$84 \div 1.05 = 80p$

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…..…… **(3)**

5. A smartphone depreciates in value every year by 25%. After 2 years the value of the smartphone is £236.25. What was its value when new?

$£236.25 \div 0.75^2$

= £420

…..…… **(3)**

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CITY A	CITY B
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At the end of 2015 the population of City A was 20400, and the population of City B was 20475. By how much did the populations differ at the end of 2014?

CITY A

$$20400 \div 1.02 = 20000$$

CITY B

$$20475 \div 1.05 = 19500$$

$$20000 - 19500 = 500$$

There was a difference of 500 people at the end of 2014

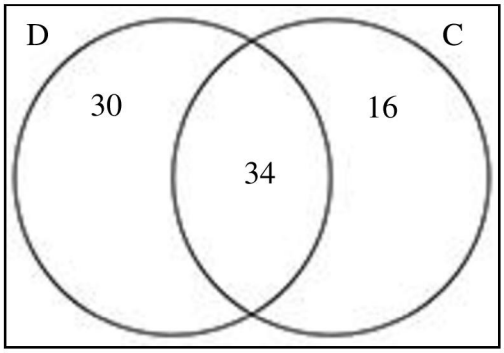
…… **(4)**

3) Venn diagrams.: Easier

Solution for Question 1:

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

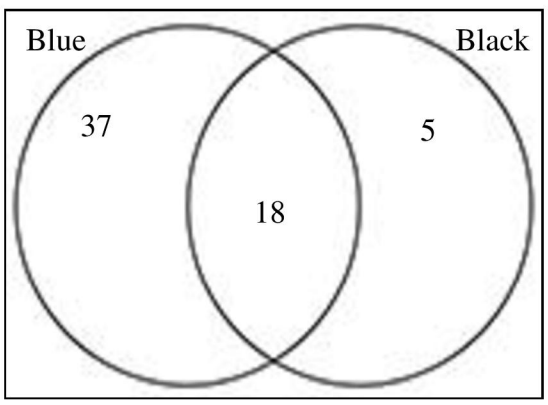
Number of people that owned cats only: $80 - 34 - 30 = 16$



Solution for Question 2:

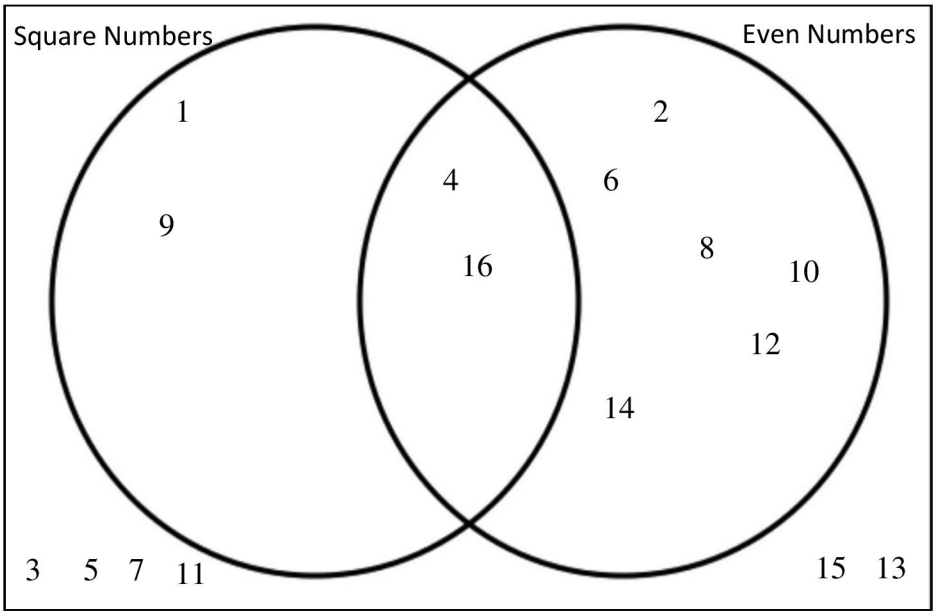
a) Number of people that only had a black pen:
$60 - 37 - 18 = 5$

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 $B = \{9,15\}$

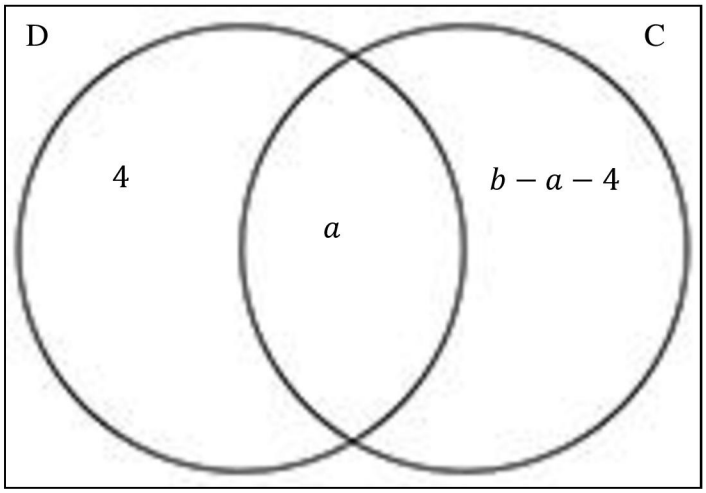
ii) $A \cup B = A$ or $B = \{3,5,6,12,18\}$

3) Venn diagrams.: Harder

Solution for Question 6:

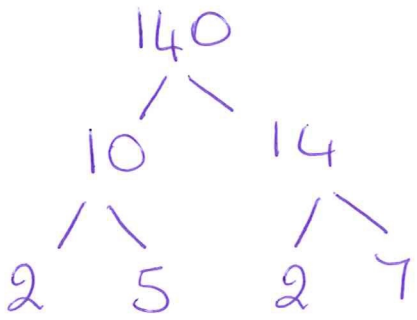
Number of people who replied with cats only:

$b - a - 4$



4) Product of Prime Factors, HCF, LCM: Easier

1. Write 140 as the product of its prime factors.



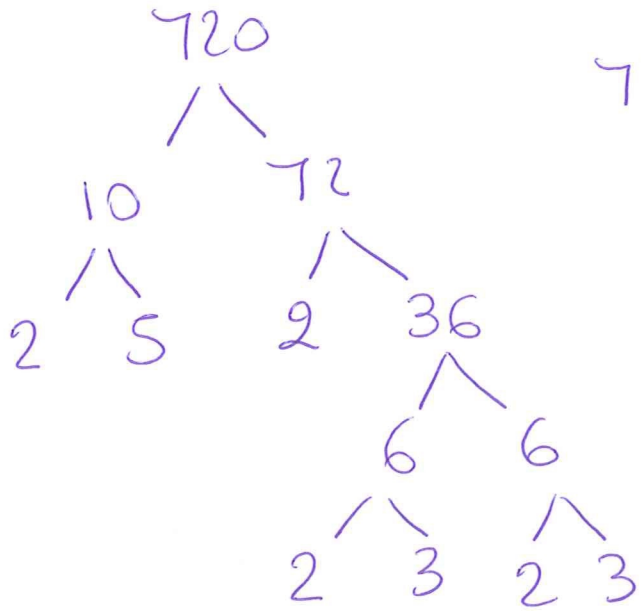
$140 = 2 \times 2 \times 5 \times 7$

$2^2 \times 5 \times 7$

.....

(2 marks)

2. Write 720 as a product of its prime factors.



$720 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$

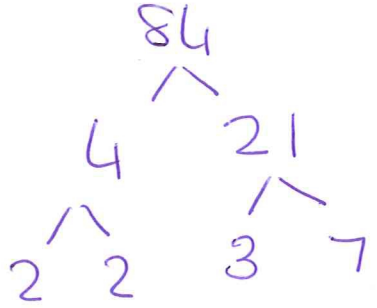
$2^4 \times 3^2 \times 5$

.....

(2 marks)

4) Product of Prime Factors, HCF, LCM: Medium

8. (a) Express 84 as a product of its prime factors.



$2^2 \times 3 \times 7$

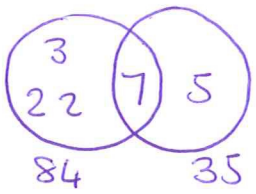
(3)

(b) Find the Highest Common Factor (HCF) of 84 and 35

$84 = 2^2 \times 3 \times 7$

$35 = \quad \times 7$

HCF



7

(2)

(5 marks)

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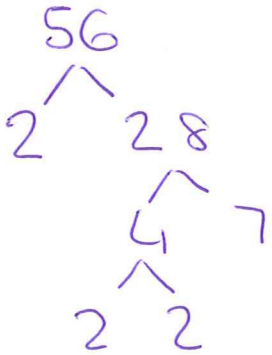
9. (a) Express 56 as the product of its prime factors.



$56 = 2 \times 2 \times 2 \times 7$

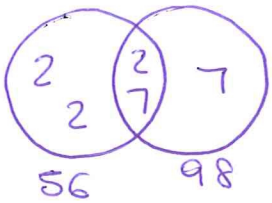
$2^3 \times 7$

(2)

(b) Find the Lowest Common Multiple of 56 and 98

$56 = 2^3 \times 7$

$98 = 2 \times 7 \times 7$



$LCM = 2 \times 2 \times 2 \times 7 \times 7$

$= 392$

392

(2)

(4 marks)

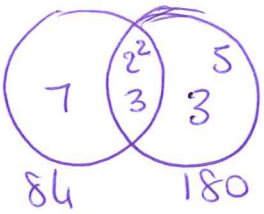
4) Product of Prime Factors, HCF, LCM: Harder

10. Find the Highest Common Factor (HCF) of 84 and 180

$84 = 2^2 \times 3 \times 7$

$180 = 2^2 \times 3^2 \times 5$

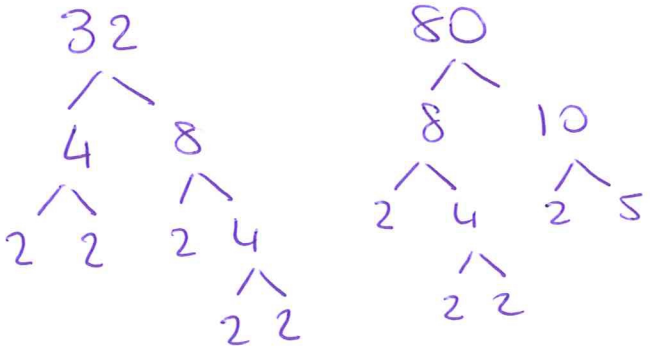
$HCF = 2^2 \times 3 = 12$



12

(3 marks)

11. Find the Highest Common Factor (HCF) of 32 and 80



$HCF = 2^4 = 16$

$32 = 2^5$

$80 = 2^4 \times 5$

$32 = 2 \times 2 \times 2 \times 2 \times 2$

$80 = 2 \times 2 \times 2 \times 2 \times 5$

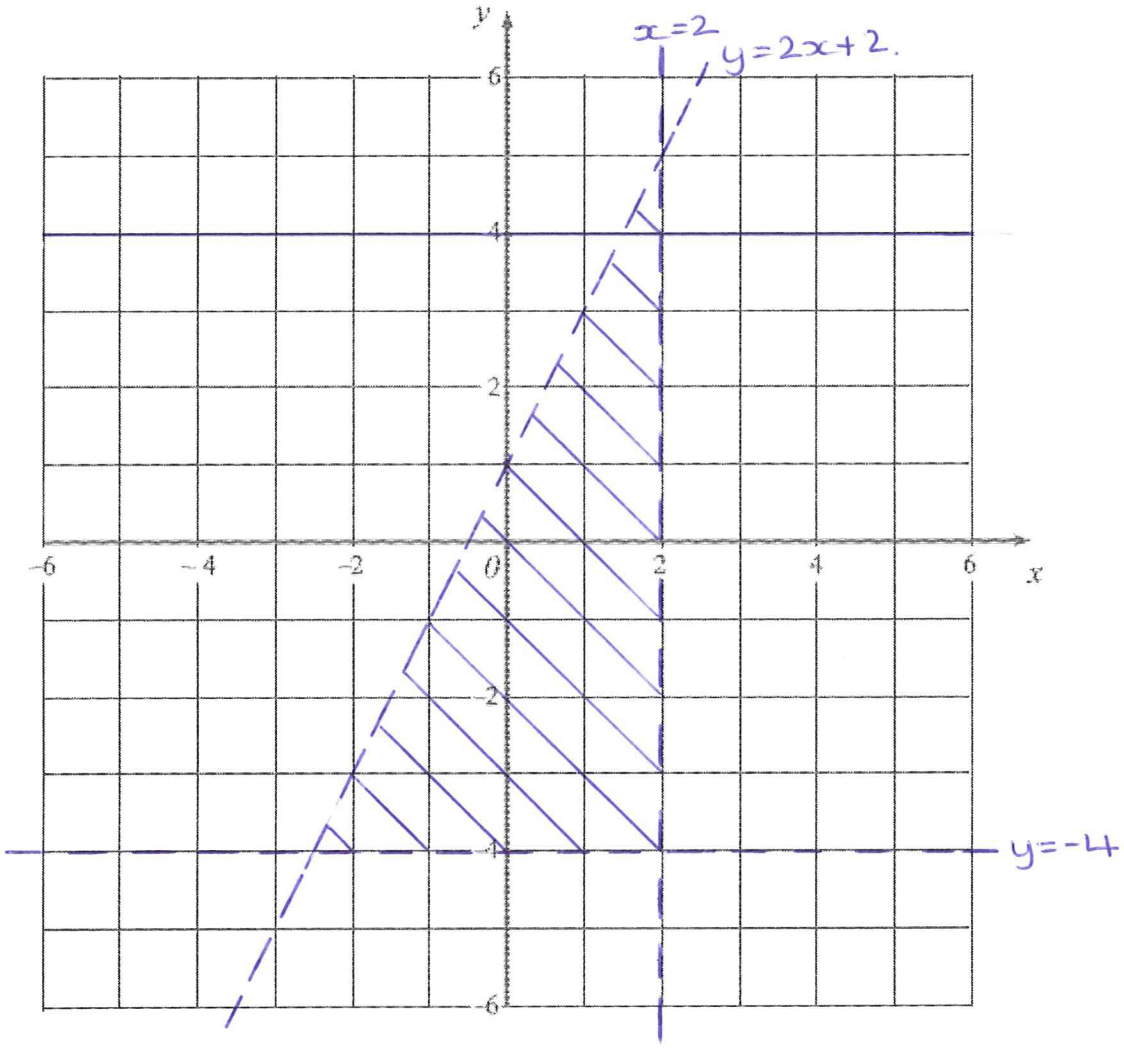
16

(3 marks)

5) Inequalities Regions: Easier

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

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

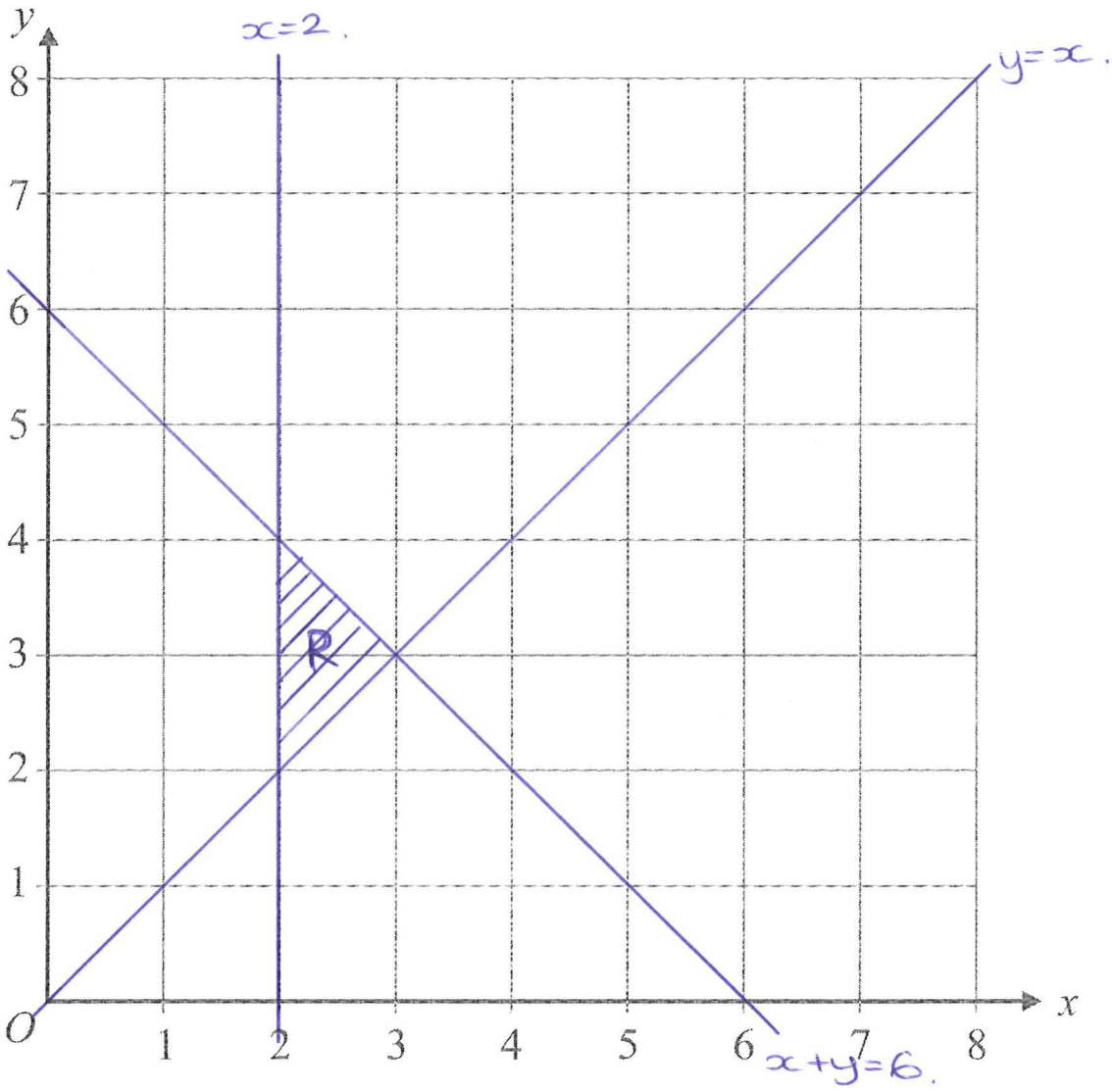


(Total for Question 19 = 4 marks)

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

$$x \geq 2 \qquad y \geq x \qquad x + y \leq 6$$



(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)

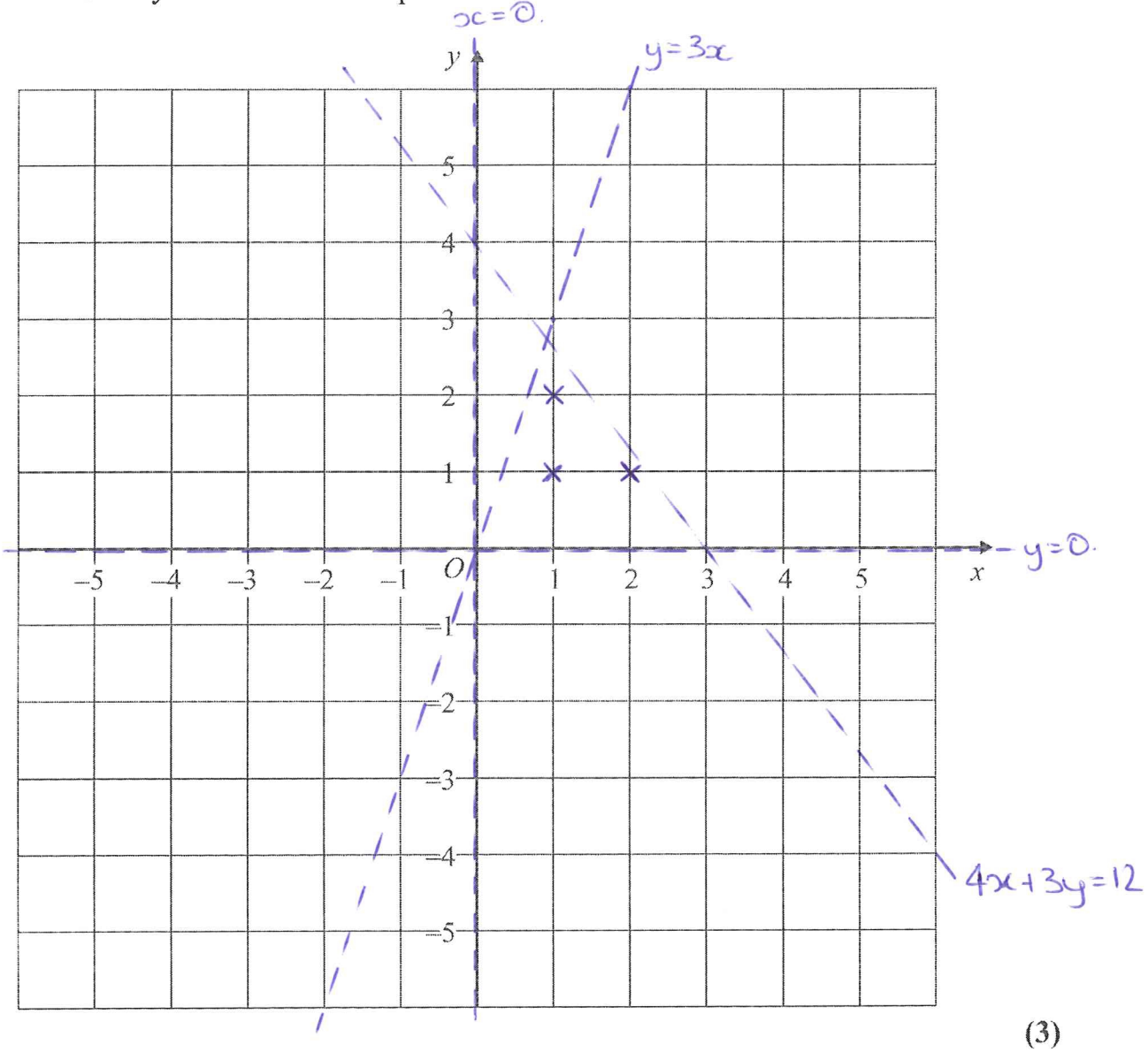
(Total 5 marks)

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 (×), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

RYAN Natalie

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	22 from 28	3 from 3	14 from 20	1 from 1	4 from 4	0 from 0
A02 and 3	25 from 52	1 from 12	6 from 9	9 from 13	8 from 16	1 from 2
Total	47 from 80	4 from 15	20 from 29	10 from 14	12 from 20	1 from 2

Your Pinpoint Topics

Topic 1: Compound Interest and Depreciation. MW: 164

Topic 2: Reverse Percentage. Mathswatch Clip: 110

Topic 3: Product of Prime Factors, HCF, LCM. MW: 78

Topic 4: Cumulative Frequency. Mathswatch Clip: 186

Topic 5: Areas under velocity time graph. MW: 216

1) Compound Interest and Depreciation: Easier

1. Tom invested £2500 for 3 years into his savings account. The bank paid him 3% per year compound interest. How much did Tom have in his bank account at the end of the 3 years?

$$2500 \times 1.03^3$$

$$= 2731.818$$

£2731.82 **(3)**

2. Dennis invested £1000 for four years into a savings account. He received 5% per annum compound interest. How much did he have in his account at the end of the four years

$$1000 \times 1.05^4$$

$$= 1215.506$$

£1215.51 **(3)**

3. The value of a smartphone depreciates by 55% each year. At the end of 2015, the value of the phone is £350. What is the value of the phone at the end of 2017?

$$350 \times 0.45^2$$

$$=70.875$$

= £70.88 **(3)**

1) Compound Interest and Depreciation: Medium

4. Eddie invests £4000 into a savings account, the bank pays him 4% compound interest per annum. At the end of ***n*** years he has £4679.43 to the nearest penny. What is the value of ***n***?

$$4000 \times 1.04^4 = 4679.43$$

4 Years **(3)**

5. Peter invests £3550 into a savings account at 3.05% per annum. How much will he have in his bank account at the end of 5 years?

$$3550 \times 1.0305^5 = 4125.422$$

£4125.42

…… **(3)**

6. The value of a car depreciates by 22.5% per year. After how many years is the value of the car first less than 40% of its original value?

$$0.775^2 = 0.600625$$

$$0.775^3 = 0.465484$$

$$0.775^4 = 0.36075$$

After 4 years the value of the car is 36% of its original value, so it first less than 40% of its original value after 4 years

…… **(2)**

1) Compound Interest and Depreciation: Harder

*10. Jeremy wants to invest £3000 into a savings account.

TQ Bank
Compound interest
6% for the first 2 years
2% for each extra year

AMC Bank
Compound Interest
8% for the first year
1.5% for each extra year

Jeremy is going to invest his money for 8 years. Which bank will give Jeremy the most money at the end of the eight years?

TQ BANK

$$3000 \times 1.06^2 = £3370.80$$

$$£3370.80 \times 1.02^6 = 3796.068$$

= £3796.07

AMC BANK $3000 \times 1.08 = £3240$

$$3240 \times 1.015^7 = 3595.898$$

$$= £3595.90$$

So Jeremy would make the most with TQ Bank

…… **(4)**

2) Reverse Percentage: Easier

1. A shop offers 25% discount on its products in the January Sale. A Sofa costs £450 in the sale. How much did it cost originally?

$$450 \div 0.75 = 600$$

£600

…… **(3)**

2. A low fat yoghurt claims to have 20% less fat than its full fat equivalent. The low fat yoghurt has 12g of fat. How much does the full fat equivalent have?

$$12g \div 0.8 = 15g$$

$15g$

…… **(3)**

3. A telephone company comes up with a strategy that reduces their customers wait time by 30%. After they have implemented the strategy a customer waits for 14 minutes. How long would they have waited for before the strategy was implemented?

$$14 \div 0.7 = 20\ mins$$

$20\ mins$

…… **(3)**

2) Reverse Percentage: Medium

4. A tax on sugary products at 5% is implemented by a new government. After the tax a chocolate bar costs 84p. How much has is increased by in pence?4

$84 \div 1.05 = 80p$

$80p$

…..…… **(3)**

5. A smartphone depreciates in value every year by 25%. After 2 years the value of the smartphone is £236.25. What was its value when new?

£236.25÷ 0.75^2

= £420

…..…… **(3)**

2) Reverse Percentage: Harder

*6. Two cities have different population growths

CITY A	CITY B
Growth 2% per year	Growth 5% Per year

At the end of 2015 the population of City A was 20400, and the population of City B was 20475. By how much did the populations differ at the end of 2014?

CITY A

$$20400 \div 1.02 = 20000$$

CITY B

$$20475 \div 1.05 = 19500$$

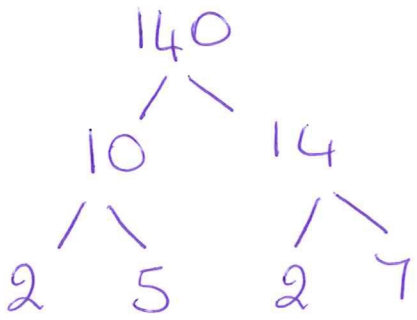
$$20000 - 19500 = 500$$

There was a difference of 500 people at the end of 2014

…… **(4)**

3) Product of Prime Factors, HCF, LCM: Easier

1. Write 140 as the product of its prime factors.



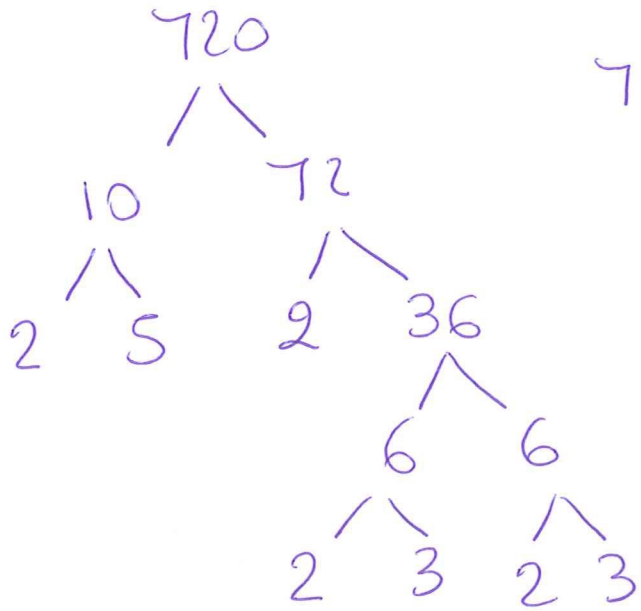
$140 = 2 \times 2 \times 5 \times 7$

$2^2 \times 5 \times 7$

.....

(2 marks)

2. Write 720 as a product of its prime factors.



$720 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$

$2^4 \times 3^2 \times 5$

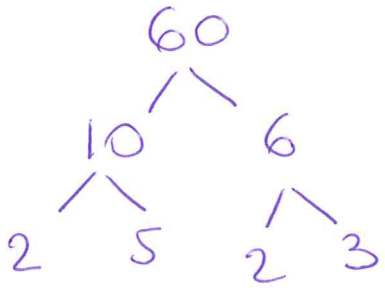
.....

(2 marks)

3) Product of Prime Factors, HCF, LCM: Medium

3. (a) Express the following numbers as products of their prime factors.

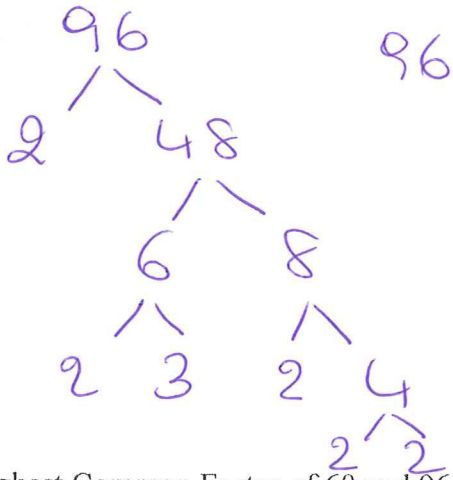
(i) 60.



$60 = 2 \times 2 \times 3 \times 5$

$2^2 \times 3 \times 5$

(ii) 96.

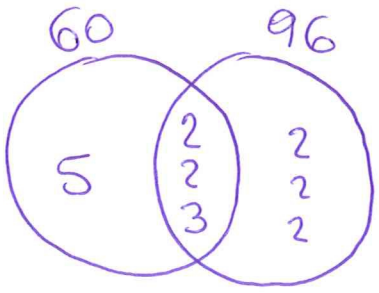


$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$

$2^5 \times 3$

(4)

(b) Find the Highest Common Factor of 60 and 96.



HCF $= 2 \times 2 \times 3 = 12$

12

(1)

(c) Work out the Lowest Common Multiple of 60 and 96.

LCM $= 2^5 \times 3 \times 5 = 480$

60 120 180 240 300 360 420 480

96 192 288 384 480

480

(2)

(7 marks)

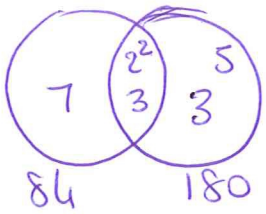
3) Product of Prime Factors, HCF, LCM: Harder

10. Find the Highest Common Factor (HCF) of 84 and 180

$84 = 2^2 \times 3 \times 7$

$180 = 2^2 \times 3^2 \times 5$

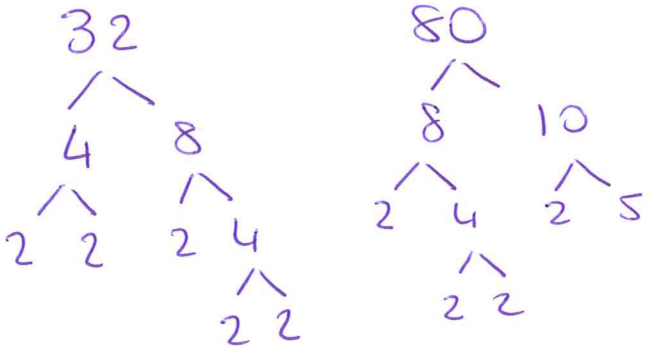
$HCF = 2^2 \times 3 = 12$



12

(3 marks)

11. Find the Highest Common Factor (HCF) of 32 and 80



$HCF = 2^4 = 16$

$32 = 2^5$

$80 = 2^4 \times 5$

$32 = 2 \times 2 \times 2 \times 2 \times 2$

$80 = 2 \times 2 \times 2 \times 2 \times 5$

16

(3 marks)

4) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

(a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	12
$20 < A \leq 40$	27
$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

..... 41 ..... years

(2)

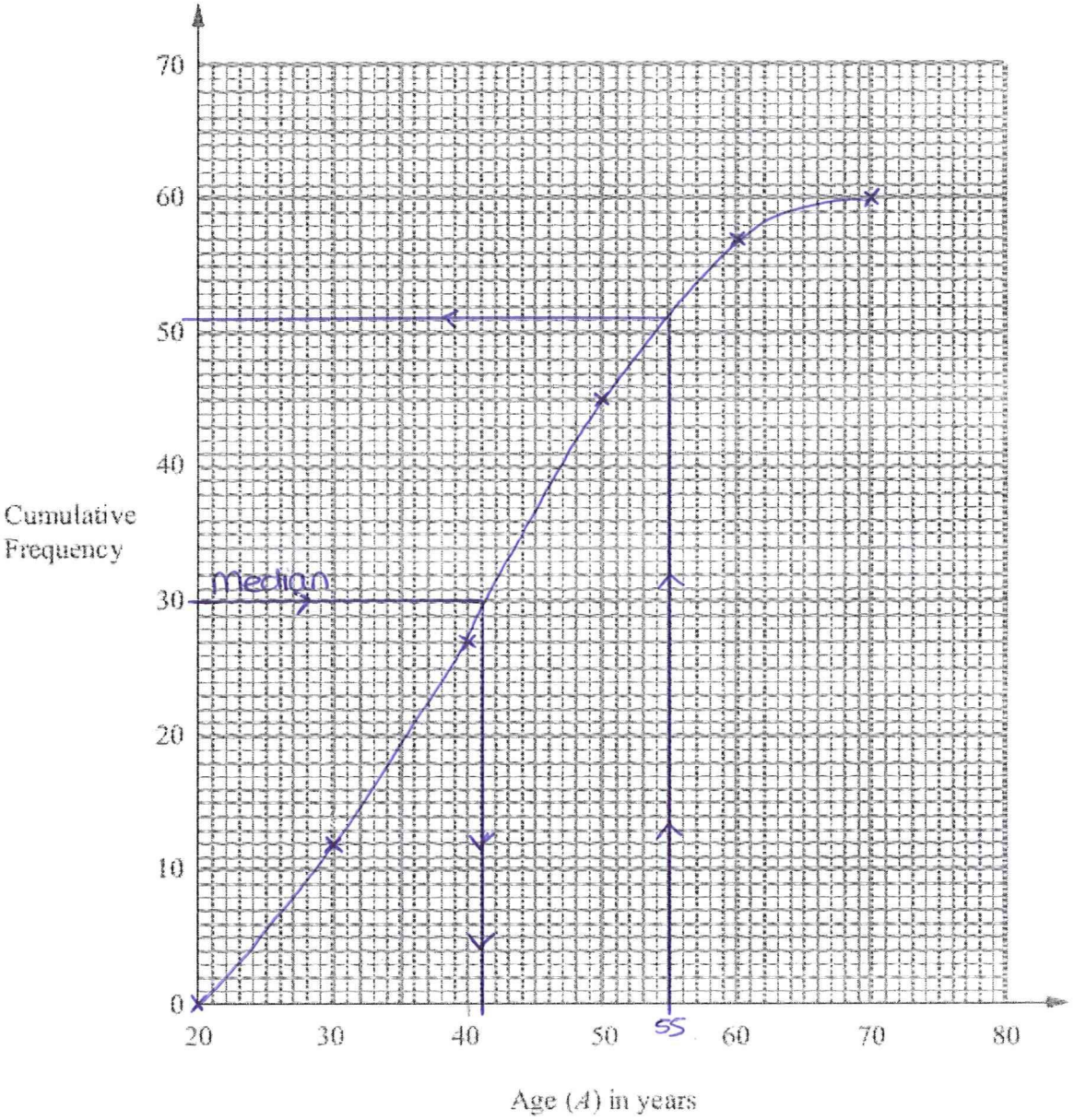
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so $60 - 51 = 9$ are older.

..... 9 .....

(2)

4) Cumulative Frequency: Medium



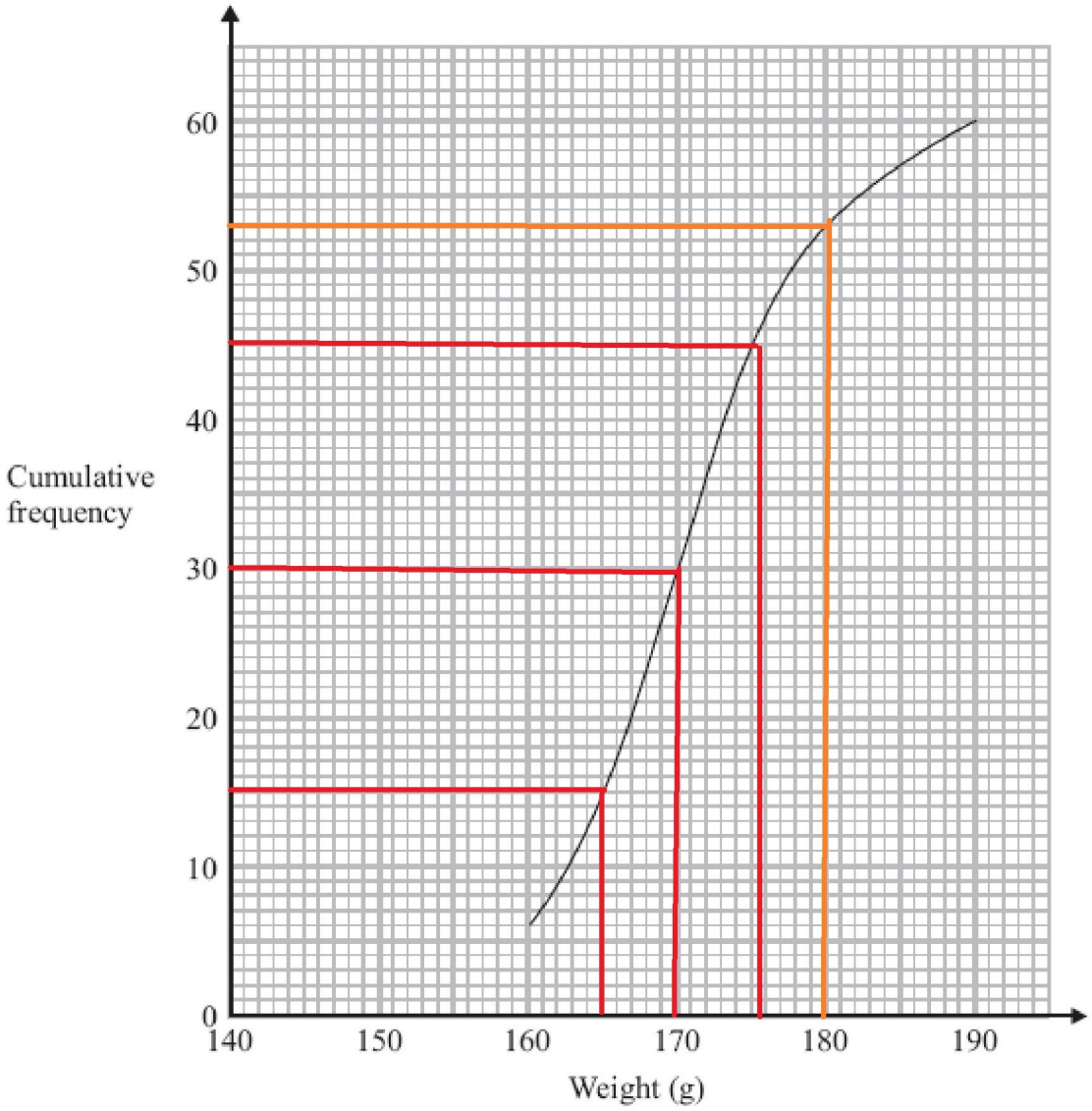
(7 marks)

4) Cumulative Frequency: Harder

4. Harry grows tomatoes.
This year he put his tomato plants into two groups, group A and group B.

Harry gave fertiliser to the tomato plants in group A.
He did not give fertiliser to the tomato plants in group B.

Harry weighed 60 tomatoes from group A.
The cumulative frequency graph shows some information about these weights.



ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

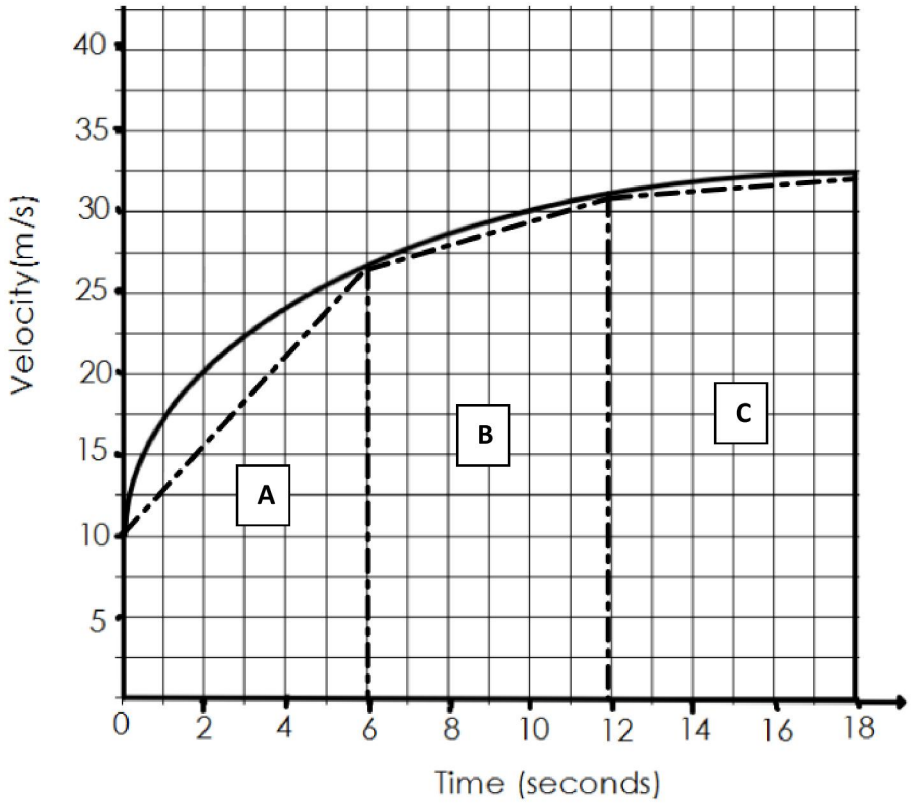
ii) The Upper Quartile 175 .....

(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

5) Areas under velocity time graph: Easier

1) The graph below shows a velocity time graph



1) a) By estimating the area under the graph using the three trapezia shown by dashed lines, work out the distance travelled in the 18 seconds.

Area of trapezium $= \frac{1}{2}(a + b)h$

Area of trapezium A $= \frac{1}{2}(10 + 27)(6) = 111$

Area of trapezium B $= \frac{1}{2}(27 + 31)(6) = 174$

Area of trapezium A $= \frac{1}{2}(31 + 32.5)(6) = 190.5$

Total Area under graph $= 111 + 174 + 190.5 = 475.5$

475.5metres travelled in 18 seconds

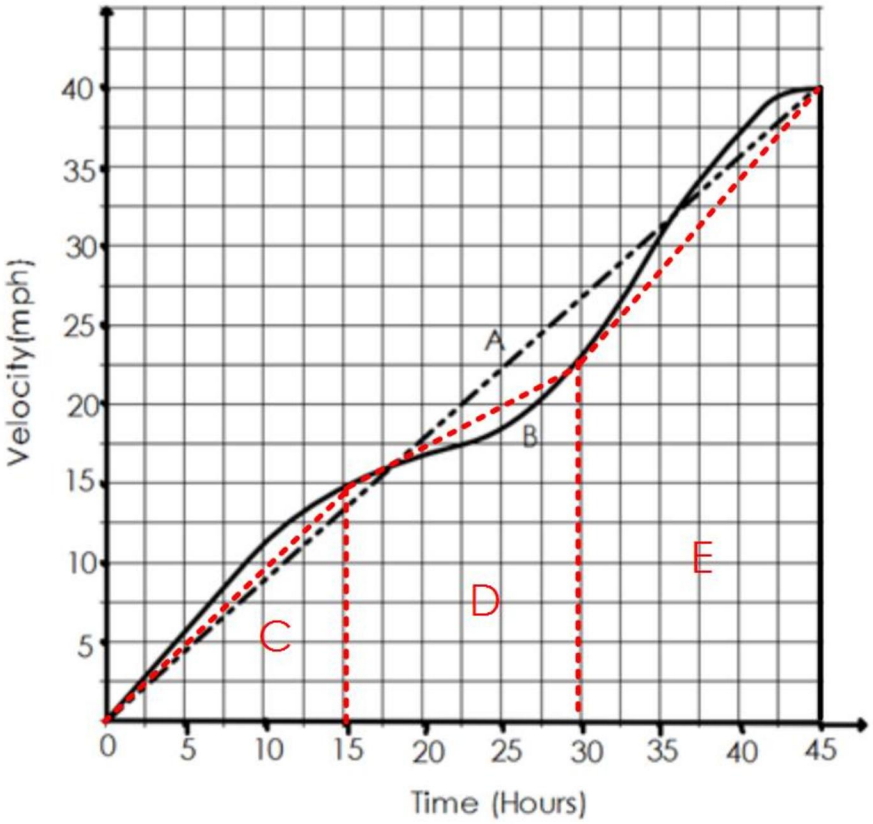
b) By considering the diagram, is your estimate for the distance an overestimate or underestimate? Explain your reasoning.

As each of the trapezia are a smaller area than the actual area, the estimate is an underestimate

(4 marks)

5) Areas under velocity time graph: Medium

2) The graph below shows a velocity time graph for two birds, A and B, over a long distance.



Which bird travels further in the 45 hours? You must show your working. Use 3 equal strips for your estimate for bird B. Comment on the reliability of your answer.

Distance travelled by bird A

Area of triangle $A = \frac{40 \times 45}{2} = 900$

Distance travelled by bird B

$$\text{Triangle C} = \frac{15 \times 15}{2} = 112.5$$

$$\text{Trapezium D} = \frac{1}{2}(15 + 22.5)(15) = 281.25$$

$$\text{Trapezium E} = \frac{1}{2}(22.5 + 40)(15) = 468.75$$

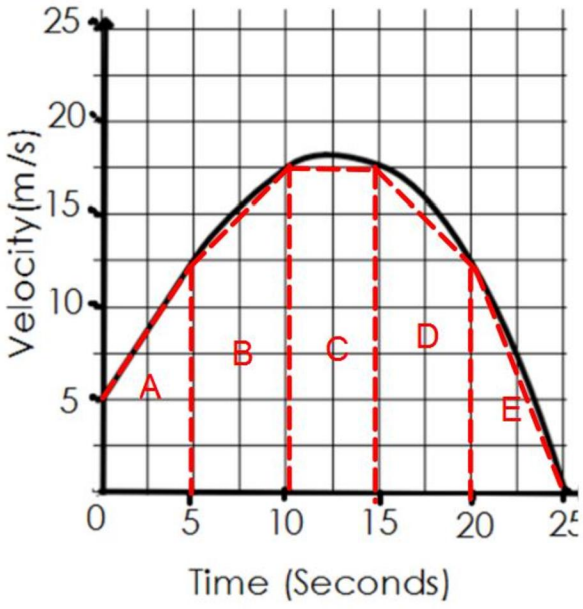
Total area under curve B is 862.5, so bird A travelled further. However, the area under the curve is an estimate and only uses three strips so not very reliable.

(4 marks)

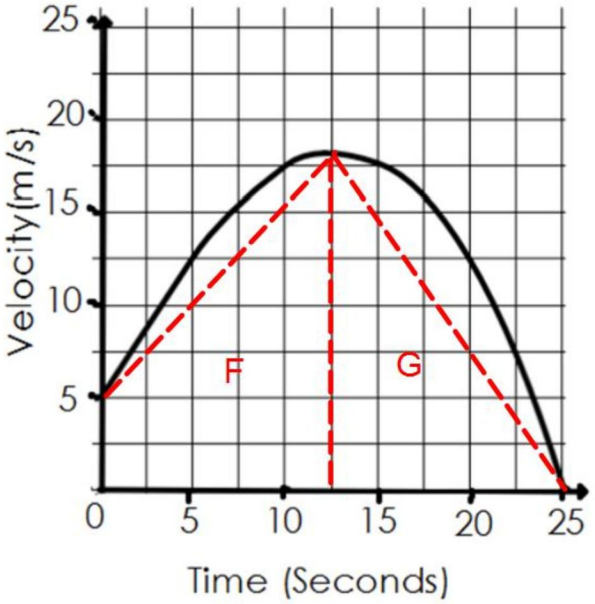
5) Areas under velocity time graph: Harder

3) The graph below shows a velocity-time graph for a drone.

Anna's method



Simone's method



a) Anna works out the distance travelled by using 3 trapezia, a rectangle and a triangle, all of equal width. Simone divides it into a triangle and a trapezium, both of equal width. Find an estimate of the distance using both Anna and Simone's method.

Anna's method :

Area $= \frac{1}{2}(5 + 12.5)(5) + \frac{1}{2}(12.5 + 17.5)(5) + (5 \times 17.5) + \frac{1}{2}(17.5 + 12.5)(5) + \frac{1}{2}(5 \times 12.5)$

Area = 43.75+ 75 + 87.5 + 75+ 31.25

Area = 312.5, distance 312.5 metres

Simone's method:

Area $= \frac{1}{2}(5 + 18)(12.5) + \frac{1}{2}(18 \times 12.5)$

Area = 143.75+ 112.5

Area =256.25 distance 256.25metres

b) Comment on which method you think gives the most reliable results.
Anna's method is more reliable as she has used more strips. we can see from the graph Simone's method is a big underestimate.

(4 marks)

STREET Tom

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Your Pinpoint Topics

Topic 1: Compound Interest and Depreciation. MW: 164

Topic 2: Dividing into a ratio. Mathswatch Clip: 106

Topic 3: Areas under velocity time graph. MW: 216

Topic 4: Vectors. Mathswatch Clip: 219

Topic 5: Transformations of Functions. Mathswatch Clip: 196

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$$350 \times 0.45^2$$

$$=70.875$$

= £70.88 **(3)**

1) Compound Interest and Depreciation: Medium

4. Eddie invests £4000 into a savings account, the bank pays him 4% compound interest per annum. At the end of ***n*** years he has £4679.43 to the nearest penny. What is the value of ***n***?

$$4000 \times 1.04^4 = 4679.43$$

4 Years **(3)**

5. Peter invests £3550 into a savings account at 3.05% per annum. How much will he have in his bank account at the end of 5 years?

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£4125.42

…… **(3)**

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$$0.775^2 = 0.600625$$

$$0.775^3 = 0.465484$$

$$0.775^4 = 0.36075$$

After 4 years the value of the car is 36% of its original value, so it first less than 40% of its original value after 4 years

…… **(2)**

1) Compound Interest and Depreciation: Harder

*10. Jeremy wants to invest £3000 into a savings account.

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Compound interest	Compound Interest
6% for the first 2 years	8% for the first year
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= £3796.07

AMC BANK $3000 \times 1.08 = £3240$

$$3240 \times 1.015^7 = 3595.898$$

$$= £3595.90$$

So Jeremy would make the most with TQ Bank

…… **(4)**

2) Dividing into a ratio: Easier

Solution for Question 1:

Ratio 1:3 total 1+3= 4

$£40 \div 4 = 10$

Multiply each part of ratio 1:3 by 10:

10:30

Solution for Question 2:

Ratio total 8:9 8+9= 17

$153kg \div 17 = 9$

Multiply ratio 8:9 by 9

72:81

$81 - 72 = 9$

Patrick is 9kg heavier than Connor

Solution for Question 3:

Ratio 1:2

x:50

$50 \div 2 = 25$

$1 \times 25 = 25$

Tim gets 25 sweets

Solution for Question 4:

Ratio Holly to Wei-Kong to Wilfred: 6:3:1

6:3:1 = 10

$£850 \div 10 = 85$

Holly receives $6 \times 85 = £510$

2) Dividing into a ratio: Medium

Solution for Question 5:

Ratio 5:2

Difference in ratio parts 5-2 = 3

$28.5 \div 3 = 9.5$

Multiply ratio 5:2 by 9.5

47.5:19

47.5 km + 19km = 66.5km

Solution for Question 6:

Ratio 5:2:3

x:22:y

$22 \div 2 = 11$

Therefore x, Carbohydrates, = $5 \times 11 = 55$g

2) Dividing into a ratio: Harder

Solution for Question 7:

Ratio Red to Blue = 3:7

3+7 = 10

30 litres$\div$ 10 = 3

Multiply ratio 3:7 by 3

9:21 litres needed.

$£20 \times \frac{9}{3\ (litre\ tin)} + £30 \times \frac{21}{3\ (litre\ tin)}$

$£20 \times 3 + £30 \times 7 = £270$

Solution for Question 8:

Superheroes to princesses = 5:4

Princesses to Celebrities = 3:1

Multiply ratio 5:4 by 3 = 15:12

Multiply ratio 3:1 by 4 = 12:4

Therefore ratio as a whole = 15:12:4

15:12:1 = 31

$\frac{93(Costumes)}{31} = 3$

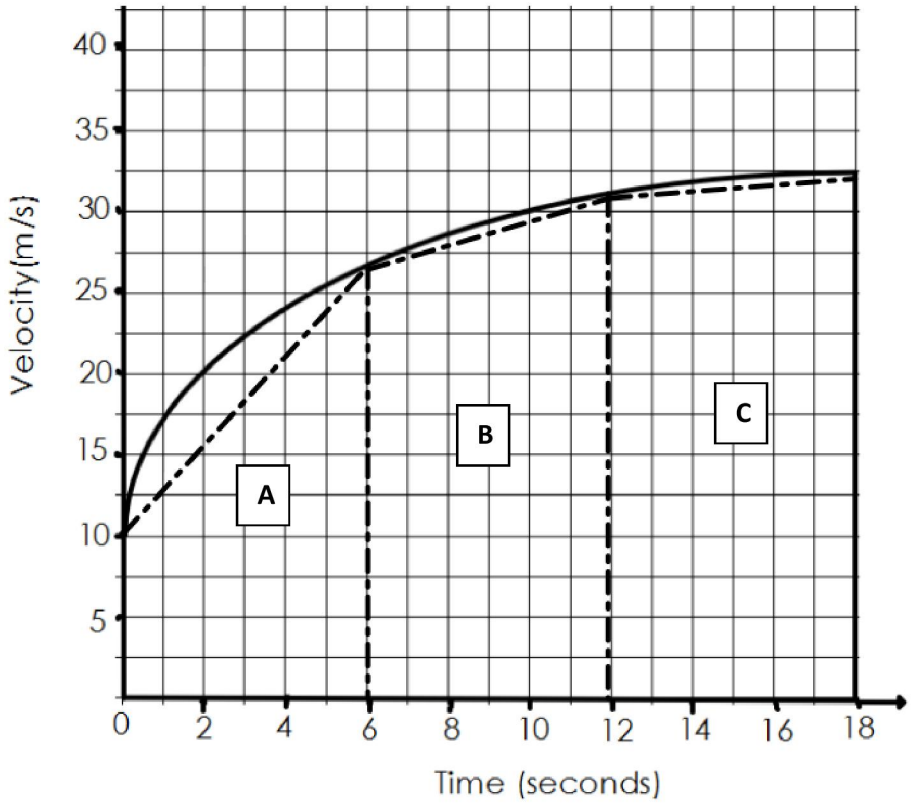
Multiply ratio 15:12:4 by 3

45:36:12

36 people dressed as princesses

3) Areas under velocity time graph: Easier

1) The graph below shows a velocity time graph



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Total Area under graph $= 111 + 174 + 190.5 = 475.5$

475.5metres travelled in 18 seconds

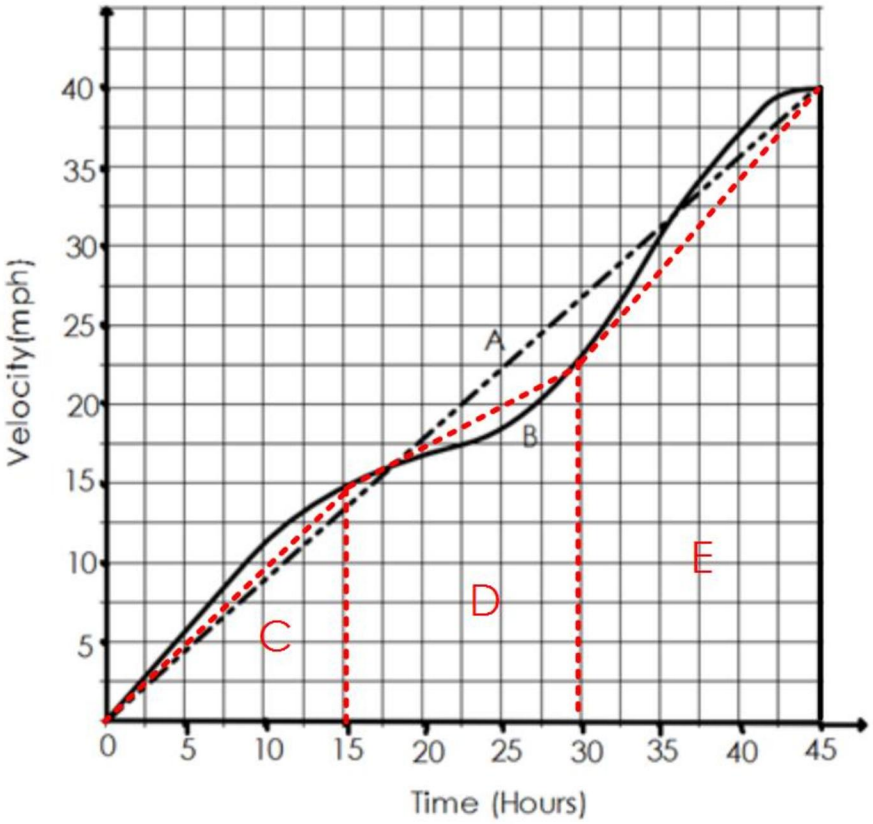
b) By considering the diagram, is your estimate for the distance an overestimate or underestimate? Explain your reasoning.

As each of the trapezia are a smaller area than the actual area, the estimate is an underestimate

(4 marks)

3) Areas under velocity time graph: Medium

2) The graph below shows a velocity time graph for two birds, A and B, over a long distance.



Which bird travels further in the 45 hours? You must show your working. Use 3 equal strips for your estimate for bird B. Comment on the reliability of your answer.

Distance travelled by bird A

Area of triangle $A = \frac{40 \times 45}{2} = 900$

Distance travelled by bird B

$$\text{Triangle C} = \frac{15 \times 15}{2} = 112.5$$

$$\text{Trapezium D} = \frac{1}{2}(15 + 22.5)(15) = 281.25$$

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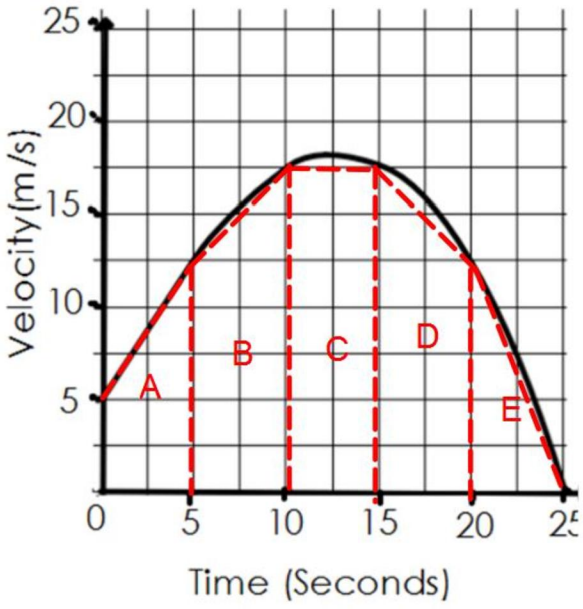
Total area under curve B is 862.5, so bird A travelled further. However, the area under the curve is an estimate and only uses three strips so not very reliable.

(4 marks)

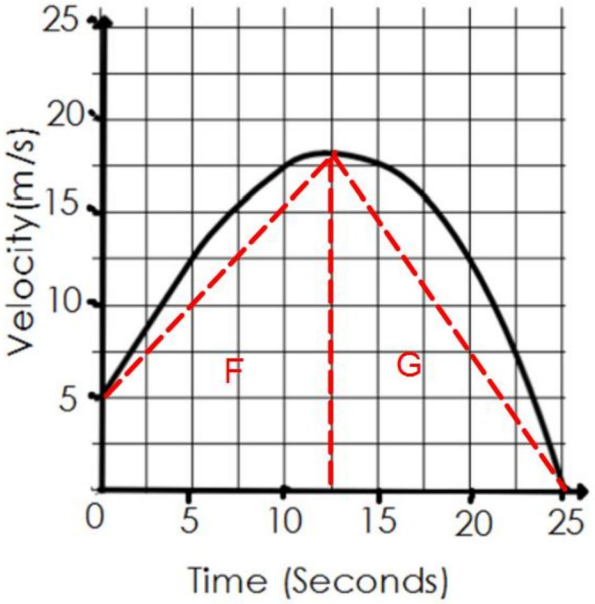
3) Areas under velocity time graph: Harder

3) The graph below shows a velocity-time graph for a drone.

Anna's method



Simone's method



a) Anna works out the distance travelled by using 3 trapezia, a rectangle and a triangle, all of equal width. Simone divides it into a triangle and a trapezium, both of equal width. Find an estimate of the distance using both Anna and Simone's method.

Anna's method :

Area $= \frac{1}{2}(5 + 12.5)(5) + \frac{1}{2}(12.5 + 17.5)(5) + (5 \times 17.5) + \frac{1}{2}(17.5 + 12.5)(5) + \frac{1}{2}(5 \times 12.5)$

Area = 43.75+ 75 + 87.5 + 75+ 31.25

Area = 312.5, distance 312.5 metres

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Area $= \frac{1}{2}(5 + 18)(12.5) + \frac{1}{2}(18 \times 12.5)$

Area = 143.75+ 112.5

Area =256.25 distance 256.25metres

b) Comment on which method you think gives the most reliable results.
Anna's method is more reliable as she has used more strips. we can see from the graph Simone's method is a big underestimate.

(4 marks)

4) Vectors: Easier

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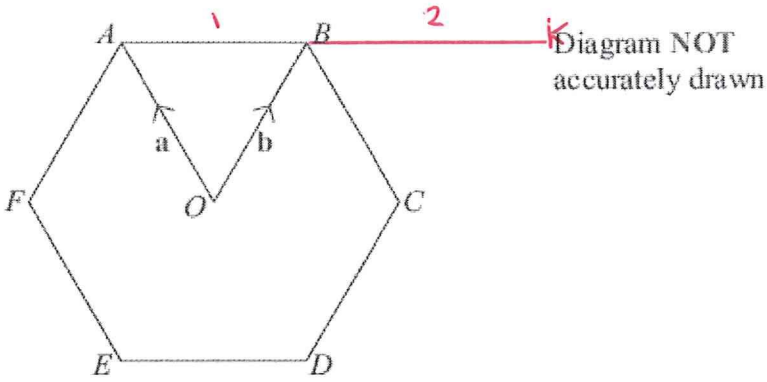

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ABCDEF is a regular hexagon, with centre *O*.

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

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

$-a+b$

.....

(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 **a** and **b**.
Give your answer in its simplest form.

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$-a+2b$

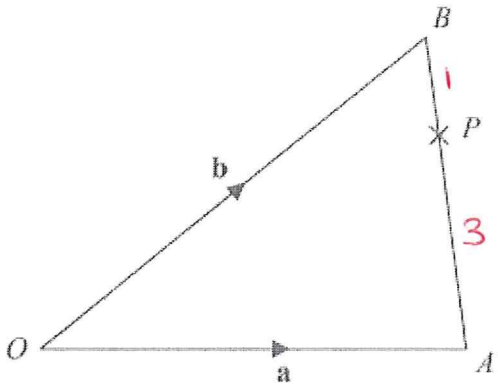
.....

(3)

(4 marks)

4) Vectors: Medium

2.



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(b) Find $\overrightarrow{OP}$ in terms of **a** and **b**.
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$\overrightarrow{AP} = -\frac{3}{4}a + \frac{3}{4}b$

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$= \frac{1}{4}a + \frac{3}{4}b$

$\frac{1}{4}a + \frac{3}{4}b$

.....

(3)

(4 marks)

4) Vectors: Harder

6.

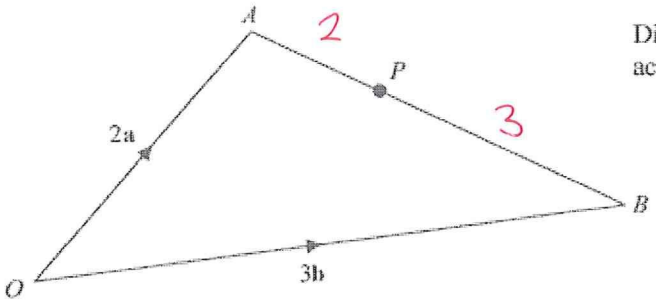


Diagram NOT accurately drawn

OAB is a triangle.

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

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

(*a*) Find *AB* in terms of **a** and **b**.

$\overrightarrow{AB}$ = $-2a+3b$

(1)

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

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

$\overrightarrow{AP} = \frac{2}{5}(-2a+3b)$

$= -\frac{4}{5}a + \frac{6}{5}b$

$\overrightarrow{OP} = 2a - \frac{4}{5}a + \frac{6}{5}b$

$= \frac{6}{5}a + \frac{6}{5}b$

$= \frac{6}{5}(a+b)$

(3)

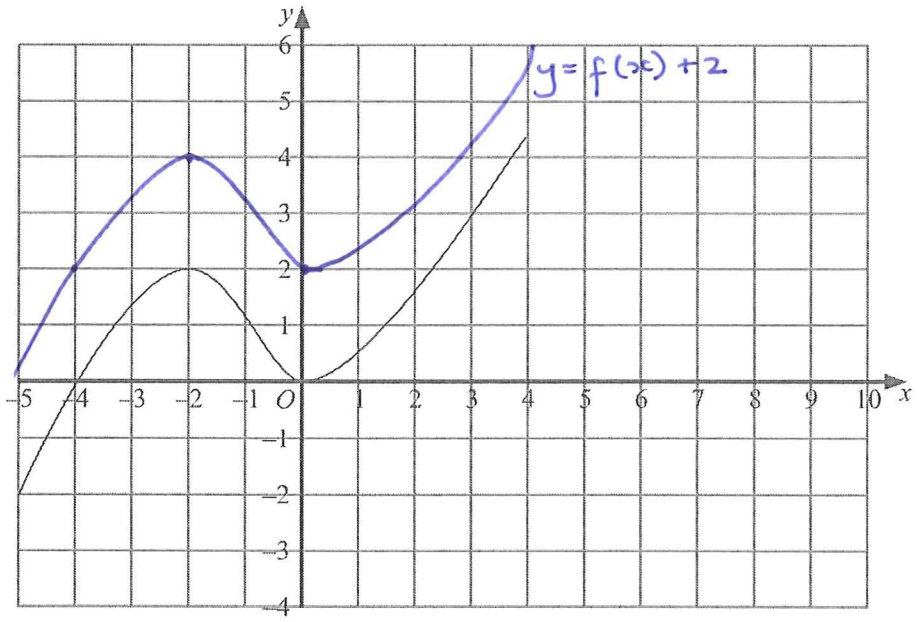
(4 marks)

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

5) Transformations of Functions: Easier

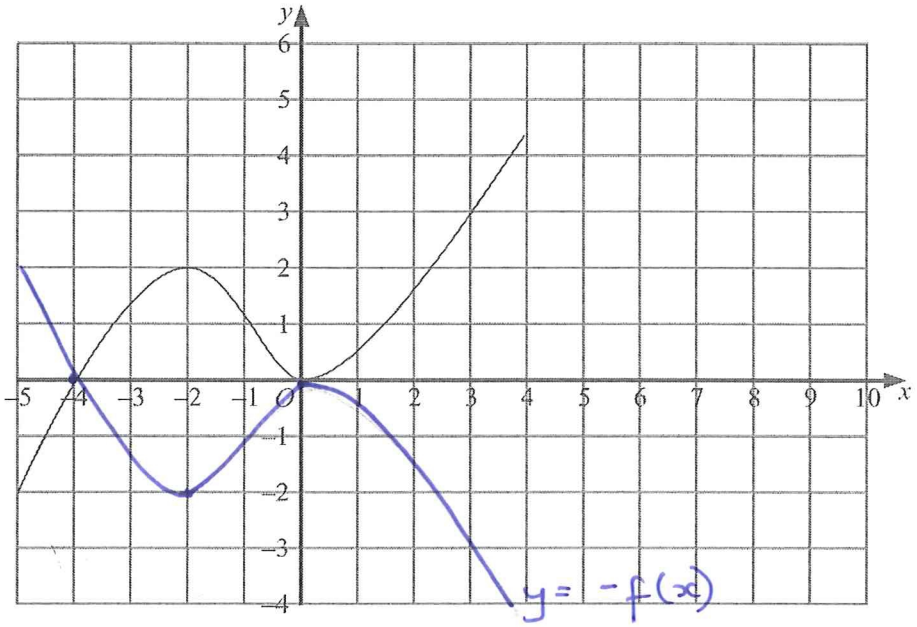
1. The graph of $y = f(x)$ is shown on the grids.

(a) On this grid, sketch the graph of $y = f(x) + 2$



(2)

(b) On this grid, sketch the graph of $y = -f(x)$

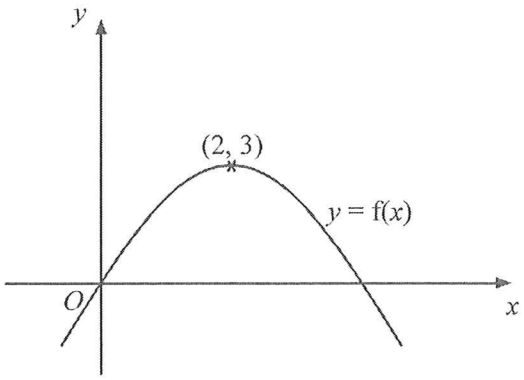


(2)

(4 marks)

5) Transformations of Functions: Medium

2.



The diagram shows part of the curve with equation $y = f(x)$.
The coordinates of the maximum point of this curve are (2, 3).

Write down the coordinates of the maximum point of the curve with equation

(a) $y = f(x - 2)$

(4 , 3)

(1)

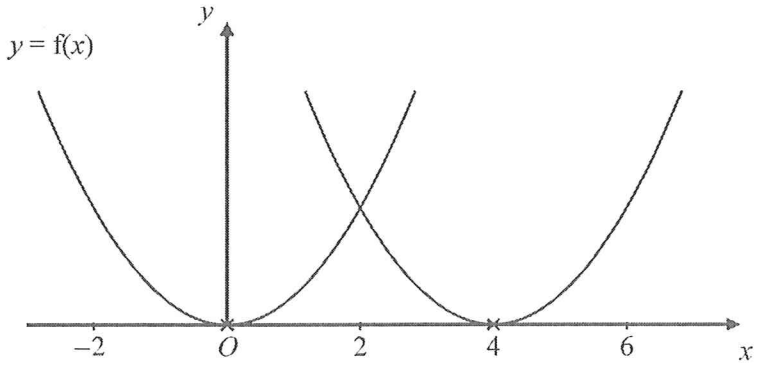
(b) $y = 2f(x)$

(2 , 6)

(1)

(2 marks)

3.



The curve with equation $y = f(x)$ is translated so that the point at (0, 0) is mapped onto the point (4, 0).

Find an equation of the translated curve.

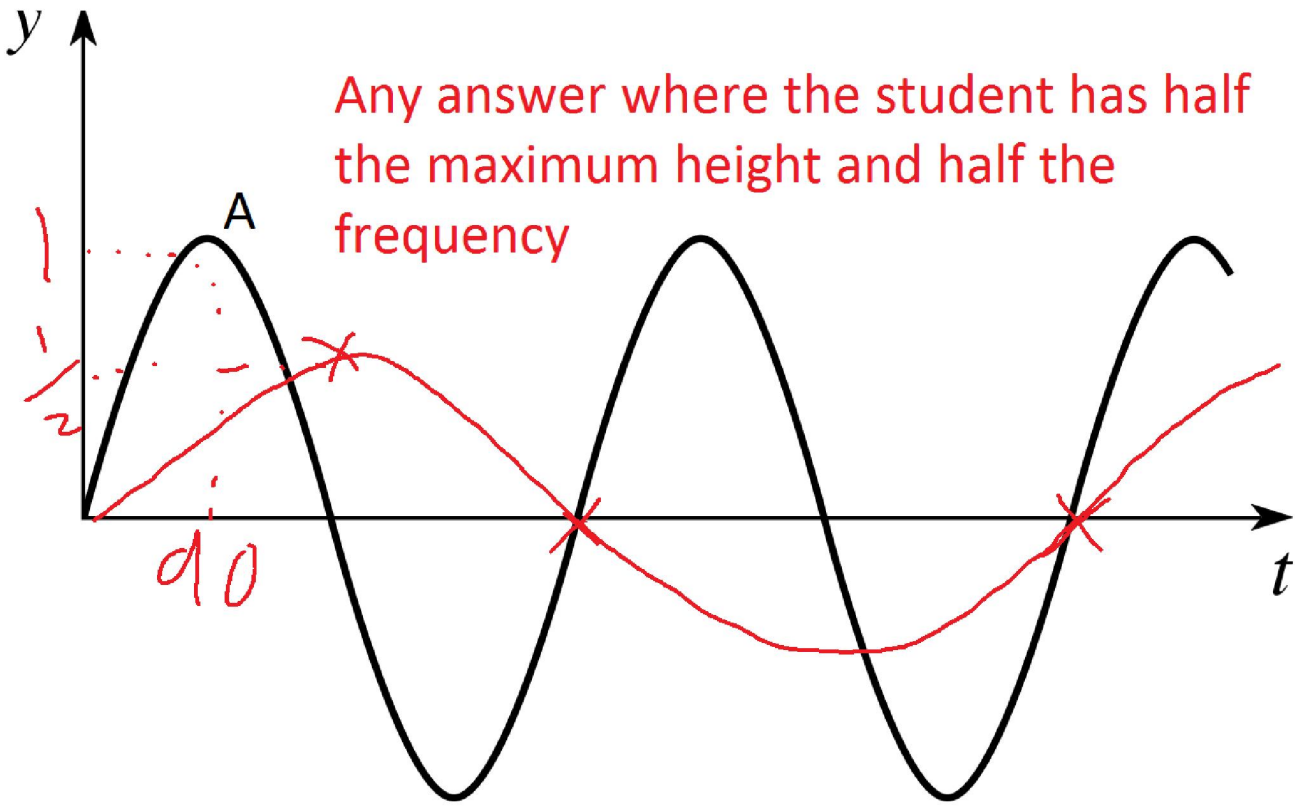
$y = f(x - 4)$

(2 marks)

5) Transformations of Functions: Harder

2) a) State the co-ordinates of A (90^o, 1) (2 marks)

b)



TALMAGE Rheanna

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	16 from 28	3 from 3	8 from 20	1 from 1	4 from 4	0 from 0
A02 and 3	29 from 52	10 from 12	3 from 9	8 from 13	6 from 16	2 from 2
Total	45 from 80	13 from 15	11 from 29	9 from 14	10 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Cumulative Frequency. Mathswatch Clip: 186

Topic 2: Inequalities Regions. Mathswatch Clip: 198

Topic 3: Composite functions. Mathswatch Clip: 215

Topic 4: Areas under velocity time graph. MW: 216

Topic 5: Vectors. Mathswatch Clip: 219

1) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

(a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	12
$20 < A \leq 40$	27
$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

..... 41 ..... years

(2)

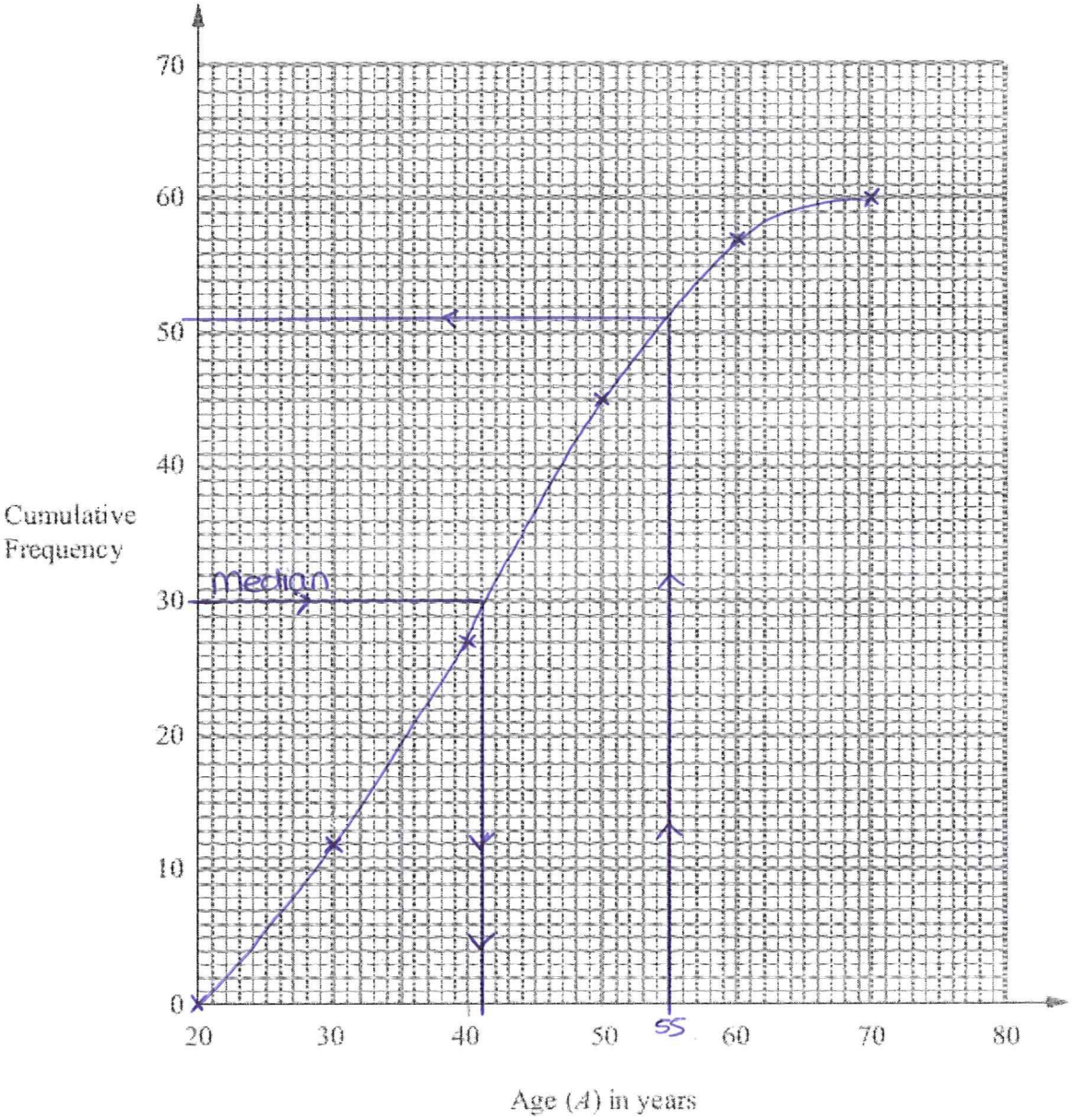
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so $60 - 51 = 9$ are older.

..... 9 .....

(2)

1) Cumulative Frequency: Medium



(7 marks)

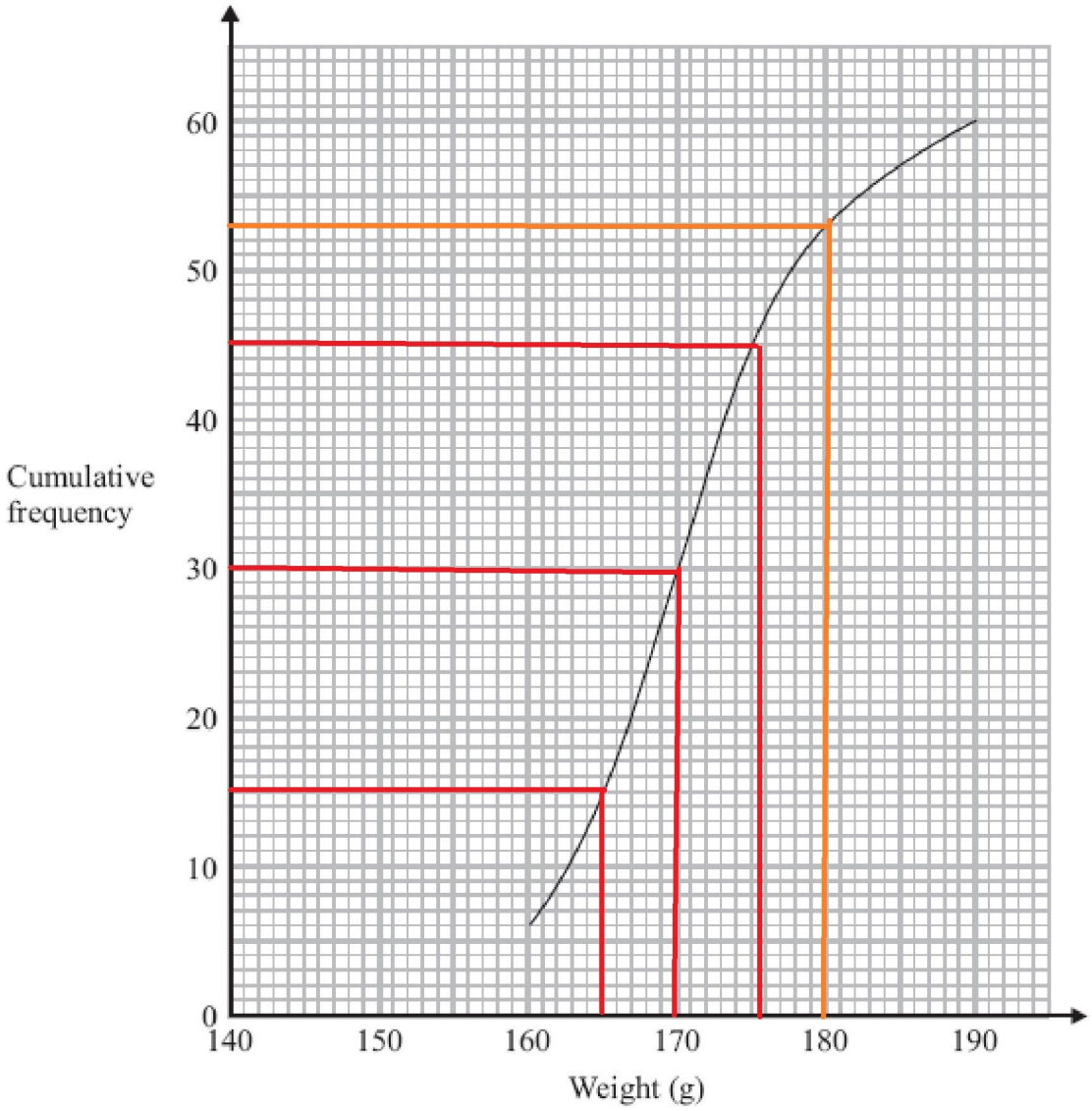
---

1) Cumulative Frequency: Harder

4. Harry grows tomatoes.
This year he put his tomato plants into two groups, group A and group B.

Harry gave fertiliser to the tomato plants in group A.
He did not give fertiliser to the tomato plants in group B.

Harry weighed 60 tomatoes from group A.
The cumulative frequency graph shows some information about these weights.



ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

ii) The Upper Quartile 175 .....

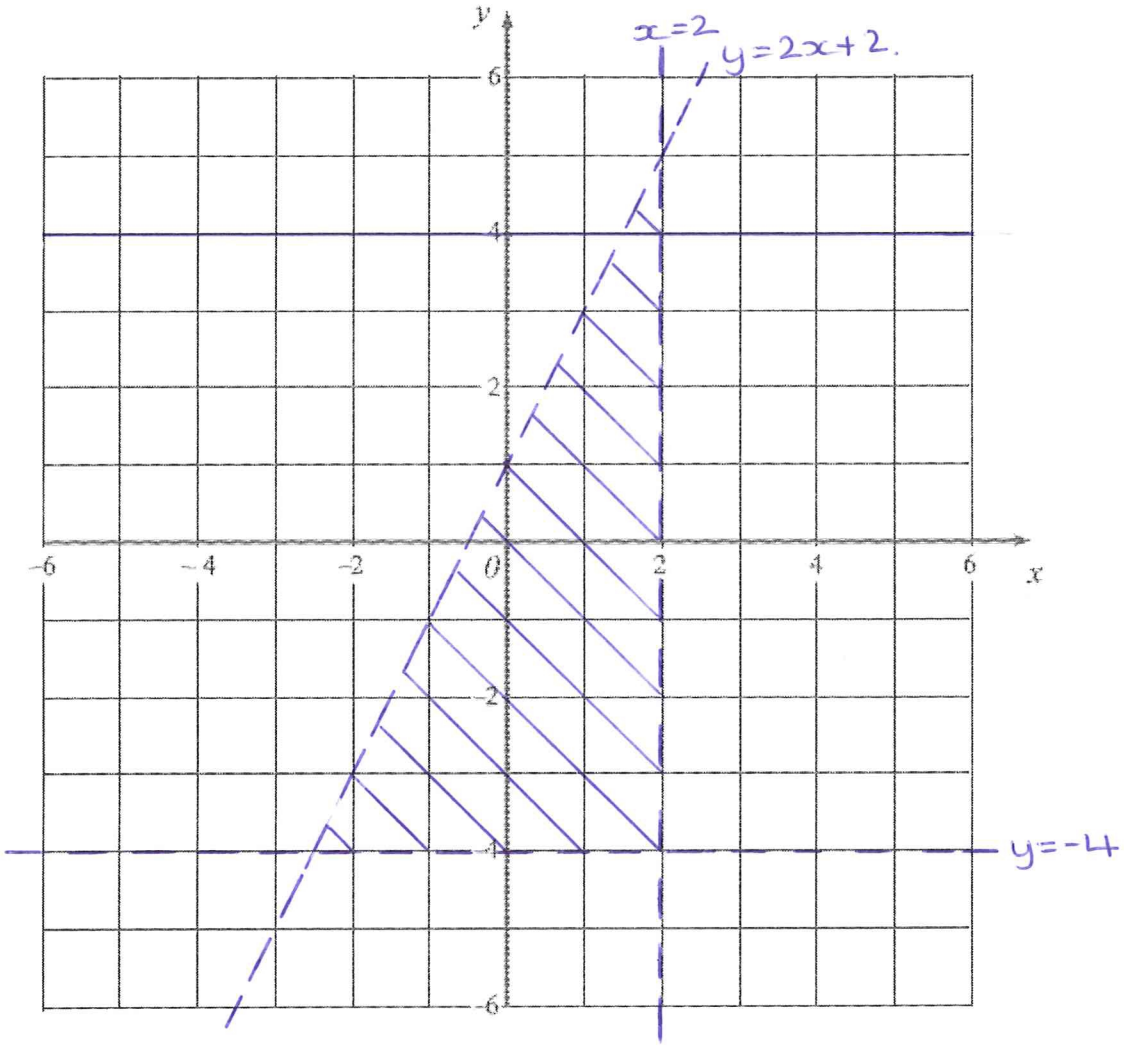
(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

2) Inequalities Regions: Easier

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

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



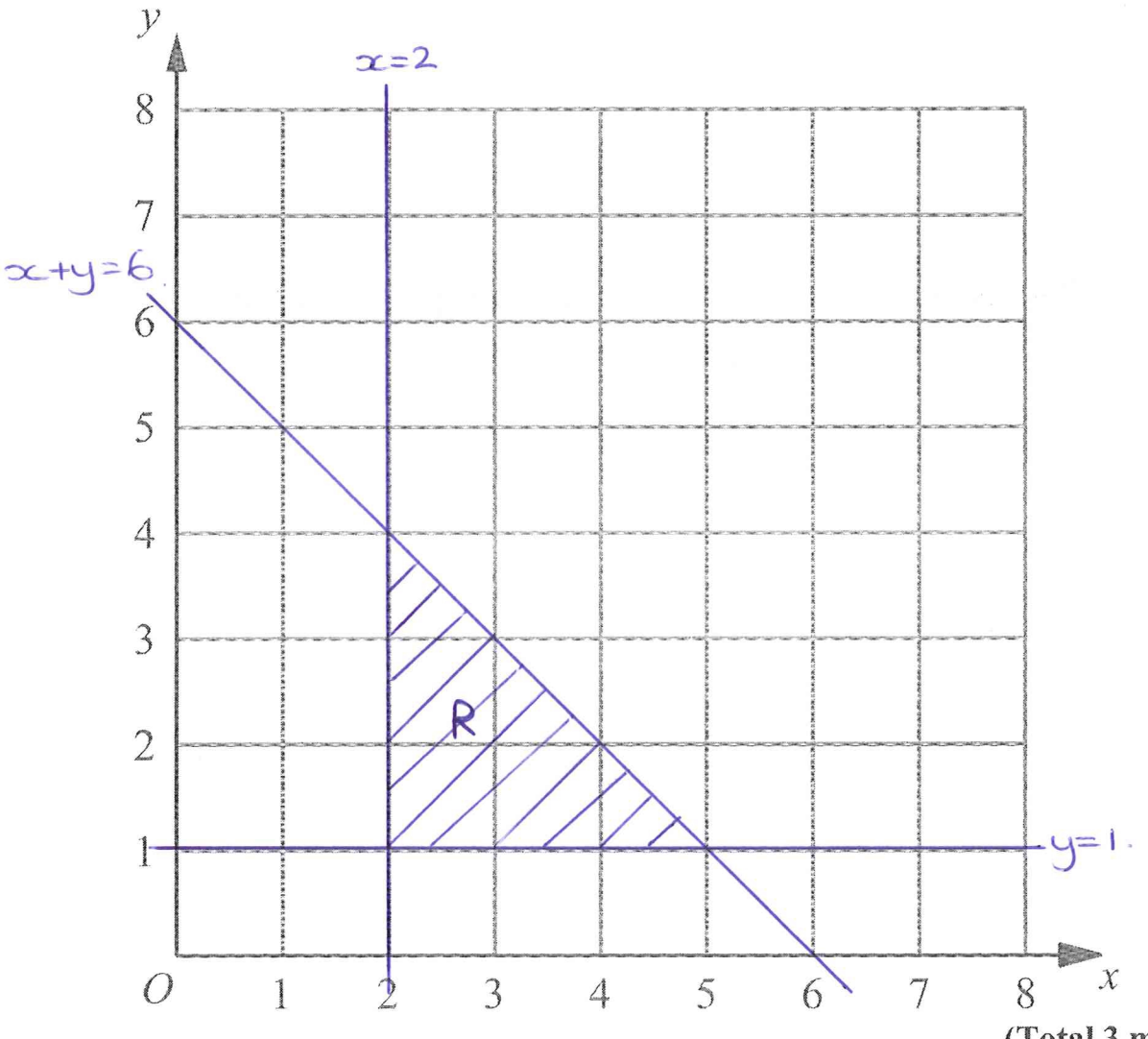
(Total for Question 19 = 4 marks)

2) 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**.



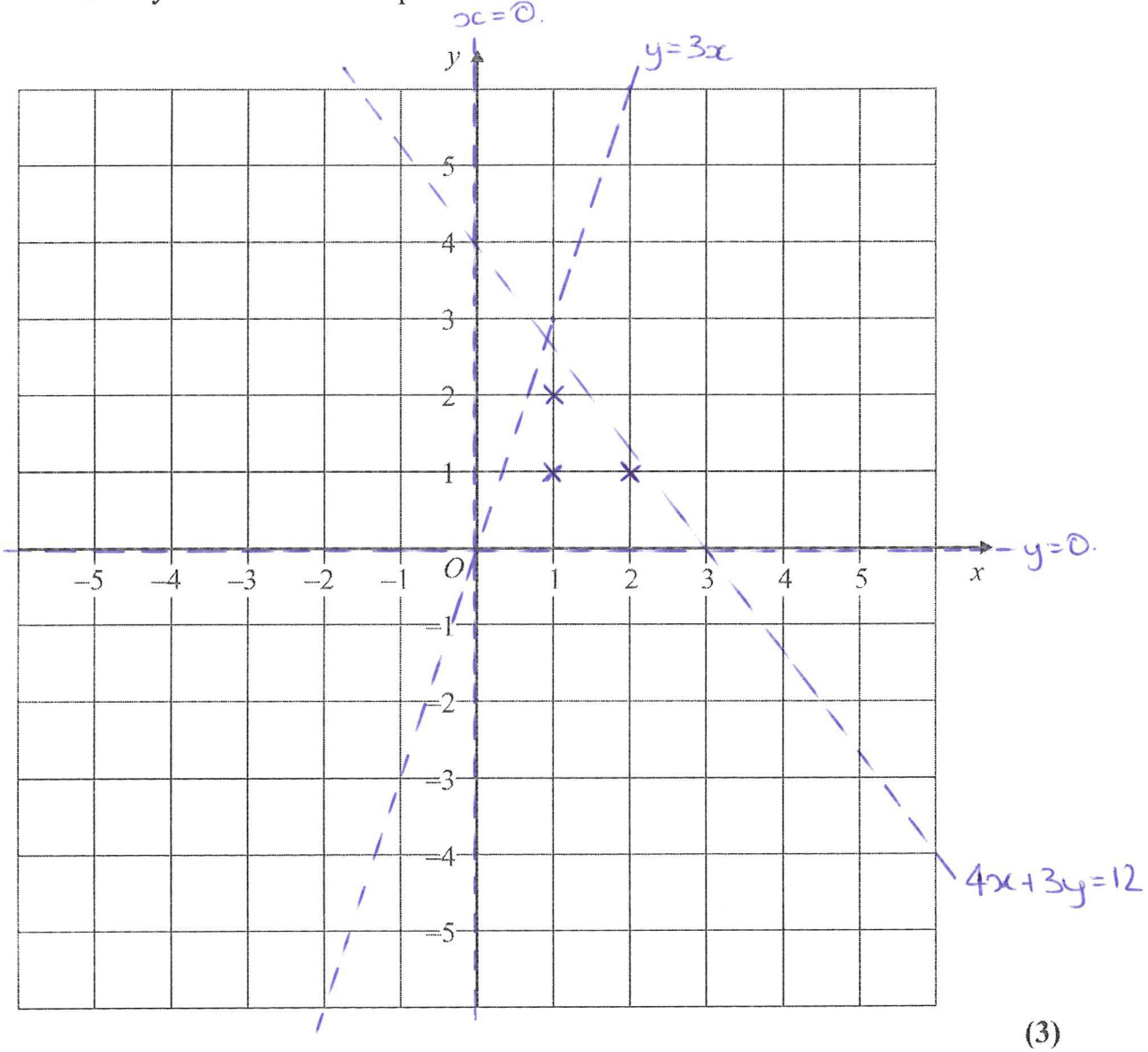
(Total 3 marks)

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 (×), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

3) Composite functions: Easier

Q1. The functions f and g are such that

$$f(x) = 2x + 3 \text{ and } g(x) = \frac{x}{4} - 2$$

(a) Find the value of f(8)

F(8) = 2(8) + 3
=16 + 3
= 19

19

.....

(1)

(b) Find gf(*4*)

f(4) = 2(4) + 3 = 11

$$g(11) = \frac{11}{4} - 2 = \frac{3}{4}$$

$\frac{3}{4}$

.....

(2)

(b) Show that

$$fg(x) = \frac{1}{2}x - 1$$

$$fg(x) = 2\left(\frac{x}{4} - 2\right) + 3$$

$$fg(x) = \frac{2x}{4} - 4 + 3$$

$$fg(x) = \frac{1}{2}x - 1$$

(2)

(Total for question = 5 marks)

3) Composite functions: Medium

2. The functions f and g are such that

$$f(x) = \frac{2}{x+3} \text{ and } g(x) = 3(x-2)$$

a) Show that $gf(5) = -\frac{21}{4}$

$$f(5) = \frac{2}{5+3} = \frac{1}{4}$$

$$g\left(\frac{1}{4}\right) = 3\left(\frac{1}{4} - 2\right)$$

$$g\left(\frac{1}{4}\right) = \frac{3}{4} - 6$$

$$g\left(\frac{1}{4}\right) = -\frac{21}{4}$$

.....

(2)

b) Show that fg(x) can be written in the form

$$\frac{2}{k(x-1)}$$

where k is an integer to be found.

$$fg(x) = \frac{2}{3(x-2)+3}$$

$$fg(x) = \frac{2}{3x-6+3}$$

$$fg(x) = \frac{2}{3x-3}$$

$$fg(x) = \frac{2}{3(x-1)} \quad , \quad k = 3$$

(3)

c) Find an expression for gg(x)

$$gg(x) = 3(3x-6) - 6$$

$$gg(x) = 9x - 24$$

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

(Total for question = 7 marks)

3) Composite functions: Harder

3. The functions f, g and h are such that

$$f(x) = 2x + 2 \quad , \quad g(x) = \frac{a}{x} \text{ and } h(x) = 3x^2 \quad for\ x > 0$$

a) Find hgf(3) in terms of a

$$f(3) = 2(3) + 2 = 8$$
$$g(8) = \frac{a}{8}$$
$$h\left(\frac{a}{8}\right) = 3\left(\frac{a}{8}\right)^2 = \frac{3a^2}{64}$$

$$hgf(3) = \frac{3a^2}{64}$$

.....

(2)

b) Given that $fg(10) = \frac{14}{5}$ find the value of a

$$2\left(\frac{a}{10}\right) + 2 = \frac{14}{5}$$

$$\frac{2a}{10} = \frac{4}{5}$$

$$a = 4$$

.....

(2)

(Total for question = 4 marks)

4. The functions f, g are such that

$$f(x) = 3x + a \text{ and } g(x) = 6x - b$$

Given that fg(2) = 19 and gf(3) = 48, find the values of a and b.

From fg(2) =19

$3(6(2) - b) + a = 19$

$36 - 3b + a = 19$

$a - 3b = -17$

From gf(3) =54

$6(3(3) + a) - b = 54$

$54 + 6a - b = 54$

$6a - b = 0$

Solving simutaneously

$6a - 18b = -102$

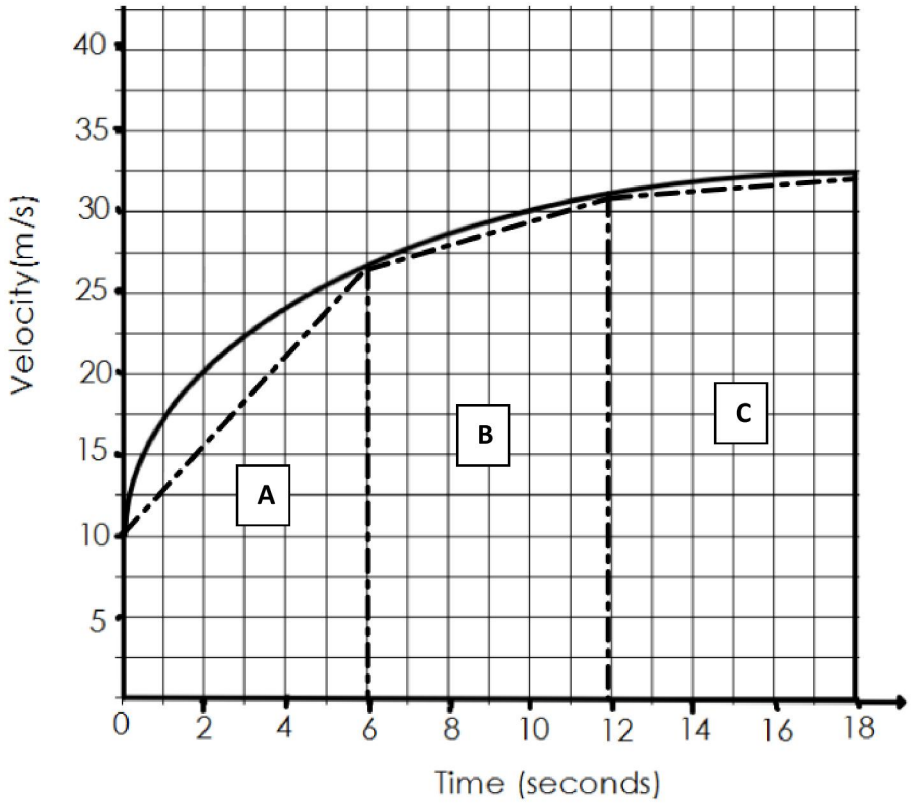
-17b = -102

b= -6, a =1

.....(5) **(Total for question = 5 marks)**

4) Areas under velocity time graph: Easier

1) The graph below shows a velocity time graph



1) a) By estimating the area under the graph using the three trapezia shown by dashed lines, work out the distance travelled in the 18 seconds.

Area of trapezium $= \frac{1}{2}(a + b)h$

Area of trapezium A $= \frac{1}{2}(10 + 27)(6) = 111$

Area of trapezium B $= \frac{1}{2}(27 + 31)(6) = 174$

Area of trapezium A $= \frac{1}{2}(31 + 32.5)(6) = 190.5$

Total Area under graph $= 111 + 174 + 190.5 = 475.5$

475.5metres travelled in 18 seconds

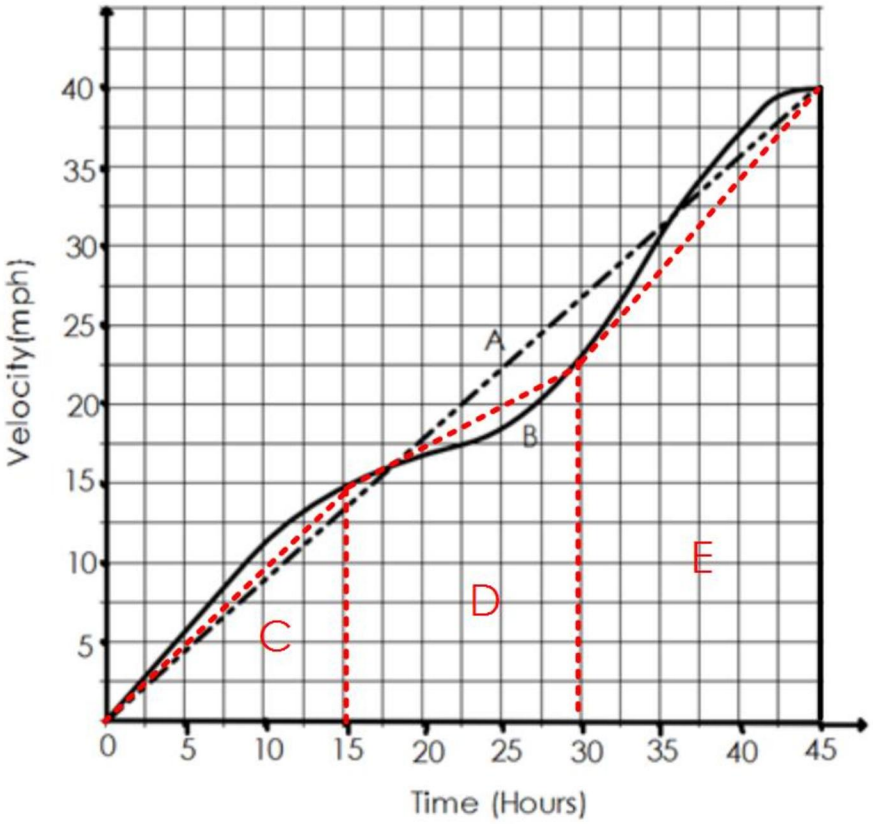
b) By considering the diagram, is your estimate for the distance an overestimate or underestimate? Explain your reasoning.

As each of the trapezia are a smaller area than the actual area, the estimate is an underestimate

(4 marks)

4) Areas under velocity time graph: Medium

2) The graph below shows a velocity time graph for two birds, A and B, over a long distance.



Which bird travels further in the 45 hours? You must show your working. Use 3 equal strips for your estimate for bird B. Comment on the reliability of your answer.

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(4 marks)

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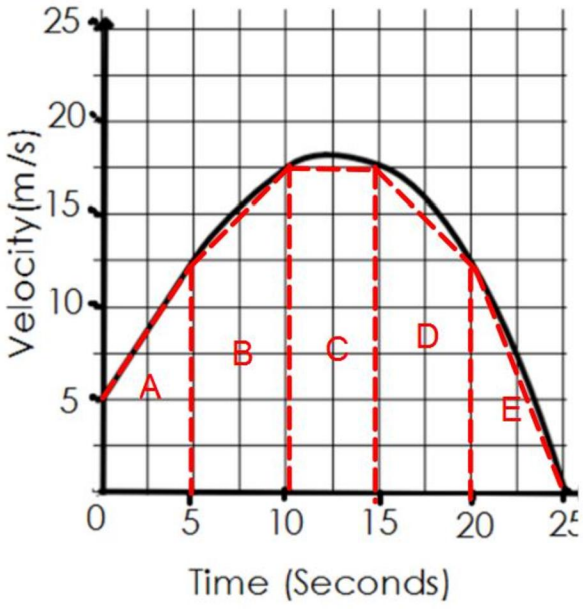
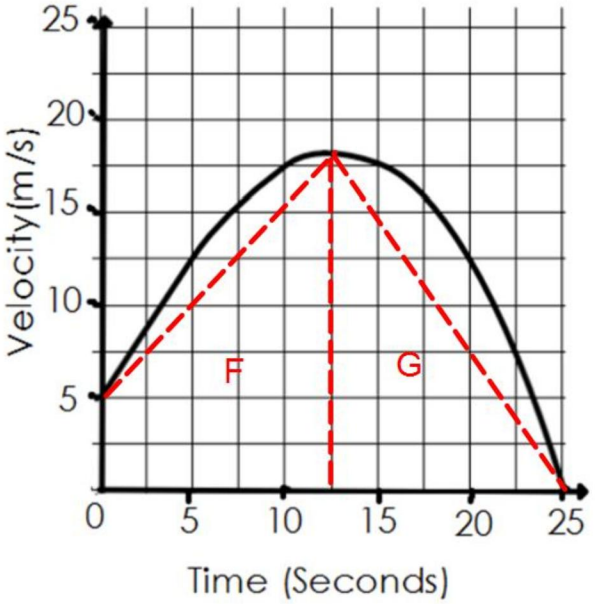


Simone's method



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Area =256.25 distance 256.25metres

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(4 marks)

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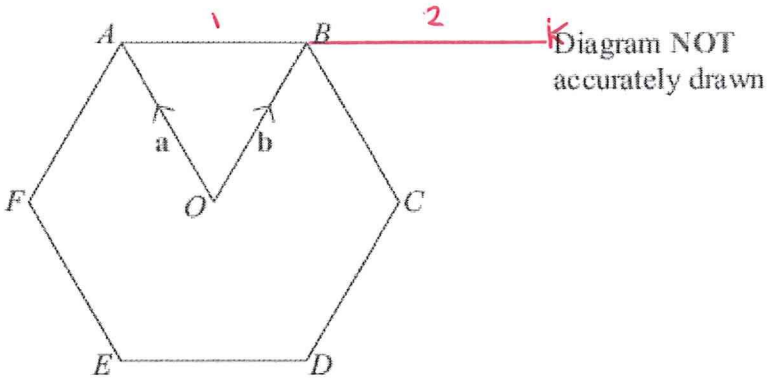

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$-a+b$

(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 **a** and **b**.
Give your answer in its simplest form.

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

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

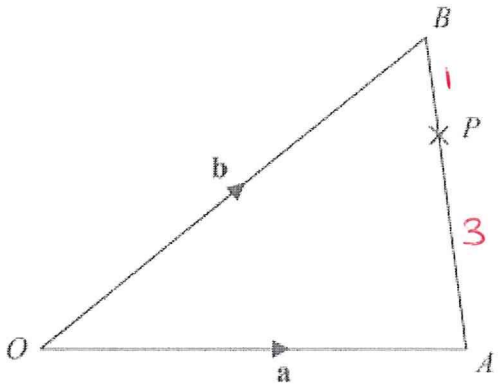
$-a+2b$

(3)

(4 marks)

5) Vectors: Medium

2.



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(a) Find $\overrightarrow{AB}$ in terms of **a** and **b**.

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.....

(1)

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(b) Find $\overrightarrow{OP}$ in terms of **a** and **b**.
Give your answer in its simplest form.

$\overrightarrow{AP} = \frac{3}{4}(-a+b)$

$\overrightarrow{AP} = -\frac{3}{4}a + \frac{3}{4}b$

$\overrightarrow{OP} = a - \frac{3}{4}a + \frac{3}{4}b$

$= \frac{1}{4}a + \frac{3}{4}b$

$\frac{1}{4}a + \frac{3}{4}b$

.....

(3)

(4 marks)

5) Vectors: Harder

6.

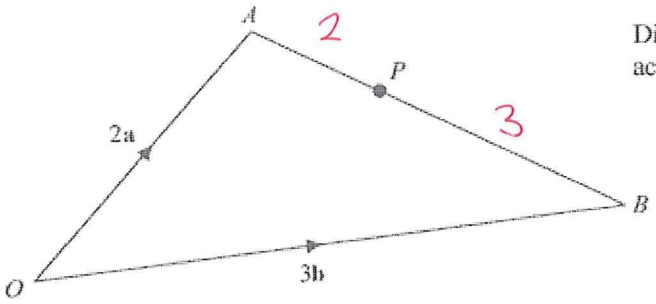

Diagram NOT accurately drawn

OAB is a triangle.

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

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

(*a*) Find *AB* in terms of **a** and **b**.

$\overrightarrow{AB}$ = $-2a+3b$

(1)

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

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

$\overrightarrow{AP} = \frac{2}{5}(-2a+3b)$

$= -\frac{4}{5}a + \frac{6}{5}b$

$\overrightarrow{OP} = 2a - \frac{4}{5}a + \frac{6}{5}b$

$= \frac{6}{5}a + \frac{6}{5}b$

$= \frac{6}{5}(a+b)$

(3)

(4 marks)

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

THOMPSON Angus

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	19 from 28	2 from 3	12 from 20	1 from 1	4 from 4	0 from 0
A02 and 3	32 from 52	11 from 12	1 from 9	4 from 13	14 from 16	2 from 2
Total	51 from 80	13 from 15	13 from 29	5 from 14	18 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Simple Bounds. Mathswatch Clip: 132

Topic 2: Venn diagrams.. Mathswatch Clip: 127

Topic 3: Product of Prime Factors, HCF, LCM. MW: 78

Topic 4: Cumulative Frequency. Mathswatch Clip: 186

Topic 5: Inequalities Regions. Mathswatch Clip: 198

1) 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)

1) 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?

Lower bound A+B 4.15 + 12.5 =16.65
Upper bound A+B 4.25 +13.5 = 17.75

$16.65 \leq A + B < 17.75$

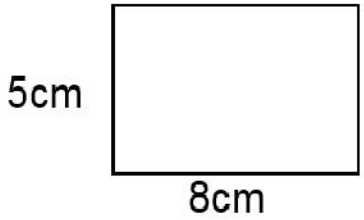
_____ cm

(1)

(4 Marks)

1) 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 $2\times4.5 + 2\times7.5 = 9 + 15 = 24cm$

$24cm$

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 $2\times5.5 + 2\times8.5 = 11 + 17 = 28cm$

$28cm$

(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 $100\times5.5 = 550g$

One kilogram = 1000 grams so

$$550g = 0.55kg$$

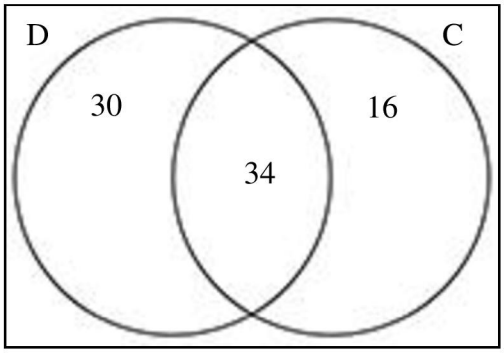
0.55 kg **(3 marks)**

2) Venn diagrams.: Easier

Solution for Question 1:

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

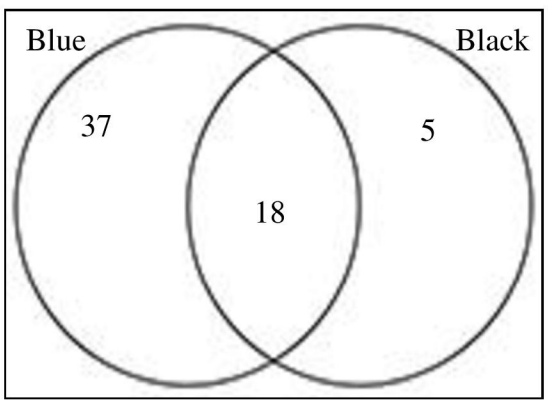
Number of people that owned cats only: $80 - 34 - 30 = 16$



Solution for Question 2:

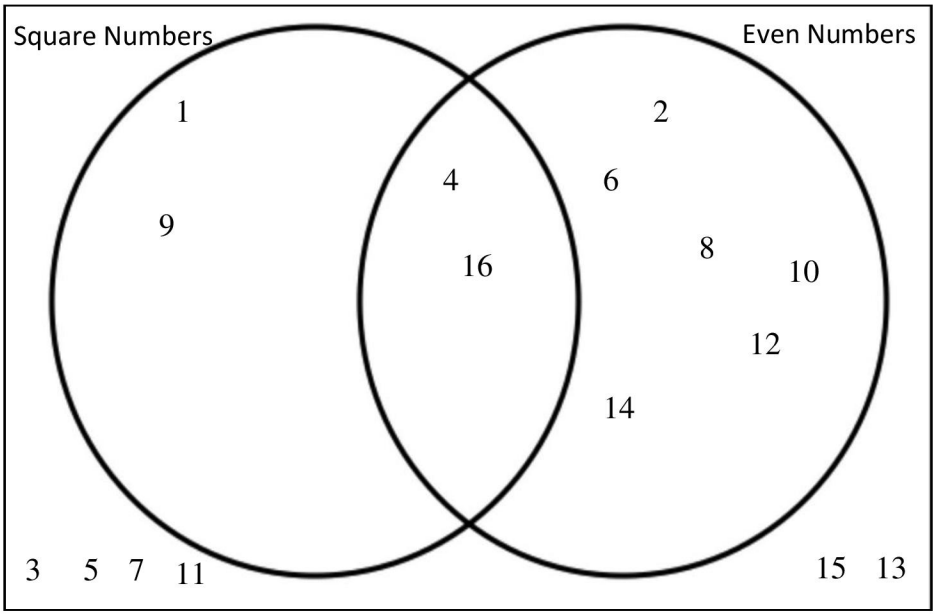
a) Number of people that only had a black pen:
$60 - 37 - 18 = 5$

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 $B = \{9,15\}$

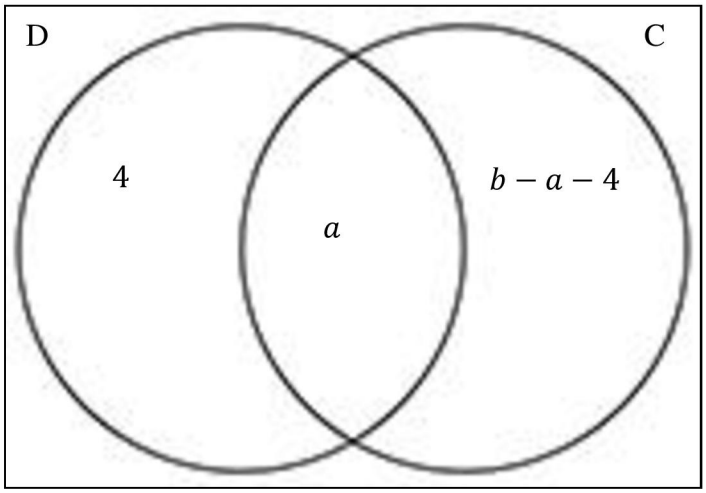
ii) $A \cup B = A$ or $B = \{3,5,6,12,18\}$

2) Venn diagrams.: Harder

Solution for Question 6:

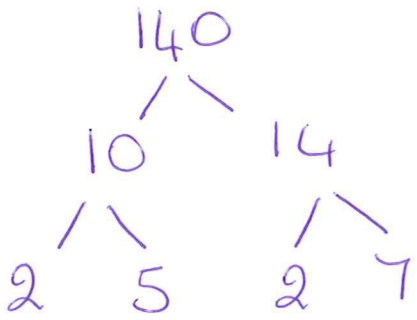
Number of people who replied with cats only:

$b - a - 4$



3) Product of Prime Factors, HCF, LCM: Easier

1. Write 140 as the product of its prime factors.



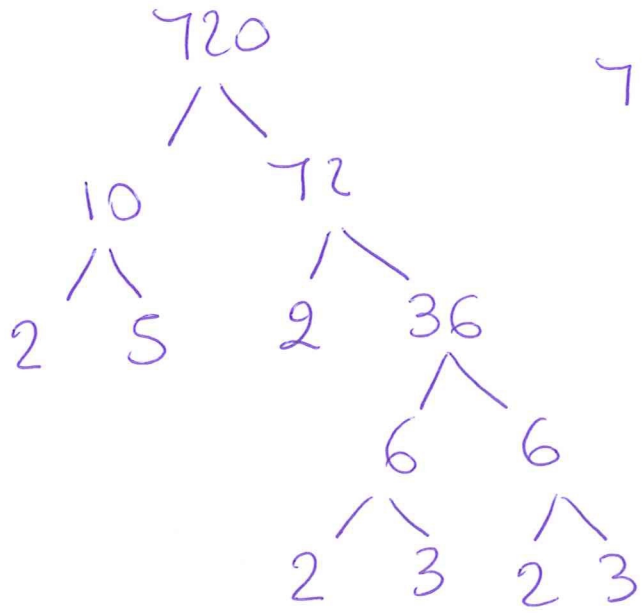
$140 = 2 \times 2 \times 5 \times 7$

$2^2 \times 5 \times 7$

.....

(2 marks)

2. Write 720 as a product of its prime factors.



$720 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$

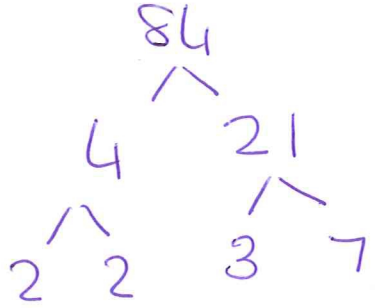
$2^4 \times 3^2 \times 5$

.....

(2 marks)

3) Product of Prime Factors, HCF, LCM: Medium

8. (a) Express 84 as a product of its prime factors.



$2^2 \times 3 \times 7$

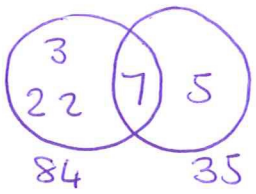
(3)

(b) Find the Highest Common Factor (HCF) of 84 and 35

$84 = 2^2 \times 3 \times 7$

$35 = \quad \times 7$

HCF



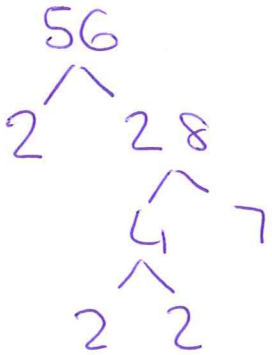
7

(2)

(5 marks)

---

9. (a) Express 56 as the product of its prime factors.



$56 = 2 \times 2 \times 2 \times 7$

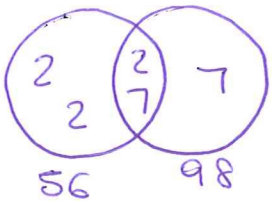
$2^3 \times 7$

(2)

(b) Find the Lowest Common Multiple of 56 and 98

$56 = 2^3 \times 7$

$98 = 2 \times 7 \times 7$



LCM $= 2 \times 2 \times 2 \times 7 \times 7$

$= 392$

392

(2)

(4 marks)

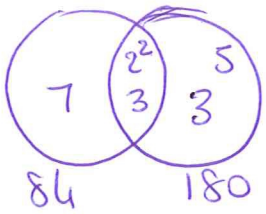
3) Product of Prime Factors, HCF, LCM: Harder

10. Find the Highest Common Factor (HCF) of 84 and 180

$84 = 2^2 \times 3 \times 7$

$180 = 2^2 \times 3^2 \times 5$

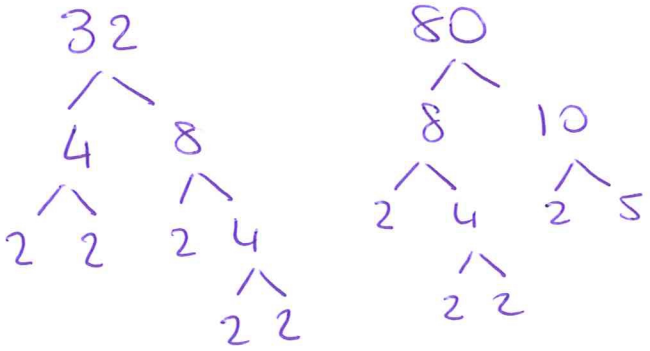
$HCF = 2^2 \times 3 = 12$



12

(3 marks)

11. Find the Highest Common Factor (HCF) of 32 and 80



$HCF = 2^4 = 16$

$32 = 2^5$

$80 = 2^4 \times 5$

$32 = 2 \times 2 \times 2 \times 2 \times 2$

$80 = 2 \times 2 \times 2 \times 2 \times 5$

16

(3 marks)

4) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

(a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	12
$20 < A \leq 40$	27
$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

..... 41 ..... years

(2)

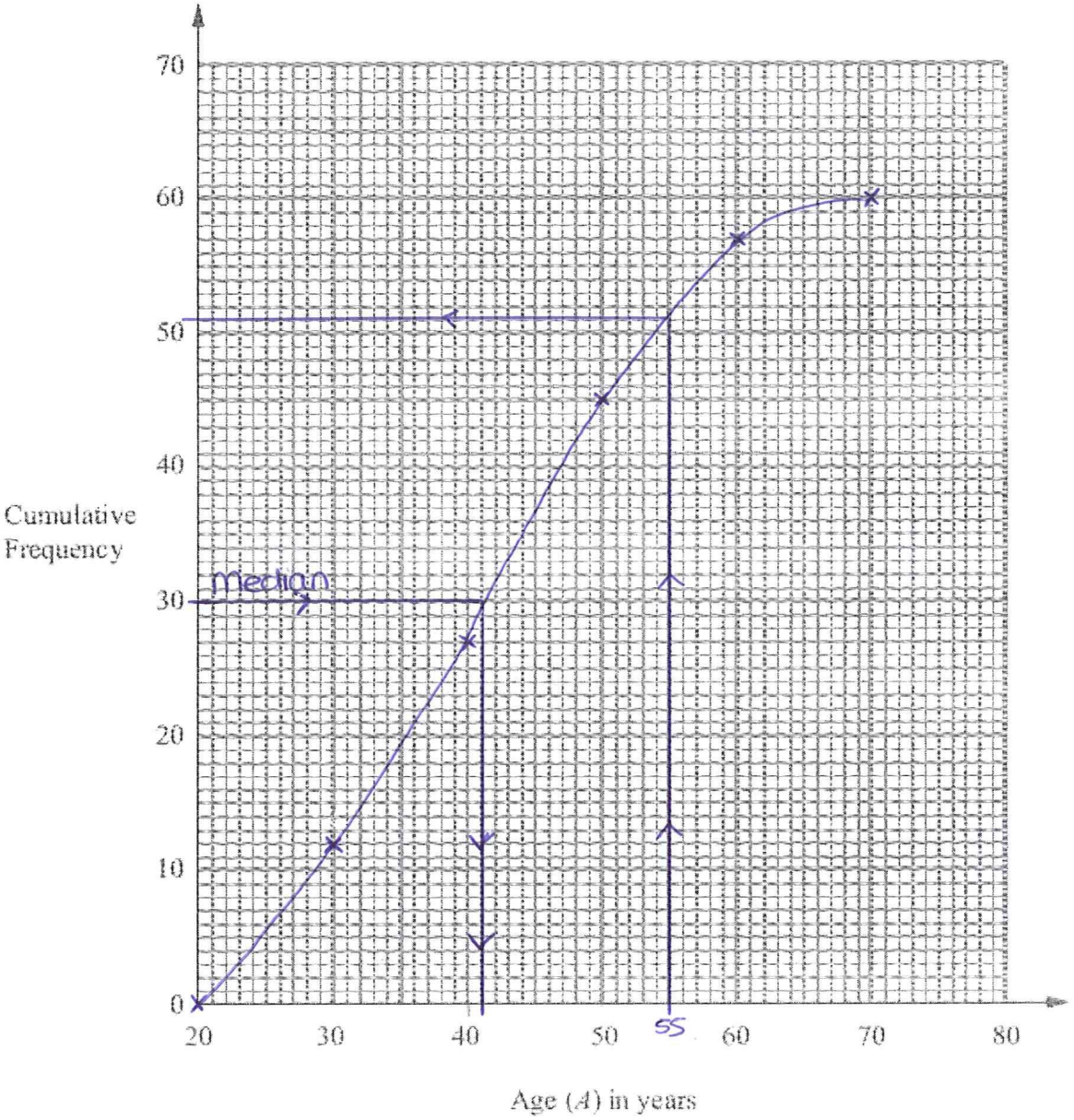
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so $60 - 51 = 9$ are older.

..... 9 .....

(2)

4) Cumulative Frequency: Medium



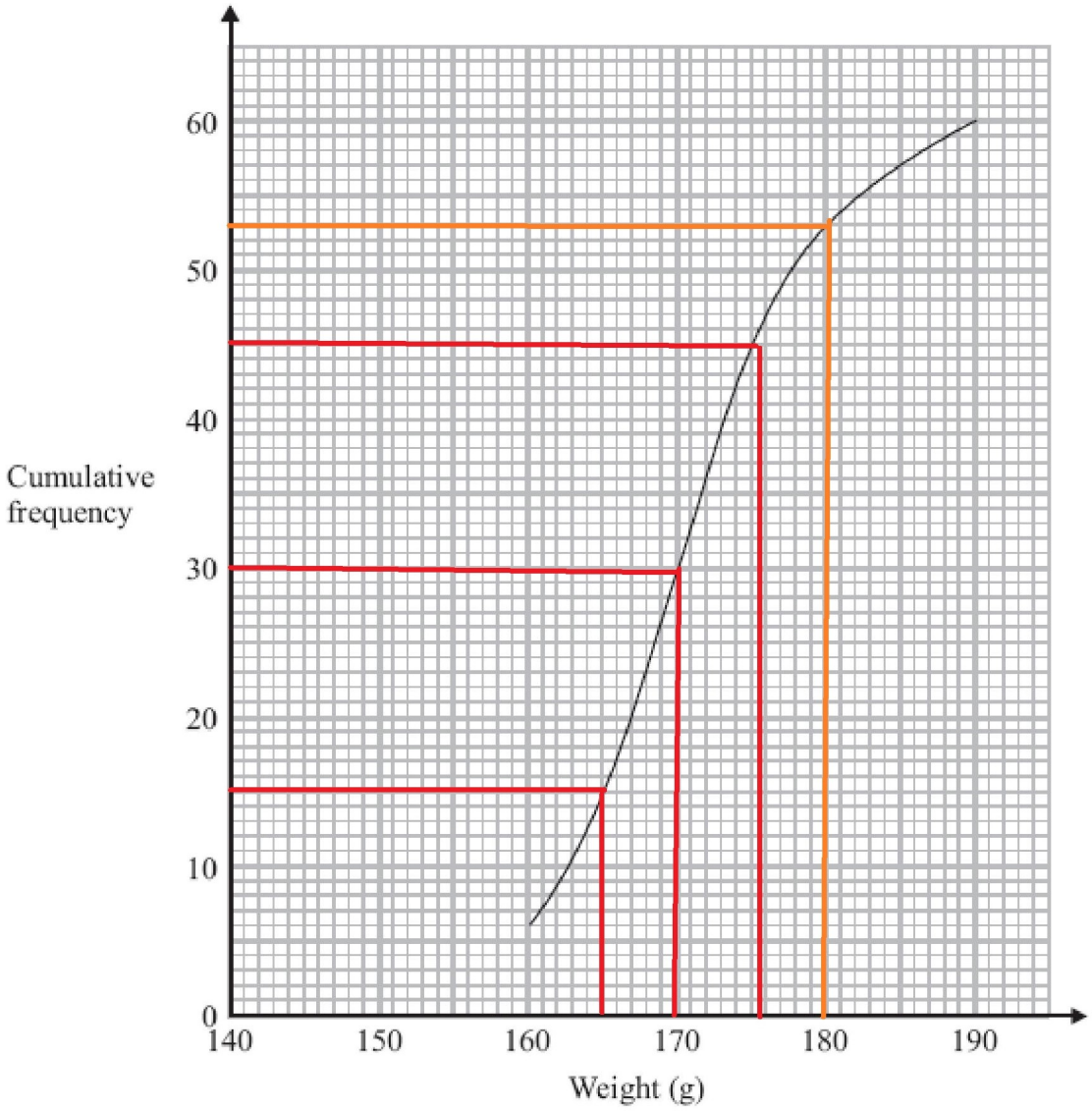
(7 marks)

4) Cumulative Frequency: Harder

4. Harry grows tomatoes.
This year he put his tomato plants into two groups, group A and group B.

Harry gave fertiliser to the tomato plants in group A.
He did not give fertiliser to the tomato plants in group B.

Harry weighed 60 tomatoes from group A.
The cumulative frequency graph shows some information about these weights.



ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

ii) The Upper Quartile 175 .....

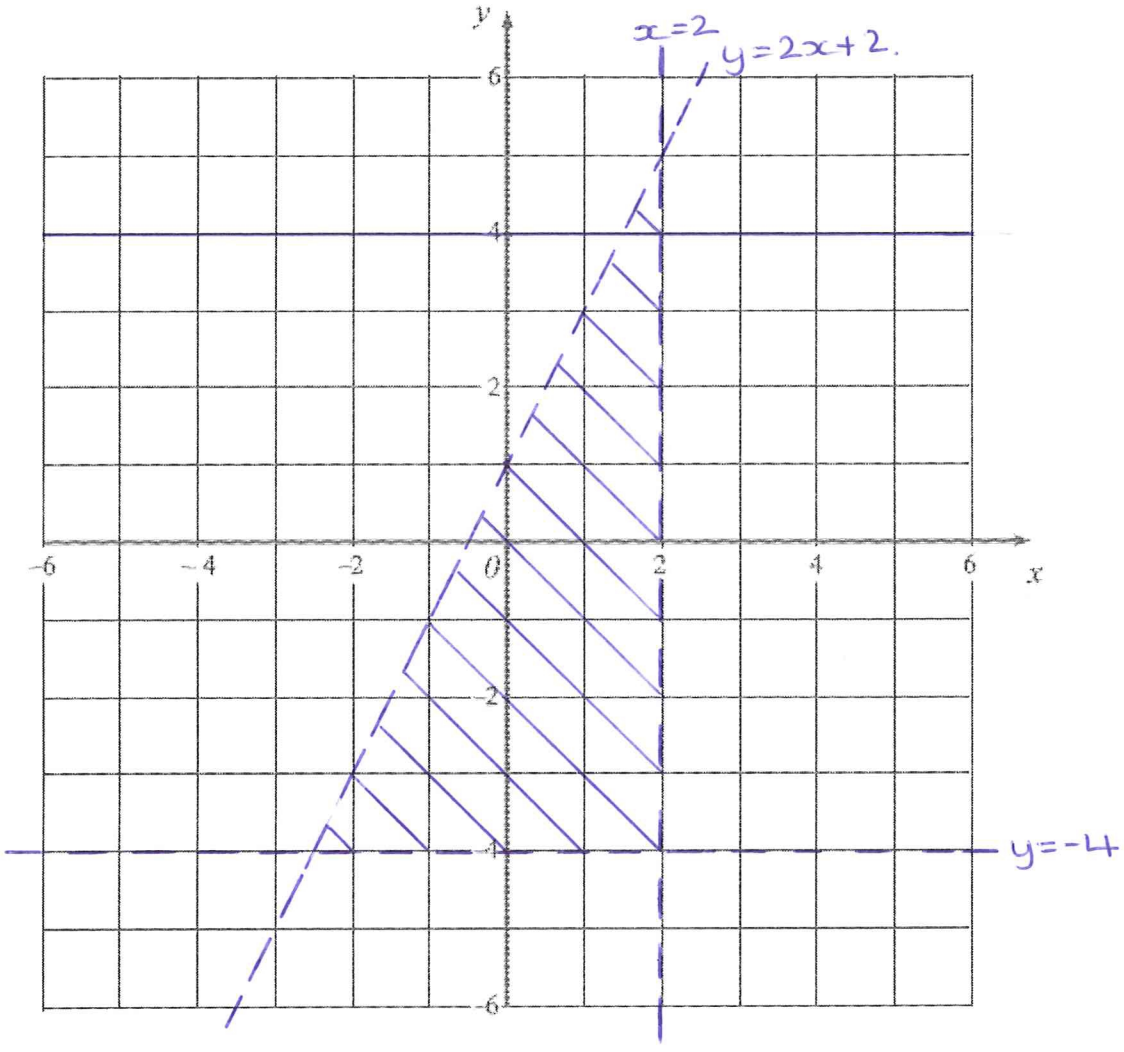
(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

5) Inequalities Regions: Easier

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

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

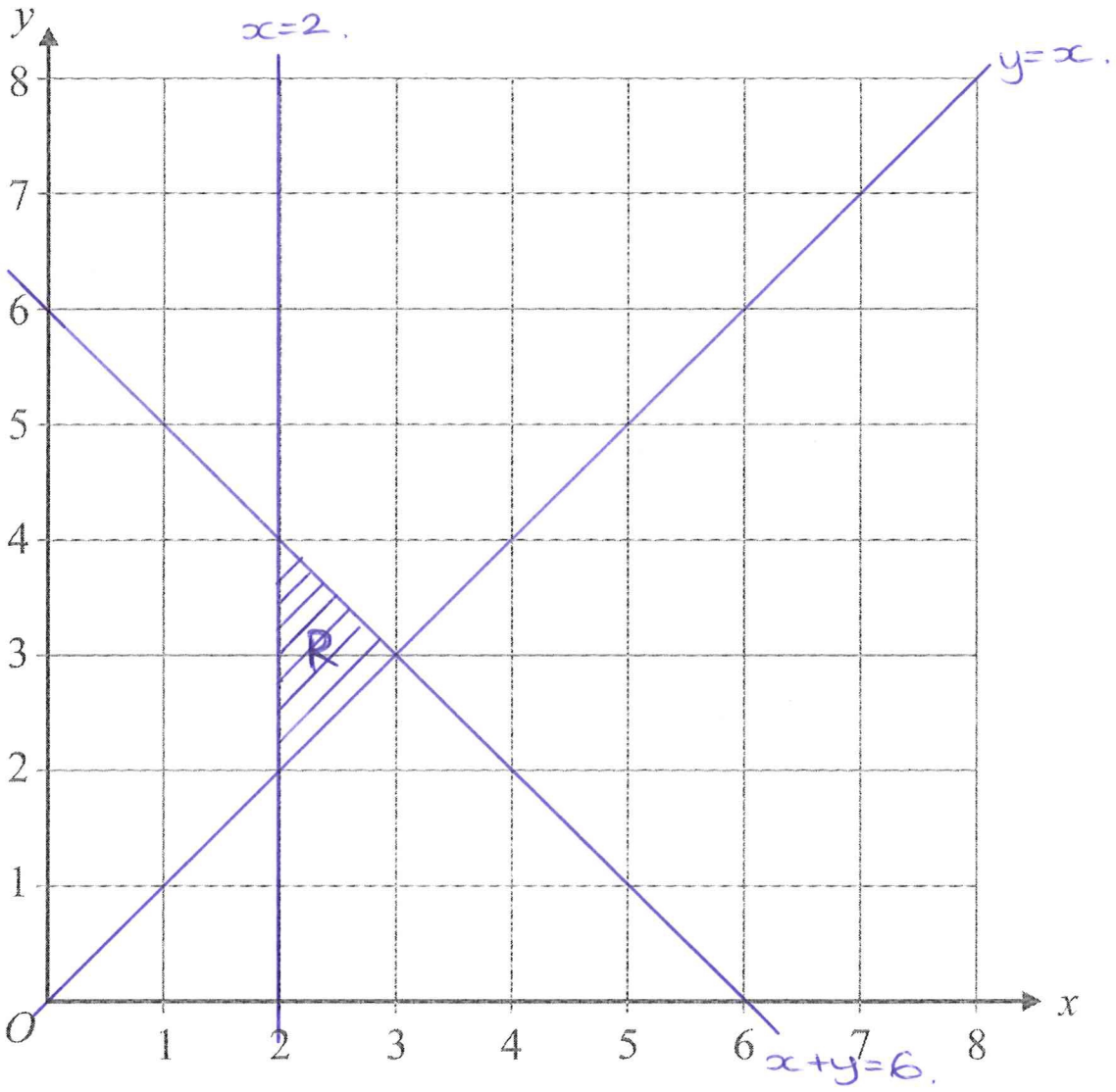


(Total for Question 19 = 4 marks)

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

$$x \geq 2 \qquad y \geq x \qquad x + y \leq 6$$



(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)

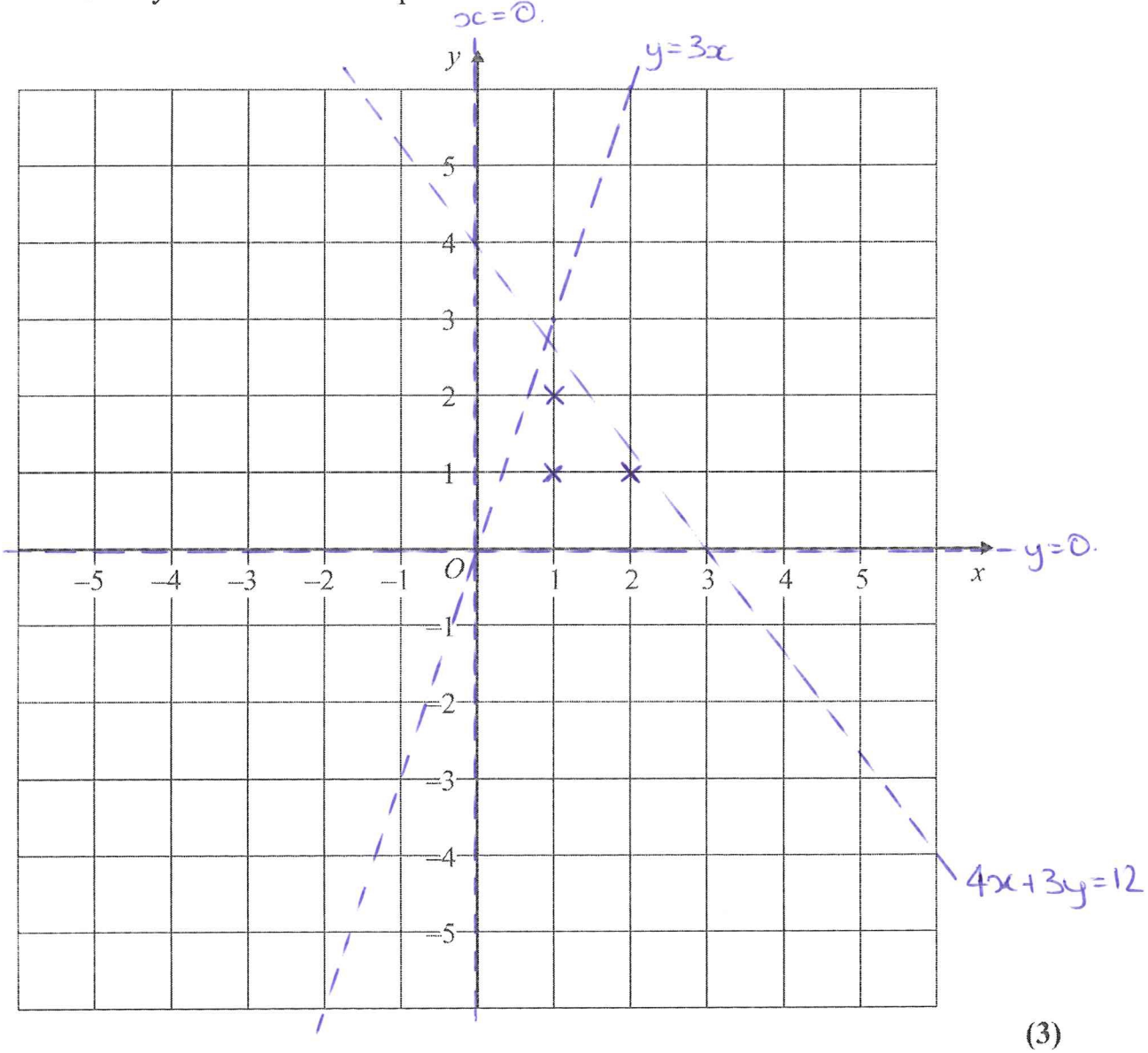
(Total 5 marks)

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 (×), each of the **three** points which satisfy **all** these four inequalities.



(3)

(Total 5 marks)

THOMPSON Daniel

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
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A02 and 3	47 from 52	10 from 12	8 from 9	13 from 13	14 from 16	2 from 2
Total	73 from 80	13 from 15	26 from 29	14 from 14	18 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Product of Prime Factors, HCF, LCM. MW: 78

Topic 2: Composite functions. Mathswatch Clip: 215

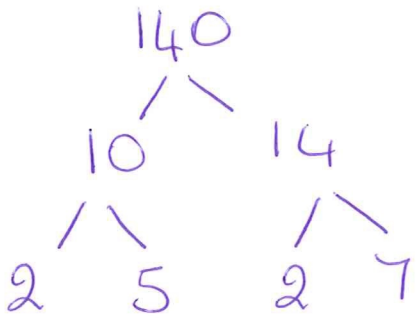
Topic 3: Areas under velocity time graph. MW: 216

Topic 4: Vectors. Mathswatch Clip: 219

Topic 5: Transformations of Functions. Mathswatch Clip: 196

1) Product of Prime Factors, HCF, LCM: Easier

1. Write 140 as the product of its prime factors.



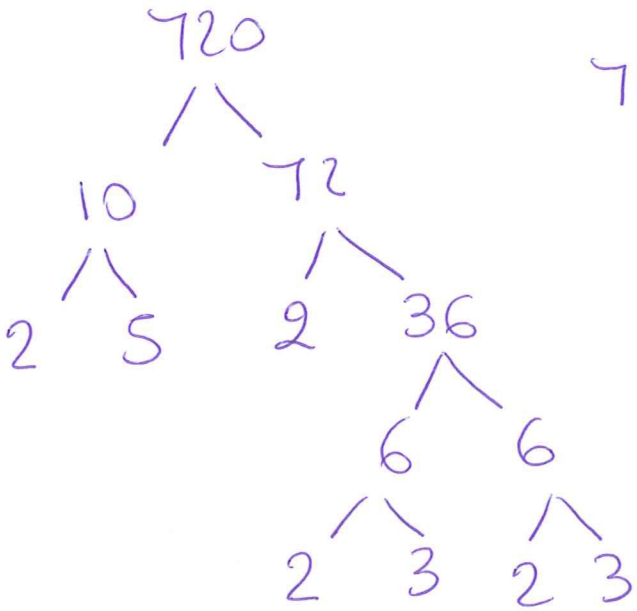
$140 = 2 \times 2 \times 5 \times 7$

$2^2 \times 5 \times 7$

.....

(2 marks)

2. Write 720 as a product of its prime factors.



$720 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$

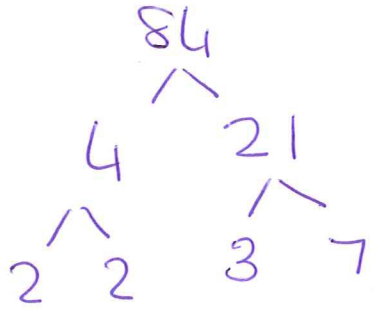
$2^4 \times 3^2 \times 5$

.....

(2 marks)

1) Product of Prime Factors, HCF, LCM: Medium

8. (a) Express 84 as a product of its prime factors.



$2^2 \times 3 \times 7$

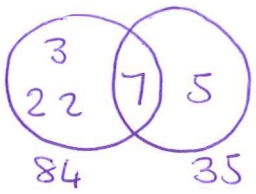
(3)

(b) Find the Highest Common Factor (HCF) of 84 and 35

$84 = 2^2 \times 3 \times 7$

$35 = \quad \times 7$

HCF



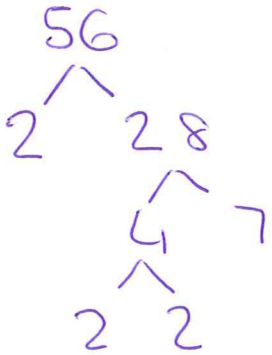
7

(2)

(5 marks)

---

9. (a) Express 56 as the product of its prime factors.



$56 = 2 \times 2 \times 2 \times 7$

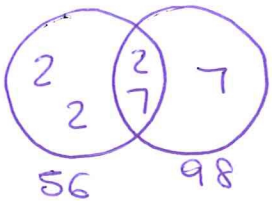
$2^3 \times 7$

(2)

(b) Find the Lowest Common Multiple of 56 and 98

$56 = 2^3 \times 7$

$98 = 2 \times 7 \times 7$



$LCM = 2 \times 2 \times 2 \times 7 \times 7$

$= 392$

392

(2)

(4 marks)

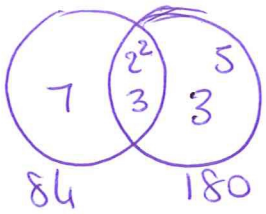
1) Product of Prime Factors, HCF, LCM: Harder

10. Find the Highest Common Factor (HCF) of 84 and 180

$84 = 2^2 \times 3 \times 7$

$180 = 2^2 \times 3^2 \times 5$

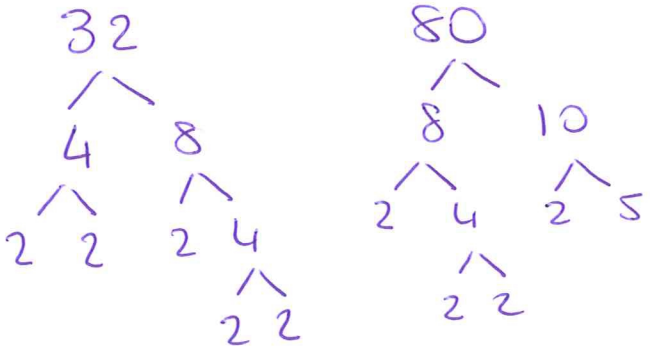
$HCF = 2^2 \times 3 = 12$



12

(3 marks)

11. Find the Highest Common Factor (HCF) of 32 and 80



$HCF = 2^4 = 16$

$32 = 2^5$

$80 = 2^4 \times 5$

$32 = 2 \times 2 \times 2 \times 2 \times 2$

$80 = 2 \times 2 \times 2 \times 2 \times 5$

16

(3 marks)

2) Composite functions: Easier

Q1. The functions f and g are such that

$$f(x) = 2x + 3 \text{ and } g(x) = \frac{x}{4} - 2$$

(a) Find the value of f(8)

F(8) = 2(8) + 3
=16 + 3
= 19

19

.....

(1)

(b) Find gf(*4*)

f(4) = 2(4) + 3 = 11

$$g(11) = \frac{11}{4} - 2 = \frac{3}{4}$$

$\frac{3}{4}$

.....

(2)

(b) Show that

$$fg(x) = \frac{1}{2}x - 1$$

$$fg(x) = 2\left(\frac{x}{4} - 2\right) + 3$$

$$fg(x) = \frac{2x}{4} - 4 + 3$$

$$fg(x) = \frac{1}{2}x - 1$$

(2)

(Total for question = 5 marks)

2) Composite functions: Medium

2. The functions f and g are such that

$$f(x) = \frac{2}{x+3} \text{ and } g(x) = 3(x-2)$$

a) Show that $gf(5) = -\frac{21}{4}$

$$f(5) = \frac{2}{5+3} = \frac{1}{4}$$

$$g\left(\frac{1}{4}\right) = 3\left(\frac{1}{4} - 2\right)$$

$$g\left(\frac{1}{4}\right) = \frac{3}{4} - 6$$

$$g\left(\frac{1}{4}\right) = -\frac{21}{4}$$

.....

(2)

b) Show that fg(x) can be written in the form

$$\frac{2}{k(x-1)}$$

where k is an integer to be found.

$$fg(x) = \frac{2}{3(x-2)+3}$$

$$fg(x) = \frac{2}{3x-6+3}$$

$$fg(x) = \frac{2}{3x-3}$$

$$fg(x) = \frac{2}{3(x-1)} \quad , \quad k = 3$$

(3)

c) Find an expression for gg(x)

$$gg(x) = 3(3x-6) - 6$$

$$gg(x) = 9x - 24$$

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

(Total for question = 7 marks)

2) Composite functions: Harder

3. The functions f, g and h are such that

$$f(x) = 2x + 2 \quad , \quad g(x) = \frac{a}{x} \text{ and } h(x) = 3x^2 \quad for\ x > 0$$

a) Find hgf(3) in terms of a

$$f(3) = 2(3) + 2 = 8$$
$$g(8) = \frac{a}{8}$$
$$h\left(\frac{a}{8}\right) = 3\left(\frac{a}{8}\right)^2 = \frac{3a^2}{64}$$

$$hgf(3) = \frac{3a^2}{64}$$

.....

(2)

b) Given that $fg(10) = \frac{14}{5}$ find the value of a

$$2\left(\frac{a}{10}\right) + 2 = \frac{14}{5}$$

$$\frac{2a}{10} = \frac{4}{5}$$

$$a = 4$$

.....

(2)

(Total for question = 4 marks)

4. The functions f, g are such that

$$f(x) = 3x + a \text{ and } g(x) = 6x - b$$

Given that fg(2) = 19 and gf(3) = 48, find the values of a and b.

From fg(2) =19

$3(6(2) - b) + a = 19$

$36 - 3b + a = 19$

$a - 3b = -17$

From gf(3) =54

$6(3(3) + a) - b = 54$

$54 + 6a - b = 54$

$6a - b = 0$

Solving simutaneously

$6a - 18b = -102$

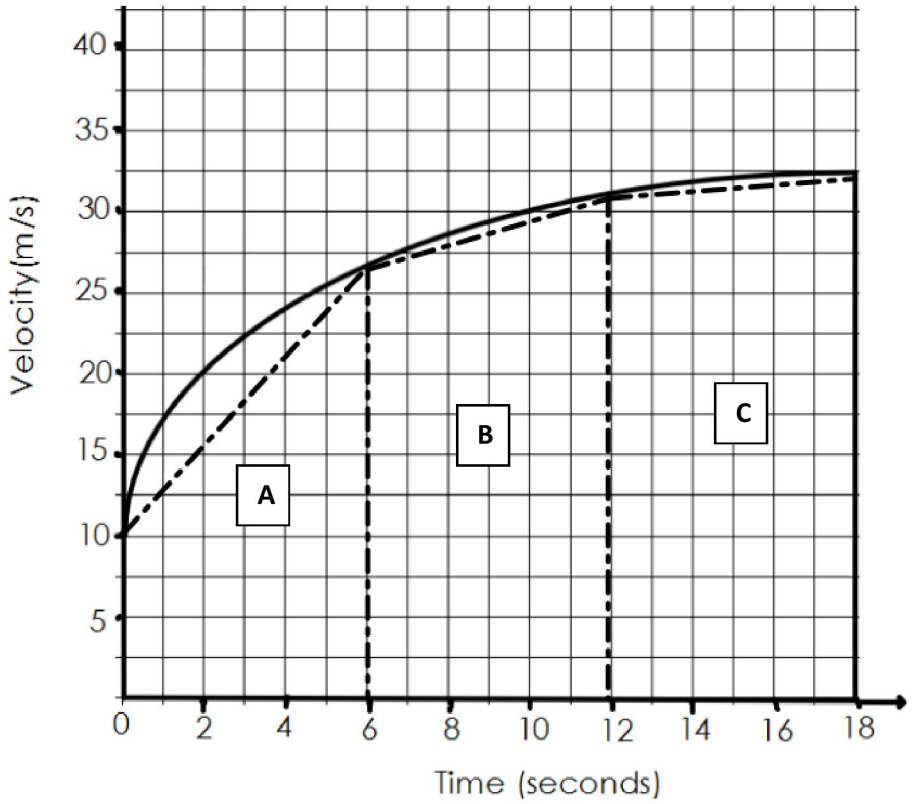
-17b = -102

b= -6, a =1

.....(5) **(Total for question = 5 marks)**

3) Areas under velocity time graph: Easier

1) The graph below shows a velocity time graph



1) a) By estimating the area under the graph using the three trapezia shown by dashed lines, work out the distance travelled in the 18 seconds.

Area of trapezium $= \frac{1}{2}(a + b)h$

Area of trapezium A $= \frac{1}{2}(10 + 27)(6) = 111$

Area of trapezium B $= \frac{1}{2}(27 + 31)(6) = 174$

Area of trapezium A $= \frac{1}{2}(31 + 32.5)(6) = 190.5$

Total Area under graph $= 111 + 174 + 190.5 = 475.5$

475.5metres travelled in 18 seconds

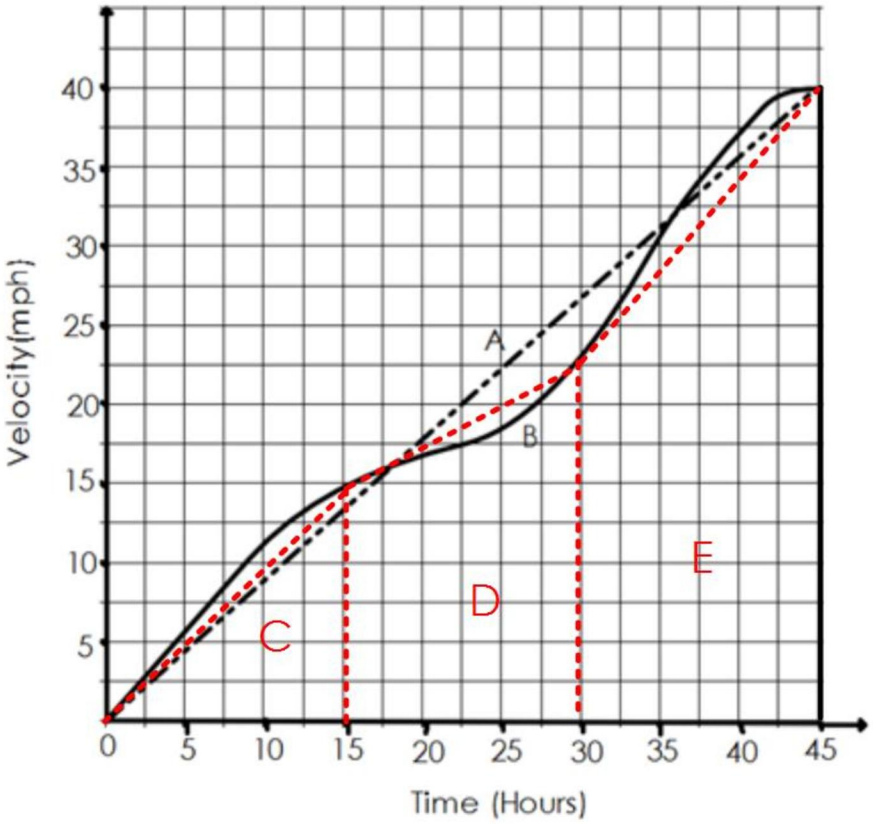
b) By considering the diagram, is your estimate for the distance an overestimate or underestimate? Explain your reasoning.

As each of the trapezia are a smaller area than the actual area, the estimate is an underestimate

(4 marks)

3) Areas under velocity time graph: Medium

2) The graph below shows a velocity time graph for two birds, A and B, over a long distance.



Which bird travels further in the 45 hours? You must show your working. Use 3 equal strips for your estimate for bird B. Comment on the reliability of your answer.

Distance travelled by bird A

Area of triangle $A = \frac{40 \times 45}{2} = 900$

Distance travelled by bird B

$$\text{Triangle C} = \frac{15 \times 15}{2} = 112.5$$

$$\text{Trapezium D} = \frac{1}{2}(15 + 22.5)(15) = 281.25$$

$$\text{Trapezium E} = \frac{1}{2}(22.5 + 40)(15) = 468.75$$

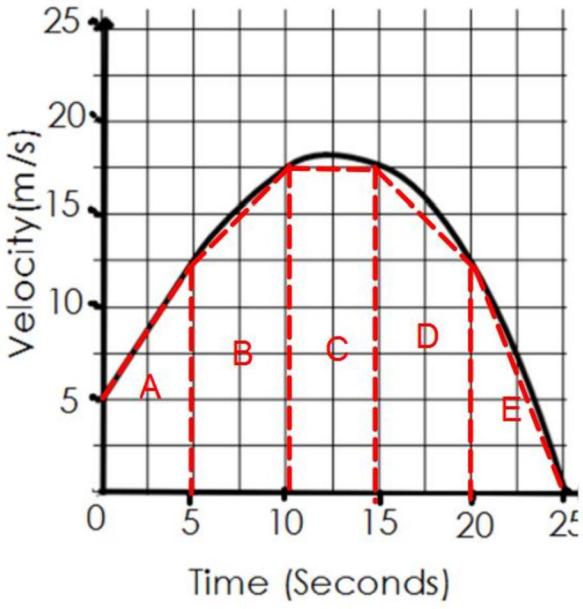
Total area under curve B is 862.5, so bird A travelled further. However, the area under the curve is an estimate and only uses three strips so not very reliable.

(4 marks)

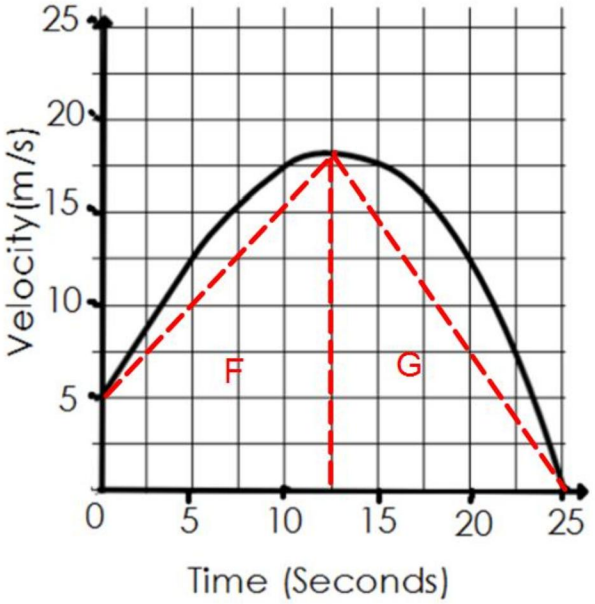
3) Areas under velocity time graph: Harder

3) The graph below shows a velocity-time graph for a drone.

Anna's method



Simone's method



a) Anna works out the distance travelled by using 3 trapezia, a rectangle and a triangle, all of equal width. Simone divides it into a triangle and a trapezium, both of equal width. Find an estimate of the distance using both Anna and Simone's method.

Anna's method :

Area $= \frac{1}{2}(5 + 12.5)(5) + \frac{1}{2}(12.5 + 17.5)(5) + (5 \times 17.5) + \frac{1}{2}(17.5 + 12.5)(5) + \frac{1}{2}(5 \times 12.5)$

Area = 43.75+ 75 + 87.5 + 75+ 31.25

Area = 312.5, distance 312.5 metres

Simone's method:

Area $= \frac{1}{2}(5 + 18)(12.5) + \frac{1}{2}(18 \times 12.5)$

Area = 143.75+ 112.5

Area =256.25 distance 256.25metres

b) Comment on which method you think gives the most reliable results.
Anna's method is more reliable as she has used more strips. we can see from the graph Simone's method is a big underestimate.

(4 marks)

4) Vectors: Easier

1.

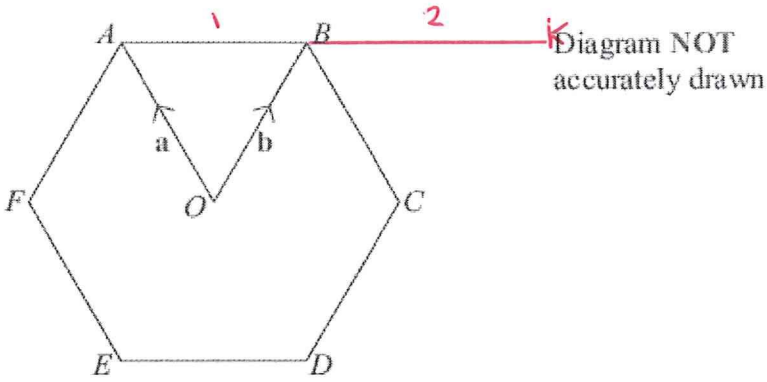


Diagram NOT accurately drawn

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 **a** and **b**.

$-a+b$

(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 **a** and **b**.
Give your answer in its simplest form.

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

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

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

$-a+2b$

(3)

(4 marks)

4) Vectors: Medium

6.

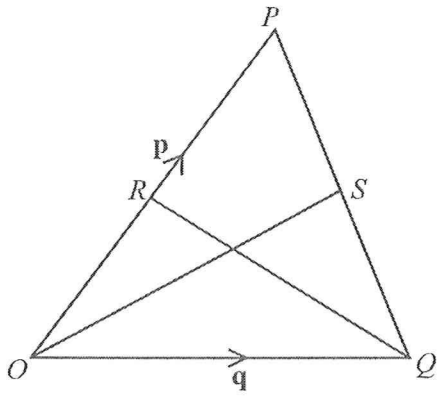


Diagram **NOT** accurately drawn

OPQ is a triangle.

R is the midpoint of OP.

S is the midpoint of PQ.

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

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

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

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

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

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

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

(ii) Show that RS is parallel to OQ.

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

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

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

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

(5 marks)

4) Vectors: Harder

6.

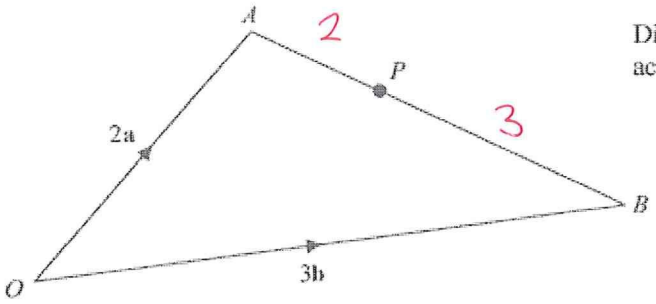


Diagram NOT accurately drawn

OAB is a triangle.

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

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

(*a*) Find *AB* in terms of **a** and **b**.

$\overrightarrow{AB}$ = $-2a+3b$

(1)

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

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

$\overrightarrow{AP} = \frac{2}{5}(-2a+3b)$

$= -\frac{4}{5}a + \frac{6}{5}b$

$\overrightarrow{OP} = 2a - \frac{4}{5}a + \frac{6}{5}b$

$= \frac{6}{5}a + \frac{6}{5}b$

$= \frac{6}{5}(a+b)$

(3)

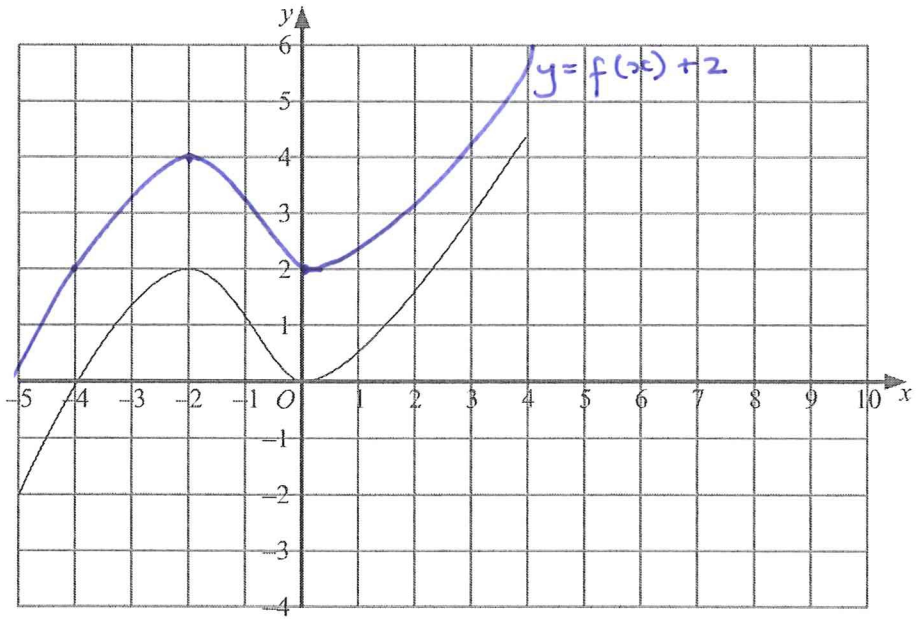
(4 marks)

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

5) Transformations of Functions: Easier

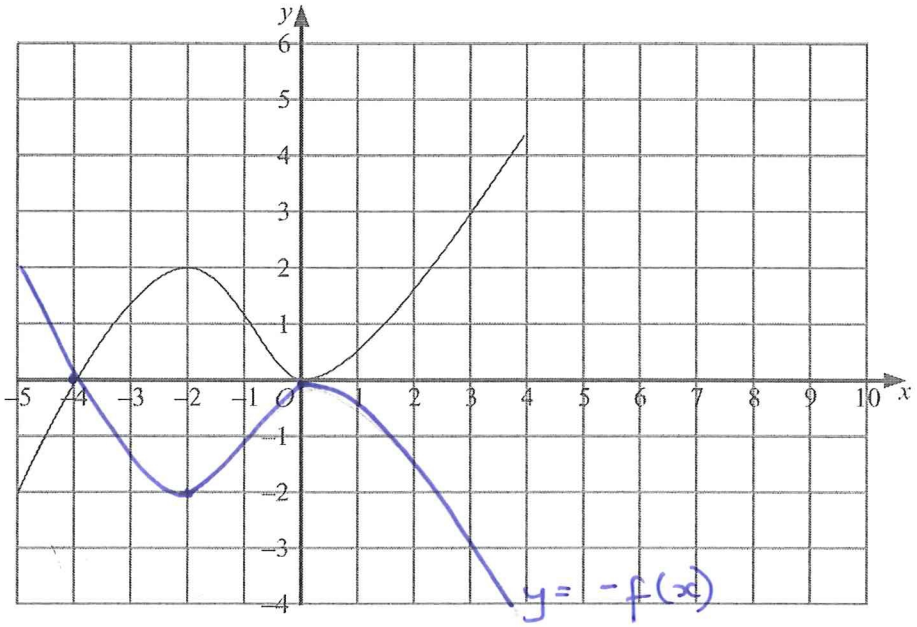
1. The graph of $y = f(x)$ is shown on the grids.

(a) On this grid, sketch the graph of $y = f(x) + 2$



(2)

(b) On this grid, sketch the graph of $y = -f(x)$

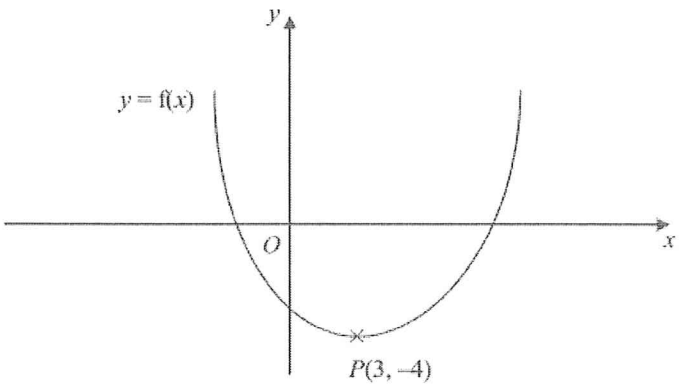


(2)

(4 marks)

5) Transformations of Functions: Medium

9. This is a sketch of the curve with the equation $y = f(x)$.
The only minimum point of the curve is at $P(3, -4)$.



(a) Write down the coordinates of the minimum point of the curve with the equation $y = f(x - 2)$.

(5 , -4)
(2)

(b) Write down the coordinates of the minimum point of the curve with the equation $y = f(x + 5) + 6$

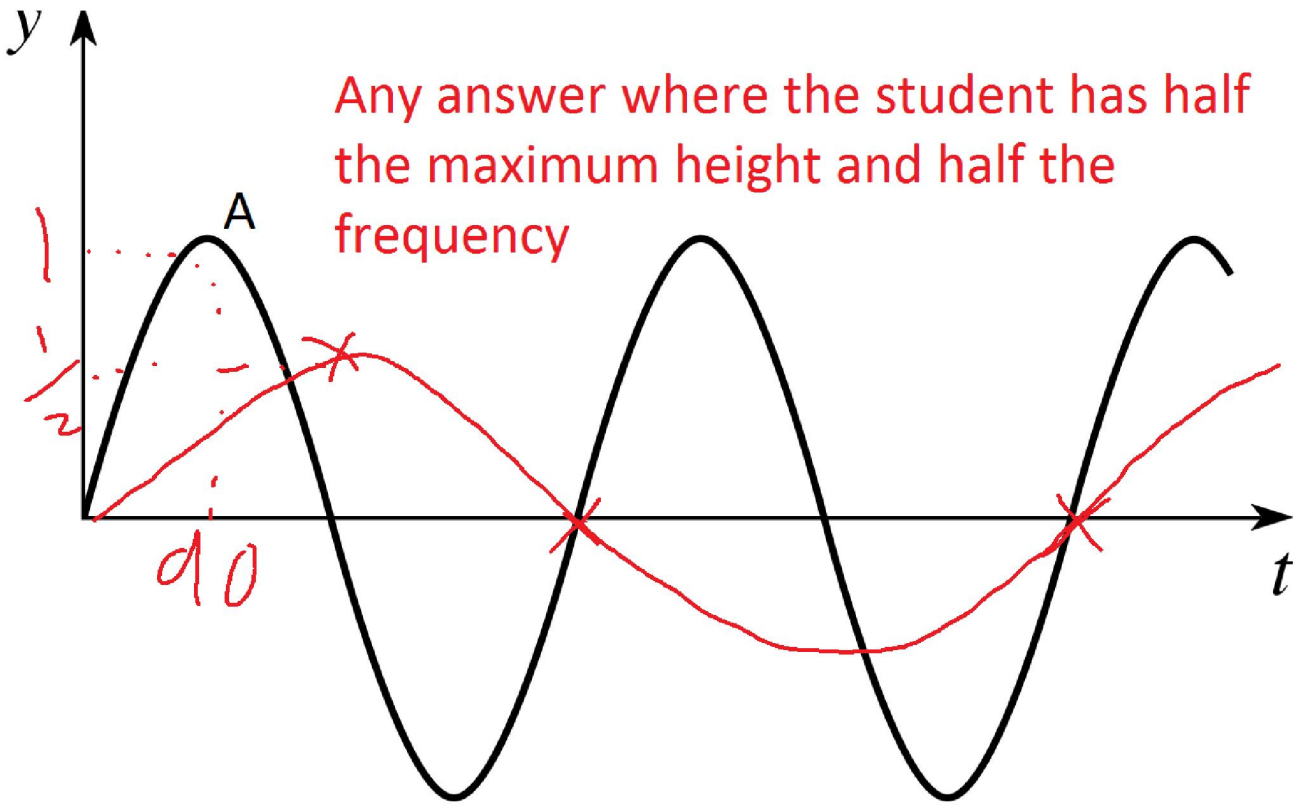
(-2 , 2)
(2)

(4 marks)

5) Transformations of Functions: Harder

2) a) State the co-ordinates of A (90^o, 1) (2 marks)

b)



WATERS Tom

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	24 from 28	3 from 3	16 from 20	1 from 1	4 from 4	0 from 0
A02 and 3	46 from 52	12 from 12	3 from 9	13 from 13	16 from 16	2 from 2
Total	70 from 80	15 from 15	19 from 29	14 from 14	20 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Composite functions. Mathswatch Clip: 215

Topic 2: Areas under velocity time graph. MW: 216

Topic 3: Transformations of Functions. Mathswatch Clip: 196

Topic 4: Extention1. Mathswatch Clip:

Topic 5: Extention2. Mathswatch Clip:

1) Composite functions: Easier

Q1. The functions f and g are such that

$$f(x) = 2x + 3 \text{ and } g(x) = \frac{x}{4} - 2$$

(a) Find the value of f(8)

F(8) = 2(8) + 3
=16 + 3
= 19

19

.....

(1)

(b) Find gf(*4*)

f(4) = 2(4) + 3 = 11

$$g(11) = \frac{11}{4} - 2 = \frac{3}{4}$$

$\frac{3}{4}$

.....

(2)

(b) Show that

$$fg(x) = \frac{1}{2}x - 1$$

$$fg(x) = 2\left(\frac{x}{4} - 2\right) + 3$$

$$fg(x) = \frac{2x}{4} - 4 + 3$$

$$fg(x) = \frac{1}{2}x - 1$$

(2)

(Total for question = 5 marks)

1) Composite functions: Medium

2. The functions f and g are such that

$$f(x) = \frac{2}{x+3} \text{ and } g(x) = 3(x-2)$$

a) Show that $gf(5) = -\frac{21}{4}$

$$f(5) = \frac{2}{5+3} = \frac{1}{4}$$

$$g\left(\frac{1}{4}\right) = 3\left(\frac{1}{4} - 2\right)$$

$$g\left(\frac{1}{4}\right) = \frac{3}{4} - 6$$

$$g\left(\frac{1}{4}\right) = -\frac{21}{4}$$

.....

(2)

b) Show that fg(x) can be written in the form

$$\frac{2}{k(x-1)}$$

where k is an integer to be found.

$$fg(x) = \frac{2}{3(x-2)+3}$$

$$fg(x) = \frac{2}{3x-6+3}$$

$$fg(x) = \frac{2}{3x-3}$$

$$fg(x) = \frac{2}{3(x-1)} \quad , \quad k = 3$$

(3)

c) Find an expression for gg(x)

$$gg(x) = 3(3x-6) - 6$$

$$gg(x) = 9x - 24$$

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

(Total for question = 7 marks)

1) Composite functions: Harder

3. The functions f, g and h are such that

$$f(x) = 2x + 2 \quad , \quad g(x) = \frac{a}{x} \text{ and } h(x) = 3x^2 \quad for\ x > 0$$

a) Find hgf(3) in terms of a

$$f(3) = 2(3) + 2 = 8$$
$$g(8) = \frac{a}{8}$$
$$h\left(\frac{a}{8}\right) = 3\left(\frac{a}{8}\right)^2 = \frac{3a^2}{64}$$

$$hgf(3) = \frac{3a^2}{64}$$

.....

(2)

b) Given that $fg(10) = \frac{14}{5}$ find the value of a

$$2\left(\frac{a}{10}\right) + 2 = \frac{14}{5}$$

$$\frac{2a}{10} = \frac{4}{5}$$

$$a = 4$$

.....

(2)

(Total for question = 4 marks)

4. The functions f, g are such that

$$f(x) = 3x + a \text{ and } g(x) = 6x - b$$

Given that fg(2) = 19 and gf(3) = 48, find the values of a and b.

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Solving simutaneously

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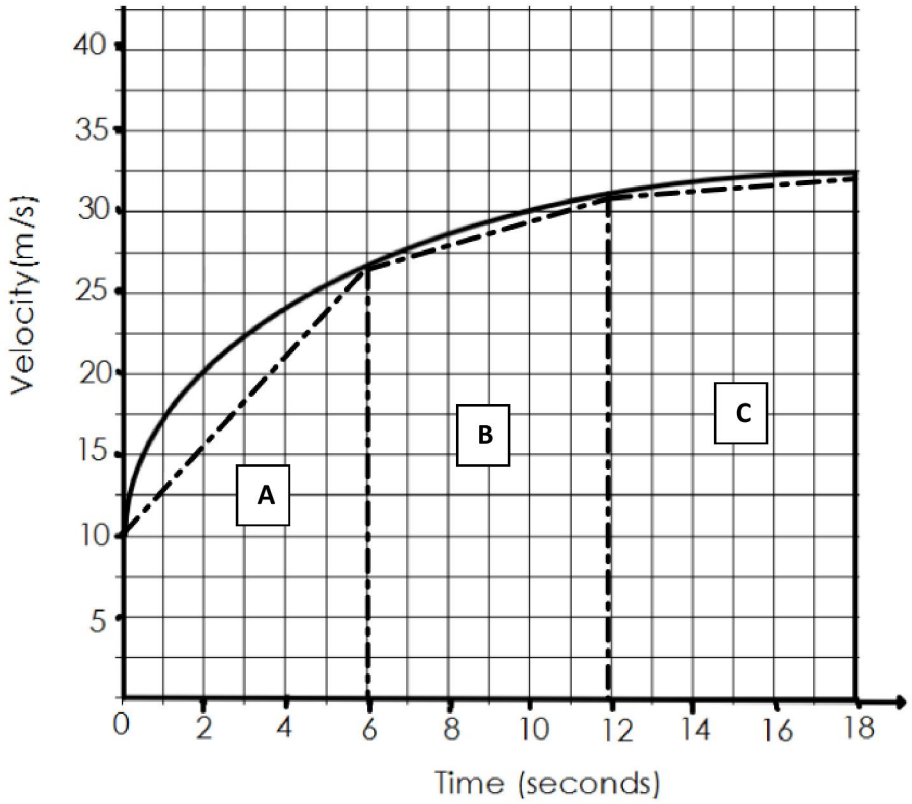
2) Areas under velocity time graph: Easier

1) The graph below shows a velocity time graph



1) a) By estimating the area under the graph using the three trapezia shown by dashed lines, work out the distance travelled in the 18 seconds.

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Total Area under graph $= 111 + 174 + 190.5 = 475.5$

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b) By considering the diagram, is your estimate for the distance an overestimate or underestimate? Explain your reasoning.

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(4 marks)

2) Areas under velocity time graph: Medium

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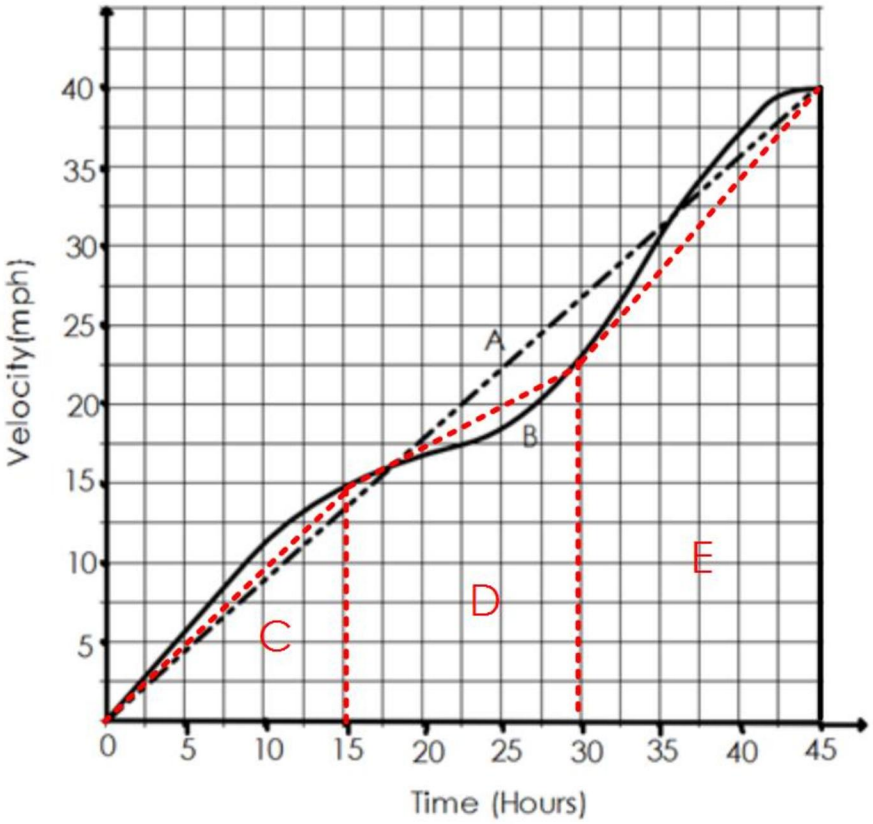

Which bird travels further in the 45 hours? You must show your working. Use 3 equal strips for your estimate for bird B. Comment on the reliability of your answer.

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Total area under curve B is 862.5, so bird A travelled further. However, the area under the curve is an estimate and only uses three strips so not very reliable.

(4 marks)

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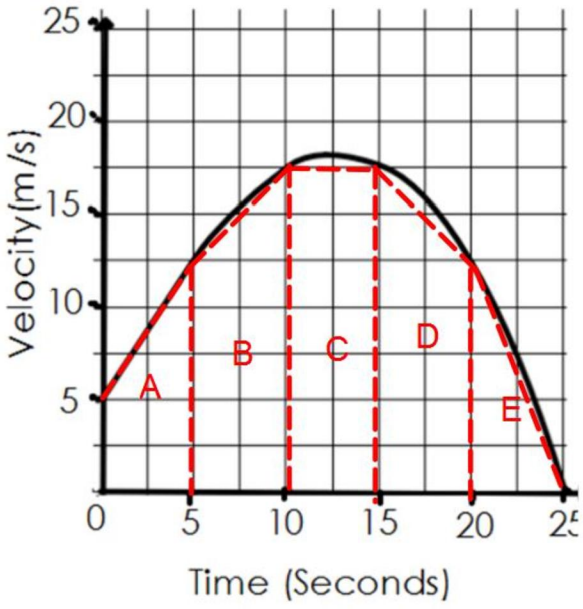
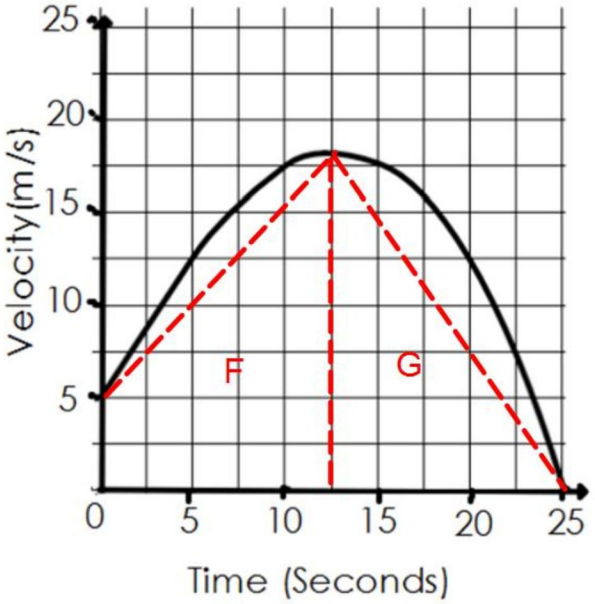
3) The graph below shows a velocity-time graph for a drone.

Anna's method



Simone's method



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Area = 43.75+ 75 + 87.5 + 75+ 31.25

Area = 312.5, distance 312.5 metres

Simone's method:

Area $= \frac{1}{2}(5 + 18)(12.5) + \frac{1}{2}(18 \times 12.5)$

Area = 143.75+ 112.5

Area =256.25 distance 256.25metres

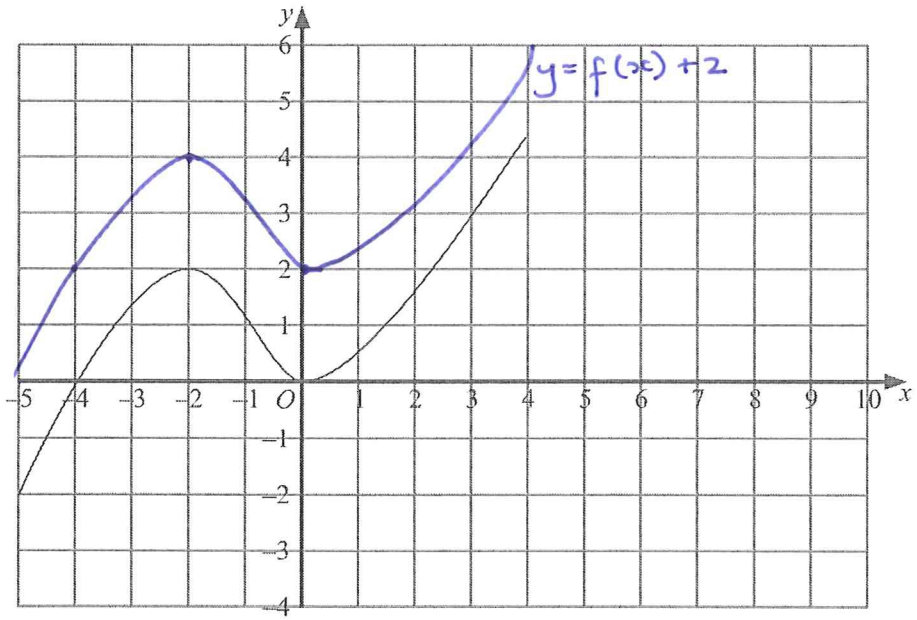
b) Comment on which method you think gives the most reliable results.
Anna's method is more reliable as she has used more strips. we can see from the graph Simone's method is a big underestimate.

(4 marks)

3) Transformations of Functions: Easier

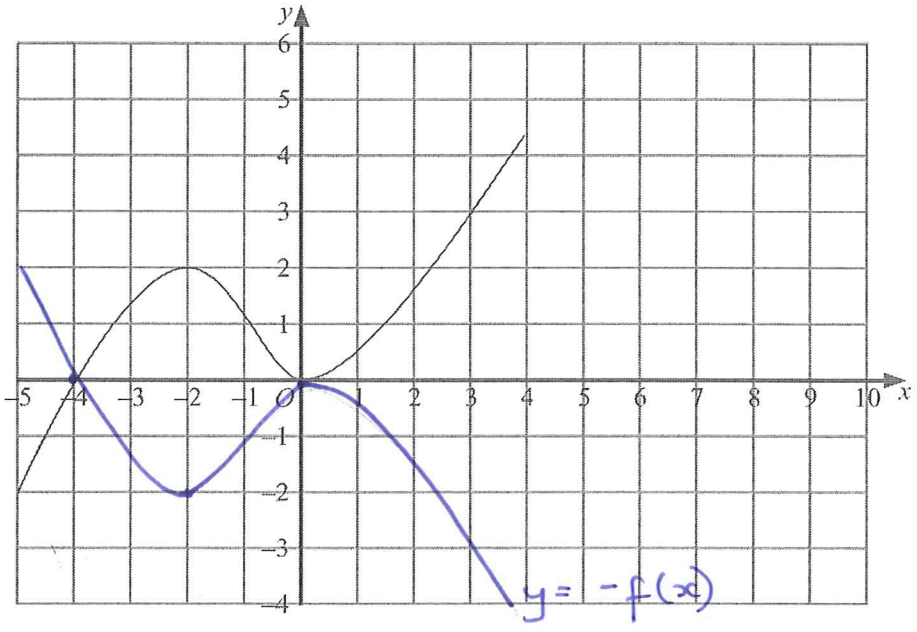
1. The graph of $y = f(x)$ is shown on the grids.

(a) On this grid, sketch the graph of $y = f(x) + 2$



(2)

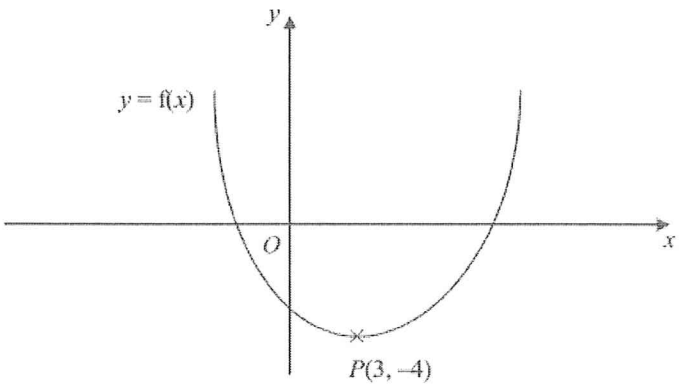
(b) On this grid, sketch the graph of $y = -f(x)$



(2)
(4 marks)

3) Transformations of Functions: Medium

9. This is a sketch of the curve with the equation $y = f(x)$.
The only minimum point of the curve is at $P(3, -4)$.



(a) Write down the coordinates of the minimum point of the curve with the equation $y = f(x - 2)$.

(5 , -4)
(2)

(b) Write down the coordinates of the minimum point of the curve with the equation $y = f(x + 5) + 6$

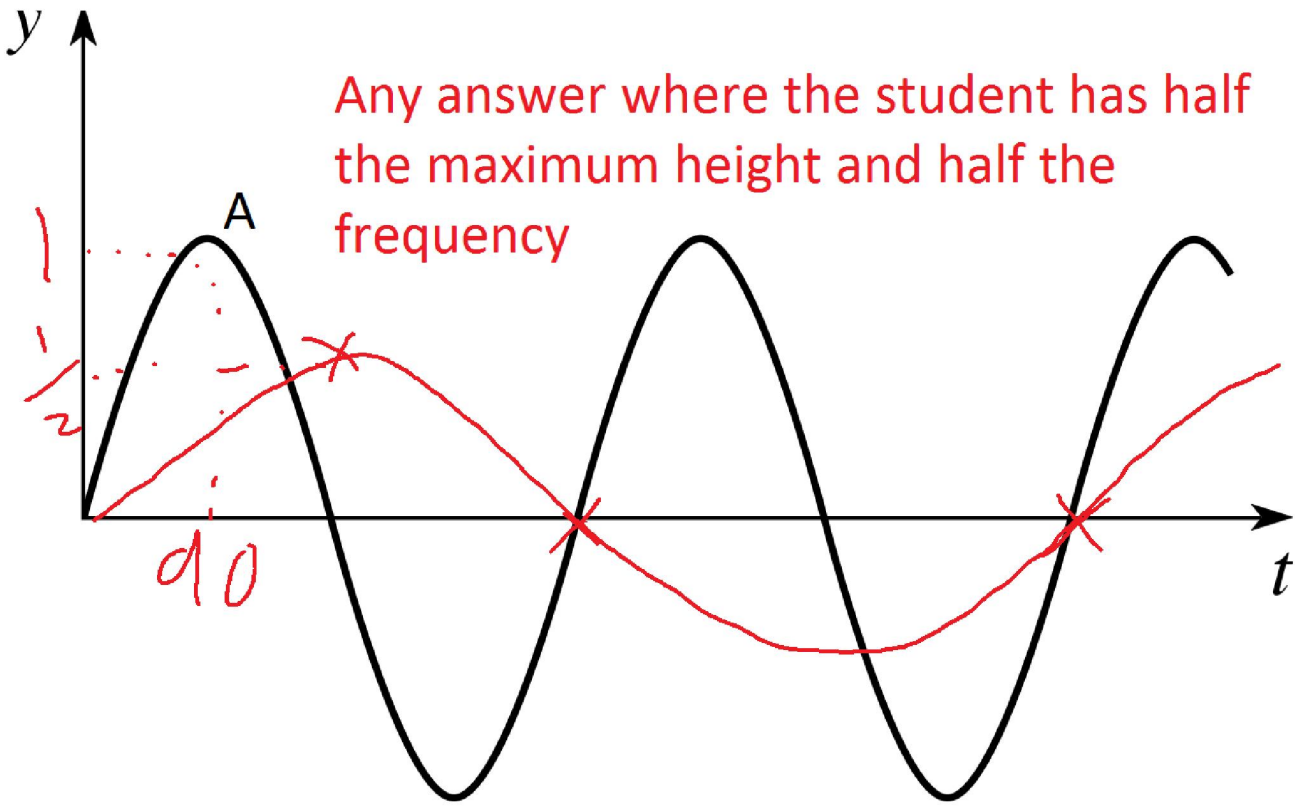
(-2 , 2)
(2)

(4 marks)

3) Transformations of Functions: Harder

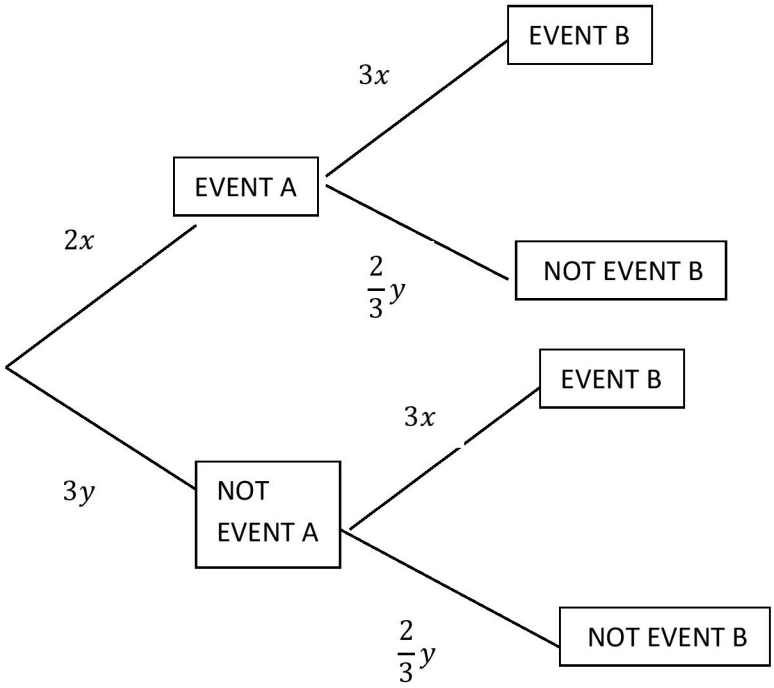
2) a) State the co-ordinates of A (90^o, 1) (2 marks)

b)



4) 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

$$6x + 9y = 3$$

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

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

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

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

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

(4 marks)

4) Extention1: Medium

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

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

$$a = -b$$

$$a + b = 0$$

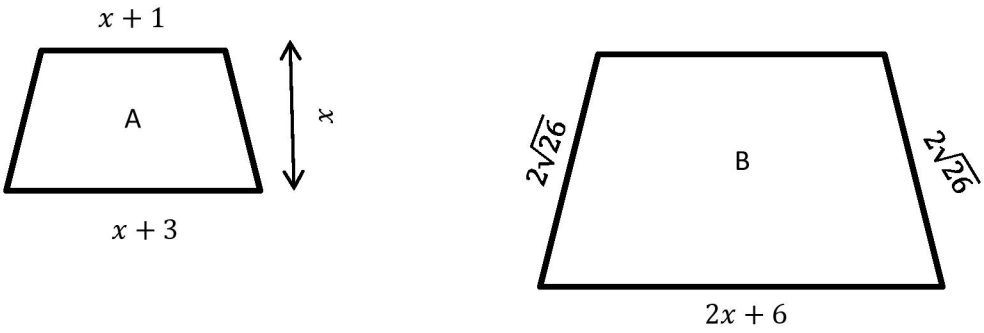
$$2(a + b) = 0$$

$$2a + 2b = 0$$

(3 marks)

4) Extention1: 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 $\frac{1}{2}(x+1+x+3)\times x$

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

$$x^2+2x = 35cm^2$$

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

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

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

The perimeter of Trapezium A is

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

When $x=5$ $\quad 4(5)+8+4\sqrt{26}$

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

(4 marks)

5) Extention2: Easier

4. Given that $9^a = 2$, What are the possible values of 27^a?

$$9^a = 2$$

$$(3^2)^a = 2$$

$$3^{2a} = 2$$

$$(3^a)^2 = 2$$

$$(3^a) = \pm\sqrt{2}$$

$$27^a = (3^3)^a$$

$$= (3^a)^3$$

$$= \left(\pm\sqrt{2}\right)^3$$

$$= \pm 2\sqrt{2}$$

(4 marks)

5) Extention2: Medium

5) Extention2: Harder

WATKINS Tom

9to1_AQA_PracticeSet3_2H_Whole_Qns

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Your Exam Statistics

Strand	Overall	Number	Algebra	Data	Shape	Ratio
AO1	16 from 28	3 from 3	9 from 20	0 from 1	4 from 4	0 from 0
A02 and 3	31 from 52	10 from 12	2 from 9	10 from 13	7 from 16	2 from 2
Total	47 from 80	13 from 15	11 from 29	10 from 14	11 from 20	2 from 2

Your Pinpoint Topics

Topic 1: Product of Prime Factors, HCF, LCM. MW: 78

Topic 2: Cumulative Frequency. Mathswatch Clip: 186

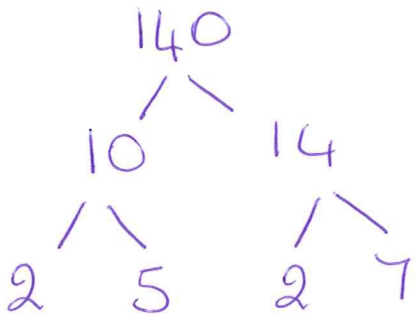
Topic 3: Composite functions. Mathswatch Clip: 215

Topic 4: Areas under velocity time graph. MW: 216

Topic 5: Vectors. Mathswatch Clip: 219

1) Product of Prime Factors, HCF, LCM: Easier

1. Write 140 as the product of its prime factors.



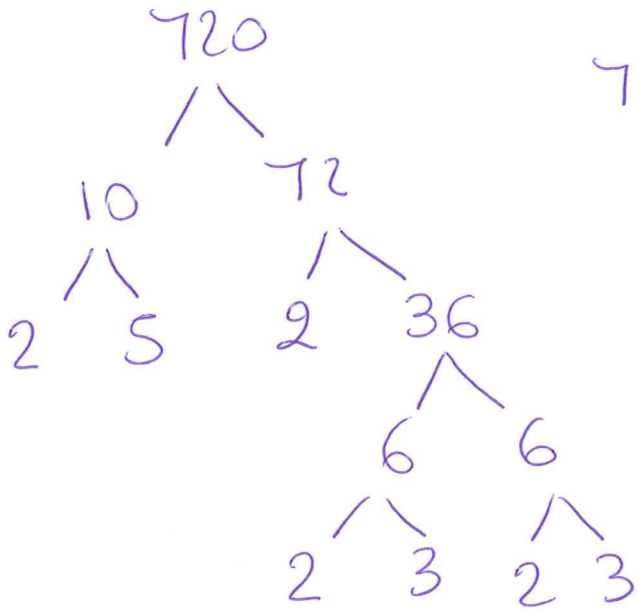
$140 = 2 \times 2 \times 5 \times 7$

$2^2 \times 5 \times 7$

.....

(2 marks)

2. Write 720 as a product of its prime factors.



$720 = 2 \times 2 \times 2 \times 2 \times 3 \times 3 \times 5$

$2^4 \times 3^2 \times 5$

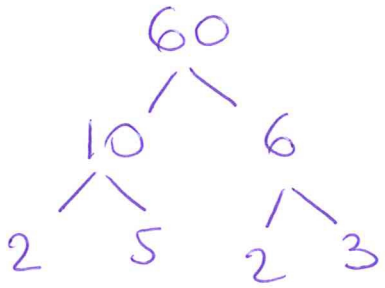
.....

(2 marks)

1) Product of Prime Factors, HCF, LCM: Medium

3. (a) Express the following numbers as products of their prime factors.

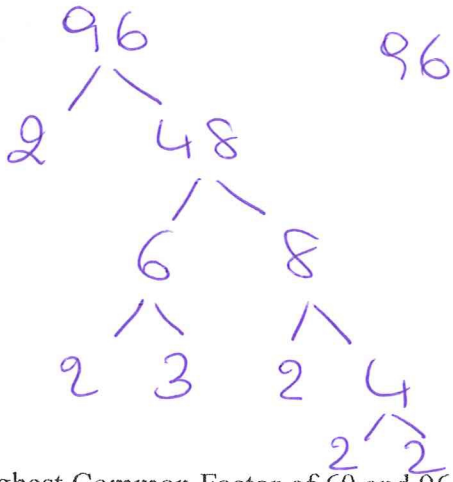
(i) 60.



$60 = 2 \times 2 \times 3 \times 5$

$2^2 \times 3 \times 5$

(ii) 96.

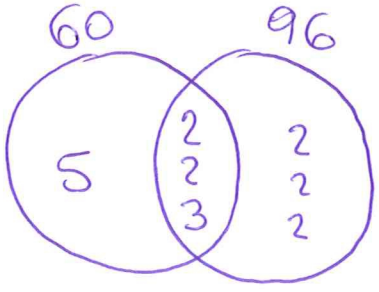


$96 = 2 \times 2 \times 2 \times 2 \times 2 \times 3$

$2^5 \times 3$

(4)

(b) Find the Highest Common Factor of 60 and 96.



HCF $= 2 \times 2 \times 3 = 12$

12

(1)

(c) Work out the Lowest Common Multiple of 60 and 96.

LCM $= 2^5 \times 3 \times 5 = 480$

60 120 180 240 300 360 420 480

96 192 288 384 480

480

(2)

(7 marks)

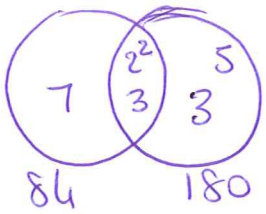
1) Product of Prime Factors, HCF, LCM: Harder

10. Find the Highest Common Factor (HCF) of 84 and 180

$84 = 2^2 \times 3 \times 7$

$180 = 2^2 \times 3^2 \times 5$

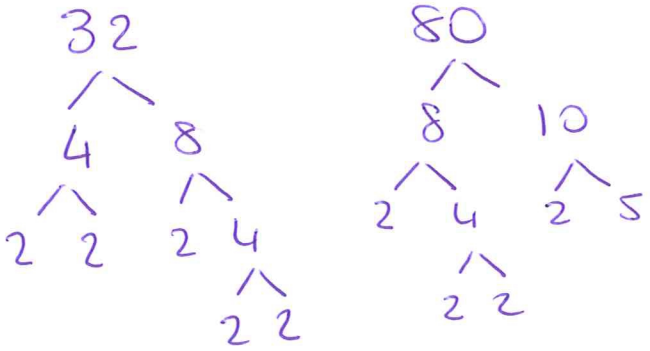
$HCF = 2^2 \times 3 = 12$



12

(3 marks)

11. Find the Highest Common Factor (HCF) of 32 and 80



$HCF = 2^4 = 16$

$32 = 2^5$

$80 = 2^4 \times 5$

$32 = 2 \times 2 \times 2 \times 2 \times 2$

$80 = 2 \times 2 \times 2 \times 2 \times 5$

16

(3 marks)

2) Cumulative Frequency: Easier

3. This frequency table gives information about the ages of 60 teachers.

Age (A) in years	Frequency
$20 < A \leq 30$	12
$30 < A \leq 40$	15
$40 < A \leq 50$	18
$50 < A \leq 60$	12
$60 < A \leq 70$	3

(a) Complete the cumulative frequency table.

Age (A) in years	Cumulative frequency
$20 < A \leq 30$	12
$20 < A \leq 40$	27
$20 < A \leq 50$	45
$20 < A \leq 60$	57
$20 < A \leq 70$	60

(1)

(b) On the grid opposite, draw a cumulative frequency graph for this information.

(2)

(c) Use your cumulative frequency graph to find an estimate for the median age.

..... 41 ..... years

(2)

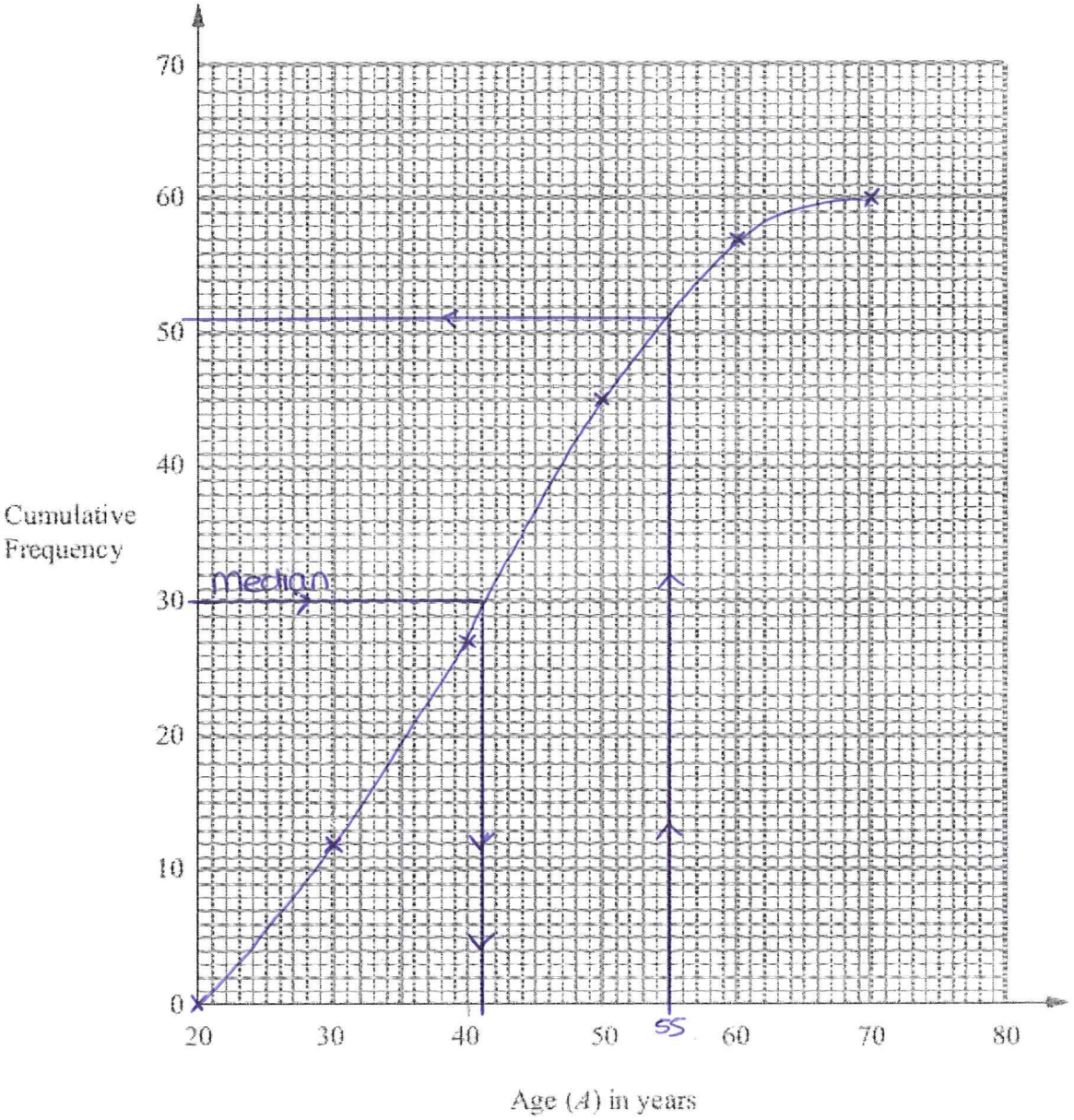
(d) Use your cumulative frequency graph to find an estimate for the number of teachers older than 55 years.

51 teachers are less than 55 years old, so $60 - 51 = 9$ are older.

..... 9 .....

(2)

2) Cumulative Frequency: Medium



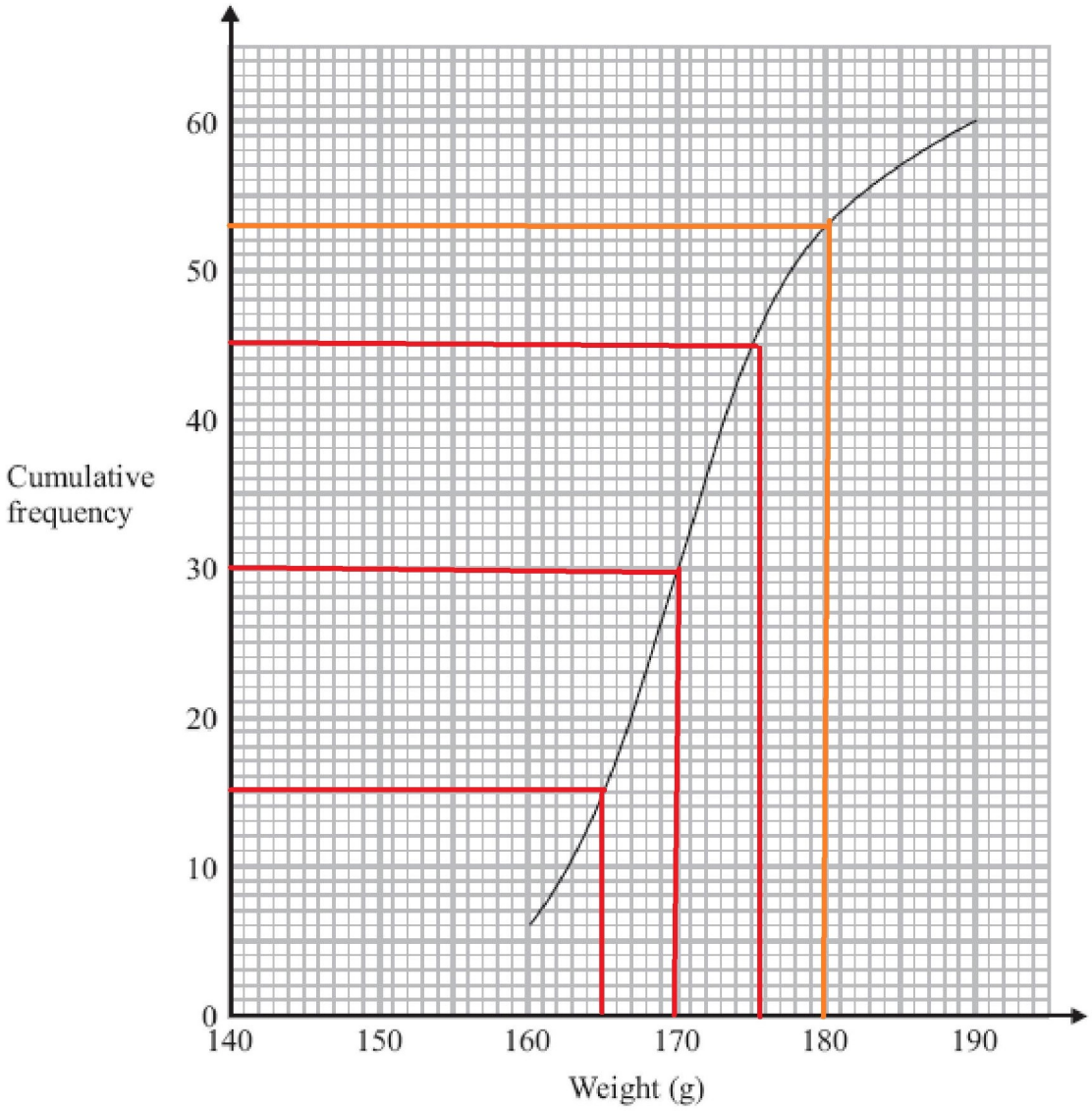
(7 marks)

2) Cumulative Frequency: Harder

4. Harry grows tomatoes.
This year he put his tomato plants into two groups, group A and group B.

Harry gave fertiliser to the tomato plants in group A.
He did not give fertiliser to the tomato plants in group B.

Harry weighed 60 tomatoes from group A.
The cumulative frequency graph shows some information about these weights.



ALL ANSWERS CAN BE PLUS OR MINUS 2 AWAY OF THESEE ANSWERS

(a) Use the graph to find an estimate for the median weight.

170 ..... g
(1)

(b) Use the graph to estimate i) The Lower Quartile 165 .....

ii) The Upper Quartile 175 .....

(c) Find the Interquartile range 175 - 165 = 10g .....

(d) Estimate the number of tomatoes over 180g 60 - 53 = 7 tomatoes .....

3) Composite functions: Easier

Q1. The functions f and g are such that

$$f(x) = 2x + 3 \text{ and } g(x) = \frac{x}{4} - 2$$

(a) Find the value of f(8)

F(8) = 2(8) + 3
=16 + 3
= 19

19

.....

(1)

(b) Find gf(*4*)

f(4) = 2(4) + 3 = 11

$$g(11) = \frac{11}{4} - 2 = \frac{3}{4}$$

$\frac{3}{4}$

.....

(2)

(b) Show that

$$fg(x) = \frac{1}{2}x - 1$$

$$fg(x) = 2\left(\frac{x}{4} - 2\right) + 3$$

$$fg(x) = \frac{2x}{4} - 4 + 3$$

$$fg(x) = \frac{1}{2}x - 1$$

(2)

(Total for question = 5 marks)

3) Composite functions: Medium

2. The functions f and g are such that

$$f(x) = \frac{2}{x+3} \text{ and } g(x) = 3(x-2)$$

a) Show that $gf(5) = -\frac{21}{4}$

$$f(5) = \frac{2}{5+3} = \frac{1}{4}$$

$$g\left(\frac{1}{4}\right) = 3\left(\frac{1}{4} - 2\right)$$

$$g\left(\frac{1}{4}\right) = \frac{3}{4} - 6$$

$$g\left(\frac{1}{4}\right) = -\frac{21}{4}$$

.....

(2)

b) Show that fg(x) can be written in the form

$$\frac{2}{k(x-1)}$$

where k is an integer to be found.

$$fg(x) = \frac{2}{3(x-2)+3}$$

$$fg(x) = \frac{2}{3x-6+3}$$

$$fg(x) = \frac{2}{3x-3}$$

$$fg(x) = \frac{2}{3(x-1)} \quad , \quad k = 3$$

(3)

c) Find an expression for gg(x)

$$gg(x) = 3(3x-6) - 6$$

$$gg(x) = 9x - 24$$

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

(Total for question = 7 marks)

3) Composite functions: Harder

3. The functions f, g and h are such that

$$f(x) = 2x + 2 \quad , \quad g(x) = \frac{a}{x} \text{ and } h(x) = 3x^2 \quad for\ x > 0$$

a) Find hgf(3) in terms of a

$$f(3) = 2(3) + 2 = 8$$
$$g(8) = \frac{a}{8}$$
$$h\left(\frac{a}{8}\right) = 3\left(\frac{a}{8}\right)^2 = \frac{3a^2}{64}$$

$$hgf(3) = \frac{3a^2}{64}$$

.....

(2)

b) Given that $fg(10) = \frac{14}{5}$ find the value of a

$$2\left(\frac{a}{10}\right) + 2 = \frac{14}{5}$$

$$\frac{2a}{10} = \frac{4}{5}$$

$$a = 4$$

.....

(2)

(Total for question = 4 marks)

4. The functions f, g are such that

$$f(x) = 3x + a \text{ and } g(x) = 6x - b$$

Given that fg(2) = 19 and gf(3) = 48, find the values of a and b.

From fg(2) =19

$3(6(2) - b) + a = 19$

$36 - 3b + a = 19$

$a - 3b = -17$

From gf(3) =54

$6(3(3) + a) - b = 54$

$54 + 6a - b = 54$

$6a - b = 0$

Solving simutaneously

$6a - 18b = -102$

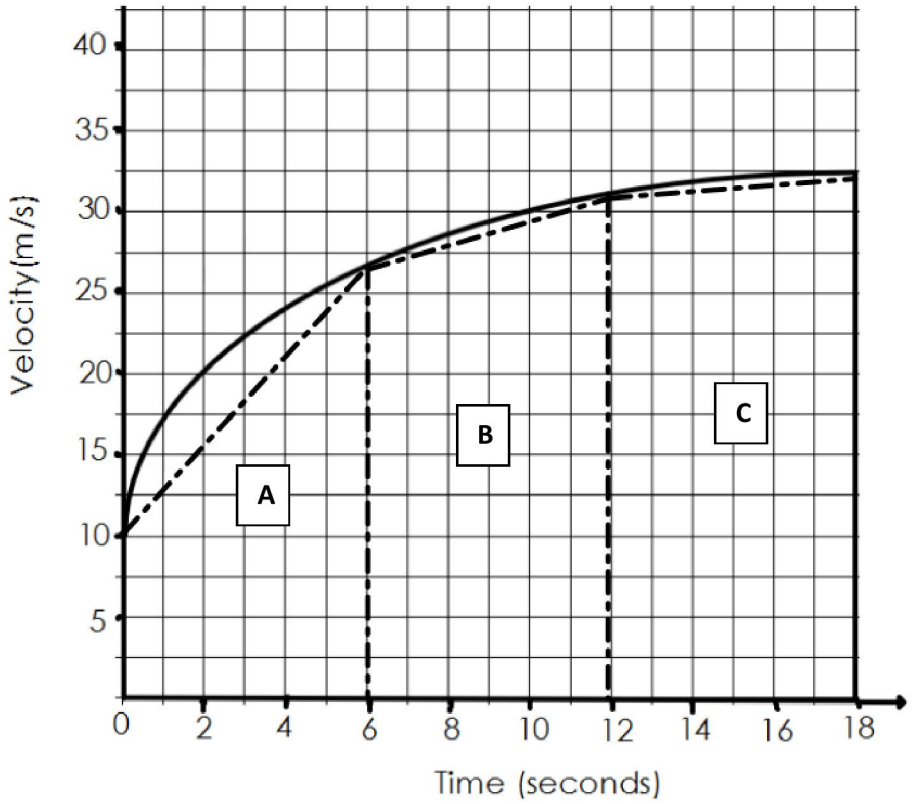
-17b = -102

b= -6, a =1

.....(5) **(Total for question = 5 marks)**

4) Areas under velocity time graph: Easier

1) The graph below shows a velocity time graph



1) a) By estimating the area under the graph using the three trapezia shown by dashed lines, work out the distance travelled in the 18 seconds.

Area of trapezium $= \frac{1}{2}(a + b)h$

Area of trapezium A $= \frac{1}{2}(10 + 27)(6) = 111$

Area of trapezium B $= \frac{1}{2}(27 + 31)(6) = 174$

Area of trapezium A $= \frac{1}{2}(31 + 32.5)(6) = 190.5$

Total Area under graph $= 111 + 174 + 190.5 = 475.5$

475.5metres travelled in 18 seconds

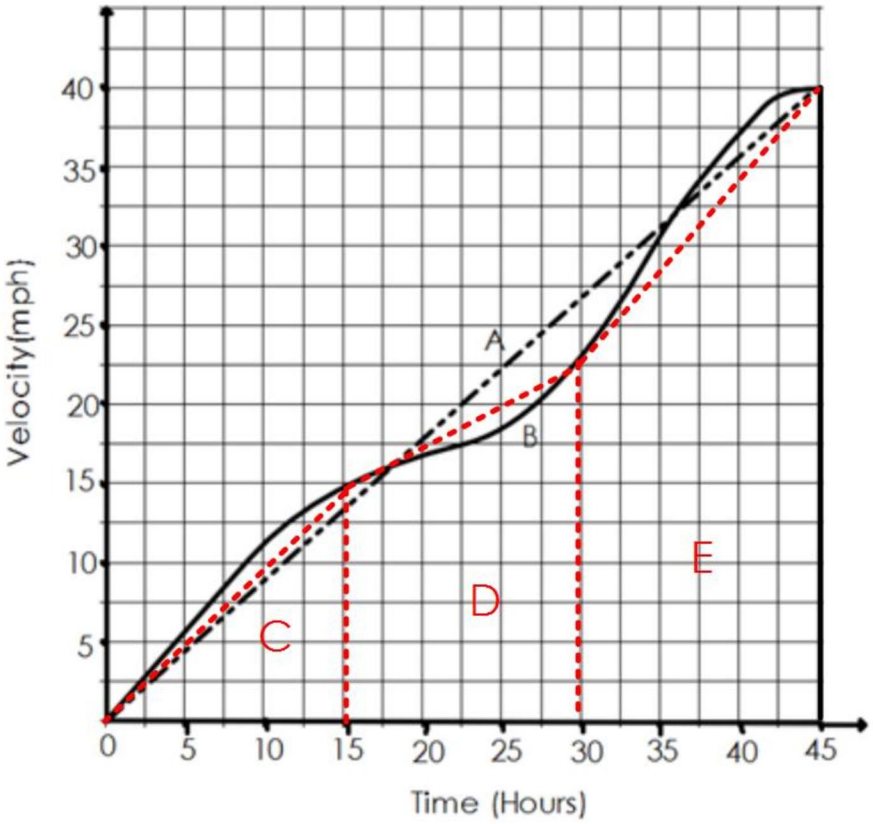
b) By considering the diagram, is your estimate for the distance an overestimate or underestimate? Explain your reasoning.

As each of the trapezia are a smaller area than the actual area, the estimate is an underestimate

(4 marks)

4) Areas under velocity time graph: Medium

2) The graph below shows a velocity time graph for two birds, A and B, over a long distance.



Which bird travels further in the 45 hours? You must show your working. Use 3 equal strips for your estimate for bird B. Comment on the reliability of your answer.

Distance travelled by bird A

Area of triangle $A = \frac{40 \times 45}{2} = 900$

Distance travelled by bird B

$$\text{Triangle C} = \frac{15 \times 15}{2} = 112.5$$

$$\text{Trapezium D} = \frac{1}{2}(15 + 22.5)(15) = 281.25$$

$$\text{Trapezium E} = \frac{1}{2}(22.5 + 40)(15) = 468.75$$

Total area under curve B is 862.5, so bird A travelled further. However, the area under the curve is an estimate and only uses three strips so not very reliable.

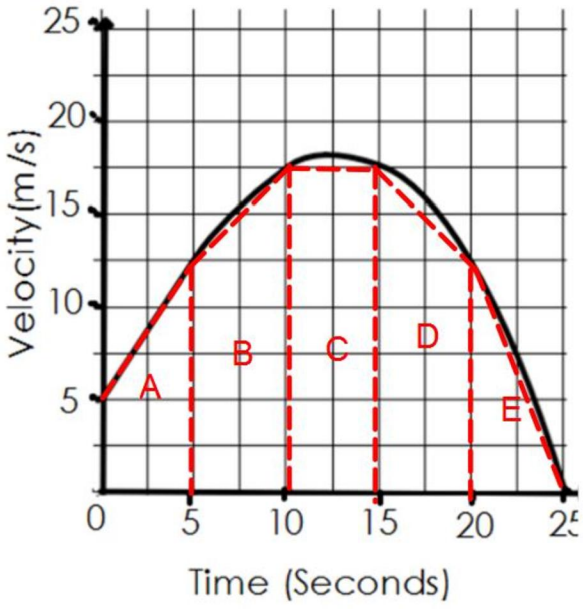
_____

(4 marks)

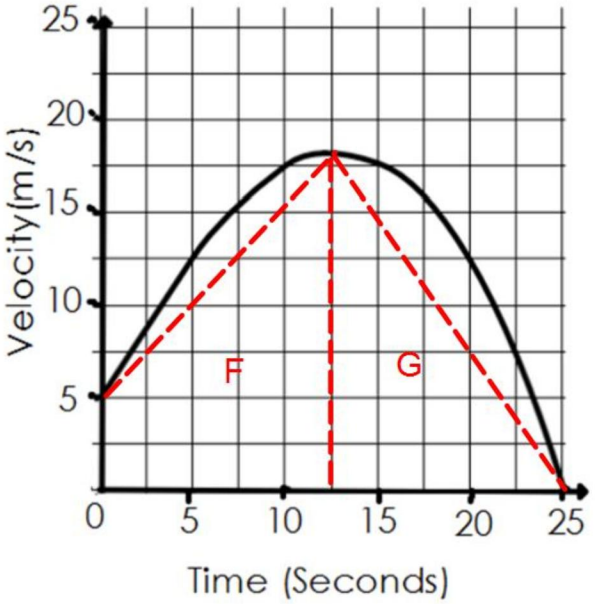
4) Areas under velocity time graph: Harder

3) The graph below shows a velocity-time graph for a drone.

Anna's method



Simone's method



a) Anna works out the distance travelled by using 3 trapezia, a rectangle and a triangle, all of equal width. Simone divides it into a triangle and a trapezium, both of equal width. Find an estimate of the distance using both Anna and Simone's method.

Anna's method :

Area $= \frac{1}{2}(5 + 12.5)(5) + \frac{1}{2}(12.5 + 17.5)(5) + (5 \times 17.5) + \frac{1}{2}(17.5 + 12.5)(5) + \frac{1}{2}(5 \times 12.5)$

Area = 43.75+ 75 + 87.5 + 75+ 31.25

Area = 312.5, distance 312.5 metres

Simone's method:

Area $= \frac{1}{2}(5 + 18)(12.5) + \frac{1}{2}(18 \times 12.5)$

Area = 143.75+ 112.5

Area =256.25 distance 256.25metres

b) Comment on which method you think gives the most reliable results.
Anna's method is more reliable as she has used more strips. we can see from the graph Simone's method is a big underestimate.

(4 marks)

5) Vectors: Easier

1.

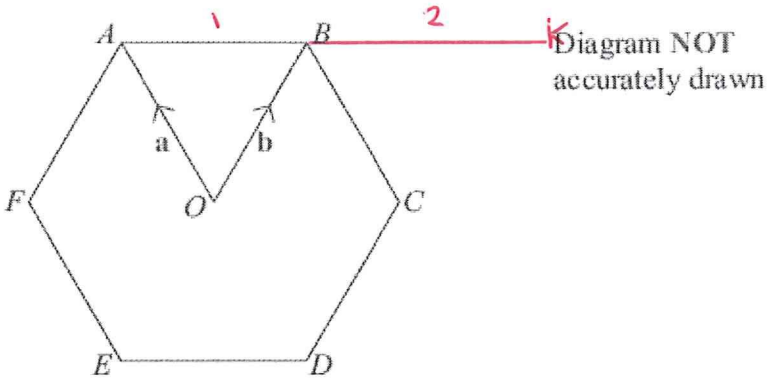


Diagram NOT accurately drawn

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 **a** and **b**.

$-a+b$

.....

(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 **a** and **b**.
Give your answer in its simplest form.

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

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

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

$-a+2b$

.....

(3)

(4 marks)

5) Vectors: Medium

2.

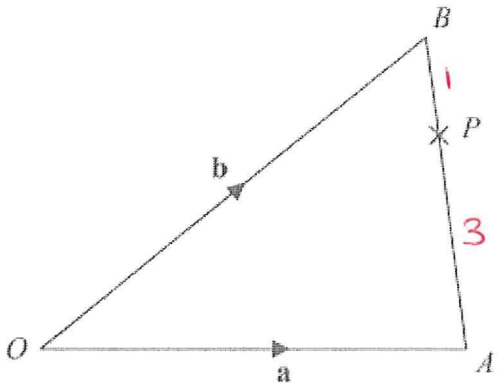


Diagram NOT accurately drawn

OAB is a triangle.

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

(a) Find $\overrightarrow{AB}$ in terms of **a** and **b**.

$-a+b$

.....

(1)

P is the point on *AB* such that $AP : PB = 3 : 1$

(b) Find $\overrightarrow{OP}$ in terms of **a** and **b**.
Give your answer in its simplest form.

$\overrightarrow{AP} = \frac{3}{4}(-a+b)$

$\overrightarrow{AP} = -\frac{3}{4}a + \frac{3}{4}b$

$\overrightarrow{OP} = a - \frac{3}{4}a + \frac{3}{4}b$

$= \frac{1}{4}a + \frac{3}{4}b$

$\frac{1}{4}a + \frac{3}{4}b$

.....

(3)

(4 marks)

5) Vectors: Harder

6.

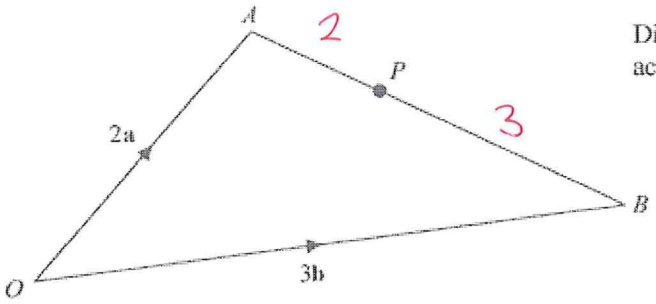


Diagram NOT accurately drawn

OAB is a triangle.

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

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

(*a*) Find *AB* in terms of **a** and **b**.

$\overrightarrow{AB}$ = $-2a+3b$

(1)

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

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

$\overrightarrow{AP} = \frac{2}{5}(-2a+3b)$

$= -\frac{4}{5}a + \frac{6}{5}b$

$\overrightarrow{OP} = 2a - \frac{4}{5}a + \frac{6}{5}b$

$= \frac{6}{5}a + \frac{6}{5}b$

$= \frac{6}{5}(a+b)$

(3)

(4 marks)

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