WEEK 5 TASKS

(Higher 4-6)

Managing your time in the exam is an important skill. Each paper is 90 minutes in length, and you need to make sure that you are using all the allocated time. Look at the number of marks for guidance where 1 mark = 1 minute. The early one mark question may not take one whole minute, but this extra time can be used for tackling trickier questions and if you find you are really stuck on a question, move on but remember to come back to the question at the end.

Remember: It's not over until its over!

WEEK 5 TASK 1

Estimated completion time = 35 minutes.

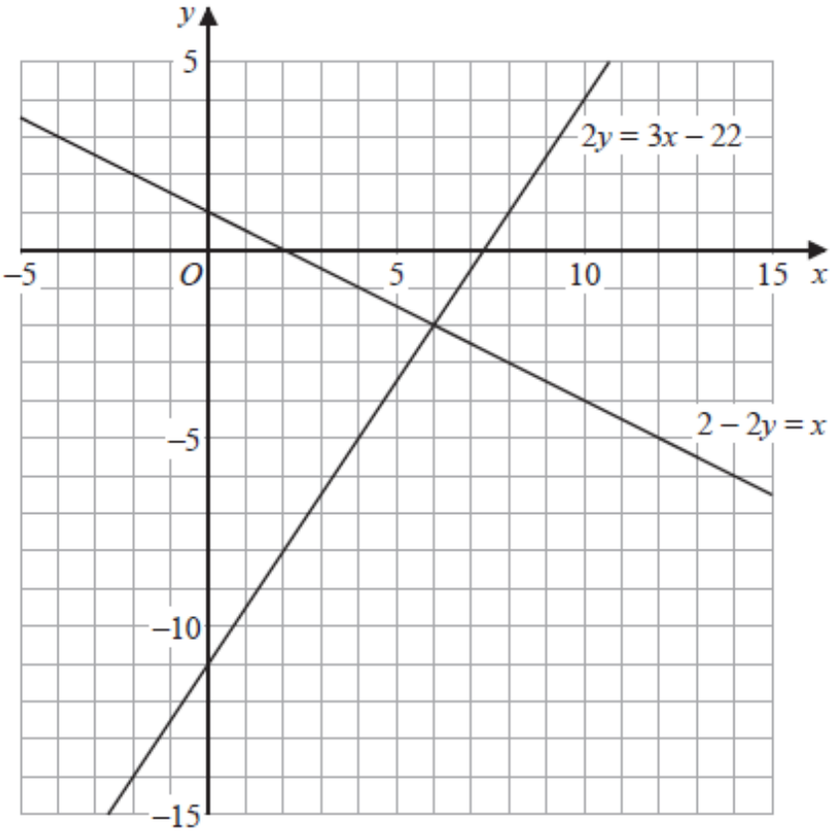
Answer all questions.
Write your answers in the spaces provided.
You must write down all the stages in your working.

1 The normal price of a mattress is reduced by 40% in a sale.
The price of the mattress in the sale is £660
Work out the normal price of the mattress.

£.....

(Total for Question 1 is 2 marks)

***2**



Use these graphs to solve the simultaneous equations

$$2 - 2y = x$$
$$2y = 3x - 22$$

x = ...

y = ...

(Total for Question 2 is 1 mark)

3 Write $\dfrac{(6x^5y^3)^2}{3x^2y^7 \times 4xy^{-3}}$ in the form $ax^b y^c$ where a, b and c are integers.

.....

(Total for Question 3 is 3 marks)

---

4 (*a*) Write $\dfrac{1}{16}$ in the form 4^n where n is an integer.

.....

(1)

(*b*) Work out the value of $8^{\frac{5}{3}} - 9^{\frac{3}{2}}$

.....

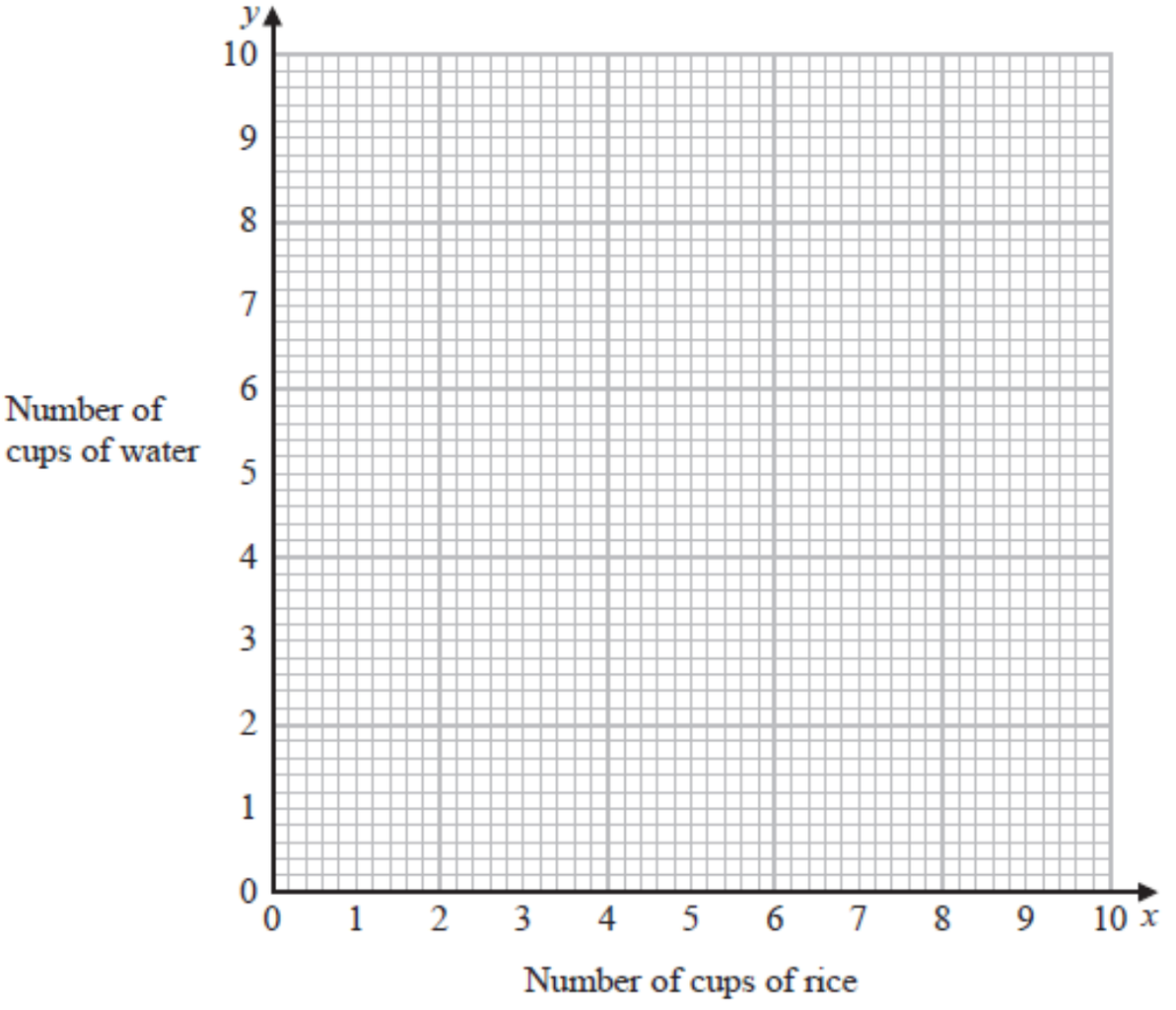
(3)

(Total for Question 4 is 4 marks)

5 To cook rice

the number of cups of rice (x) : the number of cups of water (y) = 4 : 5

(a) Use this information to draw a graph to show the relationship between the number of cups of rice and the number of cups of water needed to cook rice.



(2)

(b) Find the gradient of the line drawn in part (a).

.....

(1)

(Total for Question 5 is 3 marks)

6 At the start of year n the population of a species is P_n

At the start of the following year the population of the species is given by

$$P_{n+1} = kP_n \text{ where } k \text{ is a positive constant.}$$

The population of the species at the start of year 1 is 8 million.
The population of the species at the start of year 2 is 6 million.

Work out the population of the species at the start of year 3

..... million

(Total for Question 6 is 3 marks)

---

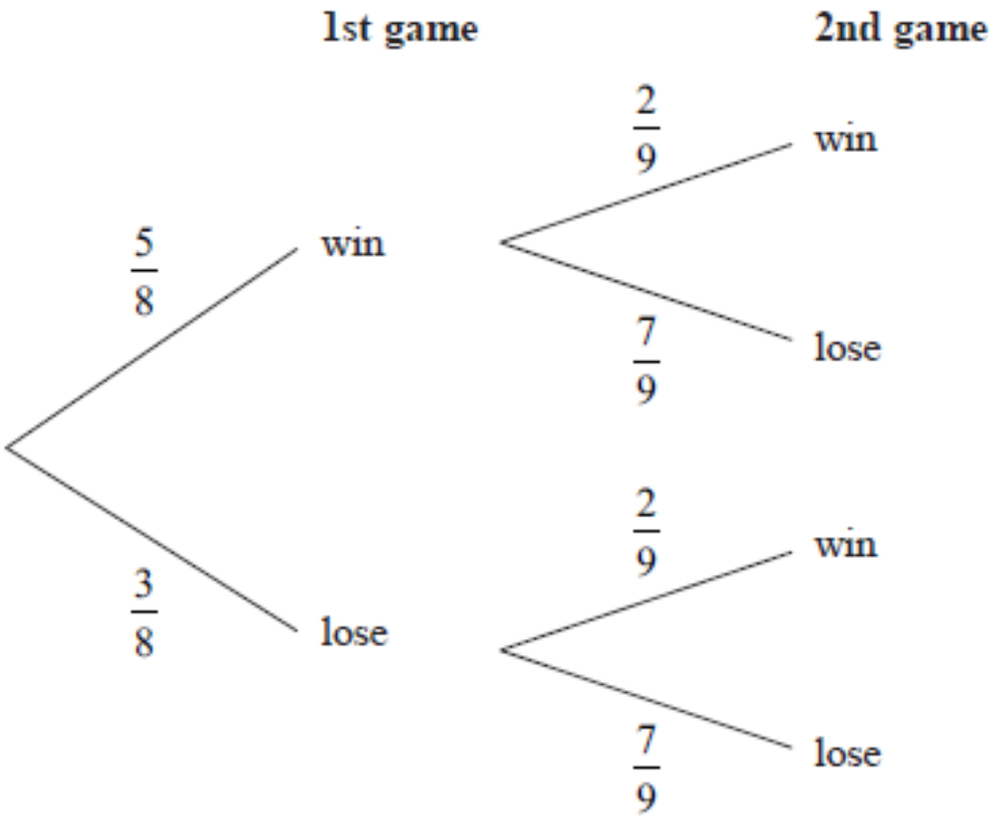
7 Factorise $6x^2 - 5x - 4$

.....

(Total for Question 7 is 2 marks)

8 Martha plays a game twice.

The probability tree diagram shows the probabilities that Martha will win or lose each game.

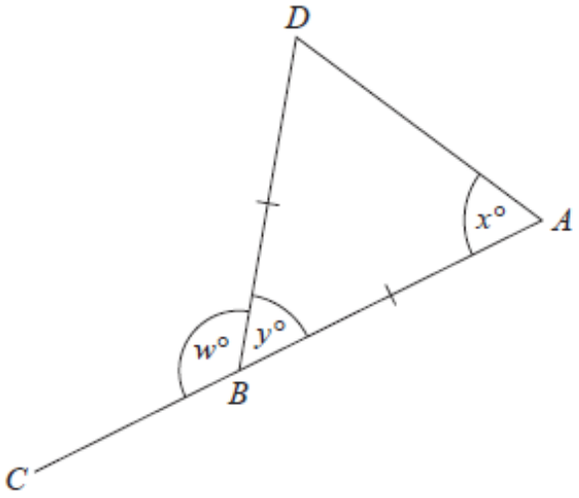


Find the probability that Martha will lose at least one game.

.....

(Total for Question 8 is 3 marks)

***9** The diagram shows an isosceles triangle ABD and the straight line ABC.



$BA = BD$

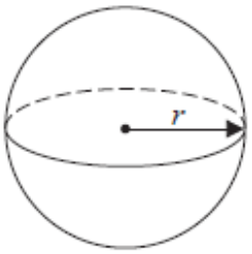
$x : y = 2 : 1$

Work out the value of w.

$w =$ .....

(Total for Question 9 is 4 marks)

10 Here is a sphere.



Surface area of sphere = $4\pi r^2$

$\frac{3}{8}$ of the surface area of this sphere is 75π cm^2

Find the diameter of the sphere.
Give your answer in the form $a\sqrt{b}$ where a is an integer and b is a prime number.

..... cm

(Total for Question 10 is 4 marks)

11 Spinner **A** and spinner **B** are each spun once.

The probability that spinner **A** lands on red is $\frac{1}{4}$

The probability that both spinner **A** and spinner **B** land on red is $\frac{1}{24}$

Work out the probability that one spinner lands on red and the other spinner does **not** land on red.

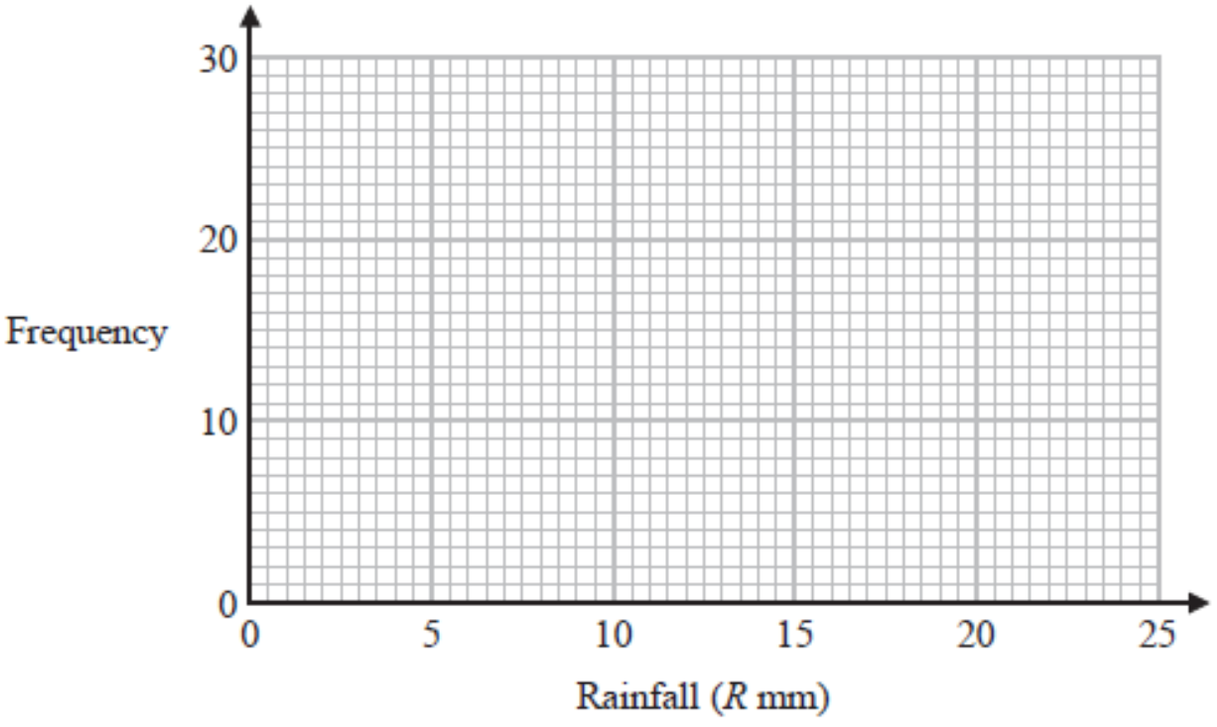
.....

(Total for Question 11 is 4 marks)

***12** The table shows information about the daily rainfall in a town for 60 days.

Rainfall (R mm)	Frequency
$0 \leq R < 5$	8
$5 \leq R < 10$	24
$10 \leq R < 15$	13
$15 \leq R < 20$	11
$20 \leq R < 25$	4

Draw a frequency polygon for this information.



(Total for Question 12 is 2 marks)

TOTAL FOR PAPER IS 35 MARKS

WEEK 5 TASK 2

Estimated completion time = 90 minutes.

Answer ALL questions.

Write your answers in the spaces provided.

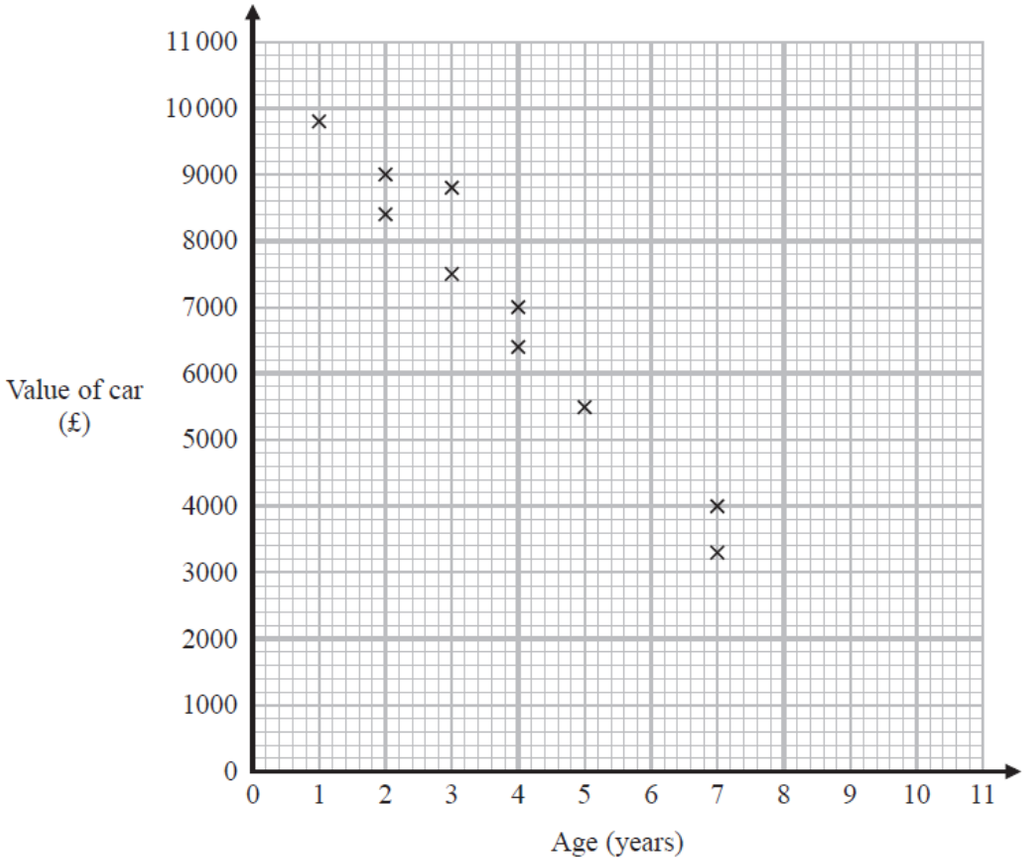
You must write down all the stages in your working.

1 Expand and simplify $2(m - 3) + 3(m + 4)$

.....

(Total for Question 1 is 2 marks)

2 The scatter graph shows the age and the value of each of ten cars of the same make and model.



(a) Describe the relationship between the value of a car and the age of the car.

……..

……..

(1)

(b) Draw a line of best fit on the scatter graph.

(1)

It may not be reliable to use the line of best fit to predict the value of a car that is 10 years old.

(c) Give a reason why.

……..

……..

……..

(1)

(Total for Question 2 is 3 marks)

3 There are 270 students in Year 7
Each student studies one of French or German or Spanish.

Of these 270 students

$\frac{2}{9}$ study French

the number who study French : the number who study Spanish = 3 : 7

42 boys study German

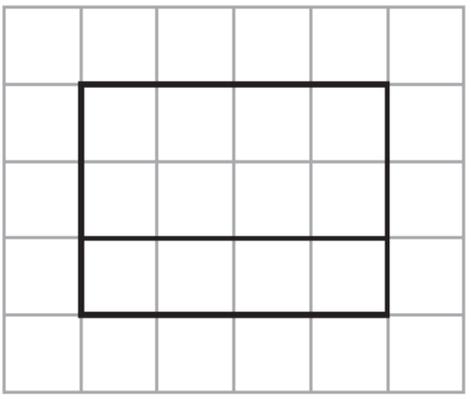
Of the students who study German, what percentage are boys?
You must show your working.

.....%

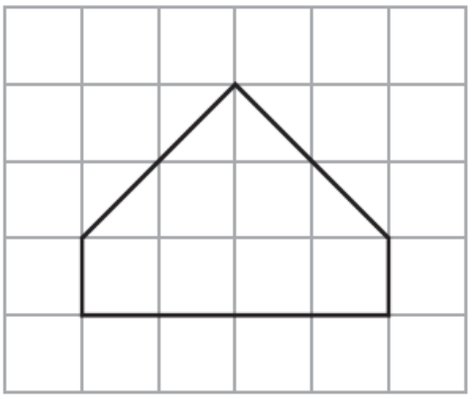
(Total for Question 3 is 5 marks)

4 Here are the front elevation and the side elevation of a solid prism.

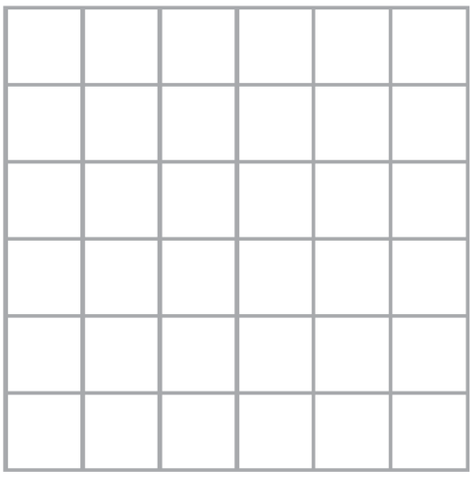
Front elevation



Side elevation



(a) On the grid below, draw a plan of the solid prism.



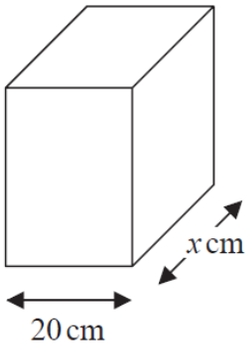
(2)

(b) In the space below, draw a sketch of the solid prism.

(2)

(Total for Question 4 is 4 marks)

5 The diagram shows a block of metal on horizontal ground.



$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

The base of the block of metal is a rectangle 20 cm by x cm.

The block exerts a force of 1500 newtons on the ground.
The pressure on the ground is 3 newtons/cm^2

Work out the value of x.

.....

(Total for Question 5 is 3 marks)

6 (a) Write 247 000 in standard form.

…..…….....

(1)

(b) Write 6.5×10^{-4} as an ordinary number.

…..…….....

(1)

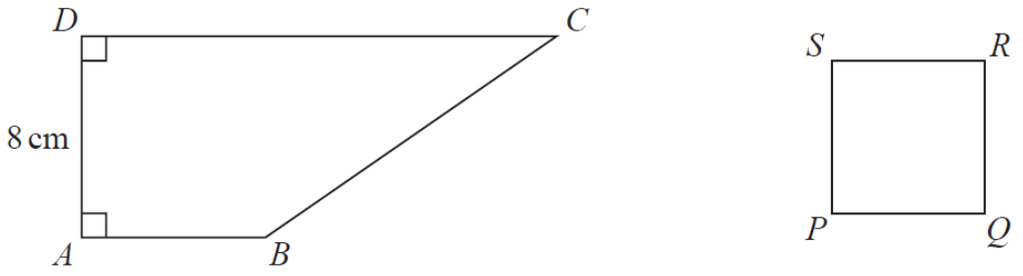
(c) Work out $(3 \times 10^{-7}) \times (8 \times 10^{-6})$
Give your answer in standard form.

…..…….....

(2)

(Total for Question 6 is 4 marks)

7 The diagram shows a trapezium $ABCD$ and a square $PQRS$.



$AD = 8$ cm
$DC = 3AB$

The perimeter of the square is 24 cm.

The area of the square is half the area of the trapezium.

Work out the length of AB.

…… cm

(Total for Question 7 is 4 marks)

8 (a) Work out an estimate for the value of $\frac{58.7^2}{\sqrt{1612}}$

.....

(2)

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

.....

.....

(1)

(Total for Question 8 is 3 marks)

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9 A company has a target to reduce the number of its stores by 40 % over the next two years.

At the end of the first year it has reduced the number of its stores by 20 %

If the company is going to reach its target, it must reduce the number of its stores by another P % in the second year

Find the value of P.

.....

(Total for Question 9 is 3 marks)

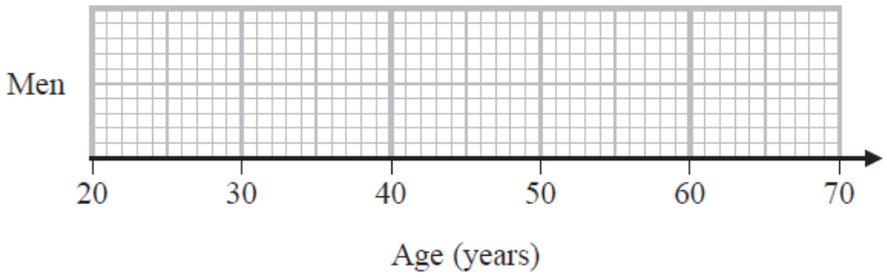
---

10 Here are the ages, in years, of the 19 men in a badminton club.

22 27 30 31 32 34 35 35 36 38

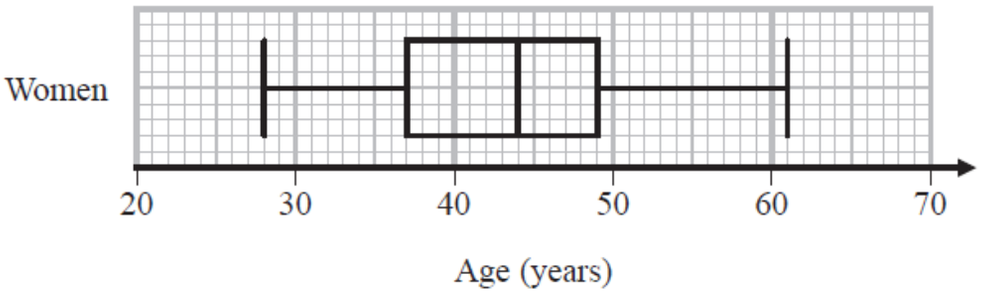
40 40 42 46 47 49 51 57 58

(a) On the grid, draw a box plot for this information.



(3)

The box plot below shows information about the distribution of the ages of the women in the badminton club.



(b) Compare the distribution of the ages of the men with the distribution of the ages of the women.

.....

.....

.....

.....

.....

(2)

(Total for Question 10 is 5 marks)

11 Nadia sells small boxes of chocolates and large boxes of chocolates.

The total number of chocolates in 3 small boxes and 1 large box is 66
The total number of chocolates in 1 small box and 2 large boxes is 72

Work out the number of chocolates in each small box and the number of chocolates in each large box.

small box …….

large box …….

(Total for Question 11 is 4 marks)

12 Work out the value of $\frac{\sqrt{7}+5}{3} \times \frac{\sqrt{7}-5}{3}$

Give your answer in its simplest form.

.....

(Total for Question 12 is 3 marks)

---

13 Julie has to solve $x^2 - 5x + 2 = 0$

Here is the first line of her working.

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

The first line of Julie's working is wrong.

What mistake has she made?

.....

.....

.....

(Total for Question 13 is 1 mark)

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14 Rachel has 10 sweets in a bag.

7 of the sweets are yellow.
3 of the sweets are red.

Rachel takes random sweets from the bag, one at a time, until she gets a red sweet.
She does not replace the sweets that she takes from the bag.

Rachel stops as soon as she gets a red sweet.

Work out the probability that Rachel takes no more than three sweets from the bag.

.....

(Total for Question is 14 is 3 marks)

15 Make x the subject of the formula $y = \dfrac{x^2 - 3}{2x^2 + 1}$

……..……

(Total for Question 15 is 4 marks)

16 a, b, c and d are integers.

$$4a = 5b$$

$$c = \frac{3}{4}b$$

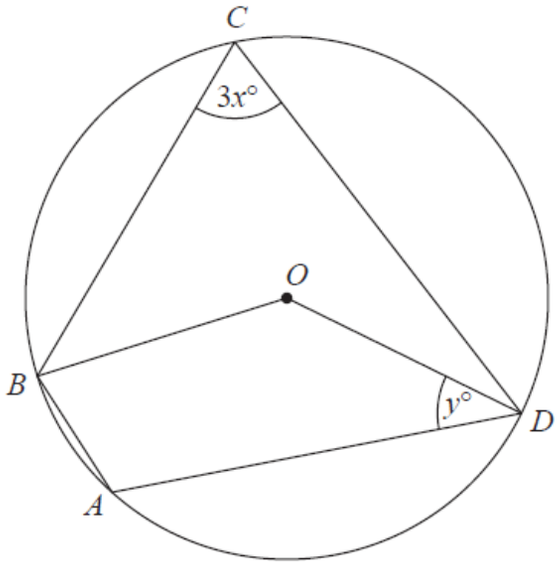
$$a : d = 3 : 5$$

Find $a : b : c : d$

……

(Total for Question 16 is 4 marks)

17



A, B, C and *D* are points on a circle with centre *O*.

size of angle *ABO* : size of angle *ODA* = 2 : 1

Find an expression for *y* in terms of *x*.
You must show all your working.

.....

(Total for Question 17 is 4 marks)

18 Factorise fully $3x^2 - 12y^2$

.....

(Total for Question 18 is 2 marks)

---

19 Show that $12^{-\frac{3}{2}}$ can be written in the form $\frac{\sqrt{3}}{h}$ where h is an integer.

(Total for Question 19 is 4 marks)

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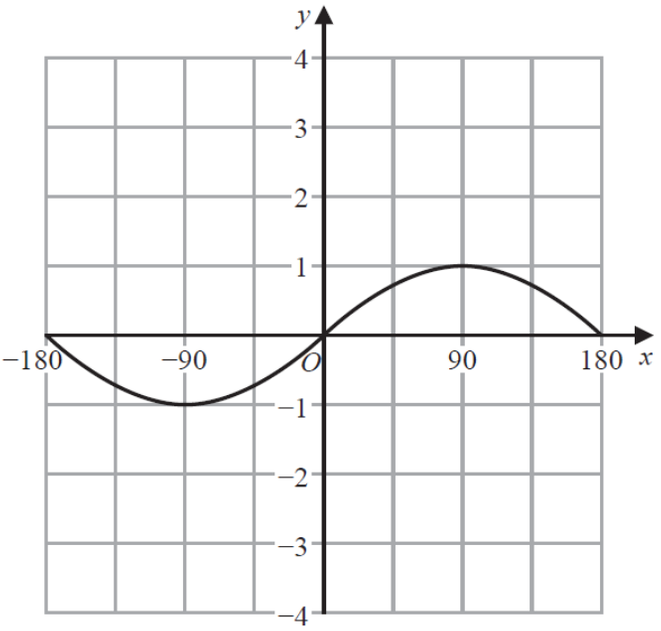
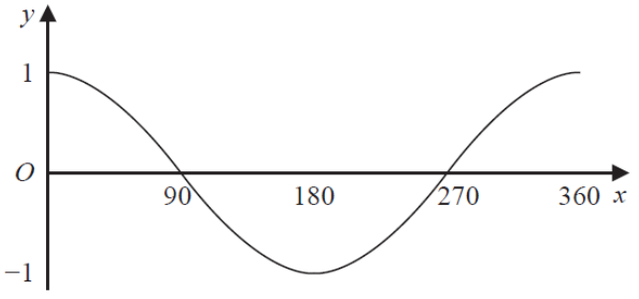
20 Here is the graph of $y = \sin x°$ for $-180 \leqslant x \leqslant 180$



(a) On the grid above, sketch the graph of $y = \sin x° - 2$ for $-180 \leqslant x \leqslant 180$

(1)

Here is the graph of $y = \cos x°$ for $0 \leqslant x \leqslant 360$



The exact value of cos 60° is 0.5

(b) (i) Write down the exact value of $\cos 300°$

……

(1)

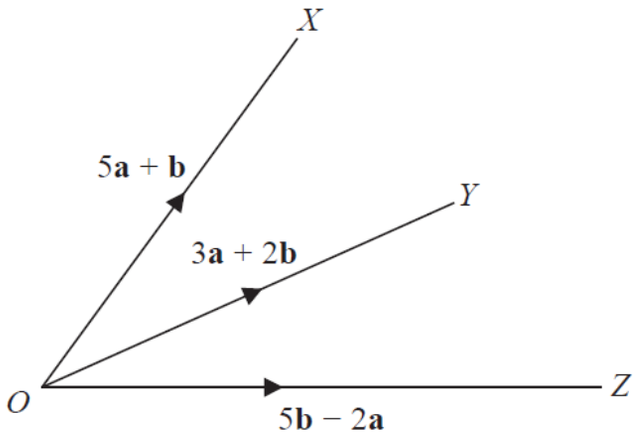
(ii) Write down one solution of the equation $\cos x° = -0.5$

……

(1)

(Total for Question 20 is 3 marks)

21 The diagram shows the lines OX, OY and OZ.



$\overrightarrow{OX} = 5\mathbf{a} + \mathbf{b}$

$\overrightarrow{OY} = 3\mathbf{a} + 2\mathbf{b}$

$\overrightarrow{OZ} = 5\mathbf{b} - 2\mathbf{a}$

Determine whether or not XYZ is a straight line.
You must show how you get your answer.

(Total for Question 21 is 3 marks)

22 (a) Write $3x^2 - 24x + 38$ in the form $a(x - b)^2 - c$ where a, b and c are integers.

.....

(3)

(b) Hence, or otherwise, write down the coordinates of the turning point on the graph of $y = 3x^2 - 24x + 38$

(....., ...)

(1)

(Total for Question 22 is 4 marks)

23 **C** is a circle with centre (0, 0)
L is a straight line with negative gradient.

The circle **C** and the line **L** intersect at the points A and B.
The coordinates of A are $(-9, 2)$
The x coordinate of B is 7

Find an equation of **L**.

.....

(Total for Question 23 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS

WEEK 5 TASK 3

Estimated completion time = 35 minutes.

Answer all questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 (*a*) Show that the equation $x^4 - x^2 - 5 = 0$ can be written in the form $x = \sqrt[4]{x^2 + 5}$

(1)

(*b*) Starting with $x_0 = 1.5$

use the iteration formula $x_{n+1} = \sqrt[4]{x_n^2 + 5}$ three times to find an estimate for a solution of $x^4 - x^2 - 5 = 0$

.....

(3)

(Total for Question 1 is 4 marks)

2 Starting with $x_0 = 1.45$

use the iteration formula $x_{n+1} = \dfrac{6}{x^2 + 2}$ twice to find an estimate

for the solution of $x^3 + 2x - 6 = 0$

Give your answer correct to 4 decimal places.

.....

(Total for Question 2 is 3 marks)

---

3 Here are the first four terms of a quadratic sequence.

3 9 17 27

Find an expression, in terms of n, for the nth term of this sequence.

.....

(Total for Question 3 is 3 marks)

4 The cumulative frequency table gives information about the ages of 80 people working for a company.

Age (a years)	**Cumulative frequency**
$20 < a \leq 30$	20
$20 < a \leq 40$	48
$20 < a \leq 50$	64
$20 < a \leq 60$	75
$20 < a \leq 70$	80

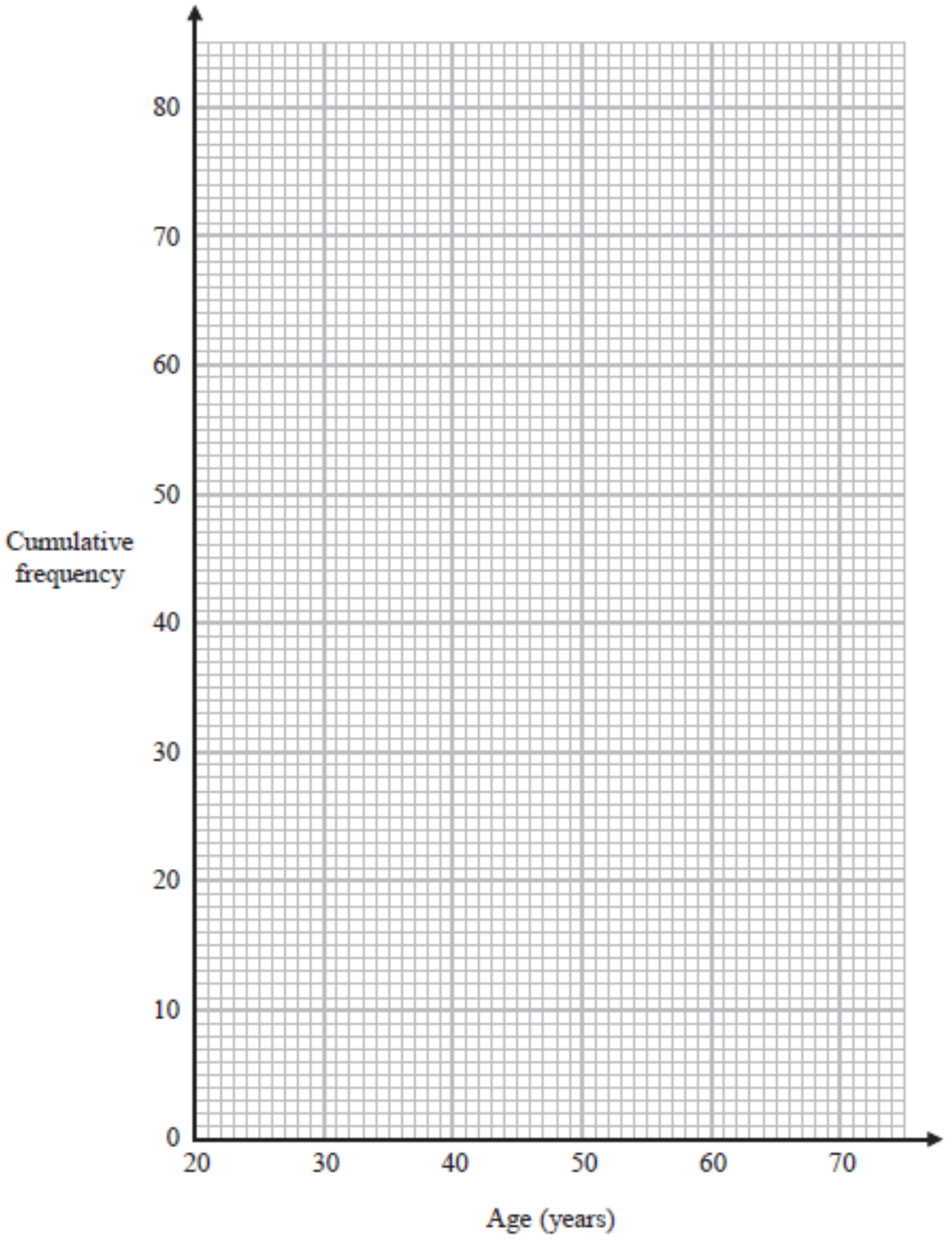
(a) On the grid on the next page, draw a cumulative frequency graph for this information.

(2)

(b) Use your graph to find an estimate for the median age.

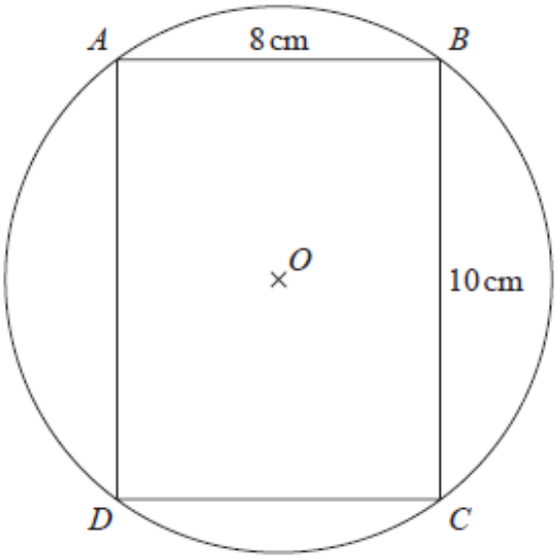
..... years

(1)



(Total for Question 4 is 3 marks)

***5** The points A, B, C and D lie on a circle, centre O.
$ABCD$ is a rectangle.

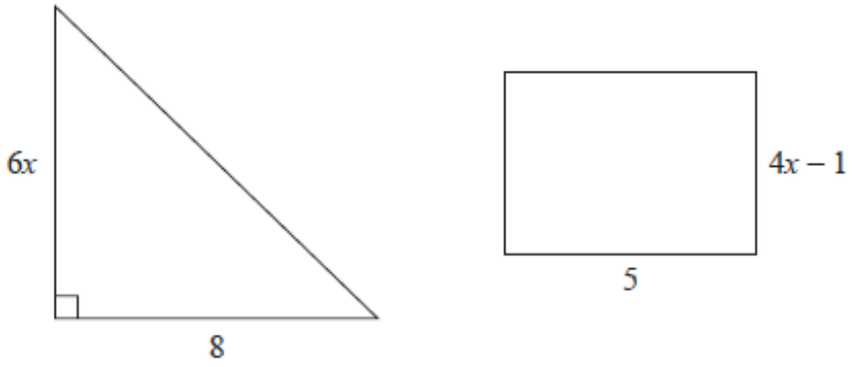


$AB = 8$ cm $BC = 10$ cm
Work out the circumference of the circle.
Give your answer correct to 3 significant figures.

..... cm

(Total for Question 5 is 4 marks)

6 Here is a triangle and a rectangle.



All measurements are in centimetres.
The area of the triangle is 10 cm^2 greater than the area of the rectangle.
Work out the value of x.

$x =$ .....

(Total for Question 6 is 4 marks)

---

7 A biased dice is thrown 60 times.
The table shows information about the number that the dice lands on each time.

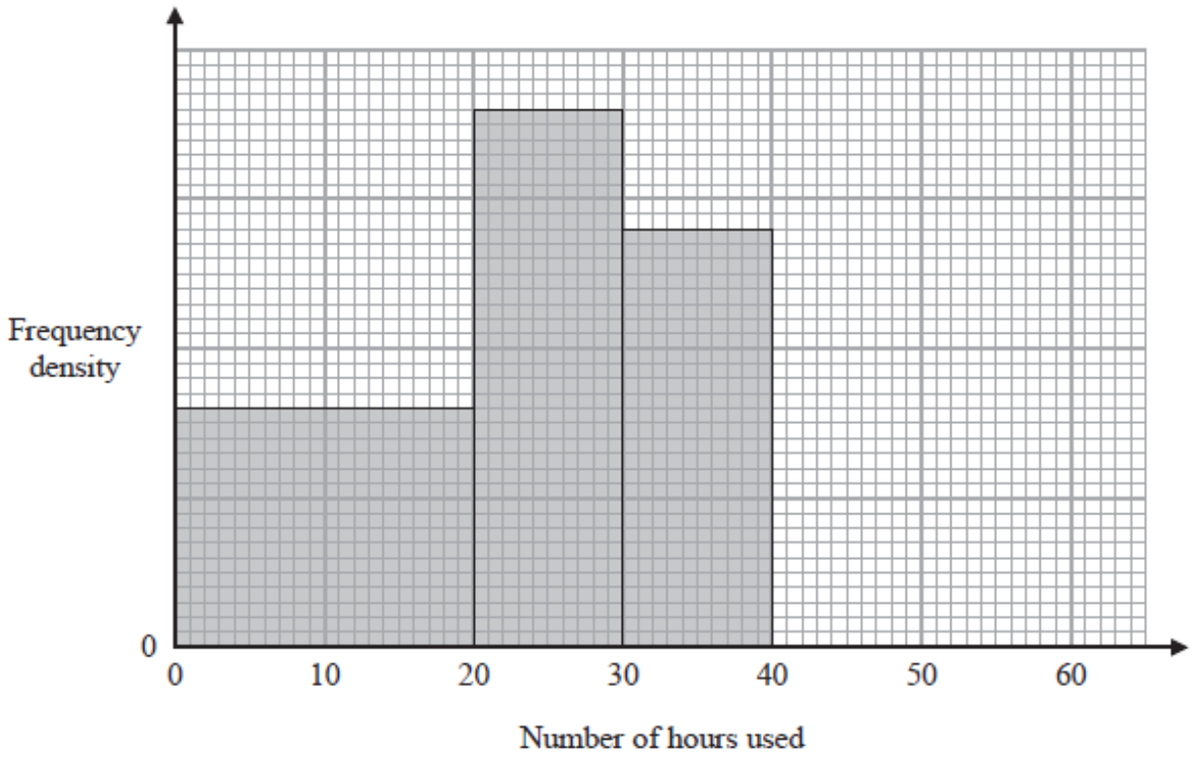
Number on dice	1	2	3	4	5	6
Frequency	12	7	8	9	9	15

Gethin throws the dice twice.
Work out an estimate for the probability that the dice will land on 6 both times.

.....

(Total for Question 7 is 3 marks)

8 The histogram gives information about the number of hours some students used their phones last week.
The histogram is incomplete.



28 students used their phones for between 30 and 40 hours.
24 students used their phones for between 40 and 60 hours.

(*a*) Use this information to complete the histogram.

(2)

No student used their phone for more than 60 hours.

(*b*) Work out the total number of students.

.....

(2)

(Total for Question 8 is 4 marks)

9 y is proportional to x^2
$y = 3$ when $x = 0.5$

x is inversely proportional to w
$x = 2$ when $w = 0.2$

Find the value of y when $w = 2$

$y =$ .....

(Total for Question 9 is 5 marks)

TOTAL FOR PAPER IS 33 MARKS

WEEK 5 TASK 4

Estimated completion time = 90 minutes.

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Find the highest common factor (HCF) of 90 and 126

……

(Total for Question 1 is 3 marks)

---

2 (a) Simplify $2a^3 \times a^4$

……..

(1)

(b) Simplify $12x^5y^2 \div 3x^2y$

……..

(2)

(Total for Question 2 is 3 marks)

---

3 Joe went on holiday to Spain.

His flights cost a total of £320

Joe stayed in an apartment for 3 weeks.
The apartment cost 560 euros each week.

Joe hired a car for 15 days.
The car hire cost 20.16 euros each day.

The exchange rate was £1 = 1.12 euros.

(a) Work out the total cost, in pounds, of the flights, the apartment and the car hire.

£……

(4)

(b) If there had been more than 1.12 euros to £1, how would this affect your answer to part (a)?

……..

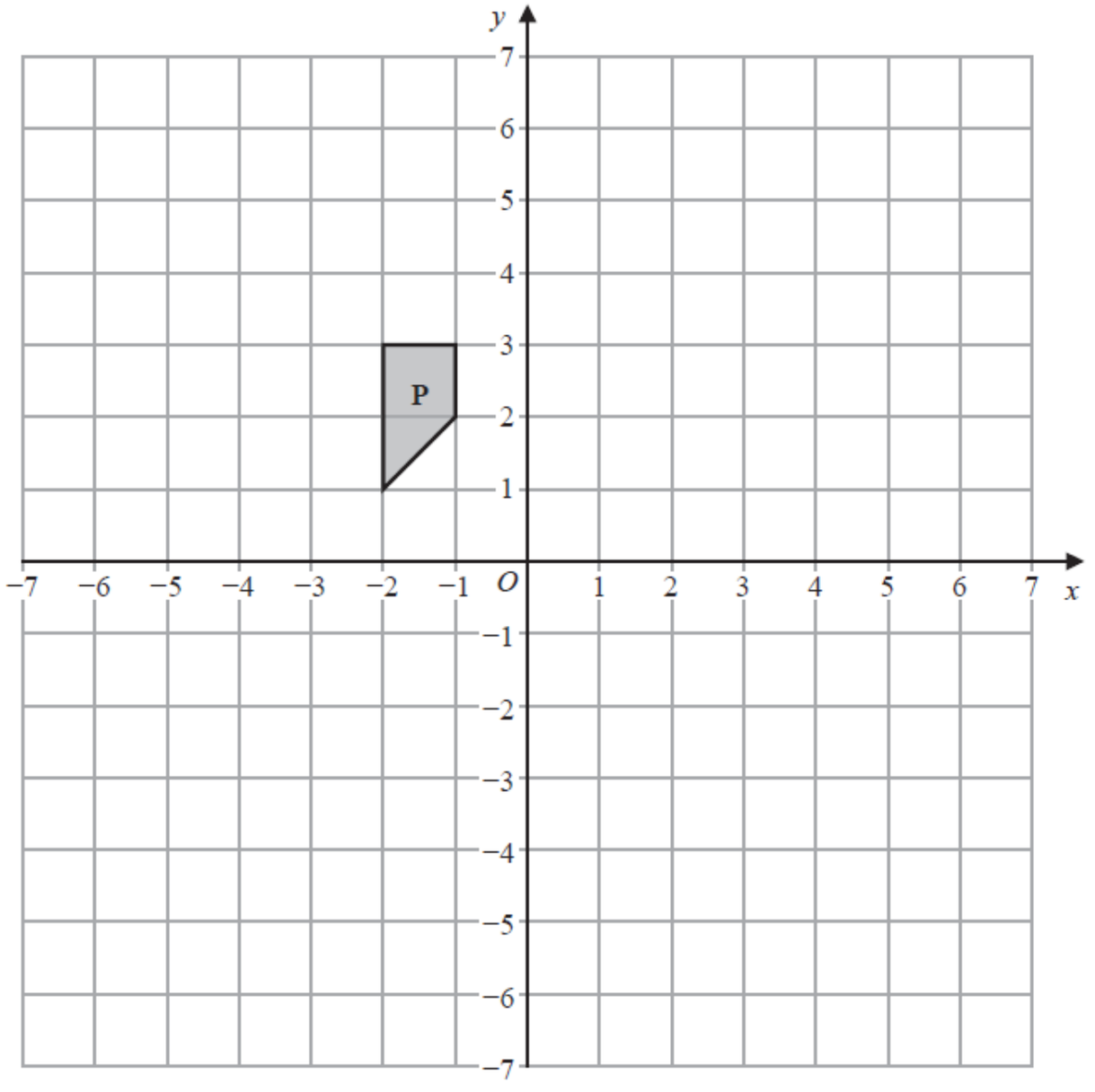
……..

……..

(1)

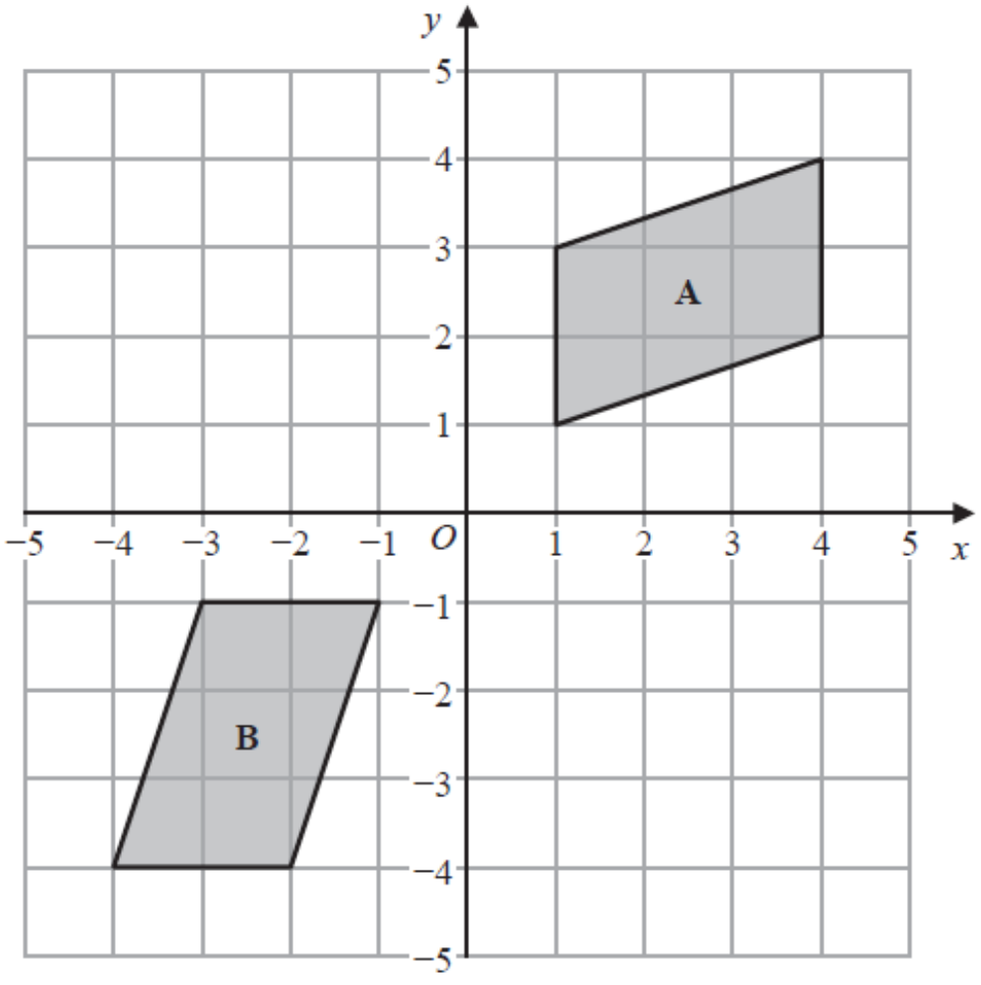
(Total for Question 3 is 5 marks)

4



(a) Translate shape **P** by the vector $\begin{pmatrix} 5 \\ -4 \end{pmatrix}$

(2)



(b) Describe fully the single transformation that maps shape **A** onto shape **B**.

……...

……...

……...

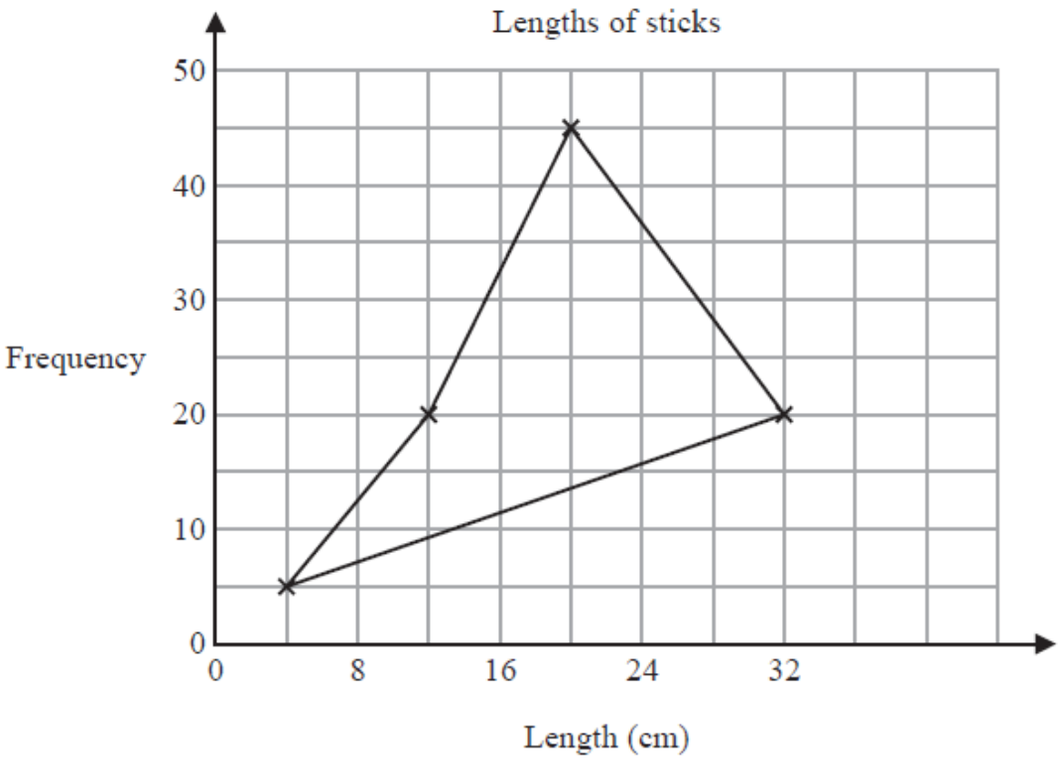
(2)

(Total for Question 4 is 4 marks)

5 The table gives information about the length of each of 90 sticks.

Length (b cm)	Frequency
$0 < b \leqslant 8$	5
$8 < b \leqslant 16$	20
$16 < b \leqslant 24$	45
$24 < b \leqslant 32$	20

Jenny drew the frequency polygon below for the information in the table.
The frequency polygon is **not** correct.



Write down **two** things that are wrong with the frequency polygon.

1 ……...

……...

2 ……...

……...

(Total for Question 5 is 2 marks)

6 A rectangle has length 8 cm
The rectangle has area 20 cm^2

The length of the rectangle is increased by 2 cm
The area of the rectangle is increased by 4 cm^2

Noah says,

"The width of the rectangle decreases by less than 5%"

Is Noah correct?
You must show how you get your answer.

(Total for Question 6 is 3 marks)

---

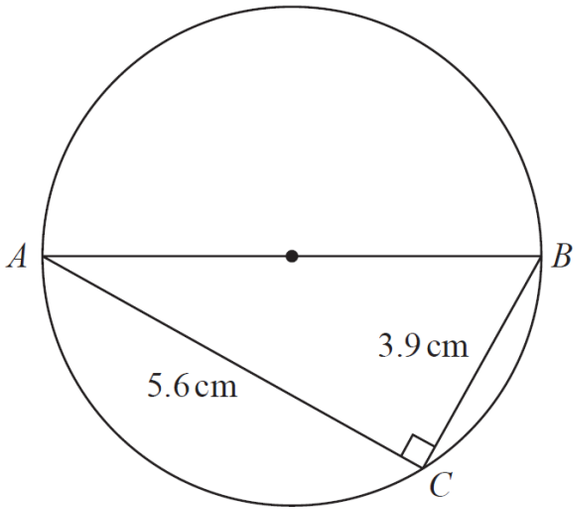
7 $a : b = 2 : 3$
$b : c = 5 : 6$

Show that $a : c = 5 : 9$

(Total for Question 7 is 2 marks)

---

8 A, B and C are points on a circle with diameter AB.
ABC is a right-angled triangle.

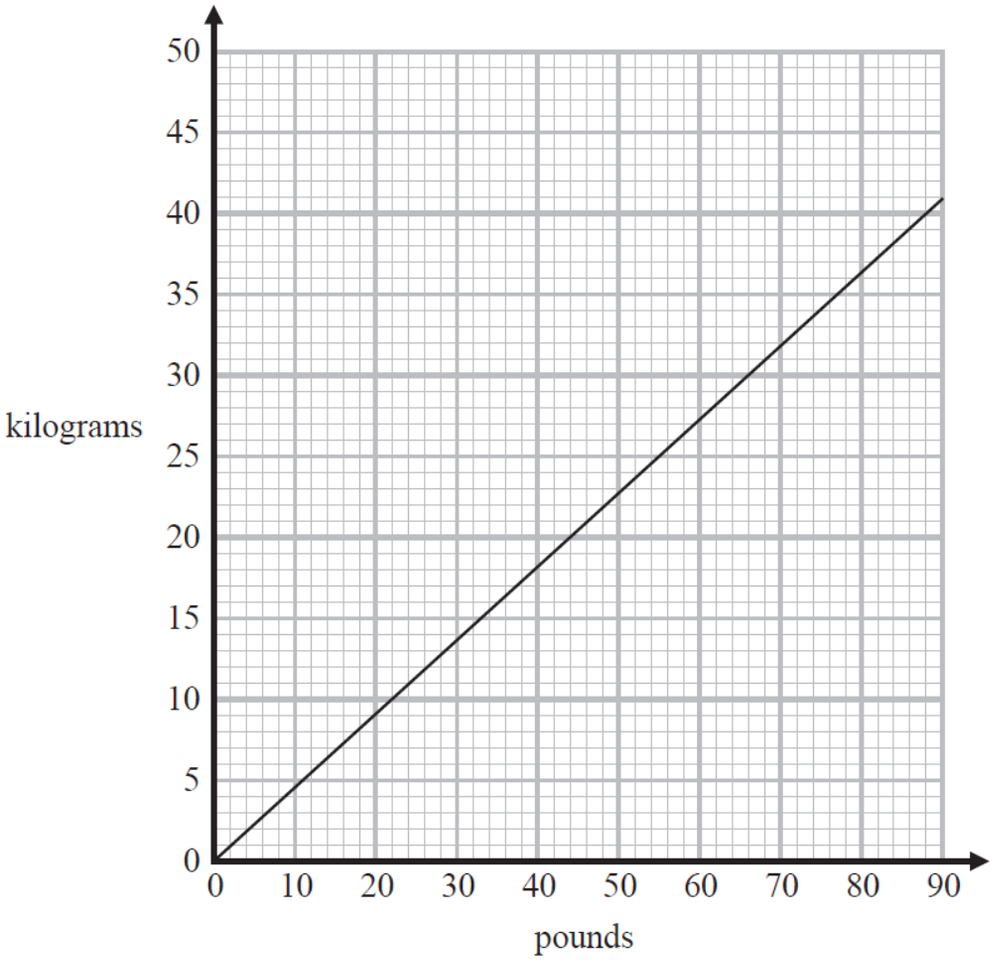


Calculate the area of the circle.
Give your answer correct to 3 significant figures.

…….. cm^2

(Total for Question 8 is 4 marks)

9 This graph can be used to convert between kilograms and pounds.



(a) Work out the gradient of the straight line.

……

(2)

(b) What does the gradient of this line represent?

……

……

……

(1)

(Total for Question 9 is 3 marks)

10 The table gives some information about the times taken by 80 students to complete a test.

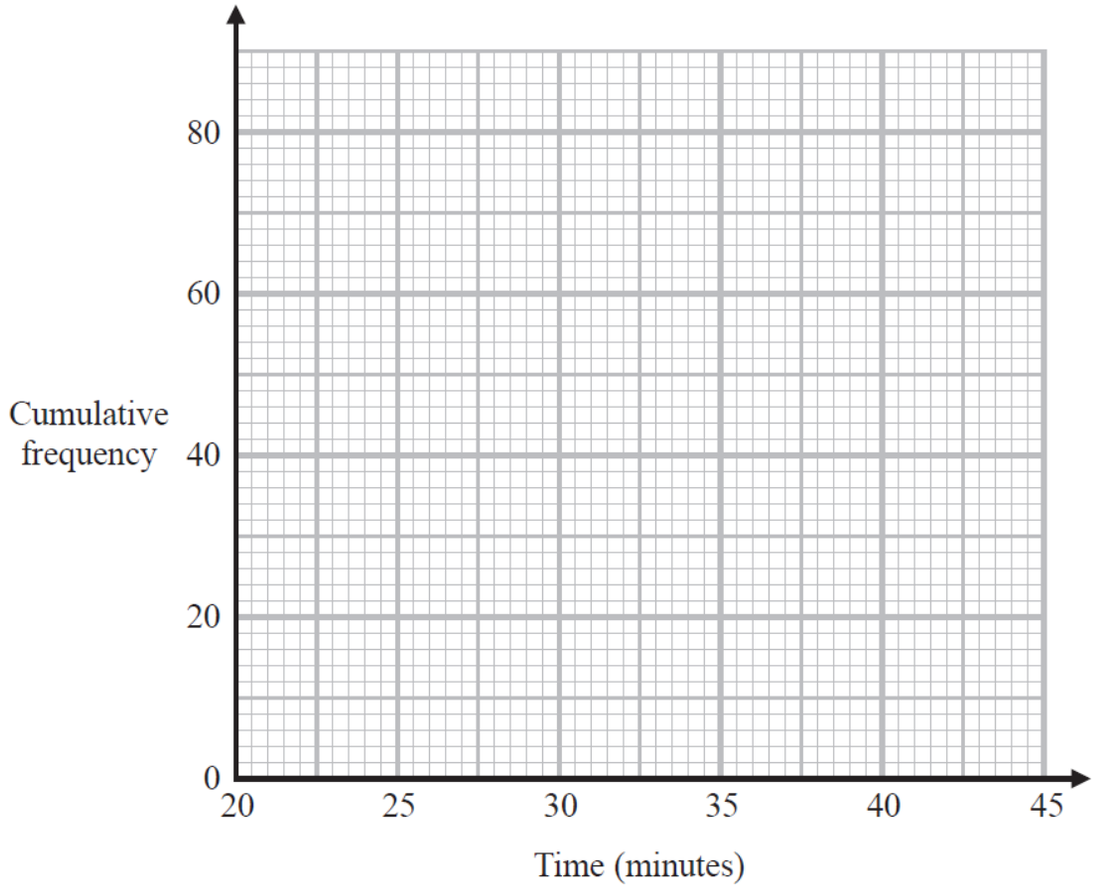
Time (t minutes)	**Frequency**
$20 < t \leqslant 25$	4
$25 < t \leqslant 30$	16
$30 < t \leqslant 35$	30
$35 < t \leqslant 40$	18
$40 < t \leqslant 45$	12

(a) Complete the cumulative frequency table for this information.

Time (t minutes)	**Cumulative frequency**
$20 < t \leqslant 25$	
$20 < t \leqslant 30$	
$20 < t \leqslant 35$	
$20 < t \leqslant 40$	
$20 < t \leqslant 45$	

(1)

(b) On the grid opposite, draw a cumulative frequency graph for your table.



(2)

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

…… minutes

(1)

One of the students is chosen at random.

(d) Use your graph to find an estimate for the probability that this student took longer than 38 minutes to complete the test.

……

(2)

(Total for Question 10 is 6 marks)

11 Lisa bought a house.

The value of the house increased by 1.5% each year for 2 years.
At the end of 2 years, the value of the house was £123 627

Work out the value of the house when Lisa bought it.

£……

(Total for Question 11 is 2 marks)

---

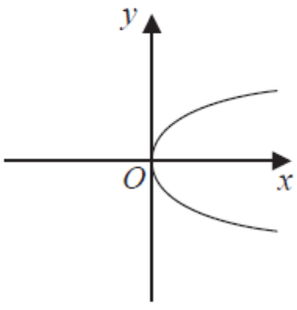
12 Expand and simplify $(x + 5)(x - 3)(x + 4)$

……

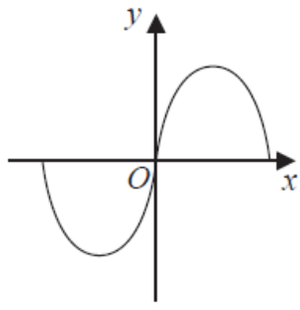
(Total for Question 12 is 3 marks)

---

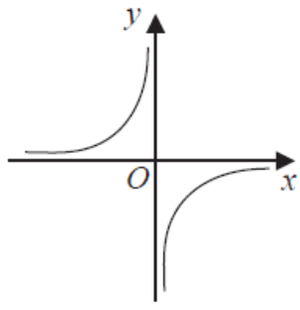
13 Here are nine graphs.



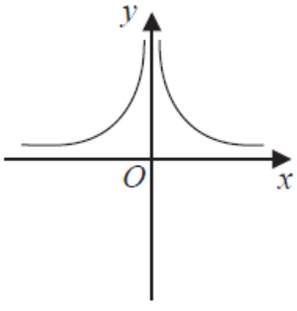
A



B



C



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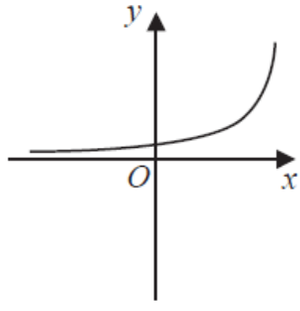

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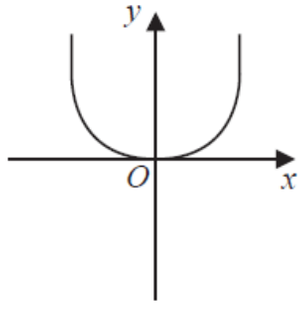

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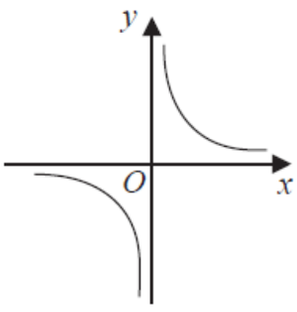
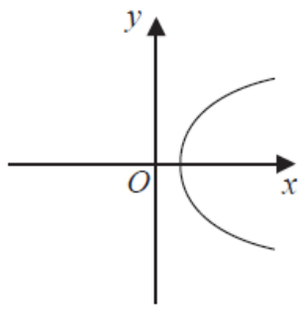
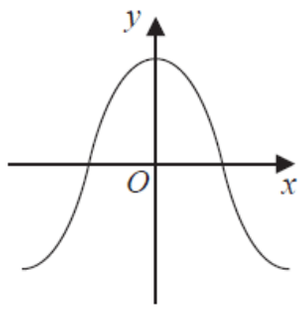


G



H



I

(a) Write down the letter of the graph that could have the equation $y = \cos x°$

.....

(1)

(b) Write down the letter of the graph that could have the equation $y = \frac{4}{x^2}$

.....

(1)

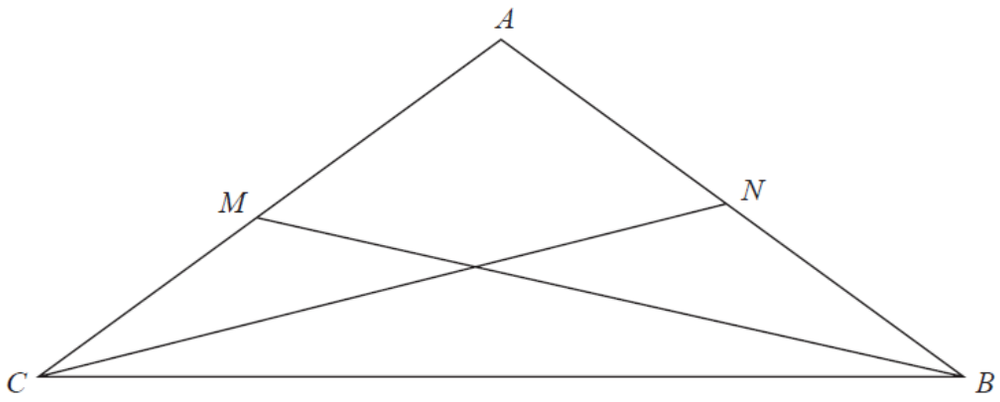
(c) Write down the letter of the graph that could have the equation $y^2 = 4x$

.....

(1)

(Total for Question 13 is 3 marks)

14 The diagram shows an isosceles triangle ABC with $AB = AC$.



M is the midpoint of AC.
N is the midpoint of AB.

Prove that triangle MBC is congruent to triangle NCB.

(Total for Question 14 is 3 marks)

15 g is a function such that

$$g(x) = x^3 + 1$$

(a) Find g(–3)

……..
(1)

(b) Find $g^{-1}(x)$

……
(2)

(Total for Question 15 is 3 marks)

---

16 The probability that Saira walks to school is 0.8

If Saira walks to school, the probability that she will be late is 0.3
If Saira does **not** walk to school, the probability that she will be late is 0.05

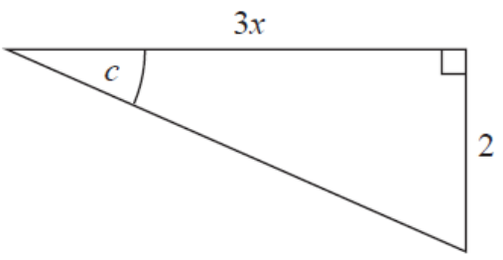
Work out an estimate for the number of days that Saira will be late on the next 20 school days.

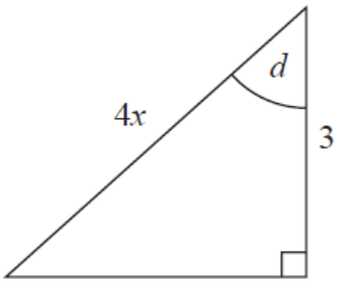
……

(Total for Question 16 is 3 marks)

---

17 Here are two right-angled triangles.





The lengths of the sides are given in centimetres.

Given that

$$\tan c + \cos d = 1.5$$

find the size of angle c.
Give your answer correct to the nearest degree.

……°

(Total for Question 17 is 4 marks)

18 Here are the first five terms of a quadratic sequence.

1 8 21 40 65

The nth term of this sequence can be written in the form $an^2 + bn$,
where a and b are integers.

Work out the value of a and the value of b.

a = ...

b = ...

(Total for Question 18 is 3 marks)

19 $T = \frac{m}{f}$

m = 120 correct to 3 significant figures

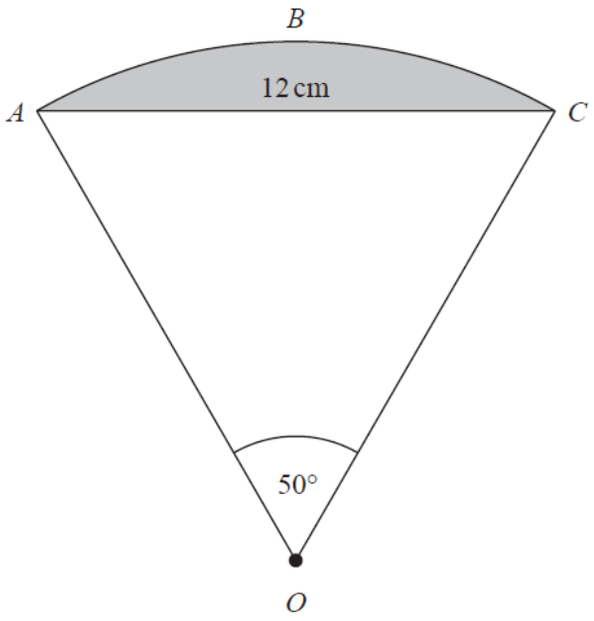
f = 25.6 correct to 1 decimal place

By considering bounds, work out the value of T to a suitable degree of accuracy.
Give a reason for your answer.
You must show all your working.

……

(Total for Question 19 is 4 marks)

20 *OABC* is a sector of a circle with centre *O*.



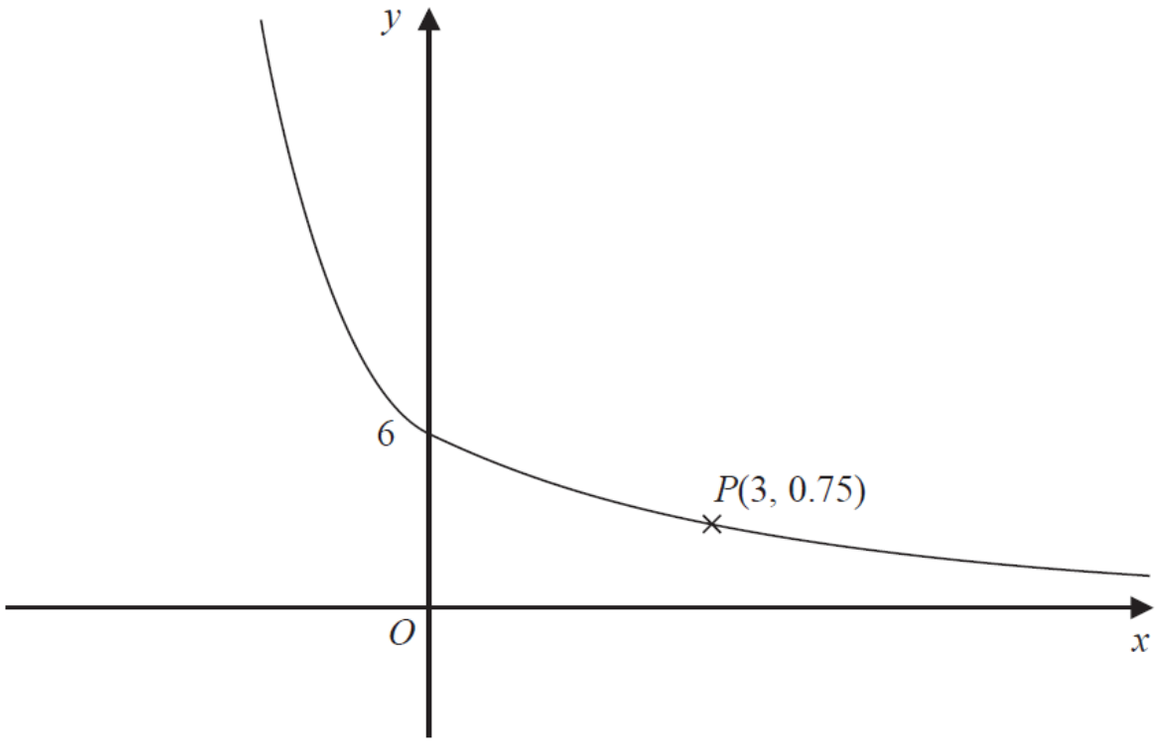
Angle $AOC = 50^{o}$
$AC = 12$ cm

Work out the area of the shaded segment of the circle.
Give your answer correct to 3 significant figures.

…… cm^2

(Total for Question 20 is 5 marks)

21 The diagram shows a sketch of the graph with equation $y = ab^{-x}$



P is a point on the graph with coordinates (3, 0.75)

Work out the value of a and the value of b.

a = ...

b = ...

(Total for Question 21 is 3 marks)

22 **A**, **B** and **C** are three similar solids.

The surface area of **A** is 24 cm^2
The surface area of **B** is 54 cm^2

The height of **B** : the height of **C** = 3 : 7
The volume of **A** is 72 cm^3

C is made of wood with density 0.14 g/cm^3

Work out the mass of **C**.

…….. g

(Total for Question 22 is 5 marks)

23 Solve $5 < (x - 2)(x + 2) < 12$

You must show all your working.

……...

(Total for Question 23 is 4 marks)

TOTAL FOR PAPER IS 80 MARKS

WEEK 5 TASK 5

Estimated completion time = 30 minutes.

Answer all questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 (*a*) (i) Write $x^2 - 8x + 3$ in the form $(x - a)^2 - b$ where a and b are integers.

.....

(2)

(ii) Hence, write down the coordinates of the turning point on the graph of $y = x^2 - 8x + 3$

(..... , ...)

(1)

(*b*) Solve $7x^2 + 8x - 5 = 0$

Give your solutions correct to 3 significant figures.

.....

(3)

Alex has to find the solutions of the quadratic equation $3k^2 + 10k - 8 = 0$

Here is his working and answer.

$(3k - 2)(k + 4) = 0$

$k = 2$ or $k = -4$

(*c*) What mistake has Alex made?

.....

.....

.....

(1)

(Total for Question 1 is 7 marks)

2 Make m the subject of $k = p + \frac{2m}{5}$

.....

(Total for Question 2 is 3 marks)

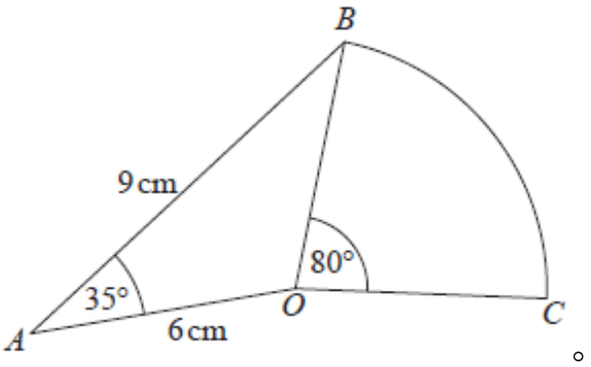
***3** It takes 14 hours for 5 identical pumps to fill a water tank.
How many hours would it take 4 of these pumps to fill another water tank of the same size?

..... hours

(Total for Question 3 is 2 marks)

---

4 *OAB* is a triangle.
OBC is a sector of a circle, centre *O*.



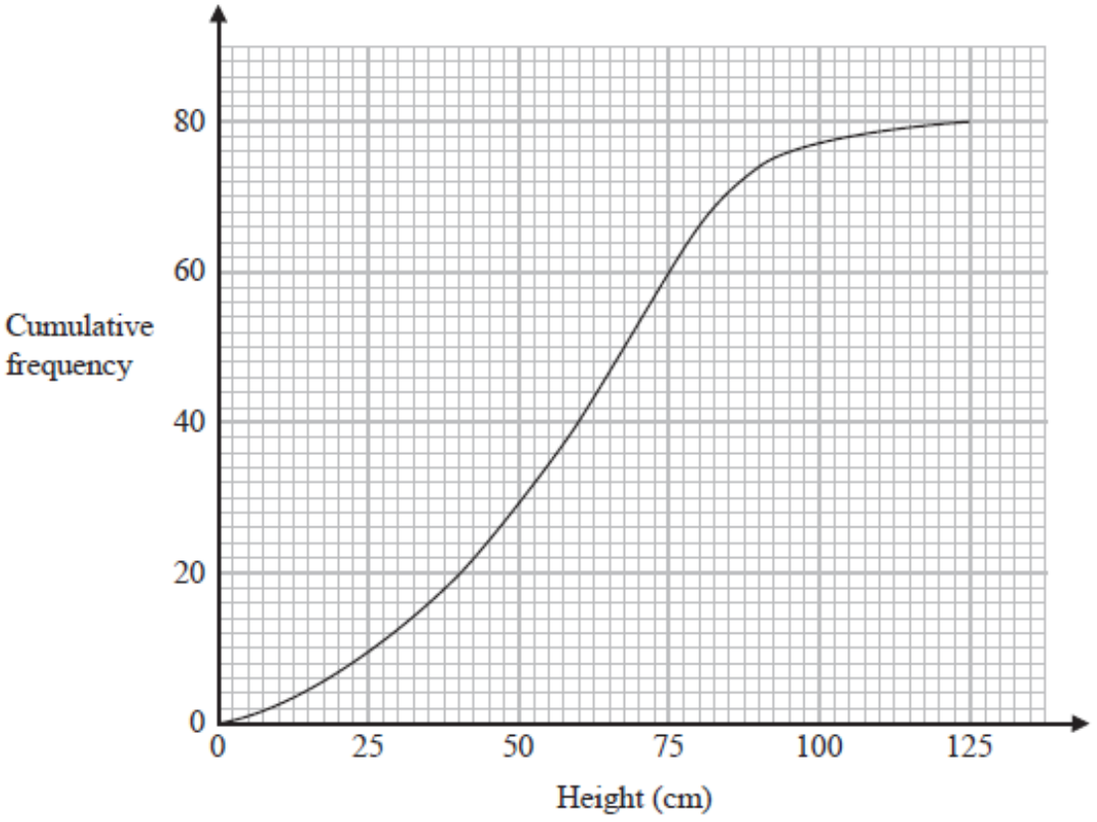
Calculate the area of *OBC*.
Give your answer correct to 3 significant figures.

..... cm^2

(Total for Question 4 is 4 marks)

5 Alan grew 80 plants of the same type outside.

The cumulative frequency graph shows information about the heights, in cm, of these plants.



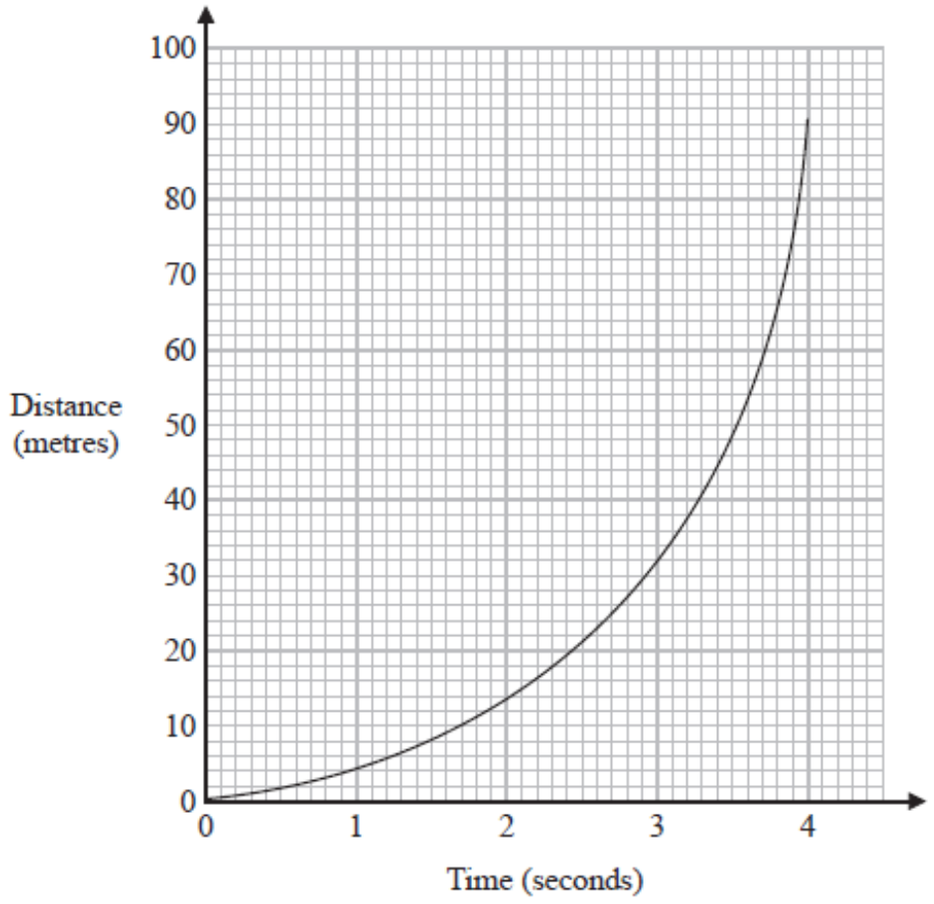
)

Use the graph to find an estimate for the interquartile range of the heights.

..... cm

(Total for Question 5 is 2 marks)

6 Here is a distance-time graph.



Find an estimate of the gradient of the graph at time 2.5 seconds.
You must show how you get your answer.

.....

(Total for Question 6 is 3 marks)

***7** Seija works at a weather station.

The table gives information about the temperature, T °C, at midday for each of 50 cities in the UK on Tuesday.

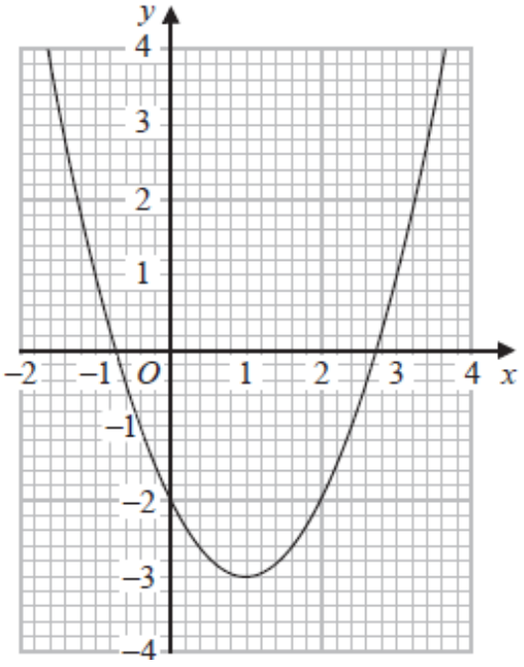
Temperature (T °C)	**Frequency**
$10 < T \leq 15$	2
$15 < T \leq 20$	8
$20 < T \leq 25$	13
$25 < T \leq 30$	21
$30 < T \leq 35$	6

Calculate an estimate for the mean temperature.

.....°C

(Total for Question 7 is 3 marks)

***8** Here is the graph of $y = x^2 - 2x - 2$



Write down an estimate for one of the roots of $x^2 - 2x - 2 = 0$

.....

(Total for Question 8 is 1 mark)

***9** A and B are numbers such that

$A = 2^2 \times 3^4 \times 7$
$B = 3^2 \times 7^2$

Find the lowest common multiple (LCM) of A and B.

.....

(Total for Question 9 is 2 marks)

---

10 Here are the first six terms of a quadratic sequence.

5 11 21 35 53 75

Find an expression, in terms of n, for the nth term of this sequence.

.....

(Total for Question 10 is 2 marks)

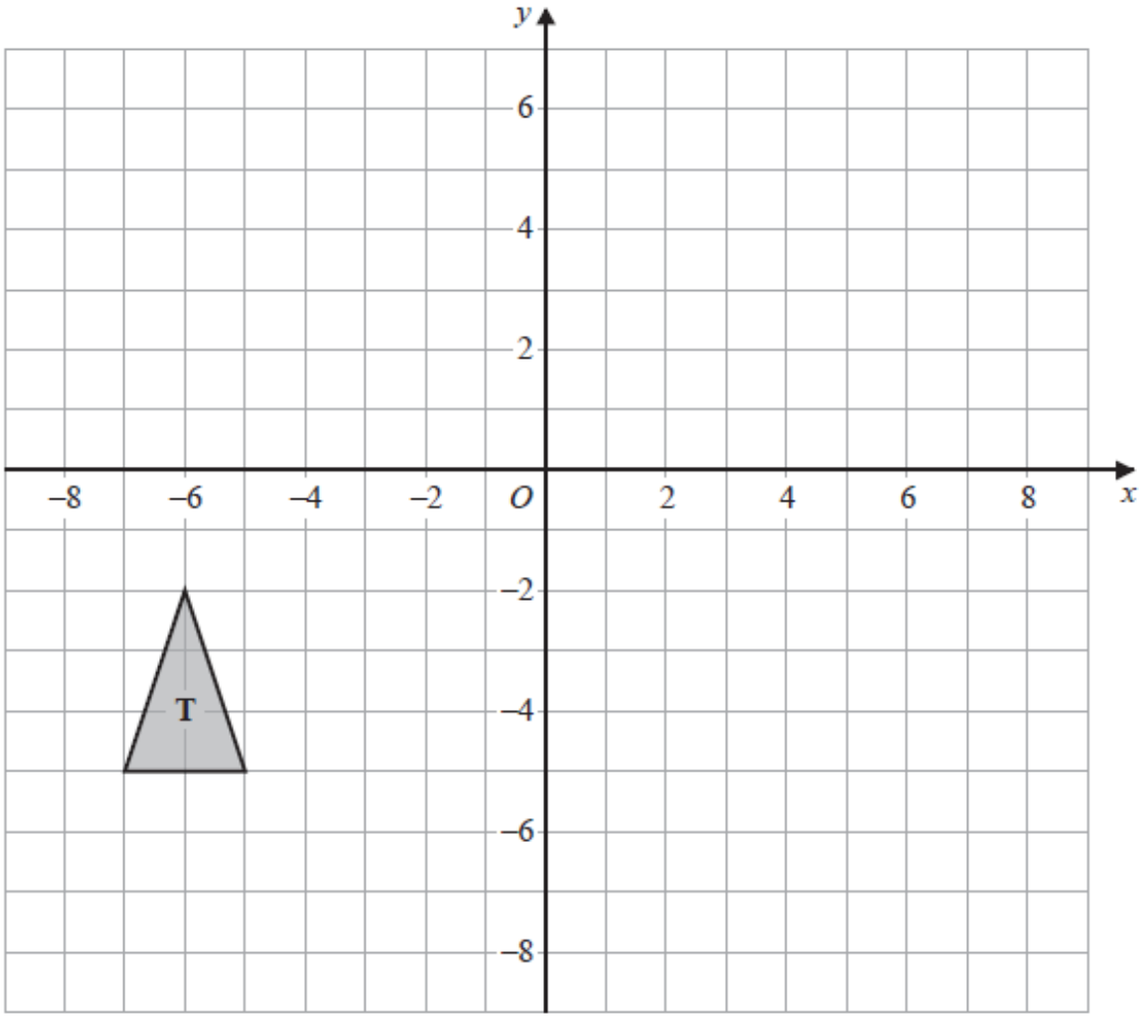
---

11 Factorise $a^2 - b^2$

.....

(Total for Question 11 is 1 mark)

12



On the grid, enlarge triangle **T** by scale factor –2 with centre of enlargement (–2, –2)

(Total for Question 12 is 2 marks)

TOTAL FOR PAPER IS 32 MARKS

Pearson

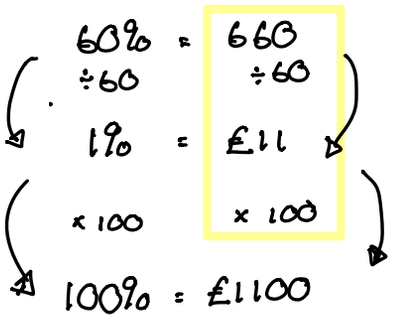
WEEK 5 MARKSCHEMES

(Higher 4-6)

WEEK 5 TASK 1

Answer all questions.
Write your answers in the spaces provided.
You must write down all the stages in your working.

1 The normal price of a mattress is reduced by 40% in a sale.
The price of the mattress in the sale is £660
Work out the normal price of the mattress.

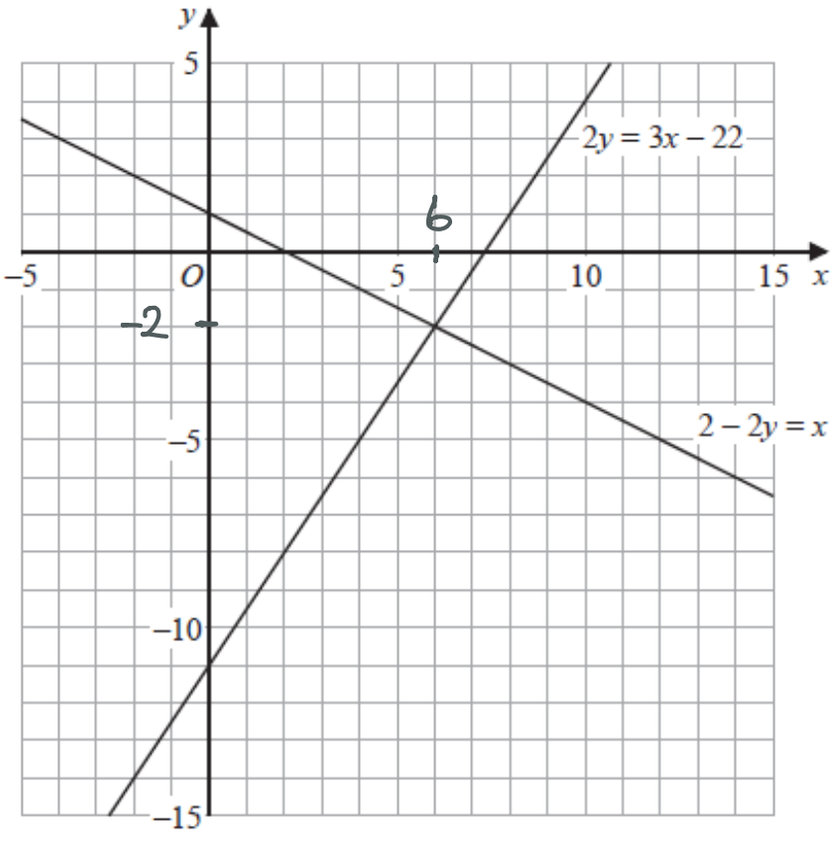


1 mark

£ 1100 Final mark

(Total for Question 1 is 2 marks)

***2**



Use these graphs to solve the simultaneous equations

$$2 - 2y = x$$
$$2y = 3x - 22$$

$x =$ 6 1 mark

$y =$ -2

(Total for Question 2 is 1 mark)

3 Write $\dfrac{(6x^5y^3)^2}{3x^2y^7 \times 4xy^{-3}}$ in the form $ax^b y^c$ where a, b and c are integers.

$(6x^5y^3)^2 = 6x^5y^3 \times 6x^5y^3 = 36x^{10}y^6$

$3 \times 4 \times x^2 \times x^1 \times y^7 \times y^{-3} = 12x^3y^4$

1 mark for either of these with at least two of three terms correct

so: $\dfrac{36x^{10}y^6}{12x^3y^4}$ 1 mark

$3x^7y^2$ Final mark

(Total for Question 3 is 3 marks)

---

4 (*a*) Write $\dfrac{1}{16}$ in the form 4^n where n is an integer.

$16 = 4^2 \qquad \dfrac{1}{4^2} = 4^{-2}$

4^{-2} 1 mark

(1)

(*b*) Work out the value of $8^{\frac{5}{3}} - 9^{\frac{3}{2}}$

$8^{5/3} \rightarrow \sqrt[3]{8} = 2$

1 mark for either of these

$2^5 = 32$

$9^{3/2} \rightarrow \sqrt{9} = 3$

$3^3 = 27$

so $32 - 27 = 5$

1 mark for either of these

5 Final mark

(3)

(Total for Question 4 is 4 marks)

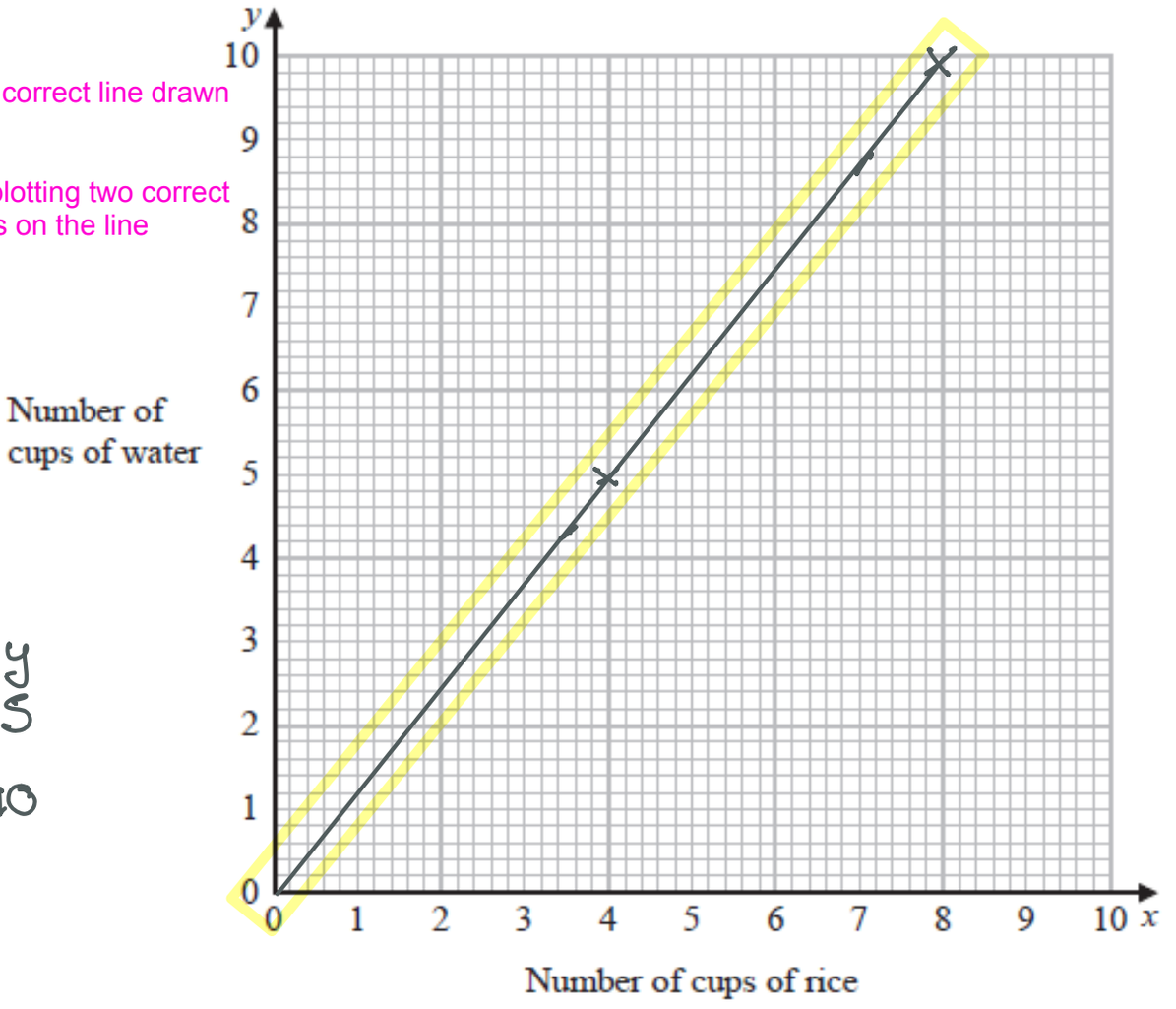
5 To cook rice

the number of cups of rice (x) : the number of cups of water (y) = 4 : 5

(a) Use this information to draw a graph to show the relationship between the number of cups of rice and the number of cups of water needed to cook rice.

2 marks for correct line drawn

1 mark for plotting two correct points on the line



x : y
4 : 5
8 : 10

(2)

(b) Find the gradient of the line drawn in part (a).

$\frac{\text{change in } y}{\text{change in } x} = \frac{10}{8} = \frac{5}{4} = 1.25$

1.25 1 mark

(1)

(Total for Question 5 is 3 marks)

6 At the start of year n the population of a species is P_n

At the start of the following year the population of the species is given by

$$P_{n+1} = kP_n$$ where k is a positive constant.

The population of the species at the start of year 1 is 8 million.
The population of the species at the start of year 2 is 6 million.

Work out the population of the species at the start of year 3

1 mark

$6 = k \times 8$

$k = \frac{6}{8} = \frac{3}{4}$

$P_3 = \frac{3}{4} \times 6$ 1 mark

$= \frac{18}{4}$ $\frac{18}{4} = \frac{9}{2} = 4.5$

4·5 Final mark

..... million

(Total for Question 6 is 3 marks)

---

7 Factorise $6x^2 - 5x - 4$

$6 \times 4 = 24$ 1,24 2,12 3,8

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

$3x(2x+1) - 4(2x+1)$

$(3x-4)(2x+1)$ 2 marks

.....

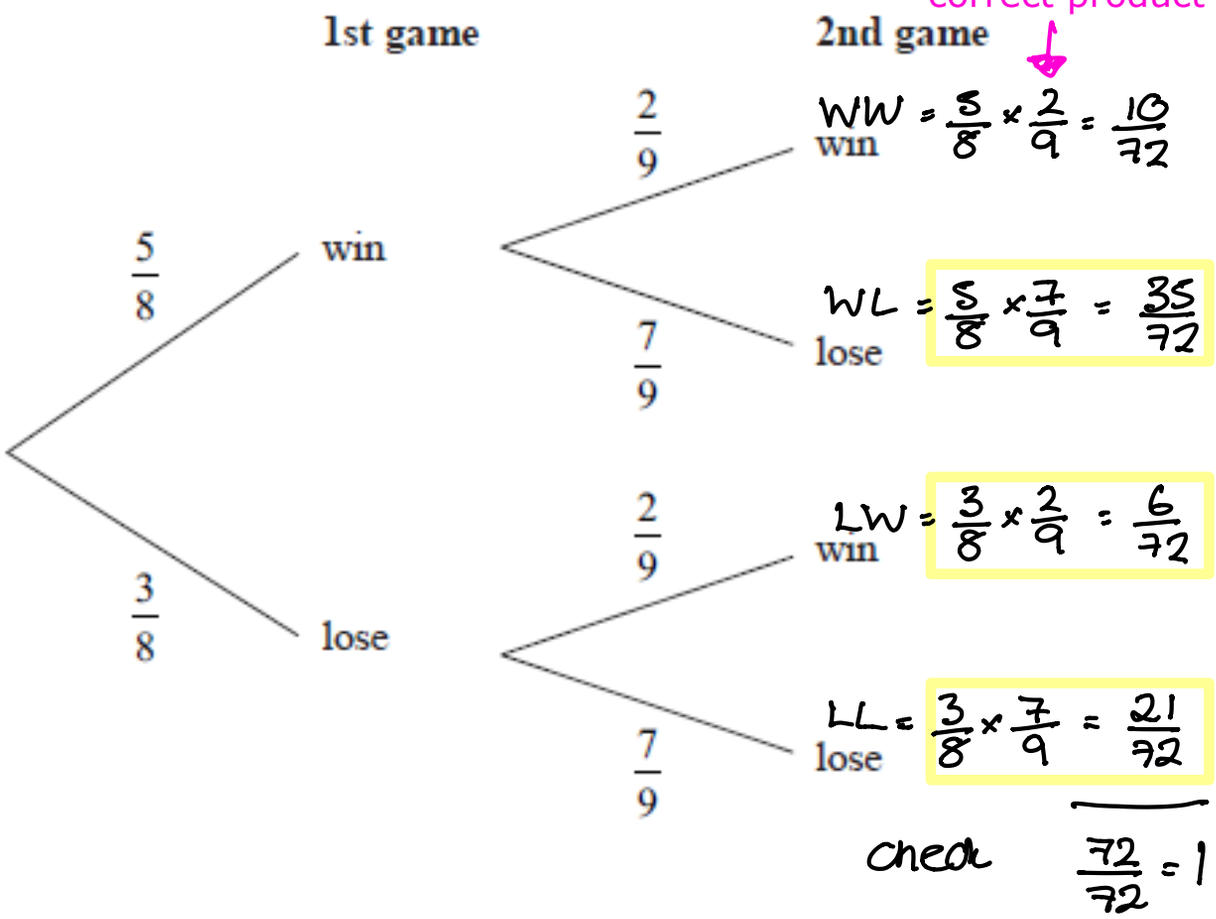
1 mark may be awarded if not fully correct for $(3x \pm 4)(2x \pm 1)$

(Total for Question 7 is 2 marks)

8 Martha plays a game twice.

The probability tree diagram shows the probabilities that Martha will win or lose each game.

1 mark for one correct product



Find the probability that Martha will lose at least one game.

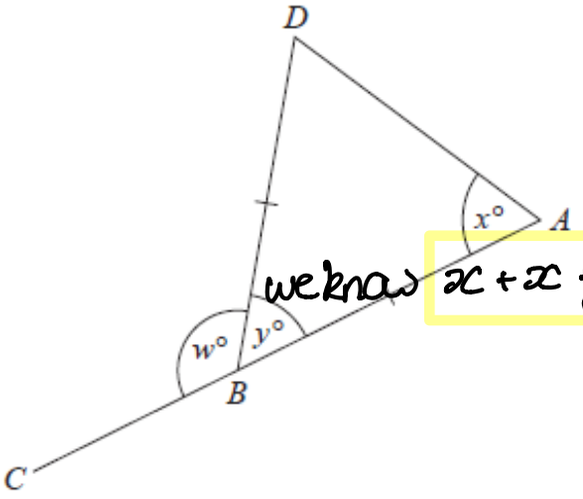
$P(WL) + P(L,W) + P(LL)$

$= \frac{35}{72} + \frac{6}{72} + \frac{21}{72}$ 1 mark

Final mark $62/72$

(Total for Question 8 is 3 marks)

***9** The diagram shows an isosceles triangle ABD and the straight line ABC.



we know $x + x + y = 180$ 1 mark

$BA = BD$

$x : y = 2 : 1$

Work out the value of w.

$x : y$

$2 : 1$ so $x = 2y$

1 mark for either of these

so using $x + x + y = 180$

$2y + 2y + y = 180$

$5y = 180$

$y = 180 \div 5$

$y = 36$

$5 \overline{)180}$ 36

so $w = 180 - 36$ 1 mark

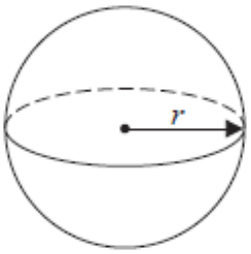
$= 144$

144 Final mark

$w =$ .....

(Total for Question 9 is 4 marks)

10 Here is a sphere.



Surface area of sphere $= 4\pi r^2$

$\frac{3}{8}$ of the surface area of this sphere is 75π cm^2

Find the diameter of the sphere.
Give your answer in the form $a\sqrt{b}$ where a is an integer and b is a prime number.

$\frac{8}{8} = 4\pi r^2$ $\quad \frac{3}{8} = 75\pi$ $\quad \frac{1}{8} = 25\pi$

$25\pi \times 8 = 200\pi$ 1 mark

$200\pi = 4\pi r^2$

$r^2 = \frac{200}{4} = 50$ 1 mark

$r = \sqrt{50} = \sqrt{2}\sqrt{25}$

1 mark $= 5\sqrt{2}$

so diameter $= 10\sqrt{2}$

$10\sqrt{2}$ Final mark

..... cm

(Total for Question 10 is 4 marks)

11 Spinner **A** and spinner **B** are each spun once.

The probability that spinner **A** lands on red is $\frac{1}{4}$

The probability that both spinner **A** and spinner **B** land on red is $\frac{1}{24}$

Work out the probability that one spinner lands on red and the other spinner does **not** land on red.

$\text{Red}_A \times \text{Red}_B = \text{Two Reds}$

$\frac{1}{4} \times \text{Red}_B = \frac{1}{24}$ 1 mark

so $\text{Red}_B = \frac{1}{6}$

$P(R, \text{Not R}) + P(\text{Not R}, R)$

1 mark for either of these

$\frac{1}{4} \times \frac{5}{6} + \frac{3}{4} \times \frac{1}{6}$

1 mark $\frac{5}{24} + \frac{3}{24} = \frac{8}{24}$

$\frac{8}{24} = \frac{1}{3}$

$\frac{1}{3}$ Final mark

(Total for Question 11 is 4 marks)

***12** The table shows information about the daily rainfall in a town for 60 days.

Rainfall (R mm)	Frequency
$0 \leq R < 5$	8
$5 \leq R < 10$	24
$10 \leq R < 15$	13
$15 \leq R < 20$	11
$20 \leq R < 25$	4

2 marks for fully correct diagram

1 mark may be given if:

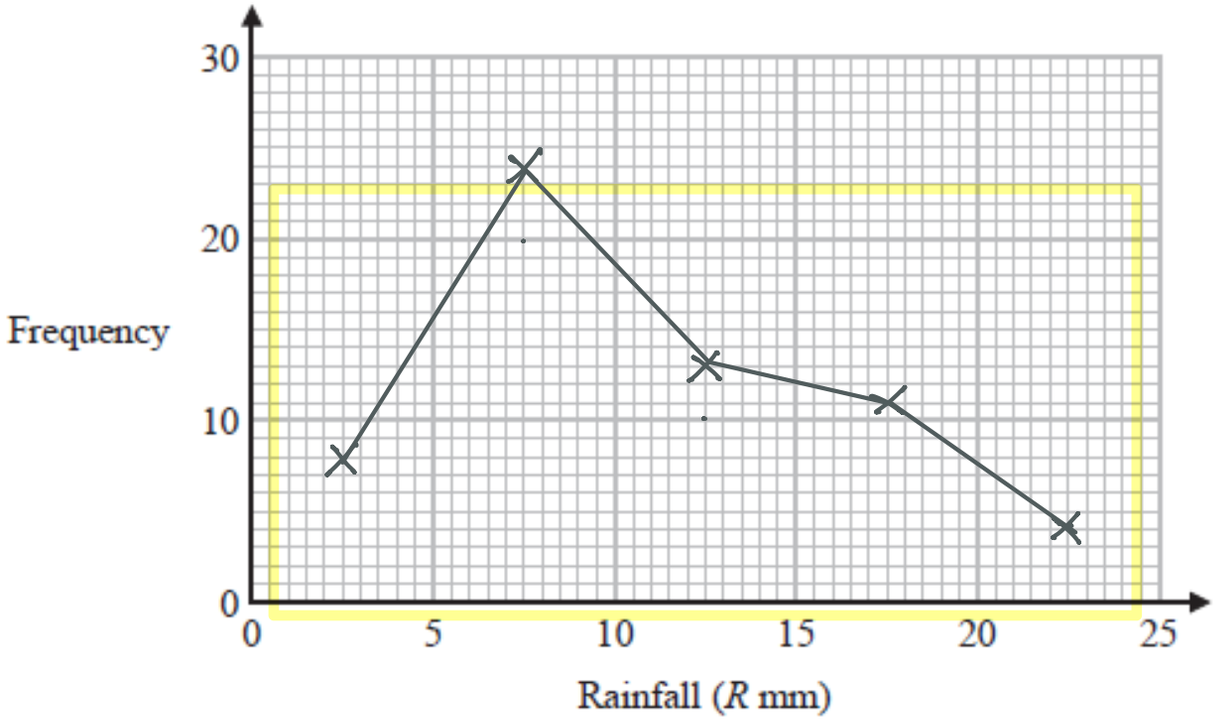
Points correct but not joined, or

First and last points joined, or

One point plotted incorrectly, or

All correct heights plotted at endpoint of intervals

Draw a frequency polygon for this information.



(Total for Question 12 is 2 marks)

TOTAL FOR PAPER IS 35 MARKS

WEEK 5 TASK 2

Paper: 1MA1/1H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
1	$5m + 6$	M1	for $2m - 6$ **or** $3m + 12$	
		A1	cao	
2 (a)	Description	C1	for description of relationship, eg the greater the age the less the value (price, cost etc) oe, accept negative correlation	Do NOT accept "negative", "negative relationship" or "negative proportion"
(b)	Line of best fit	C1	for a single straight line that could be used to take readings	
(c)	Explanation	C1	for explanation, eg the LOBF would have to be used outside the data	
3	60	P1	for process to find number studying French, eg $270 \div 9 \times 2$ (= 60)	
		P1	for process to find number studying Spanish, eg "60" $\div 3 \times 7$ (= 140)	
		P1	(dep P1) for process to find number studying German, eg 270 – [number studying French] – [number studying Spanish] (= 70)	[number studying French] and [number studying Spanish] must be clearly identified eg from working
		P1	for process to find a percentage, eg 42 ÷ "70" × 100 oe	
		A1	cao	
4 (a)		B2	cao	Any orientation
		(B1	for a 4 by 4 square)	
(b)		M1	for attempt at a 3D sketch with a pentagonal face	Hidden edges may or may not be shown
		A1	for a correct 3D sketch	Do not accept a sketch which shows additional flaps

Paper: 1MA1/1H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
5	25	P1	for substituting, eg $3 = \frac{1500}{A}$ **or** (A =) $1500 \div 3$ (=500)	
		P1	(dep P1) for [area of base] ÷ 20	[area of base] must be clearly stated or come from an attempt at using the formula if 500 is not being used
		A1	cao	
6 (a)	2.47×10^5	B1	cao	
(b)	0.00065	B1	cao	
(c)	2.4×10^{-12}	M1	for 3×8 (= 24) **and** $10^{(-7+-6)}$ ($=10^{-13}$) **OR** for 0.0000000000024 oe eg 0.24×10^{-11} **or** 24×10^{-13} **OR** for an answer of 2.4×10^n where $n \neq -12$	
		A1	cao	
7	4.5	P1	for process to find area of square, eg $(24 \div 4)^2$ (=36)	Award for 6^2 or 36 seen
		P1	for start of process to find area of trapezium, eg $\frac{1}{2}(x + 3x) \times 8$ **or** $\frac{1}{2}(AB + 3AB) \times 8$ **or** $x \times 8 + \frac{1}{2} \times 2x \times 8$	
		P1	for using a suitable equation, eg $\frac{1}{2}(x + 3x) \times 8 = 2 \times$ "36"	
		A1	cao	Accept $\frac{72}{16}$ oe
8	90	M1	for using a rounded value, eg $60^2 \div \sqrt{1600}$ **or** $60^2 = 3600$ **or** $\sqrt{1600} = 40$	
		A1	for 90	
		C1	overestimate and reason, eg 58.7 rounded up and 1612 rounded down	

Paper: 1MA1/1H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
9	25	P1	for process to find link between start and end of 1st or 2nd year, eg two values in the ratio 1 : 0.8 such as 100 and 80 **or** two values in the ratio 1 : 0.6 such as 100 and 60 **OR** for 0.8 **or** 0.6 **OR** uses own figures eg 40% of 1000 (= £400), 20% of 1000 (= £200)	
		P1	for process to find link between end of 1st year and end of 2nd year, eg two values in the ratio 0.8 : 0.6 such as 80 and 60 **OR** for 0.6 ÷ 0.8 (= 0.75) **OR** uses own figures eg 200 ÷ 800 × 100	
		A1	cao	
10 (a)	Box plot	M1	for correctly identifying one of the LQ (32), median (38), or UQ (47)	Might be indicated in the set of data values
		M1	for showing a box and at least 3 correctly plotted values	Values: 22, 32, 38, 47, 58
		A1	for a fully correct box plot	
(b)	Comparisons	C1	ft for correct comparison of the medians	Figures need not be stated but if they are they must be correct (ft)
		C1	ft for correct comparison of ranges or IQRs NB for award of both marks at least one comparison must be in context	Context can include reference to age or years
11	12 and 30	P1	for start of process, eg forms two equations $3x + y = 66$ and $x + 2y = 72$	
		M1	for a correct process to eliminate one variable	Condone one arithmetic error
		M1	(dep) for substituting found value in one of the equations or appropriate method after starting again (condone one arithmetic error)	
		A1	for small = 12 and large = 30	

Paper: 1MA1/1H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
12	–2	M1	for expanding, eg $\sqrt{7} \times \sqrt{7}+5 \times \sqrt{7}-5 \times \sqrt{7}-5 \times 5$ **or** $(\sqrt{7})^2 - 25$ **or** $\sqrt{49} - 25$ **or** $7 - 25$ **or** -18	
		M1	(indep) for $(\sqrt{7})^2 = 7$ **or** $\sqrt{7} \times \sqrt{7} = 7$	
		A1	cao	
13	Mistake identified	C1	for identifying the mistake **Acceptable** The first number should be 5 (or – –5 or +5) Its $-b$ so it should be – –5 (or 5 or +5) She wrote –5, not – –5 (or 5 or +5) **Not acceptable** She should have written 5^2, not $(-5)^2$ She didn't work out the square root	
14	$\frac{17}{24}$	P1	for a correct product, $\frac{7}{10} \times \frac{6}{9} \times \frac{3}{8}$ **or** $\frac{7}{10} \times \frac{6}{9} \times \frac{5}{8}$ **or** $\frac{7}{10} \times \frac{3}{9}$	
		P1	for a complete process, eg $\frac{3}{10} + \frac{7}{10} \times \frac{3}{9} + \frac{7}{10} \times \frac{6}{9} \times \frac{3}{8}$ **or** $1-\left(\frac{7}{10} \times \frac{6}{9} \times \frac{5}{8}\right)$	
		A1	for $\frac{17}{24}$ oe	Accept equivalent fractions, decimals (eg 0.70… or 0.71) or percentages (eg 70.. or 71)

Paper: 1MA1/1H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
15	$x = (\pm)\sqrt{\frac{3+y}{1-2y}}$	M1 M1 M1 A1	for multiplying both sides by $2x^2 + 1$ eg $y(2x^2 + 1) = x^2 - 3$ **or** $2x^2y + y = x^2 - 3$ (dep M1) for a method to isolate terms in x in a correct equation eg $x^2 - 2x^2y = y + 3$ **or** $2x^2y - x^2 = -y - 3$ for $x^2 = \frac{3+y}{1-2y}$ oe A1 for $x = (\pm)\sqrt{\frac{3+y}{1-2y}}$ oe eg $x = (\pm)\sqrt{\frac{-y-3}{2y-1}}$	Condone missing brackets for this mark only
16	15 : 12 : 9 : 25	P1 P1 P1 A1	for starting the process, eg $a = \frac{5}{4}b$ **or** $b = \frac{5}{4}a$ **or** $d = \frac{5}{3}a$ **OR** $a : b = 5 : 4$ **or** $b : c = 4 : 3$ for three terms equivalent to $\frac{5}{4}(b)$, $1(b)$, $\frac{3}{4}(b)$ **or** to $1(a)$, $\frac{4}{5}(a)$, $\frac{5}{3}(a)$ **OR** for $a : b : c = 5 : 4 : 3$ for ratio with at least 3 of the values, including both c **and** d, correct eg $\frac{5}{4} : 1 : \frac{3}{4} : \frac{25}{12}$ oe **or** $1 : \frac{4}{5} : \frac{3}{5} : \frac{5}{3}$ oe **OR** for $5\times3 : 4\times3 : 3\times3$ (= 15 : 12 : 9) **and** $3\times5 : 5\times5$ (= 15 : 25) for 15 : 12 : 9 : 25 oe ratio with integer values	

Paper: 1MA1/1H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
17	$60 - x$	M1	for using angle at centre is twice the angle at the circumference, eg angle $BOD = 6x$	Reasons need not be given.
		M1	for using opposite angles of a cyclic quadrilateral, eg angle $BAD = 180 - 3x$	
		M1	for a complete process, eg $(360 - (180 - 3x) - 6x) \div 3$	
		A1	for $60 - x$	Do not award marks for answer if not supported by working.
18	$3(x + 2y)(x - 2y)$	B2	cao	
		(B1	for $3(x^2 - 4y^2)$ **or** $(3x + 6y)(x - 2y)$ **or** $(x + 2y)(3x - 6y)$)	
19	$\frac{\sqrt{3}}{72}$	M1	for $\frac{1}{12^{\frac{3}{2}}}$ **or** $\frac{1}{(\sqrt{12})^3}$	These marks can be awarded whenever this is seen (ie as independent marks), which might be later in the process
		M1	for writing $\sqrt{12}$ as $2\sqrt{3}$	
		M1	for method to rationalise the denominator eg $\frac{1}{(2\sqrt{3})^3} \times \frac{(2\sqrt{3})^3}{(2\sqrt{3})^3}$	
		A1	for $\frac{\sqrt{3}}{72}$ (accept $h = 72$) SC B3 for equivalent fraction in form $\frac{\sqrt{b}}{c}$, eg $\frac{\sqrt{12}}{144}$	

Paper: 1MA1/1H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
20 (a)	Graph drawn	C1	correct graph drawn	Graph should cross through the 5 key intersection points.
(b)(i)	0.5	B1	cao	
(ii)	120 or 240	B1	for 120 **or** 240 **or** any appropriate value from $120 \pm 360n$ or $240 \pm 360n$, where n is an integer	
21	No	P1	Process to find $\overrightarrow{XY}$ **or** $\overrightarrow{YZ}$ **or** $\overrightarrow{XZ}$	$\overrightarrow{XY} = -2\mathbf{a} + \mathbf{b}$ $\overrightarrow{YZ} = -5\mathbf{a} + 3\mathbf{b}$ $\overrightarrow{XZ} = -7\mathbf{a} + 4\mathbf{b}$
	(supported)	P1	Process to find two of $\overrightarrow{XY}$, $\overrightarrow{YZ}$, $\overrightarrow{XZ}$	
		C1	No, with explanation based on two fully correct vectors in simplified form eg $-5\mathbf{a} + 3\mathbf{b}$ is not a multiple of $-2\mathbf{a} + \mathbf{b}$ so YZ and XY are not parallel	
22 (a)	$3(x - 4)^2 - 10$	M1	method to find a, eg $3x^2 - 24x + 38 = 3(x^2 + \ldots)$ **or** $a = 3$	
		M1	for $3((x - 4)^2 + \ldots))$ **or** $b = 4$	
		A1	for $3(x - 4)^2 - 10$ **or** $a = 3$, $b = 4$, $c = 10$	
(b)	(4, –10)	B1	ft from answer of form $a(x + b)^2 + c$	

Paper: 1MA1/1H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
23	$y = -\frac{1}{2}x - \frac{5}{2}$	P1	for $x^2 + y^2 = 85$ **or** $+ (-9)^2 + 2^2 = 85$	
		P1	for process to find y coordinate of B, eg $\sqrt{85 - 7^2}$	
		A1	for selecting $b = -6$	
		P1	for complete process to find equation of line **L** eg substitutes $x = -9$ and $y = 2$ in $y =$ "$-\frac{1}{2}$" $x + c$	
		A1	for $y = -\frac{1}{2}x - \frac{5}{2}$ oe	

WEEK 5 TASK 3

Answer all questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 (*a*) Show that the equation $x^4 - x^2 - 5 = 0$ can be written in the form $x = \sqrt[4]{x^2 + 5}$

$x^4 = x^2 + 5$

$x = \sqrt[4]{x^2 + 5}$

1 mark for correct rearrangement must see

(1)

(*b*) Starting with $x_0 = 1.5$

use the iteration formula $x_{n+1} = \sqrt[4]{x_n^2 + 5}$ three times to find an estimate for a solution of $x^4 - x^2 - 5 = 0$

$x_0 = 1.5$ 1 mark

$x_1 = \sqrt[4]{1.5^2 + 5} = 1.6409$

1 mark

$x_2 = \sqrt[4]{1.6409..^2 + 5} = 1.66539..$

1 mark

$x_3 = \sqrt[4]{1.66..^2 + 5} = 1.6697..$

Both x_2 and x_3 round to 1.67

Final mark 1.67

(3)

(Total for Question 1 is 4 marks)

2 Starting with $x_0 = 1.45$

use the iteration formula $x_{n+1} = \dfrac{6}{x^2 + 2}$ twice to find an estimate

for the solution of $x^3 + 2x - 6 = 0$

Give your answer correct to 4 decimal places.

$x_0 = 1.45$

$x_1 = \dfrac{6}{1.45^2 + 2} = 1.46252...$ 1 mark

$x_2 = \dfrac{6}{1.46...^2 + 2} = 1.44963...$

1 mark

so 1.4496 (4dp)

Final mark

1.4496

.....

Answers in the range 1.4496 to 1.4497 accepted **(Total for Question 2 is 3 marks)**

---

3 Here are the first four terms of a quadratic sequence.

3 9 17 27

Find an expression, in terms of n, for the nth term of this sequence.

n =	1	2	3	4
	3	9	17	27
	6	8	10	
	2	2		

1 mark for second differences

$2 \div 2 = 1$

so n^2 =>

	1	4	9	16
	2	5	8	11
	3	3	3	

$3n - 1$

1 mark for working with n squared

so $n^2 + 3n - 1$

$n^2 + 3n - 1$ Final mark

.....

(Total for Question 3 is 3 marks)

4 The cumulative frequency table gives information about the ages of 80 people working for a company.

Age (a years)	Cumulative frequency
$20 < a \leq 30$	20
$20 < a \leq 40$	48
$20 < a \leq 50$	64
$20 < a \leq 60$	75
$20 < a \leq 70$	80

(a) On the grid on the next page, draw a cumulative frequency graph for this information.

(2)

(b) Use your graph to find an estimate for the median age.

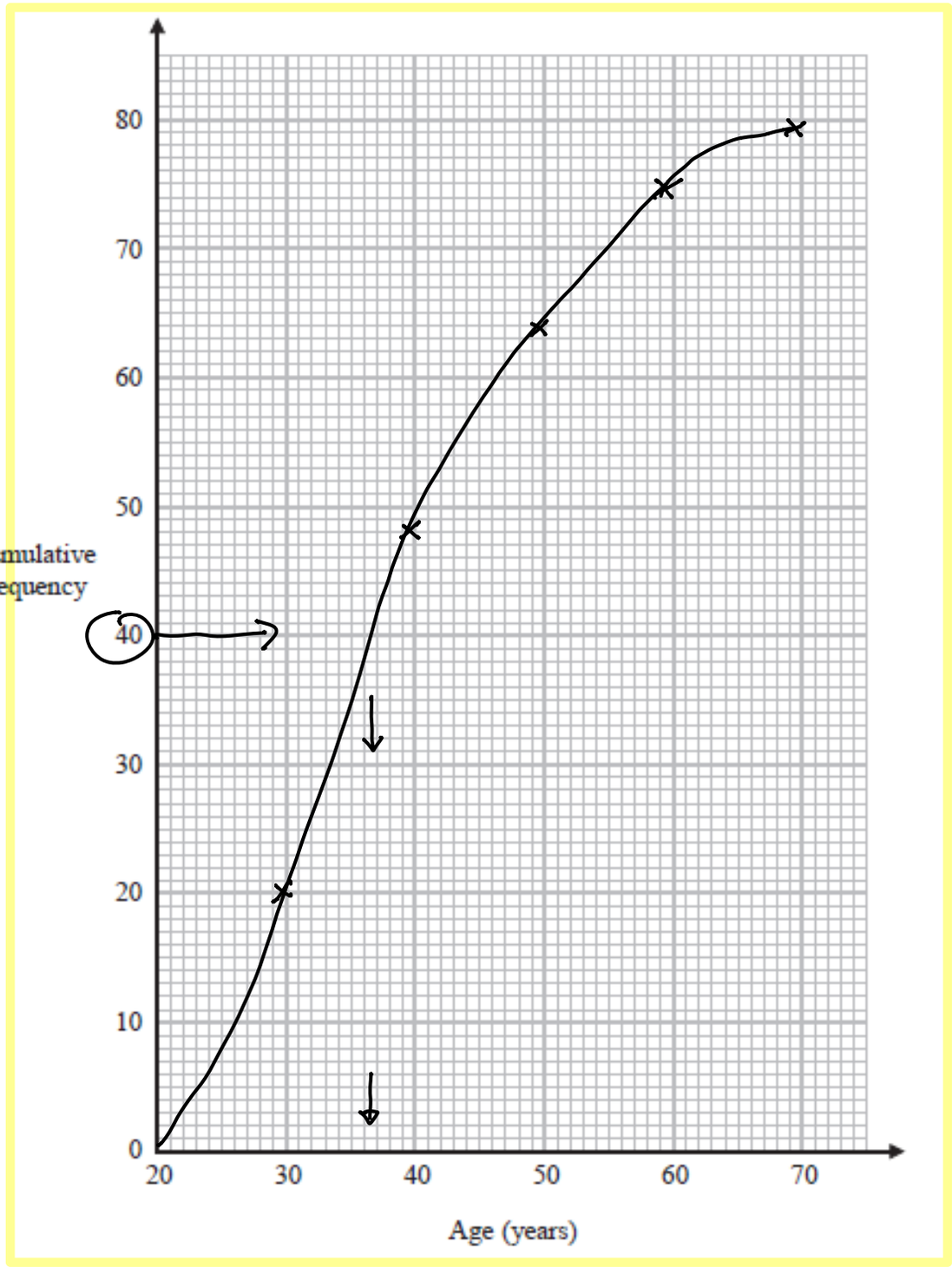
Your graph may vary slightly

37

..... years

(1)

1 mark. Answer in the range 36 to 38.
Or FT using your graph.



(Total for Question 4 is 3 marks)

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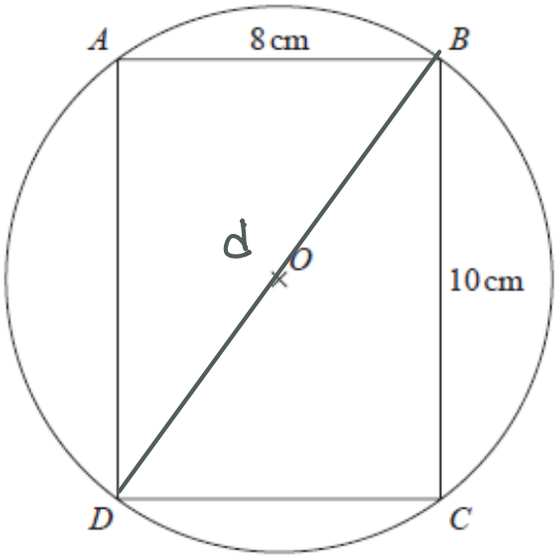
2 marks for correct graph

1 mark may be awarded if points plotted consistently within all class intervals (ie not at end points) and joined with a curve

***5** The points A, B, C and D lie on a circle, centre O.
$ABCD$ is a rectangle.



$C = \pi d$
$A = \pi r^2$

$AB = 8$ cm $BC = 10$ cm
Work out the circumference of the circle.
Give your answer correct to 3 significant figures.

$d^2 = 10^2 + 8^2$ 1 mark

$d = \sqrt{10^2 + 8^2}$ 1 mark
$= \sqrt{164}$

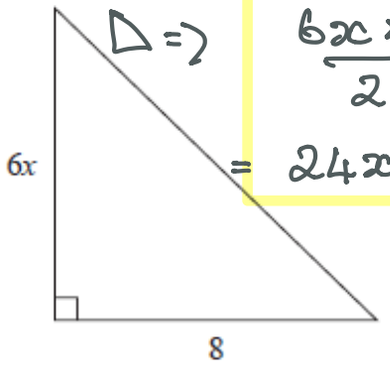
$C = \pi \times \sqrt{164}$ 1 mark
$= 40.2320\ldots$
3.sf.
$= 40.2$

Final mark 40.2 ..... cm

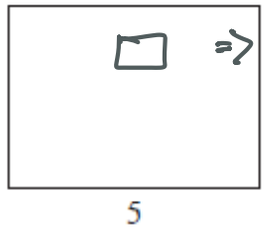
(Total for Question 5 is 4 marks)

Answer in the range 40.2 to 40.24

6 Here is a triangle and a rectangle.



$\Delta \Rightarrow \frac{6x \times 8}{2} = 24x$ 1 mark



$\square \Rightarrow 5(4x-1) = 20x - 5$ 1 mark

All measurements are in centimetres.
The area of the triangle is 10 cm^2 greater than the area of the rectangle.
Work out the value of x.

$\Delta = \square + 10$

$24x = 20x - 5 + 10$ 1 mark for correct equation

$4x = 5$

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

$= 1.25$

Final mark 1.25

$x =$ .....

(Total for Question 6 is 4 marks)

---

7 A biased dice is thrown 60 times.
The table shows information about the number that the dice lands on each time.

Number on dice	1	2	3	4	5	6
Frequency	12	7	8	9	9	15

Gethin throws the dice twice.
Work out an estimate for the probability that the dice will land on 6 both times.

1 mark $P(6) = \frac{15}{60} = \frac{1}{4}$

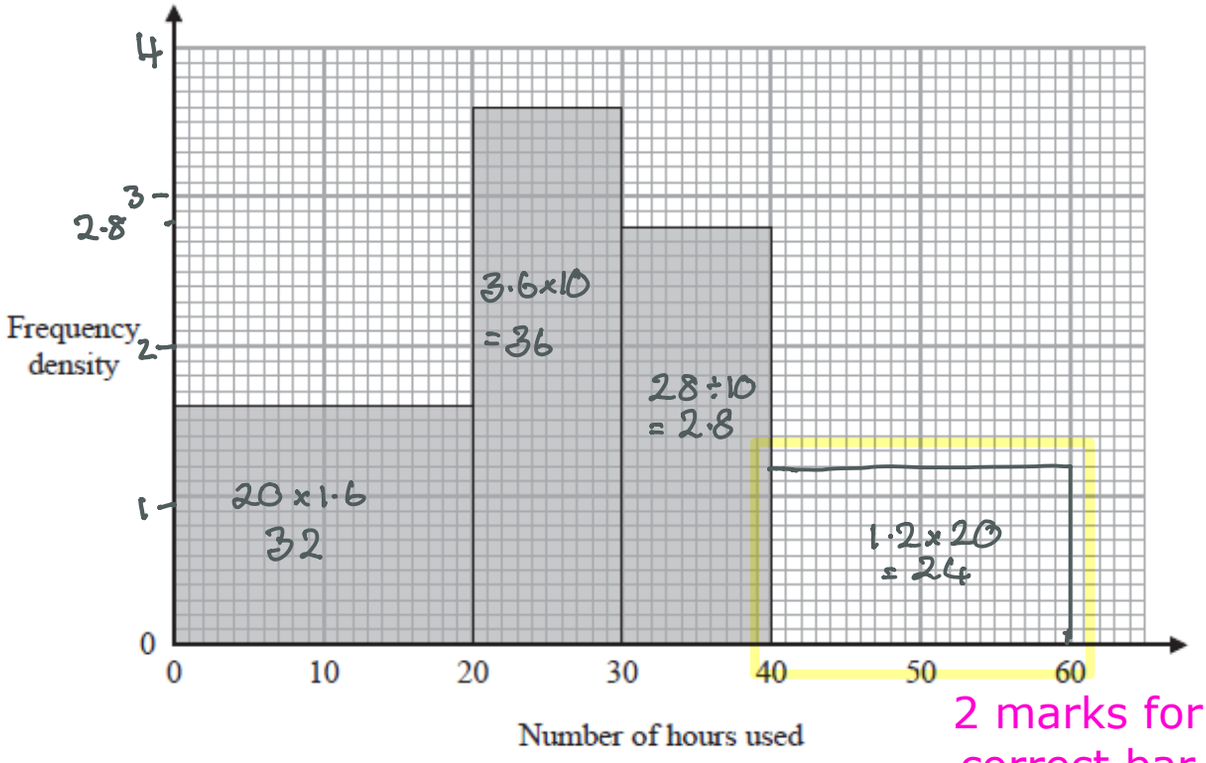
$P(6,6) = \frac{1}{4} \times \frac{1}{4} = \frac{1}{16}$ 1 mark

Final mark $\frac{1}{16}$ $\left(\frac{225}{3600}\right)$

.....

(Total for Question 7 is 3 marks)

8 The histogram gives information about the number of hours some students used their phones last week.
The histogram is incomplete.



2 marks for correct bar

28 students used their phones for between 30 and 40 hours.
24 students used their phones for between 40 and 60 hours.

24 ÷ 20 = 1·2

(*a*) Use this information to complete the histogram.

1 mark can be awarded for correct scale or for if 2 marks not awarded

(2)

No student used their phone for more than 60 hours.

(*b*) Work out the total number of students.

32 + 36 + 28 + 24 = 120

1 mark

120 Final mark

.....

(2)

(Total for Question 8 is 4 marks)

9 y is proportional to x^2
$y = 3$ when $x = 0.5$
x is inversely proportional to w
$x = 2$ when $w = 0.2$
Find the value of y when $w = 2$

$y \propto x^2$

$y = kx^2$ ← 1 mark for either of these

$y = 3$ when $x = 0.5$

$3 = k \times 0.5^2$ ← 1 mark for either of these

$k = \frac{3}{0.5^2} = 12$

$y = 12x^2$

$x \propto \frac{1}{w}$ $\quad x = \frac{k}{w}$ → 1 mark for either of these

when $x = 2$ $w = 0.2$

$2 = \frac{k}{0.2}$ so $k = 0.4$

$x = \frac{0.4}{w}$

1 mark

when $w = 2$ $x = \frac{0.4}{2} = 0.2$

$y = 12 \times 0.2^2 = 0.48$

1 mark

$y =$ 0.48 Final mark

(Total for Question 9 is 5 marks)

TOTAL FOR PAPER IS 33 MARKS

WEEK 5 TASK 4

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
1	18	M1	for listing factors of 90 and 126, at least 5 correct for each (with no more than 1 incorrect in each list), could be in factor pairs **OR** for the prime factors of 90 (2, 3, 3, 5) **or** 126 (2, 3, 3, 7)	Factors of 90: 1, 2, 3, 5, 6, 9, 10, 15, 18, 30, 45, 90 Factors of 126: 1, 2, 3, 6, 7, 9, 14, 18, 21, 42, 63, 126
		M1	for listing factors of 90 and 126, at least 5 of each, one of which includes 18 **OR** for method to write both numbers as a product of prime factors (condone a total of one division error) eg. two complete factor trees or 2, 3, 3, 5 and 2, 3, 3, 7	
		A1	cao	
2 (a)	$2a^7$	B1	cao	
(b)	$4x^3y$	M1	for any two correct of 4, x^3 and y	Accept y^1
		A1	cao	

Paper: 1MA1/2H					
Question		**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
3	(a)	2090	P1	for a process to convert any value in euros into pounds, eg. 560 ÷ 1.12 (= 500) or 20.16 ÷ 1.12 (= 18)	This may be awarded later if working in euros
			P1	for a process to find total cost of apartment and car hire in euros or pounds, eg. 560 × 3 (= 1680) + 20.16 × 15 (= 302.4) or "500" × 3 (= 1500) + "18" × 15 (= 270)	
			P1	for complete process to find total cost, in pounds, eg. 320 + "1500" + "270"	
			A1	cao	
	(b)	Cost would be less	C1	for statement that the cost of Joe's holiday would be less.	
4	(a)	translation	B2	for shape with vertices (3, – 1), (4, – 1), (4, – 2), (3, – 3)	
			(B1	for translation by the vector $\begin{pmatrix} 5 \\ b \end{pmatrix}$ where $b \neq -4$ or $\begin{pmatrix} a \\ -4 \end{pmatrix}$ where $a \neq 5$)	
	(b)	reflection in $y = -x$	B1	for a reflection	Award no marks if more than one transformation is given
			B1	for $y = -x$	

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
5	Two statements	C2	Two different statements **Acceptable** The polygon should not be closed / have a line at the bottom / have first and last points connected (28, 20) has been plotted incorrectly / at (28, 32) / (The last point is at) 32 rather than 28 / last point is at the top end (of class interval) **Not acceptable** Points should be joined with a curve The points haven't (all) been plotted correctly / should be at interval ends The points have been joined up wrong / Points should not be joined in the shape of a polygon / They've connected all the points Has not started at the origin	Ignore additional statements provided there is no contradiction
		(C1	for one statement eg from those above)	
6	Yes (supported)	P1	for process to find the width of the rectangle before or after the increases, eg. $20 \div 8$ (= 2.5) or $(20 + 4) \div (8 + 2)$ (= 2.4) **or** for method to find % increase in area, eg. $4 \div 20 \times 100$ (= 20) **or** for method to find % increase in length, eg. $2 \div 8 \times 100$ (= 25)	
		P1	for process to find percentage change in width, eg. ("2.5" – "2.4") ÷ "2.5" × 100 (= 4) or $\frac{100 + "20"}{100} \div \frac{100 + "25"}{100}$ (= 0.96) **or** for process to find change in width if 5% decrease, eg. "2.5" × 0.05 (= 0.125) and ("2.5" – "2.4") (= 0.1)	
		C1	for Yes with fully correct figures eg 4 or 0.96, or 0.125 **and** 0.1	

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
7	showing that $a : c = 5 : 9$	C1 C1	for using a common multiple of 3 and 5, eg. 15 giving $a : b = 10 : 15$ and $b : c = 15 : 18$ for $a : c = 10 : 18 = 5 : 9$	These may be seen in lists of equivalent ratios for each ratio
8	36.6	P1 P1 P1 A1	for $(AB^2 =) 5.6^2 + 3.9^2$ for $\sqrt{5.6^2 + 3.9^2}$ (= 6.82..) for $\pi \times \left(\frac{"6.82.."}{2}\right)^2$ for answer in the range 36.2 to 36.6	
9 (a)	0.49	M1 A1	for a method to find the gradient of the line, eg. $36 \div 80$ for answer in the range 0.4 to 0.5	Use of change in y over change in x
(b)	number of kg in a pound	C1	for statement that the gradient represents the conversion factor from kg into pounds	

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
10 (a)	4, 20, 50, 68, 80	B1	cao	
(b)	cf graph	M1	for 4 or 5 of their points plotted correctly from a cf table	Ignore anything drawn to the left of the first point
		A1	for a fully correct cf graph SC B1 for 4 or 5 of their points plotted not at the end but consistent within each interval and joined, providing no gradient is negative	May be a cumulative frequency curve or a cumulative frequency polygon If histograms drawn, plots must be identified
(c)	33	B1	for answer in the range 32.5 to 34 or ft their cf graph	
(d)	$\frac{12}{80}$	M1	for $\frac{80 - "n"}{80}$ where n is in the range 58 to 64 or ft their cf graph	
		A1	for answer in the range $\frac{16}{80}$ to $\frac{22}{80}$ or 0.2 to 0.275 ft their cf graph	Accept any equivalent fraction, decimal or percentage ft
11	120 000	M1	for a correct use of 1.015, eg. 123 627 ÷ 1.015 (= 121 800) or 123 627 ÷ 1.015^2 (= 120 000)	
		A1	cao	
12	$x^3 + 6x^2 - 7x - 60$	M1	for method to find the product of any two linear expressions (3 terms correct or 4 terms ignoring signs)	Note that, for example, $x^2 + 2x$ or $2x - 15$ is regarded as three terms in the expansion of $(x + 5)(x - 3)$
		M1	for method of multiplying out remaining products, (half of which are correct) ft their first product	First product must be quadratic but need not be simplified or may be simplified incorrectly
		A1	cao	

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
13 (a)	I	B1	cao	
(b)	D	B1	cao	
(c)	A	B1	cao	
14	Proof	C1	for angle *MCB* = angle *NBC* since base angles of an isosceles triangle are equal	
		C1	for *MC* = *NB* since $AC = AB$, $\frac{1}{2}AC = \frac{1}{2}AB$ oe	
		C1	for a complete proof including *BC* is common to both triangles and SAS as the condition of congruency	
15 (a)	-26	B1	cao	
(b)	$\sqrt[3]{x-1}$	M1	for a start of the process to find $g^{-1}(x)$ eg $x - 1$ or $\sqrt[3]{}$	
		A1	cao	
16	5	P1	for 0.8×0.3 (= 0.24) **or** 0.2×0.05 (= 0.01)	Accept fractions in working
		P1	for "0.24" + "0.01" (= 0.25) **or** "0.24" × 20 (= 4.8) **or** "0.01" × 20 (= 0.2)	
		A1	cao	

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
17	35	P1	for $\tan c = \frac{2}{3x}$ or $\cos d = \frac{3}{4x}$	
		P1	for process to set up an algebraic fraction equation and eliminating fractions to give a linear equation, eg. for a complete process to solve their equation, eg. $\frac{2}{3x} \times 12x + \frac{3}{4x} \times 12x = \frac{3}{2} \times 12x$ oe or $8 + 9 = 18x$ or $x = 17 \div 18$ (= 0.944…)	
		P1	(dep P2) for using their value of x to find c, eg. $c = \tan^{-1}\left(\frac{12}{17}\right)$ oe	
		A1	for angle between 35 and 36	
18	3, – 2	M1	for method to find value of a, eg. finding 2nd differences of 6 and dividing by 2 (= 3) **or** for method to solve two of the equations from; $a + b = 1$, $4a + 2b = 8$, $9a + 3b = 21$, $16a + 4b = 40$, $25a + 5b = 65$	
		M1	Substituting a = "3" into one of the above equations, eg. $a + b = 1$	
		A1	cao	

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
19	4.7 (supported)	M1	for one correct bound from, 119.5, 120.5, 25.55, 25.65	for m accept $120.4\dot{9}$ or 120.499… for f accept $25.64\dot{9}$ or 25.499…
		M1	for a correct method to find one bound of T, eg [UB of T] = [UB of m] ÷ [LB of f] **or** [LB of T] = [UB of m] ÷ [UB of f]	$120 <$ [UB of m] ≤ 120.5 $119.5 \leq$ [LB of m] < 120 $25.6 <$ [UB of f] ≤ 25.65 $25.55 \leq$ [LB of f] < 25.6
		A1	for 4.716.. and 4.658.. from correct working	Accept bounds rounded or truncated to at least 4 sf
		C1	for 4.7 from 4.716.. and 4.658.. with a supportive reason eg because both values round to 4.7 correct to one decimal place	
20	10.7	P1	for the start of a process to find the radius, eg. $\sin 25 = \frac{6}{OC}$	For process marks accept figures rounded or truncated to one decimal place.
		P1	for a complete process to find the radius, eg. 6 ÷ sin 25 (= 14.197..)	
		P1	for process to find area of triangle OAC, eg. $0.5 \times$ "14.197.."$^2 \times \sin 50$ or $6 \times 6 \div \tan 25$ (= 77.20..)	
		P1	for process to find area of sector $OABC$, eg. $\frac{50}{360} \times \pi \times$ ("14.197.."$)^2$ (= 87.947..)	
		A1	for answer in the range 10.6 to 10.9	

Paper: 1MA1/2H				
Question	**Answer**	**Mark**	**Mark scheme**	**Additional guidance**
21	6, 2	M1	For using $x^0 = 1$ with the y-intercept to derive the equation $6 = a \times 1$	
		M1	for $0.75 = 6 \times b^{-3}$	
		A1	cao	
22	432.18	P1	for a process to find the ratio of height of **A** to **B**, eg. $\sqrt{24 \div 6} : \sqrt{54 \div 6}$ (= 2 : 3)	
		P1	for a process to find the ratio of volume **A** to volume **C**, eg. $2^3 : 7^3$ (= 8 : 343)	
		P1	for process to find volume of **C**, eg. $72 \times \frac{"343"}{"8"}$ (= 3087)	
		P1	for "3087" × 0.14	
		A1	accept an answer in the range 432 to 432.2	
23	$3 < x < 4$, $-4 < x < -3$	M1	for a correct method to begin rearranging to solve for x^2, eg. $5 < x^2 - 4$ or $x^2 - 4 < 12$	Accept incorrect inequality signs used or the use of equality signs
		M1	for a set of critical values; at least two out of 3, 4, – 3, – 4	
		M1	for inequalities for one set of critical values, eg. $x > 3$ and $x < -3$ or $x < 4$ and $x > -4$	
		A1	for $3 < x < 4$, $-4 < x < -3$	Do not award marks for answer if not supported by working.

WEEK 5 TASK 5

Answer all questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 (*a*) (i) Write $x^2 - 8x + 3$ in the form $(x - a)^2 - b$ where a and b are integers.

1 mark

$(x-4)^2 - 16 + 3$

so $(x-4)^2 - 13$

Final mark

$(x-4)^2 - 13$

(2)

(ii) Hence, write down the coordinates of the turning point on the graph of $y = x^2 - 8x + 3$

1 mark

(4 , −13)

(1)

(*b*) Solve $7x^2 + 8x - 5 = 0$

Give your solutions correct to 3 significant figures.

Answers accepted in the range 0.448 to 0.449 and -1.59 to -1.60

$a = 7 \quad b = 8 \quad c = -5$

$x = \dfrac{-8 \pm \sqrt{8^2 - 4 \times 7 \times -5}}{2 \times 7}$ 1 mark

$= \dfrac{-8 \pm \sqrt{204}}{14}$ 1 mark

$= 0.448775\ldots$ or $-1.5916\ldots$

Final mark

0.449, −1.59

(3)

Alex has to find the solutions of the quadratic equation $3k^2 + 10k - 8 = 0$

Here is his working and answer.

$(3k - 2)(k + 4) = 0$

$k = 2$ or $k = -4$

(*c*) What mistake has Alex made?

1 mark

correct solution from $3k - 2 = 0$

should be $3k = 2$

$k = \frac{2}{3}$ not 2

(1)

(Total for Question 1 is 7 marks)

2 Make m the subject of $k = p + \frac{2m}{5}$

$k - p = \frac{2m}{5}$ 1 mark

$\times 5$ $\times 5$

$\frac{5(k-p)}{2} = \frac{2m}{2}$ 1 mark

so $m = \frac{5(k-p)}{2}$

Final mark

$m = \frac{5(k-p)}{2}$

.....

(Total for Question 2 is 3 marks)

***3** It takes 14 hours for 5 identical pumps to fill a water tank. inverse proportion
How many hours would it take 4 of these pumps to fill another water tank of the same size?

14 hours = 5 pumps

$\times 5$ ↓ 70 hours = 1 pump ↓ $\div 5$

1 mark

$\div 4$ ↓ 17.5 hours = 4 pumps ↓ $\times 4$

Final mark

17.5 ..... hours

(Total for Question 3 is 2 marks)

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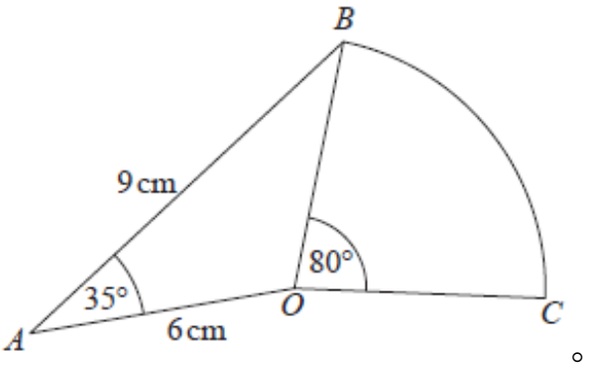
4 *OAB* is a triangle.
OBC is a sector of a circle, centre *O*.



Calculate the area of *OBC*.
Give your answer correct to 3 significant figures.

$BC^2 = 9^2 + 6^2 - 2 \times 9 \times 6 \times \cos 35$ 1 mark

$= 28.53..$ 1 mark

$BC = \sqrt{28.53..}$

$= 5.341...$

area $OBC = \frac{80}{360} \times \pi \times 5.341..^2$ 1 mark

$= 19.9187...$ Final mark

3 s.f. $= 19.9$

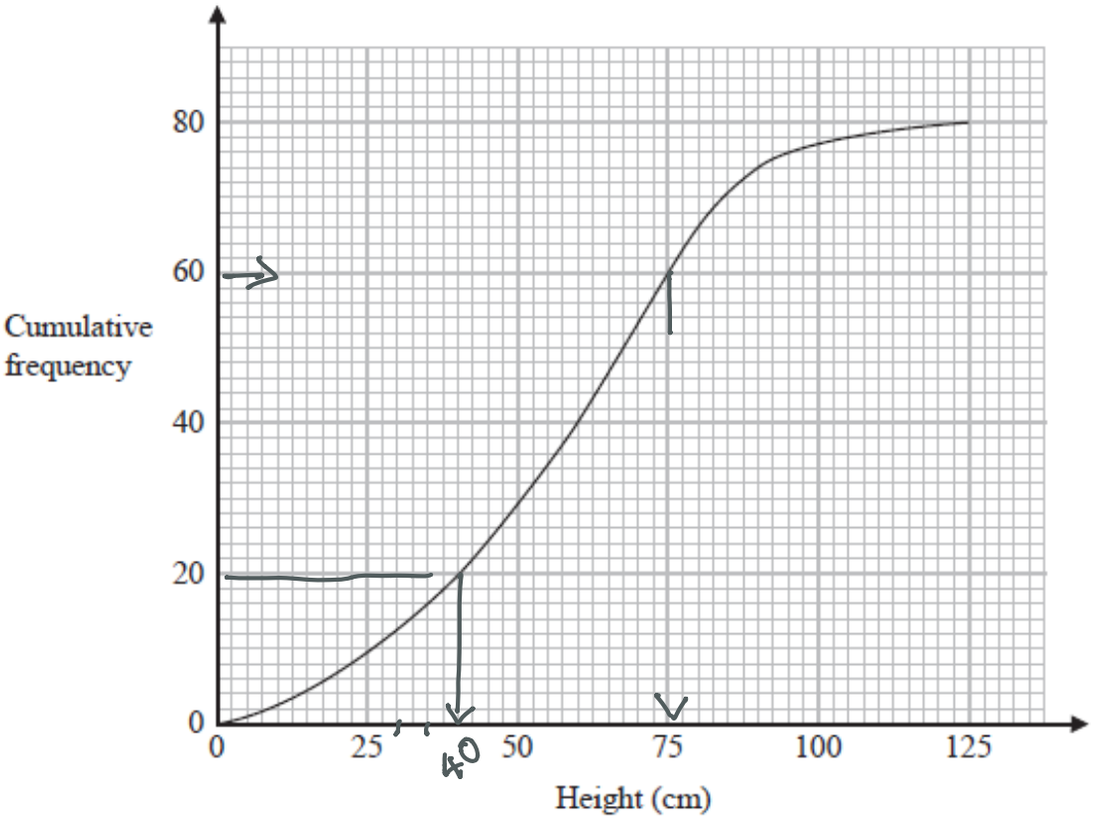
19.9 ..... cm^2

(Total for Question 4 is 4 marks)

Range accepted 19.8 to 20

5 Alan grew 80 plants of the same type outside.

The cumulative frequency graph shows information about the heights, in cm, of these plants.



)

Use the graph to find an estimate for the interquartile range of the heights.

1 mark for either of these

LQ = 40 UQ = 75

78 - 40

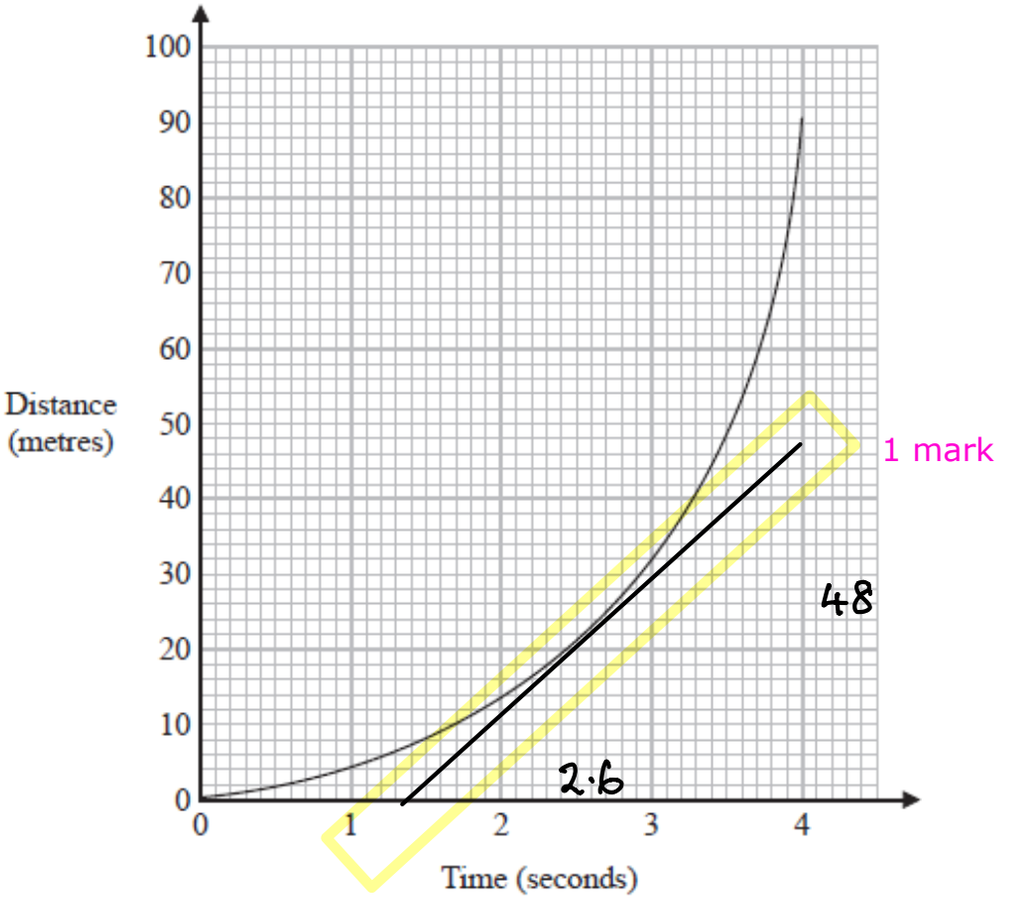
Final mark

35

..... cm

(Total for Question 5 is 2 marks)

6 Here is a distance-time graph.



1 mark

Find an estimate of the gradient of the graph at time 2.5 seconds.
You must show how you get your answer.

gradient = $\frac{48}{2.6}$ 1 mark

= 18·46 ..

(this will depend on your tangent line ...
range of final answers allowed = 18 to 22

Final mark 18·5

.....

(Total for Question 6 is 3 marks)

***7** Seija works at a weather station.

The table gives information about the temperature, T °C, at midday for each of 50 cities in the UK on Tuesday.

1 mark for five multiplications of frequency x "a point within the interval"

Temperature (T °C)	Frequency	Mid	F x M
$10 < T \leq 15$	2	x 12.5	= 25
$15 < T \leq 20$	8	x 17.5	= 140
$20 < T \leq 25$	13	x 22.5	= 292.5
$25 < T \leq 30$	21	x 27.5	= 577.5
$30 < T \leq 35$	6	x 32.5	= 195
	50		1230

Calculate an estimate for the mean temperature.

1 mark

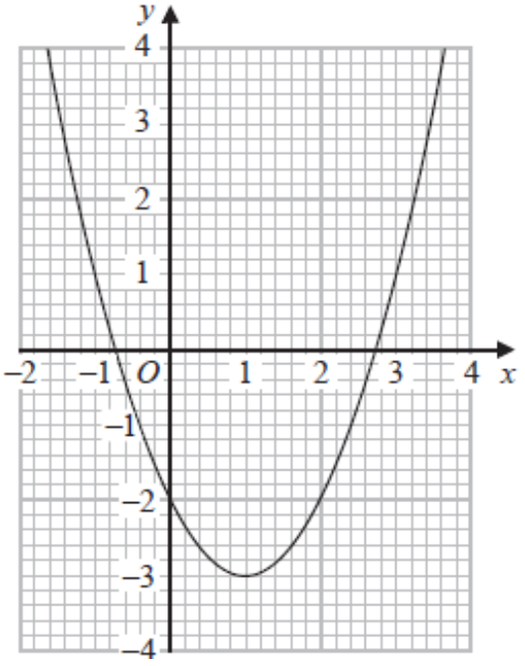
1230 ÷ 50 = 24.6

Final mark

24.6 .....°C

(Total for Question 7 is 3 marks)

***8** Here is the graph of $y = x^2 - 2x - 2$



1 mark

Write down an estimate for one of the roots of $x^2 - 2x - 2 = 0$

x = -0.75 x = 2.75 .....

(Total for Question 8 is 1 mark)

range (-0.8 to -0.6 2.6 to 2.8)

***9** A and B are numbers such that

1 mark may be awarded if at least three multiples of 2268 and 441 are shown.

$$A = 2^2 \times 3^4 \times 7$$
$$B = 3^2 \times 7^2$$

Find the lowest common multiple (LCM) of A and B.

$A = 2 \times 2 \times 3 \times 3 \times 3 \times 3 \times 7$

$B = 3 \times 3 \times 7 \times 7$

LCM $= 3 \times 3 \times 7 \times 2 \times 2 \times 3 \times 3 \times 7$

$= 15876$

$= 15876$ 2 marks

(Total for Question 9 is 2 marks)

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10 Here are the first six terms of a quadratic sequence.

5	11	21	35	53	75
6	10	14	18	22	

So $4 \div 2 = 2$

Find an expression, in terms of n, for the nth term of this sequence

4 4 4 4

1 mark for either of these

1	2	3	4	5	6
5	11	21	35	53	75
$2n^2$ 2	8	18	32	50	72
+3	+3	+3	+3	+3	+3

So $2n^2 + 3$

$2n^2 + 3$ Final mark

(Total for Question 10 is 2 marks)

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11 Factorise $a^2 - b^2$

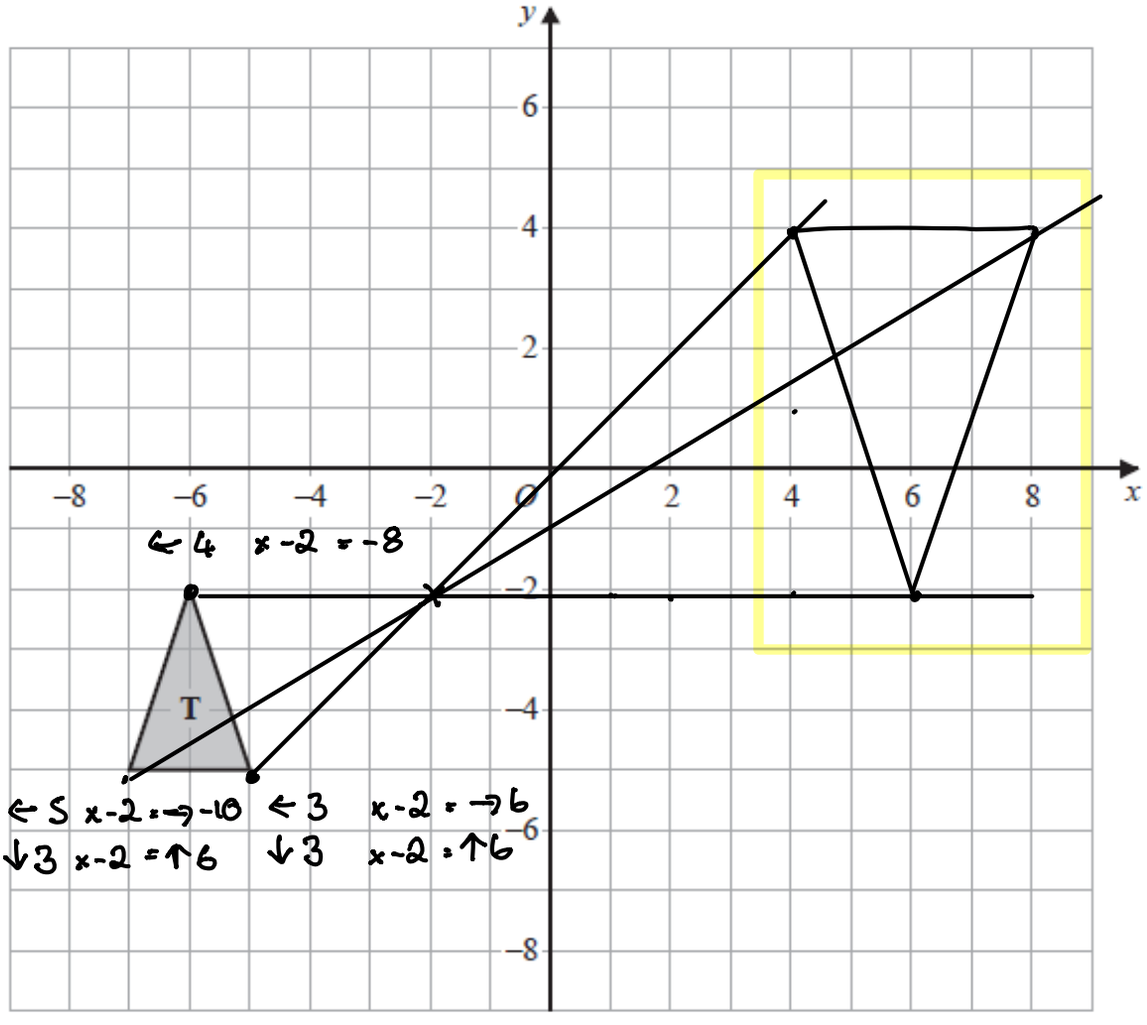
$(a - b)(a + b)$

1 mark

$(a - b)(a + b)$

(Total for Question 11 is 1 mark)

12



On the grid, enlarge triangle **T** by scale factor –2 with centre of enlargement (–2, –2)

2 marks for fully correct triangle
1 mark may be awarded for two correct points or correct shape & orientation in the wrong place

(Total for Question 12 is 2 marks)

TOTAL FOR PAPER IS 32 MARKS