

WEEK 5 TASKS

(Higher 7+)

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 = 40 minutes.

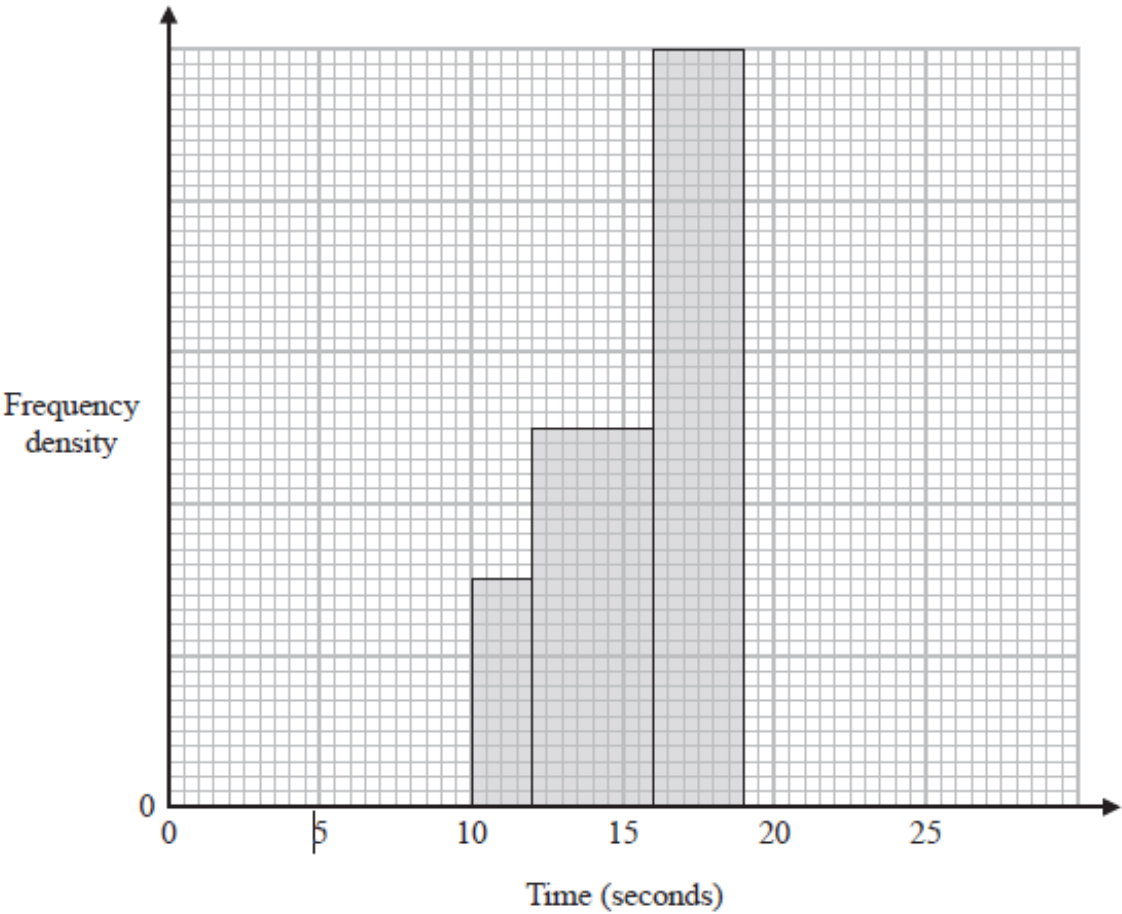
Answer all questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1 The incomplete table and the incomplete histogram give information about the times taken by some students to run a race.

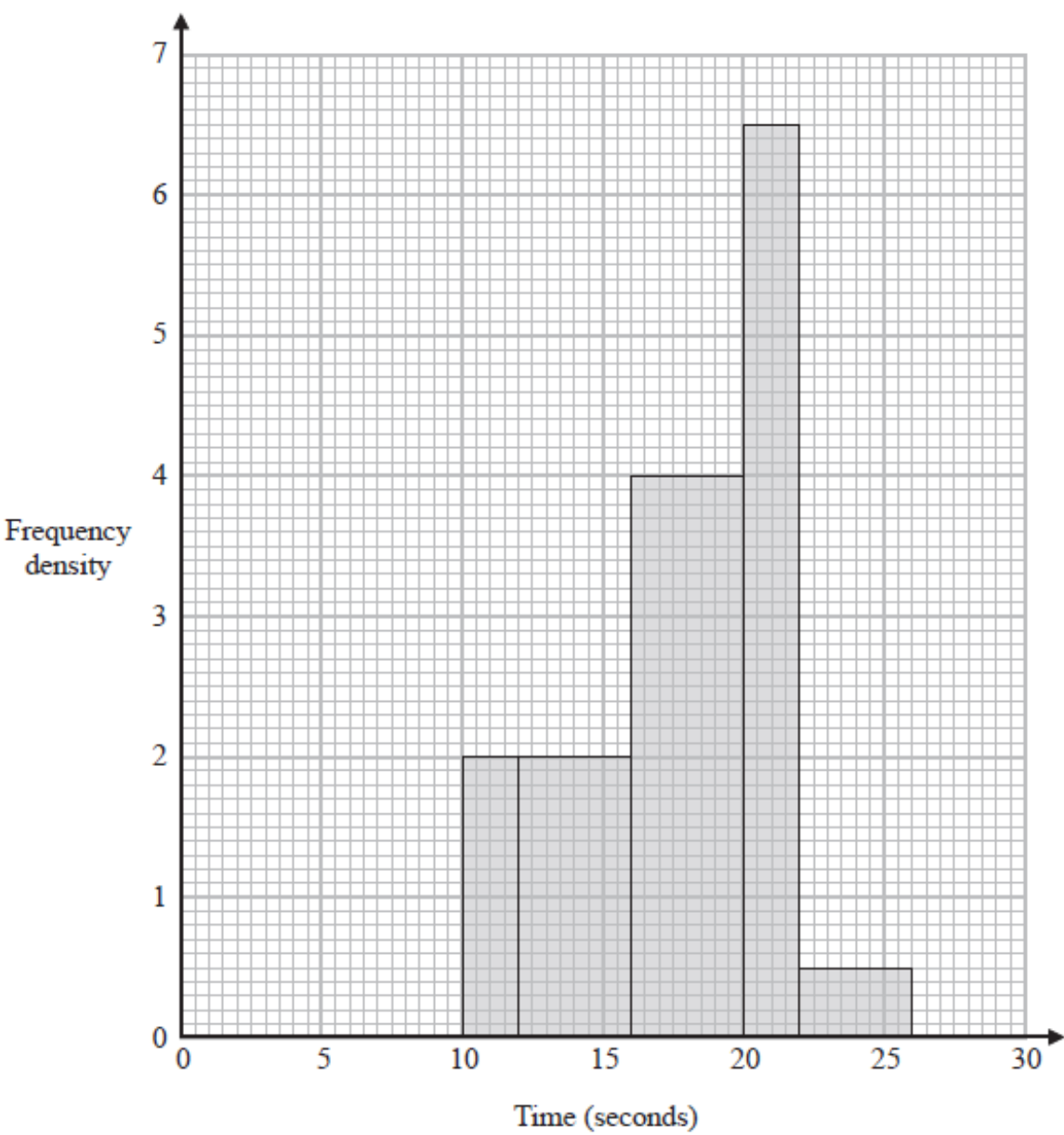
Time (t seconds)	Frequency
$10 < t \leq 12$	
$12 < t \leq 16$	10
$16 < t \leq 19$	15
$19 < t \leq 21$	9
$21 < t \leq 26$	7



None of these students had a time for the race such that $t < 10$ or $t > 26$
(a) Use the histogram to complete the table.

(b) Use the table to complete the histogram. (2)

The histogram below gives information about the times taken by 43 students to run a different race.



(c) Work out an estimate for the median of the times taken by these 43 students to run the race.

..... seconds

(3)

(Total for Question 1 is 6 marks)

2 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.

(a) Work out an estimate for the probability that the dice will land on 6 both times.

(3)

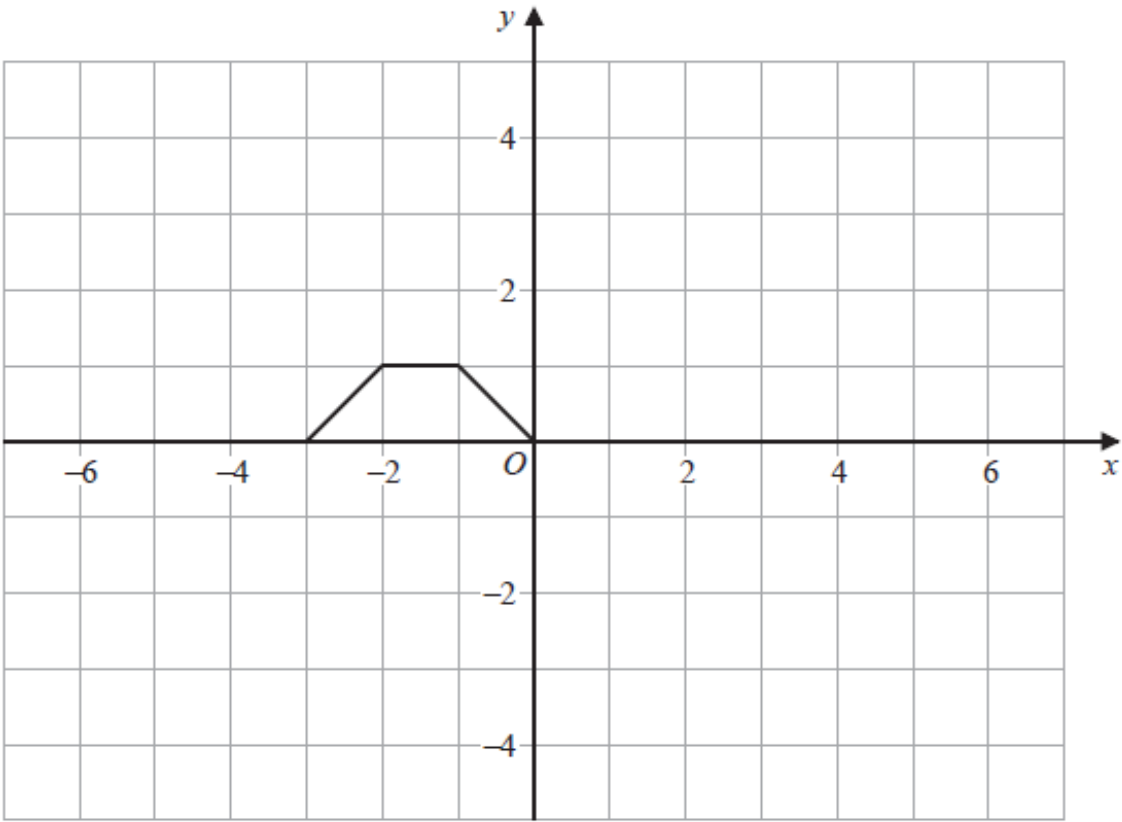
Sally is going to throw the same dice n times and record the number it lands on each time.
 She will use her results to work out a more reliable estimate for the probability in part (a).

(b) What can you say about the value of n ?

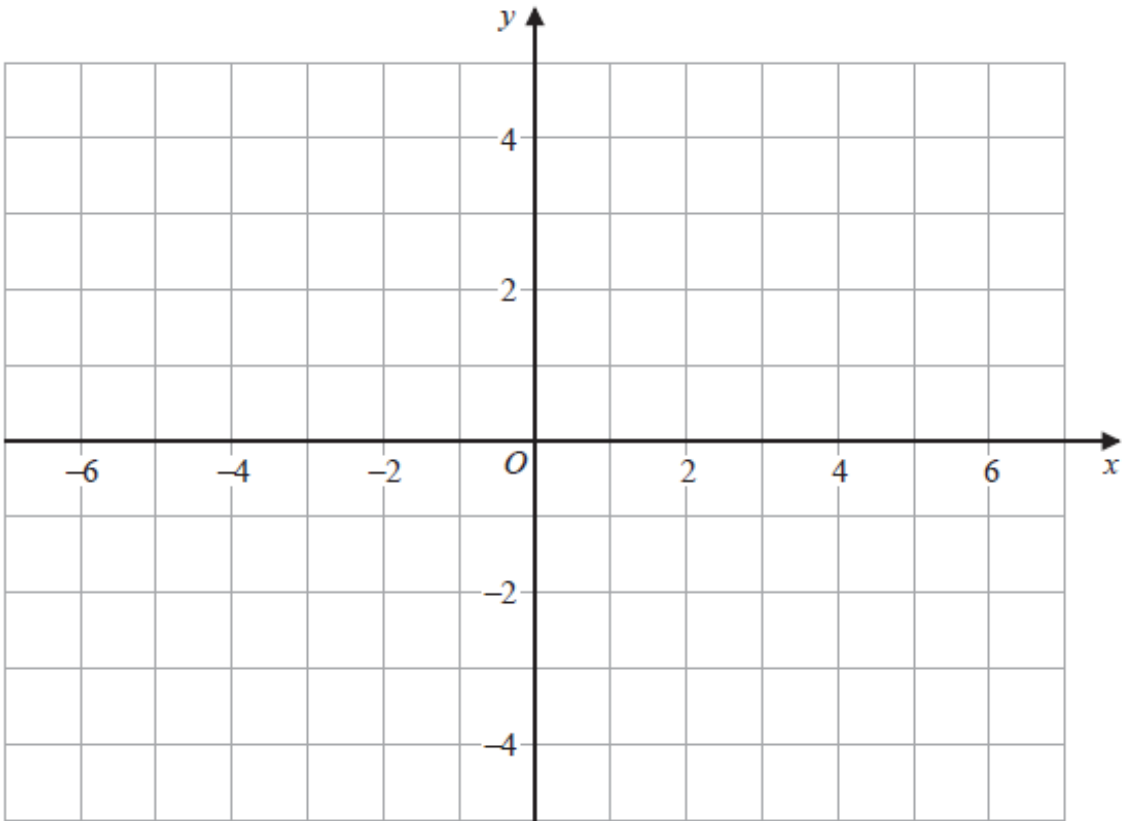
(1)

(Total for Question 2 is 4 marks)

3 Here is the graph of $y = f(x)$



On the grid below, draw the graph of $y = f(-x)$



(Total for Question 3 is 1 mark)

- *4** The bearing of port B from port A is 147°
Work out the bearing of port A from port B .

.....°
(Total for Question 4 is 2 marks)

- 5** $2a : 5c = 6 : 25$
 $4b : 7c = 20 : 21$

Show that $a + b : b + c = 17 : 20$

(Total for Question 5 is 3 marks)

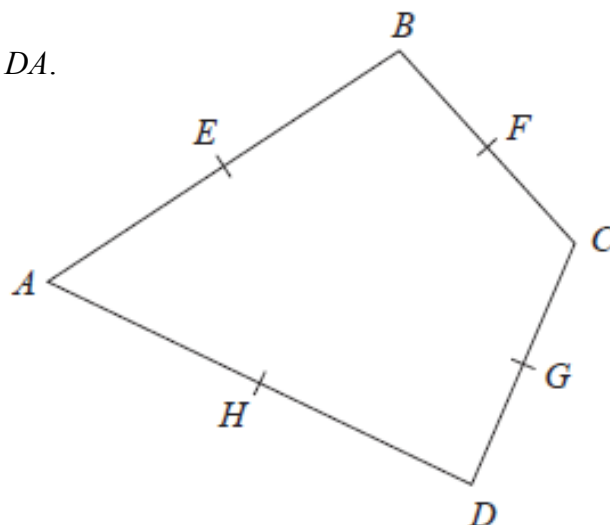
6 Write $\frac{14}{3x-21} + \left[(x+4) \div \frac{2x^2-6x-56}{2x+3} \right]$ in the form $\frac{ax+b}{cx+d}$ where a, b, c and d are integers.

.....
(Total for Question 6 is 4 marks)

- 7 $ABCD$ is a quadrilateral.
 E, F, G and H are the midpoints of AB, BC, CD and DA .

$$\vec{AH} = \mathbf{a} \quad \vec{AE} = \mathbf{b} \quad \vec{DG} = \mathbf{c}$$

Prove, using vectors, that $EFGH$ is a parallelogram.

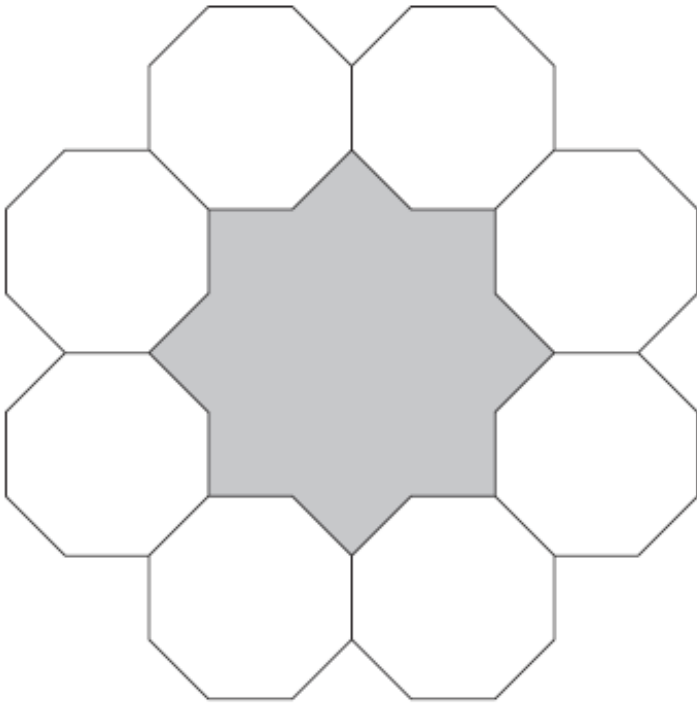


(Total for Question 7 is 4 marks)

- 8 Show that the equation $x^3 + 2x - 6 = 0$ has a solution between $x = 1$ and $x = 2$

(Total for Question 8 is 2 marks)

9 The diagram shows 8 identical regular octagons joined to enclose a shaded shape.



Each octagon has sides of length a .
Find, in terms of a , an expression for the area of the shaded shape.
Give your answer in the form $p(2 + \sqrt{2})a^2$ where p is an integer.
You must show all your working.

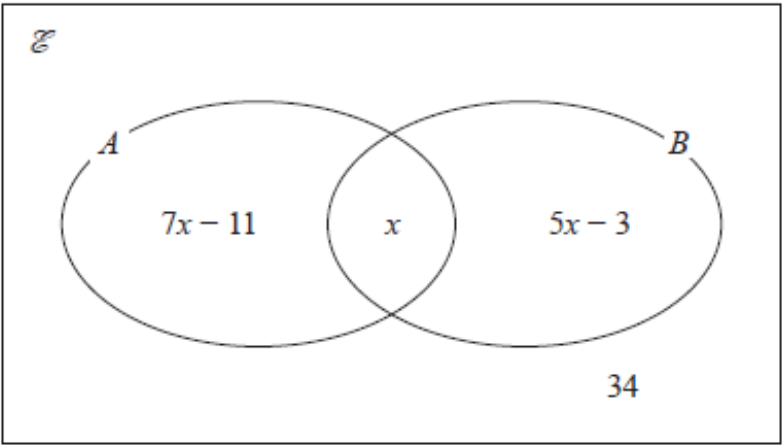
10 Vicky has a collection of medals.

The Venn diagram gives information about the number of medals in her collection where

$\mathcal{E} = \{\text{all medals}\}$

$A = \{\text{English medals}\}$

$B = \{\text{gold medals}\}$



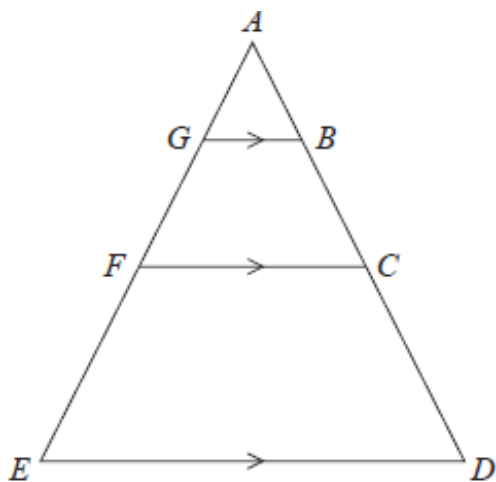
Vicky is going to take at random a medal from her collection.

Given that the medal is gold, the probability that the medal is English is $\frac{2}{11}$

Work out the number of medals in Vicky's collection.

.....
(Total for Question 10 is 4 marks)

11 Here are three similar triangles, ABG , ACF and ADE .



$ABCD$ and $AGFE$ are straight lines.

$$AB : BC : CD = 1 : 2 : 3$$

Show that

$$\text{area of } ABG : \text{area of } BCFG : \text{area of } CDEF = 1 : 8 : 27$$

(Total for Question 11 is 3 marks)

12 There are only blue pens and red pens in a box.

The number of blue pens is four times the number of red pens.

Rita takes at random one pen from the box.

She records the colour of the pen and then replaces it in the box.

Rita does this n times, where $n \geq 2$

Write down an expression, in terms of n , for the probability that Rita gets a blue pen at least once and a red pen at least once.

.....
(Total for Question 12 is 2 marks)

TOTAL FOR PAPER IS 36 MARKS



WEEK 5 TASK 2

Estimated completion time = 90 minutes.

Answer ALL questions.

Write your answers in the spaces provided.

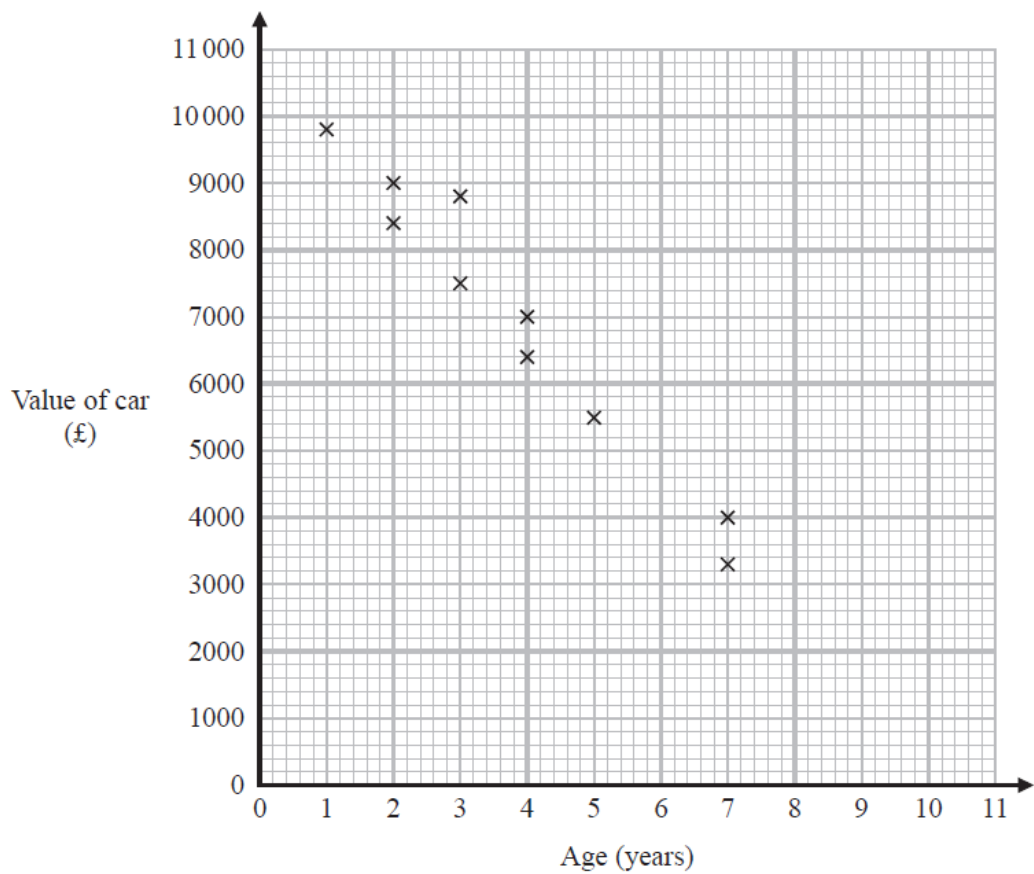
You must write down all the stages in your working.

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

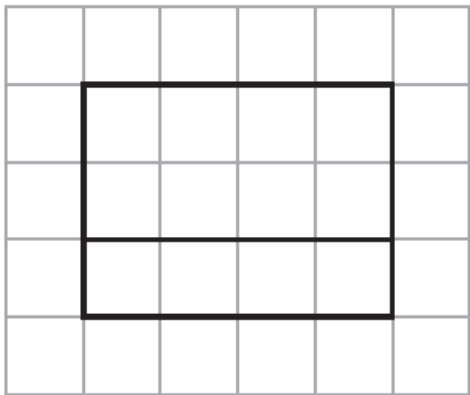
Of the students who study German, what percentage are boys?
You must show your working.

.....%

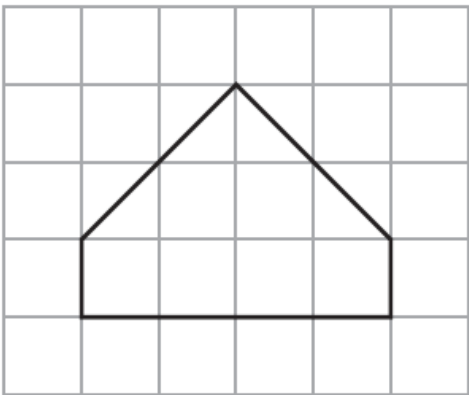
(Total for Question 3 is 5 marks)

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

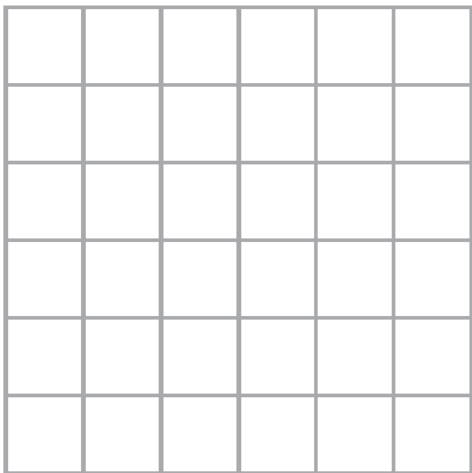
Front elevation



Side elevation



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



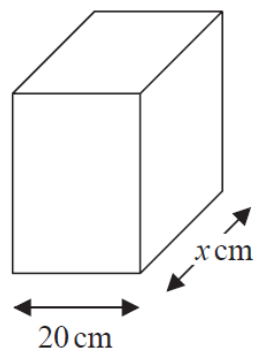
(2)

(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/cm²

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.

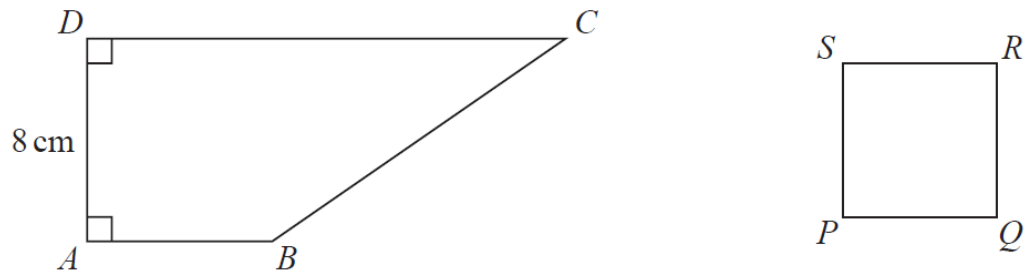
.....
(1)

(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 $PQRS$.



$AD = 8\text{ cm}$
 $DC = 3AB$

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)

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

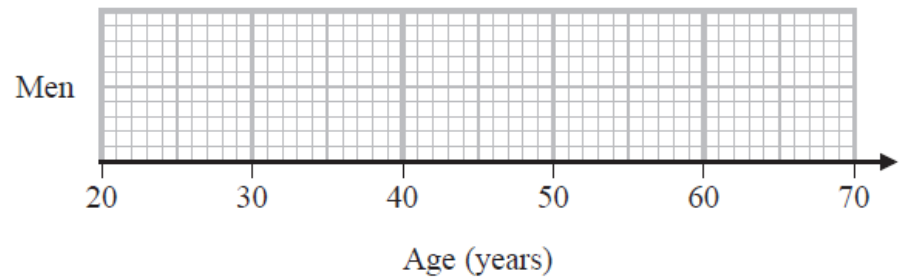
Find the value of P .

.....
(Total for Question 9 is 3 marks)

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

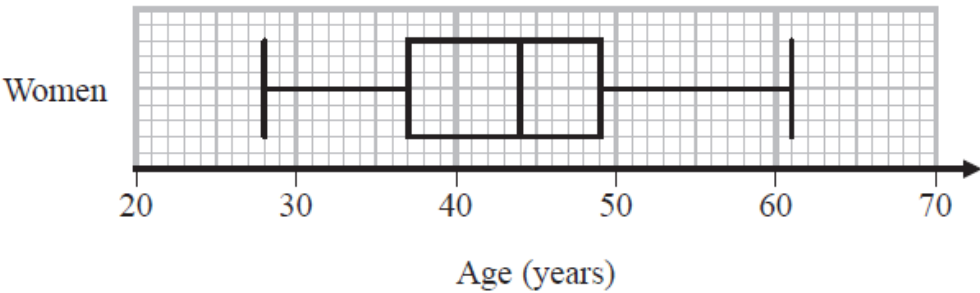
22 27 30 31 32 34 35 35 36 38
40 40 42 46 47 49 51 57 58

(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)

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

.....

(Total for Question 15 is 4 marks)

16 a, b, c and d are integers.

$$4a = 5b$$

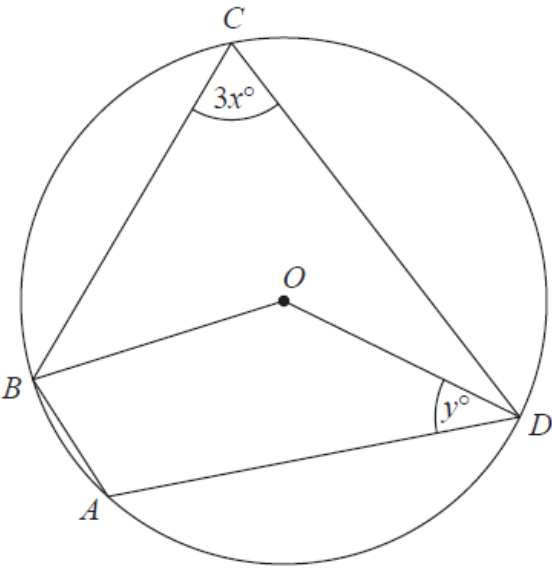
$$c = \frac{3}{4}b$$

$$a : d = 3 : 5$$

Find $a : b : c : d$

.....

(Total for Question 16 is 4 marks)



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 $3x^2 - 12y^2$

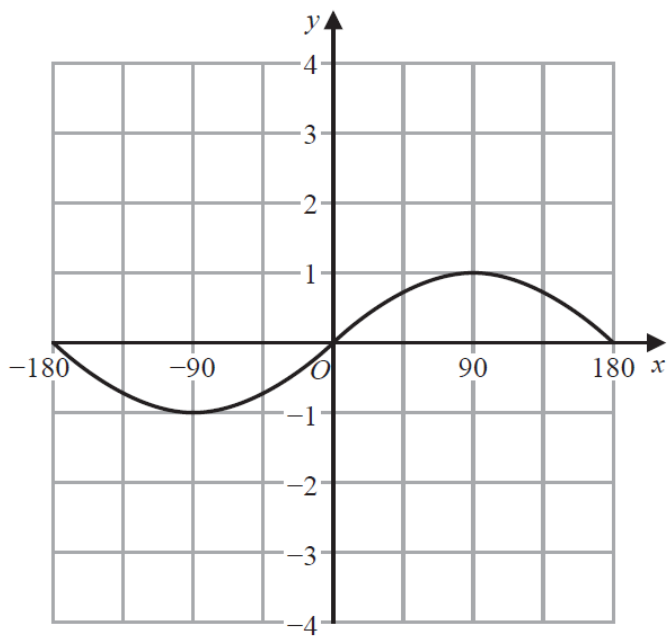
.....

(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)

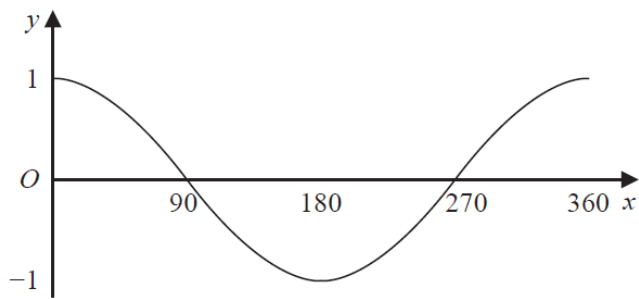
20 Here is the graph of $y = \sin x^\circ$ for $-180 \leq x \leq 180$



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

(1)

Here is the graph of $y = \cos x^\circ$ for $0 \leq x \leq 360$



The exact value of $\cos 60^\circ$ is 0.5

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

.....
(1)

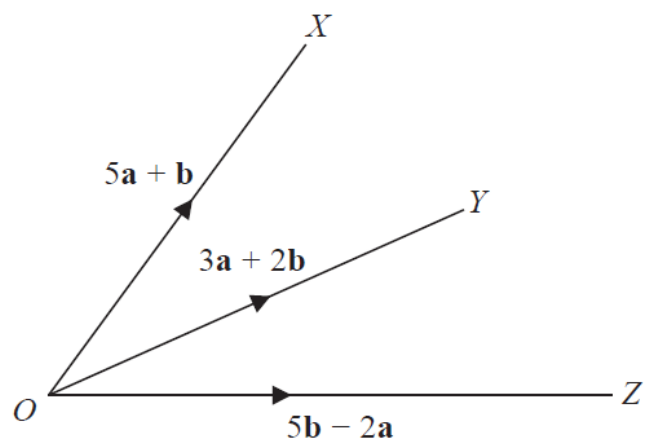
(ii) Write down one solution of the equation $\cos x^\circ = -0.5$

.....
(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 = 40 minutes.

Answer all questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 (a) Factorise $a^2 - b^2$

.....
(1)

(b) Show that $2^{40} - 1$ is the product of two consecutive odd numbers.

(2)

(Total for Question 1 is 3 marks)

2 A circle has equation $x^2 + y^2 = 25$

The point P with coordinates $(-3, 4)$ lies on the circle.

Alex says that the tangent to the circle at P crosses the x -axis at the point $(-8, 0)$

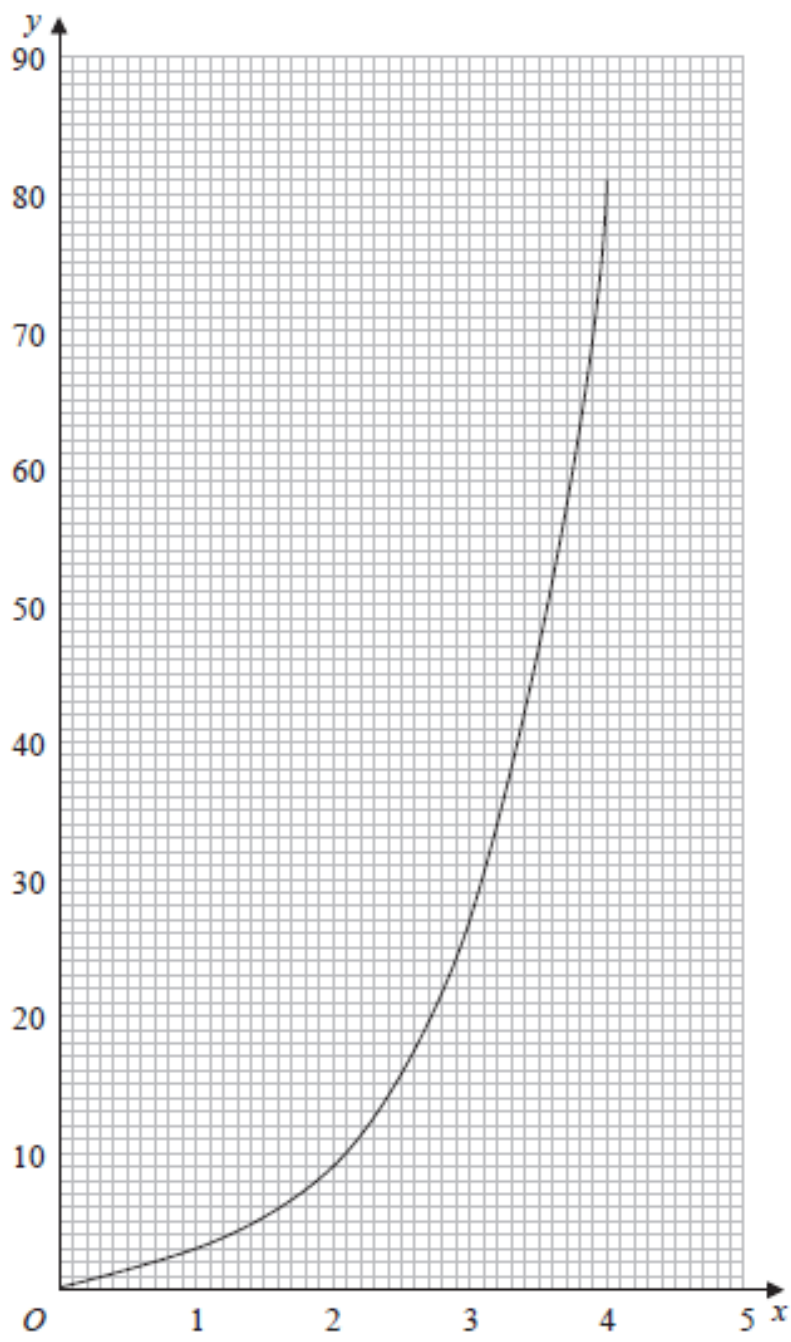
Is Alex correct?

You must show how you get your answer.

(Total for Question 2 is 4 marks)

3 Sana needs to draw the graph of $y = 3^x$ for $0 \leq x \leq 4$

She draws the graph shown on the grid.



Write down one thing Sana has done wrong.

.....

.....

.....

(Total for Question 3 is 1 mark)

- Label your image **Q**.

Triangle **P** is transformed by a combined transformation of a rotation of 90° anticlockwise about the origin followed by a translation to give triangle **R**.

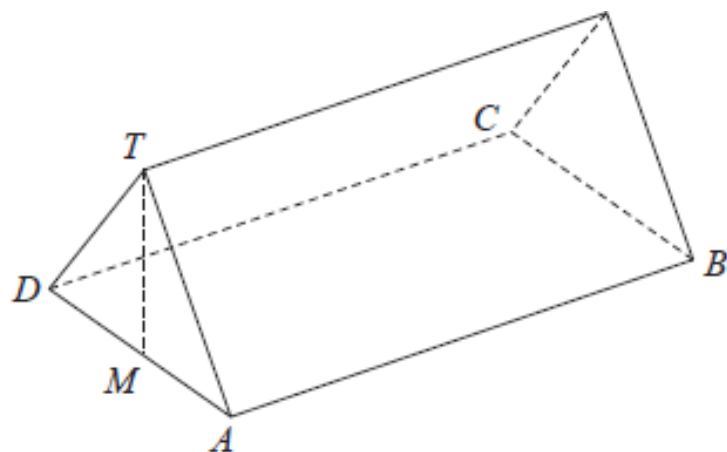
Exactly one vertex of triangle **P** is invariant under the combined transformation.

- (b) Find one possible column vector for the translation.

()

(Total for Question 4 is 3 marks)

5 The diagram shows a triangular prism with a horizontal rectangular base $ABCD$.



M is the midpoint of AD .

The vertex T of the prism is vertically above M .

$AB = 14.7 \text{ cm} \qquad BC = 3.8 \text{ cm} \qquad MT = 2.3 \text{ cm}$

P is the point on AB such that

$AP : PB = 5 : 2$

Calculate the size of the angle between TP and the base $ABCD$ of the prism.
Give your answer correct to 1 decimal place.

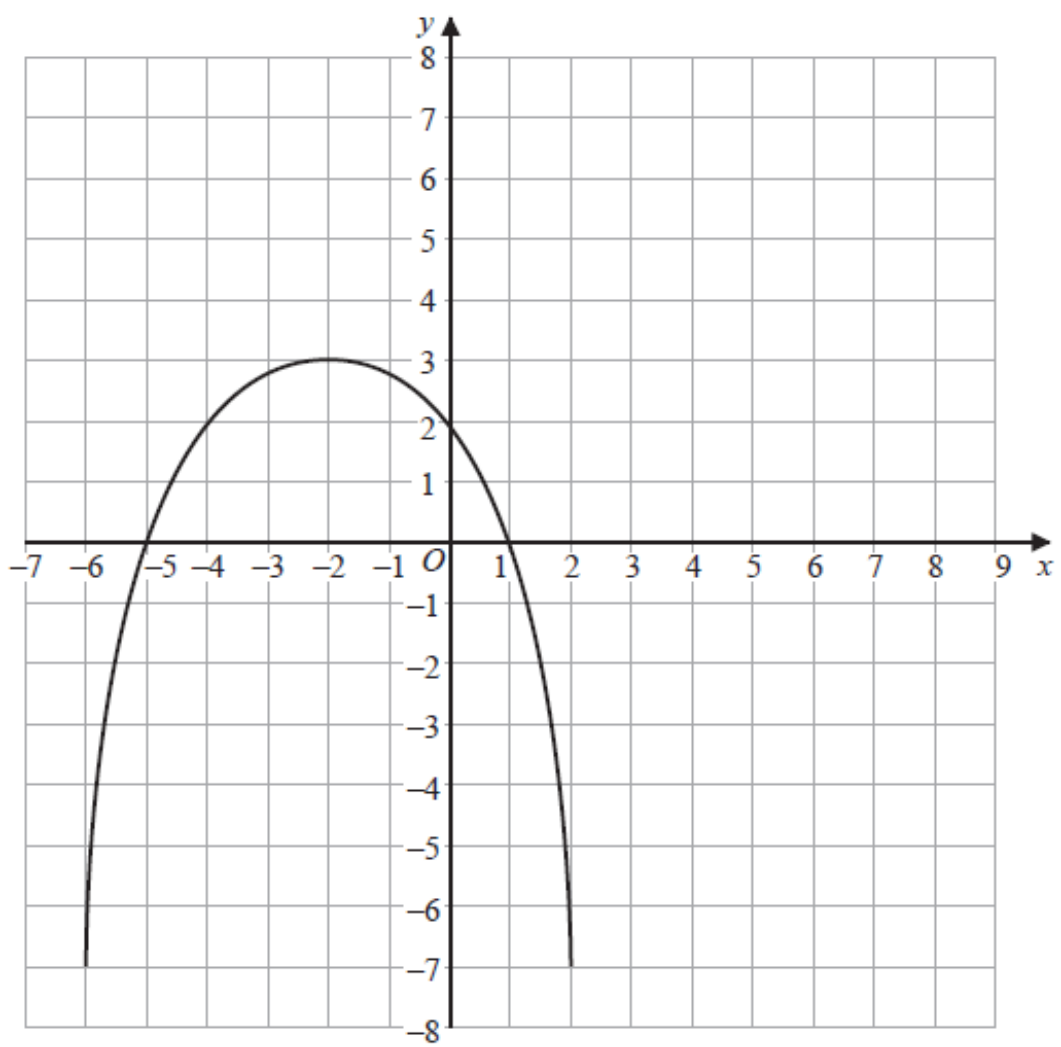
- 6 An expression for the n th term of the sequence of triangular numbers is $\frac{n(n+1)}{2}$
Prove that the sum of any two consecutive triangular numbers is a square number.

(Total for Question 6 is 3 marks)

- 7 The floor plan of a house is drawn using a scale of 1 : 50
On the plan, a room in the house has a floor area of 48 cm^2
Work out the real area of the floor of this room.
Give your answer in m^2

..... m^2
(Total for Question 7 is 3 marks)

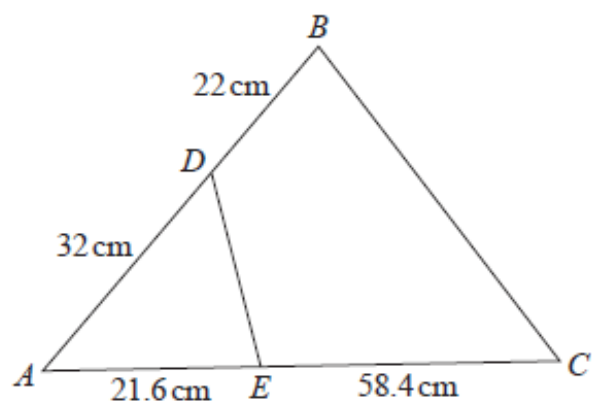
8 The graph of $y = f(x)$ is shown on the grid.



On the grid, sketch the graph of $y = f(-x) + 3$

(Total for Question 8 is 2 marks)

9 The diagram shows triangle ABC and triangle AED .



Show that triangle ABC and triangle AED are similar.

(Total for Question 9 is 2 marks)

10 There is a total of y counters in a box.

There are x pink counters and 5 blue counters in the box.

The rest of the counters are green.

$$x : y = 1 : 3$$

Freda takes at random two counters from the box.

Find, in terms of x , an expression for the probability that Freda takes two counters of the same colour.

Give your answer as a fraction in the form $\frac{ax^2 + bx + c}{dx^2 + ex}$ where a, b, c, d and e are integers.

.....
(Total for Question 10 is 5 marks)

11 Ebony makes some bracelets to sell.

The materials to make all the bracelets cost £190, correct to the nearest £5

Ebony sells all the bracelets for a total of £875, correct to the nearest £5

The total time taken to make and sell all these bracelets was 72 hours, correct to the nearest hour.

Ebony uses this method to calculate her hourly rate of pay

$$\text{Hourly rate of pay} = \frac{\text{total selling price} - \text{total cost of materials}}{\text{total time taken}}$$

The minimum hourly rate of pay for someone of Ebony's age is £8.20

By considering bounds, determine if Ebony's hourly rate of pay was definitely more than £8.20

You must show all your working.

(Total for Question 11 is 4 marks)

- 12** Given that the vector $a\begin{pmatrix} 2 \\ 6 \end{pmatrix} + b\begin{pmatrix} 8 \\ 2 \end{pmatrix}$ is parallel to the vector $\begin{pmatrix} 13 \\ 6 \end{pmatrix}$
find an expression for b in terms of a .

.....
(Total for Question 12 is 3 marks)

TOTAL FOR PAPER IS 37 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.

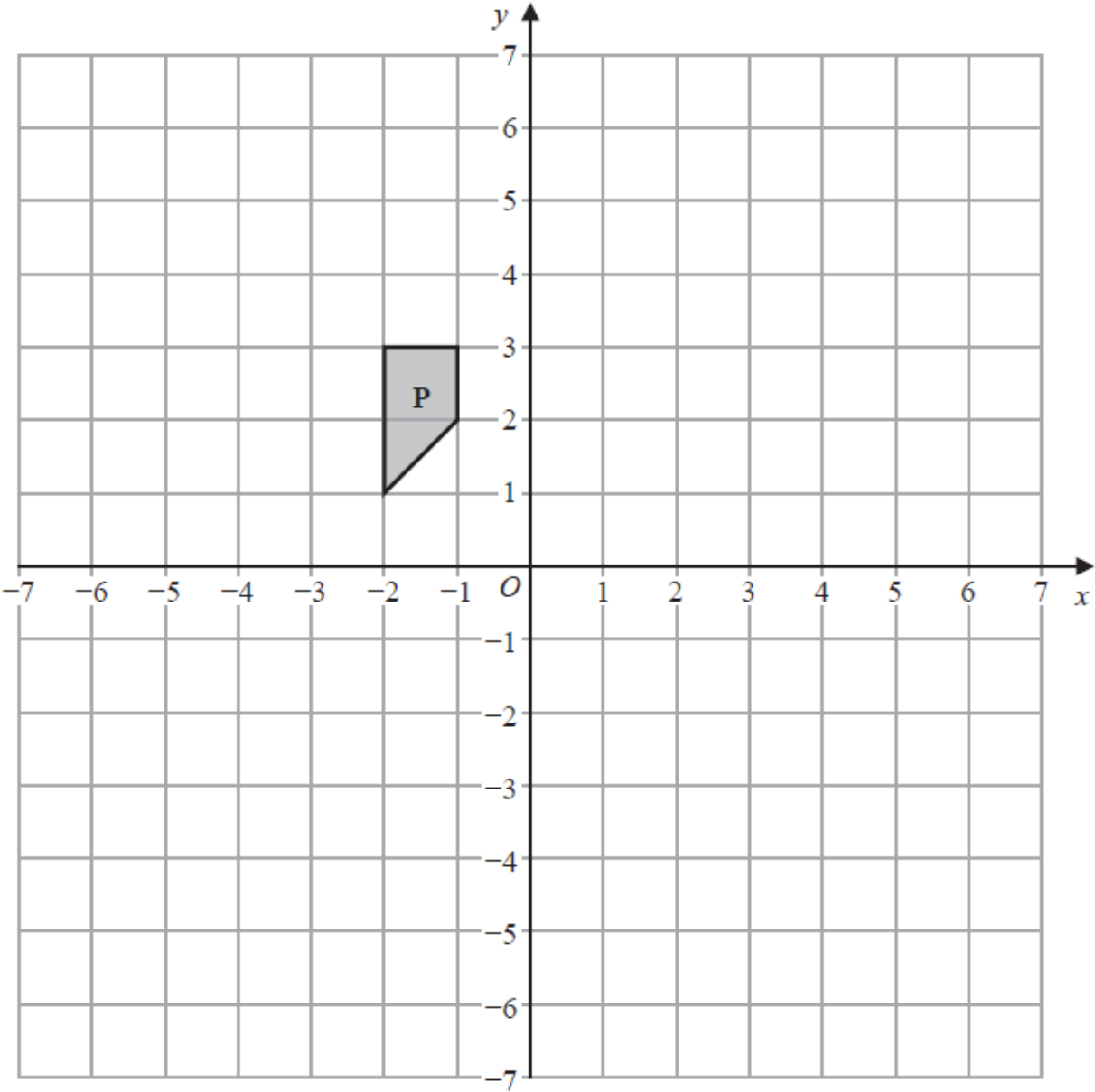
(a) Work out the total cost, in pounds, of the flights, the apartment and the car hire.

£.....
(4)

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

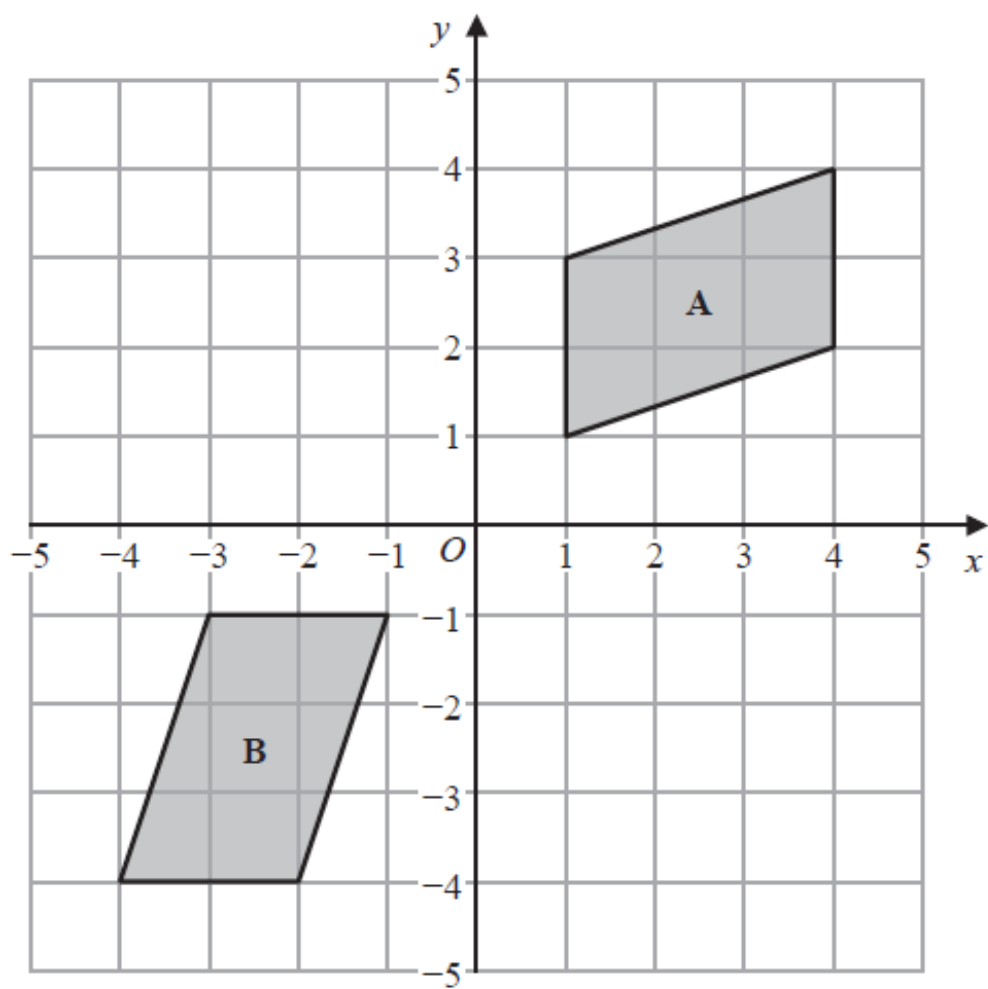
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(1)

(Total for Question 3 is 5 marks)



(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**.

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.....

.....

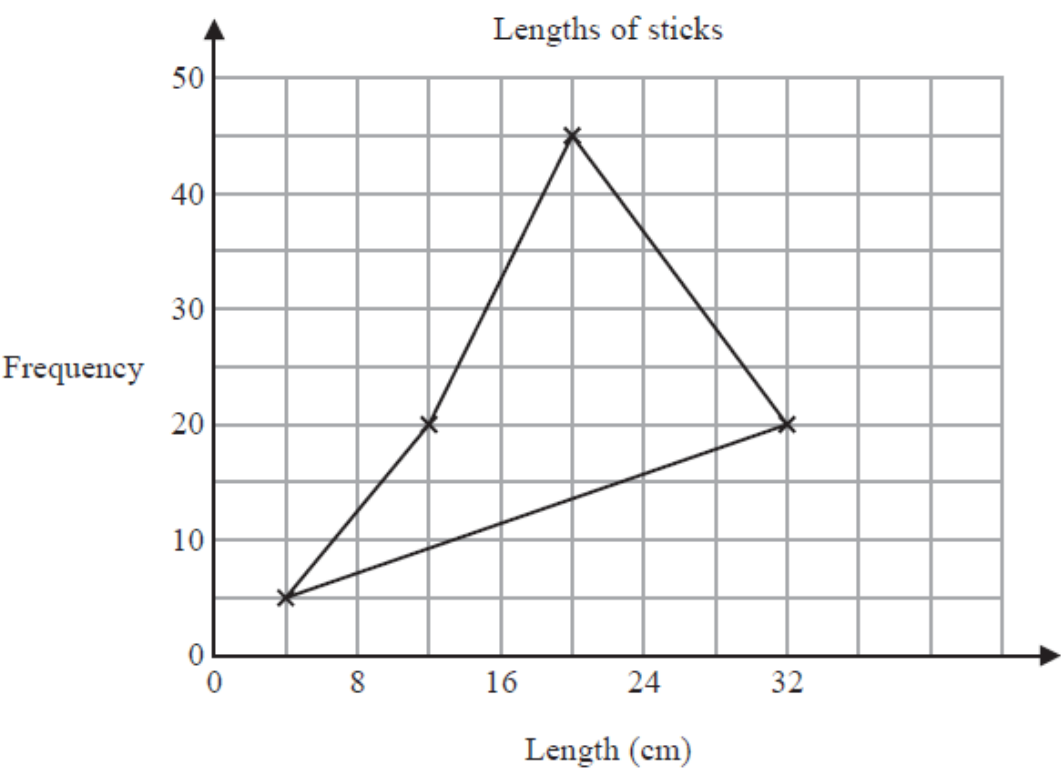
(2)

(Total for Question 4 is 4 marks)

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

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

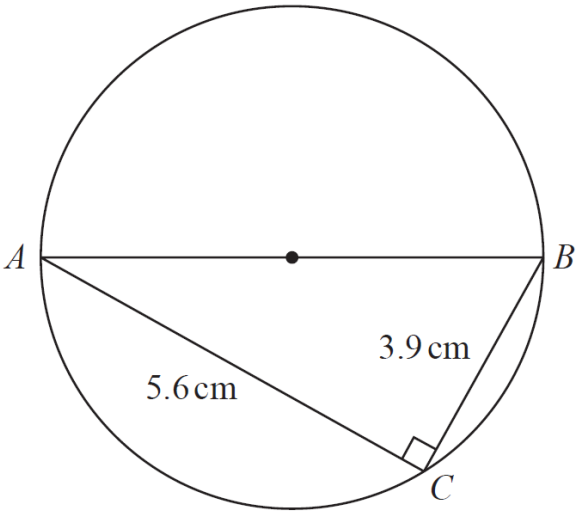
(Total for Question 6 is 3 marks)

- 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.

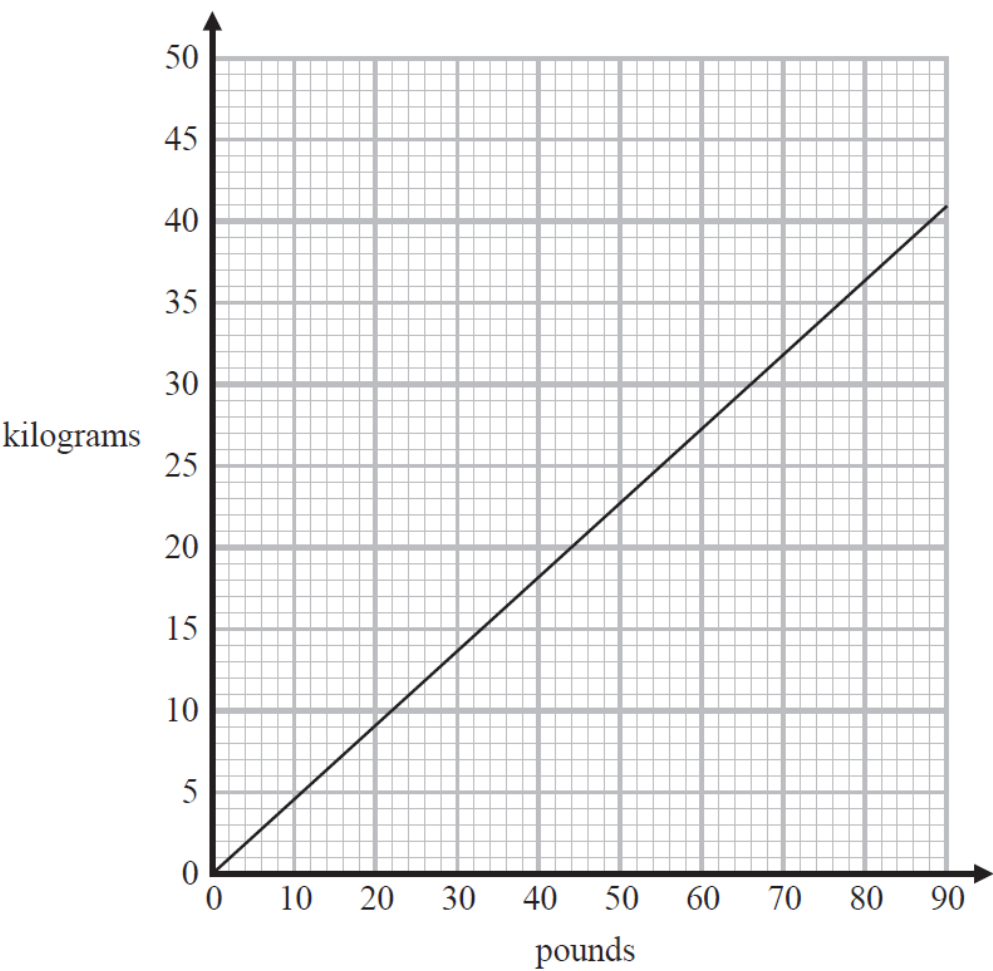


Calculate the area of the circle.
 Give your answer correct to 3 significant figures.

..... cm²

(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.

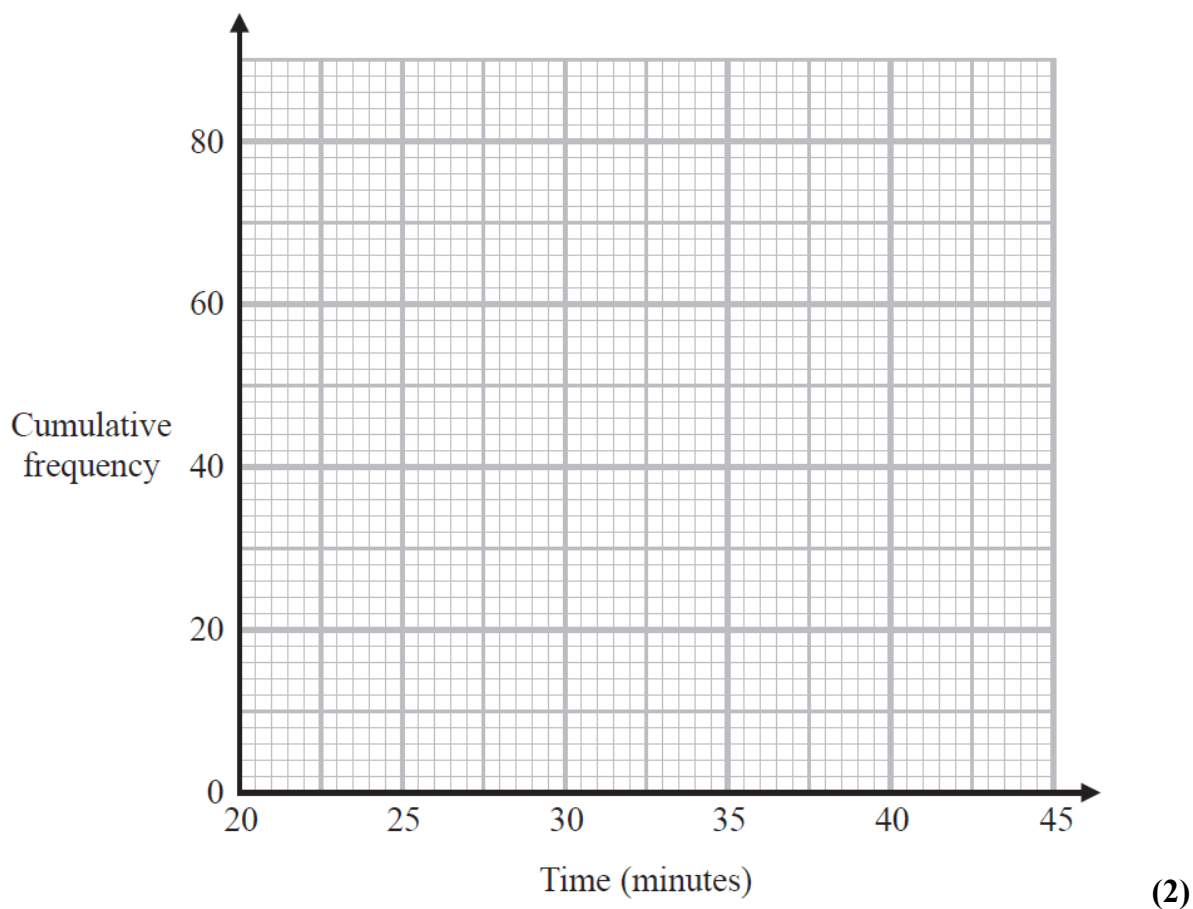
Time (t minutes)	Frequency
$20 < t \leq 25$	4
$25 < t \leq 30$	16
$30 < t \leq 35$	30
$35 < t \leq 40$	18
$40 < t \leq 45$	12

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

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

(1)

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



(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.

£.....

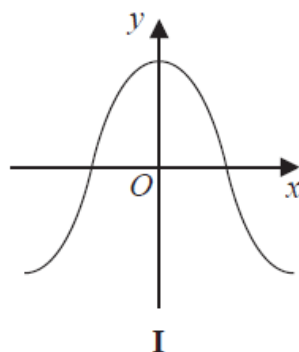
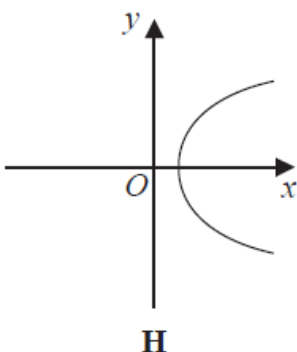
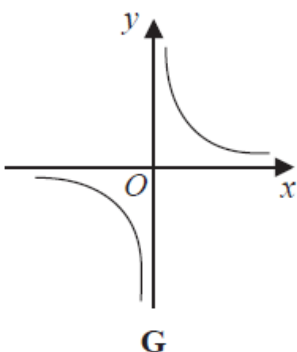
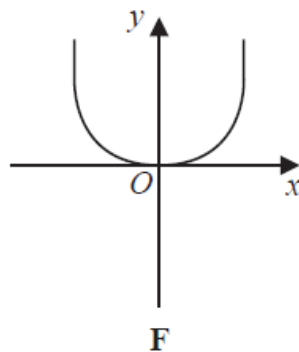
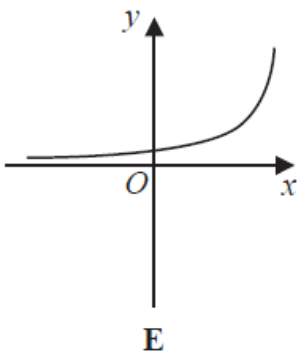
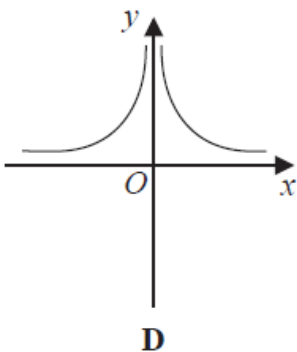
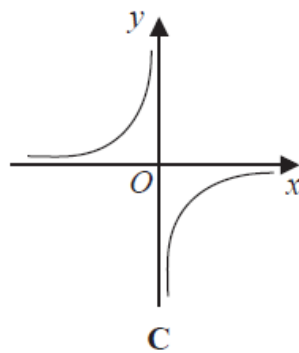
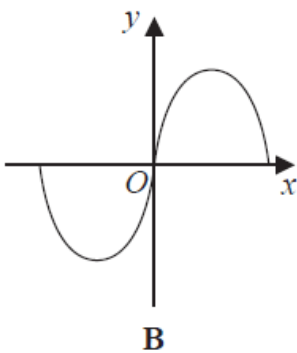
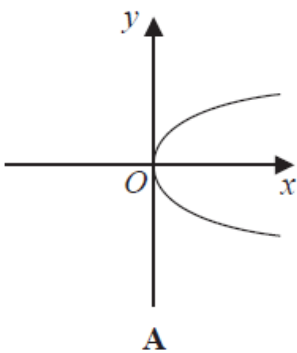
(Total for Question 11 is 2 marks)

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

.....

(Total for Question 12 is 3 marks)

13 Here are nine graphs.



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

.....

(1)
- (b) Write down the letter of the graph that could have the equation $y = \frac{4}{x^2}$

.....

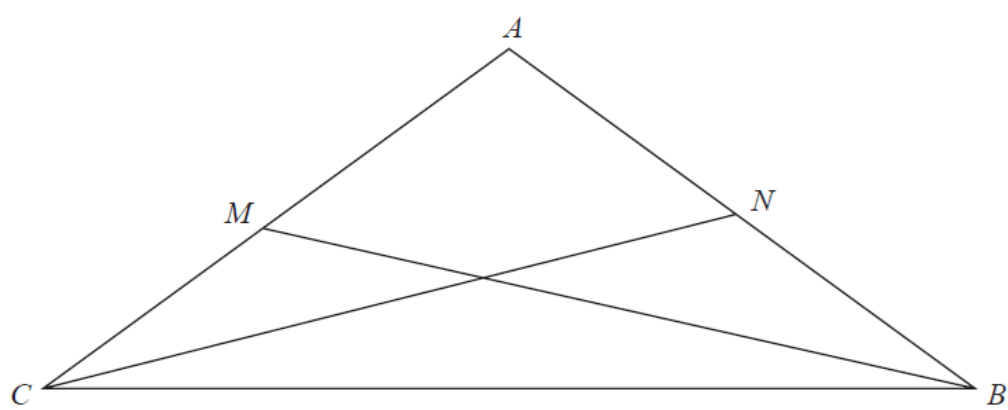
(1)
- (c) Write down the letter of the graph that could have the equation $y^2 = 4x$

.....

(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)

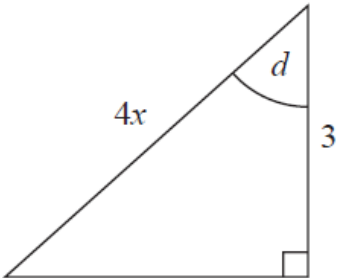
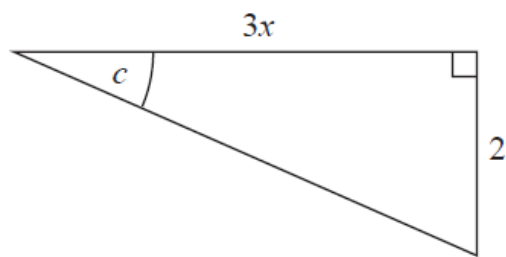
16 The probability that Saira walks to school is 0.8

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.

.....^o

(Total for Question 17 is 4 marks)

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

1 8 21 40 65

The n th 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 .

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

(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

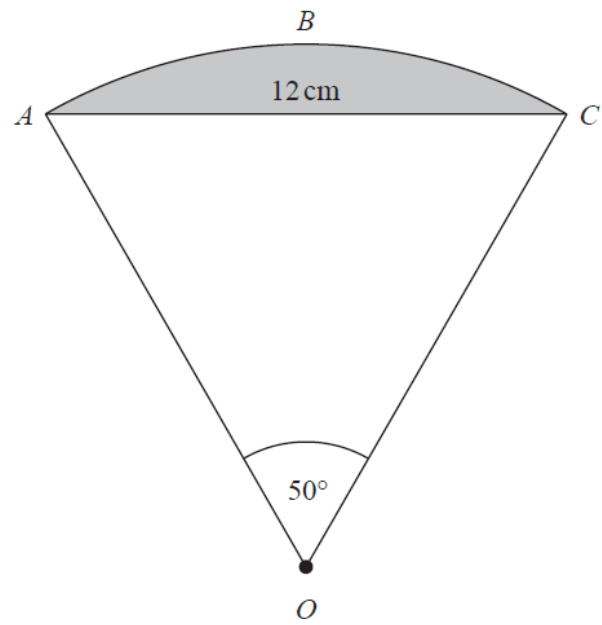
By considering bounds, work out the value of T to a suitable degree of accuracy.
Give a reason for your answer.
You must show all your working.

.....

(Total for Question 19 is 4 marks)



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



Angle $AOC = 50^\circ$
 $AC = 12\text{ cm}$

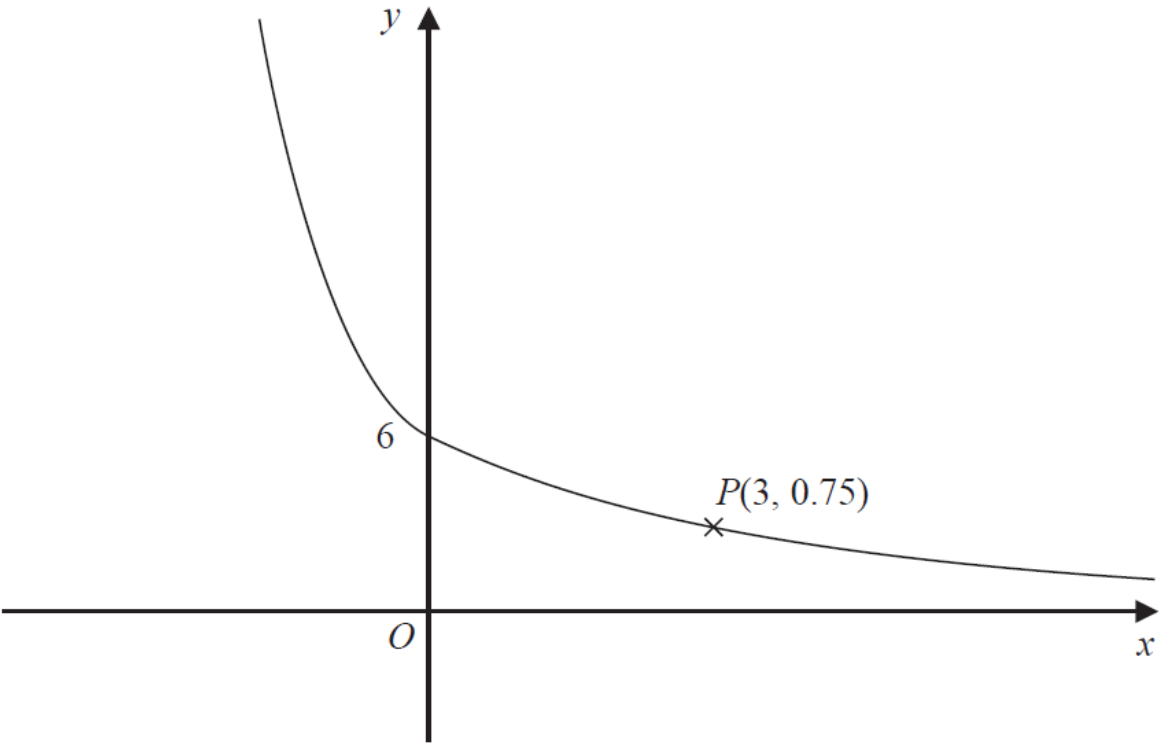
Work out the area of the shaded segment of the circle.
Give your answer correct to 3 significant figures.

..... 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 .

$a = \dots\dots\dots$

$b = \dots\dots\dots$

(Total for Question 21 is 3 marks)

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

The surface area of **A** is 24 cm²
The surface area of **B** is 54 cm²

The height of **B** : the height of **C** = 3 : 7
The volume of **A** is 72 cm³

C is made of wood with density 0.14 g/cm³

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)



WEEK 5

MARKSCHEMES

(Higher 7+)

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 incomplete table and the incomplete histogram give information about the times taken by some students to run a race.

Freq. density

$10 \div 4 = 2.5$

$15 \div 3 = 5$

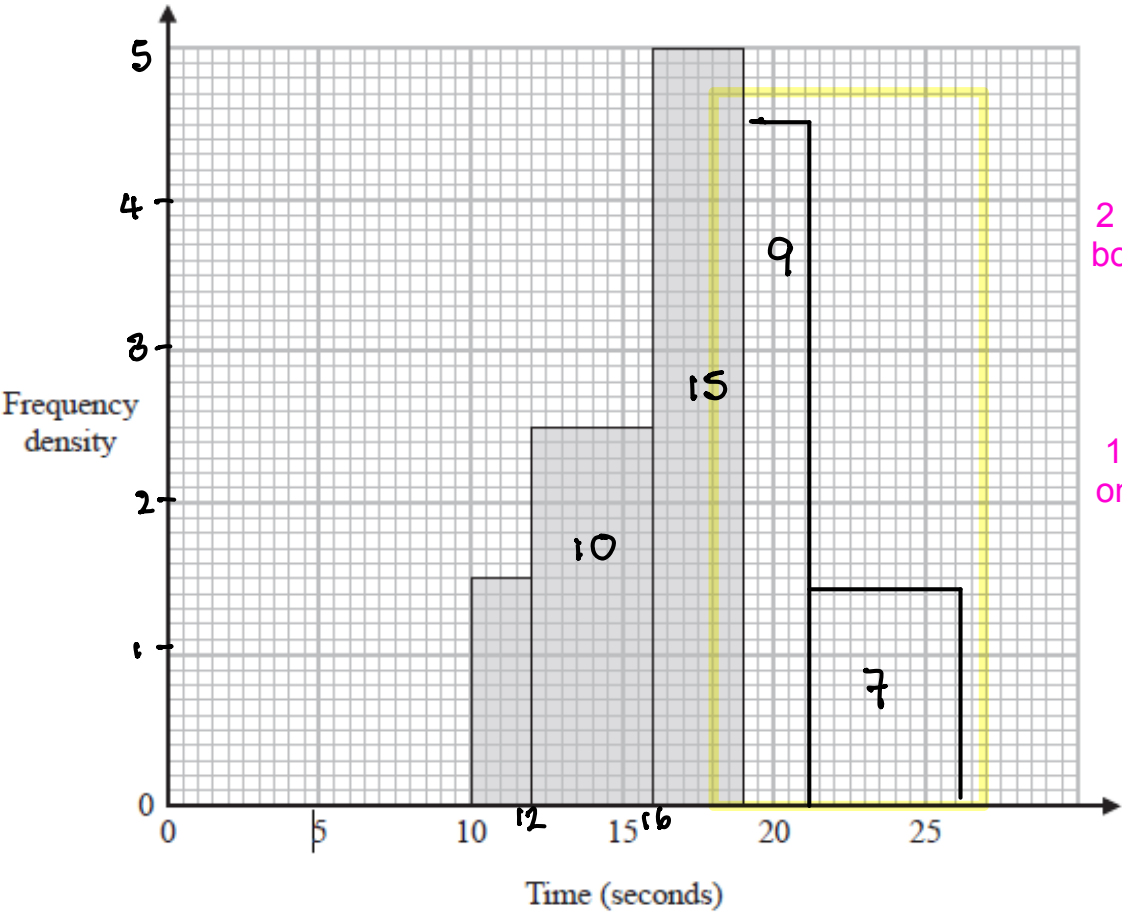
$9 \div 2 = 4.5$

$7 \div 5 = 1.4$

Time (t seconds)	Frequency
$10 < t \leq 12$	3
$12 < t \leq 16$	10
$16 < t \leq 19$	15
$19 < t \leq 21$	9
$21 < t \leq 26$	7

1 mark

$1.5 \times 2 = 3$



2 marks for both correct bars

1 mark for one correct bar

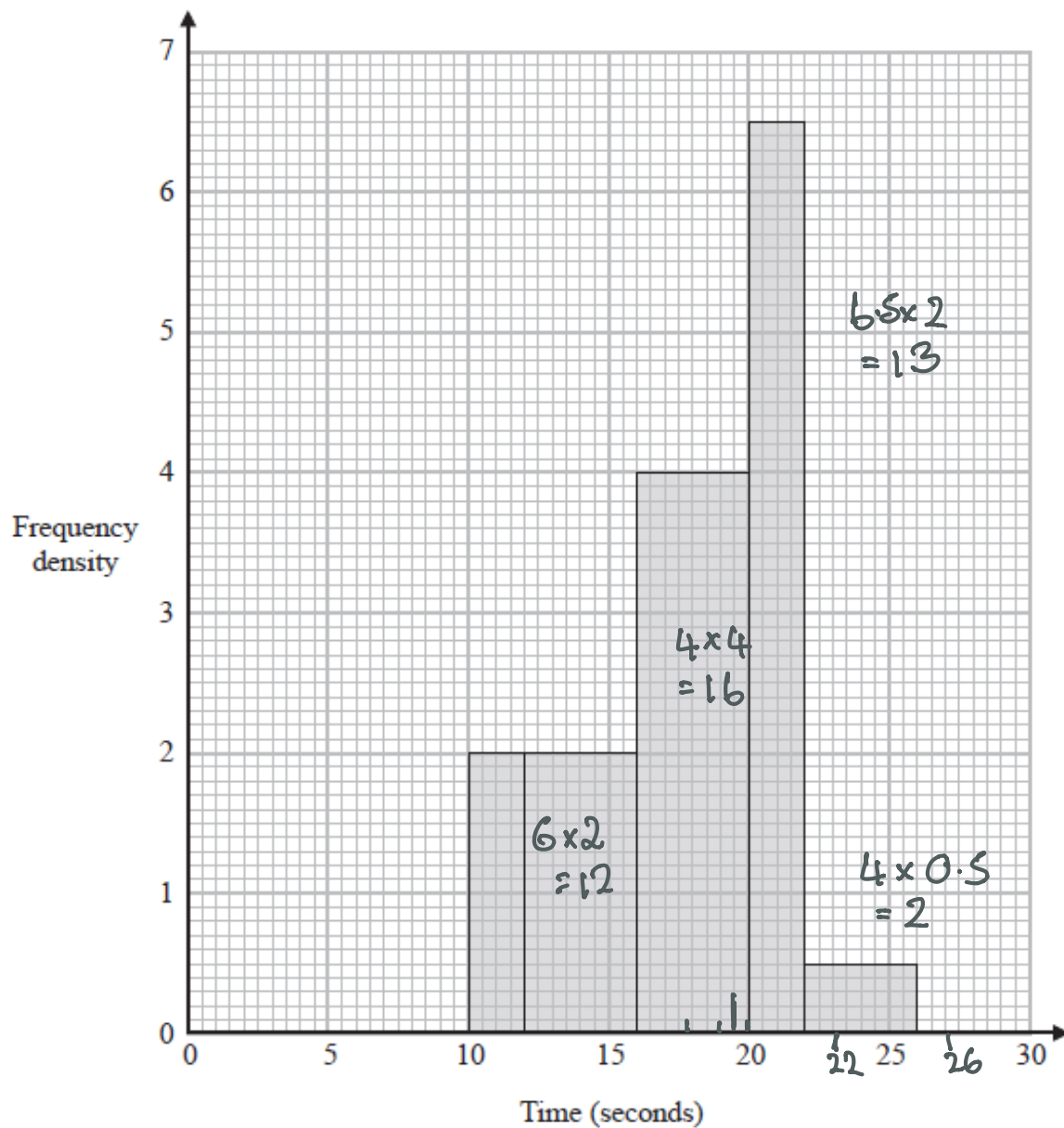
None of these students had a time for the race such that $t < 10$ or $t > 26$

(a) Use the histogram to complete the table.

(b) Use the table to complete the histogram.

(2)

The histogram below gives information about the times taken by 43 students to run a different race.



(c) Work out an estimate for the median of the times taken by these 43 students to run the race. 1 mark

$$\text{Total} = 12 + 16 + 13 + 2 = 43$$

$$\text{median} = \frac{43 + 1}{2} = 22 \text{nd} \dots \dots \dots 18.5 \text{ seconds}$$

(3)

$$22 - 12 = 10$$

1 mark

(Total for Question 1 is 6 marks)

- 2 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.

- (a) 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

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

(3)

Sally is going to throw the same dice n times and record the number it lands on each time. She will use her results to work out a more reliable estimate for the probability in part (a).

- (b) What can you say about the value of n ?

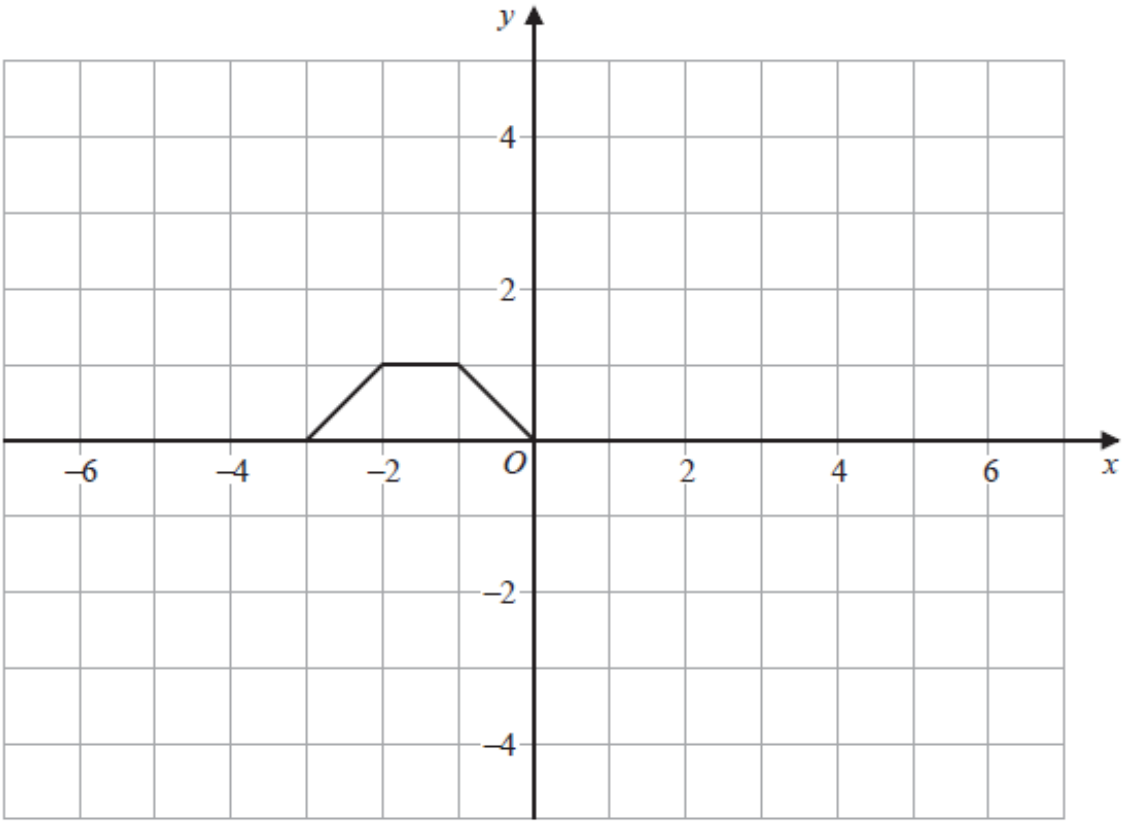
The greater the value of n , the more reliable her results will be so n should be greater than 60

1 mark

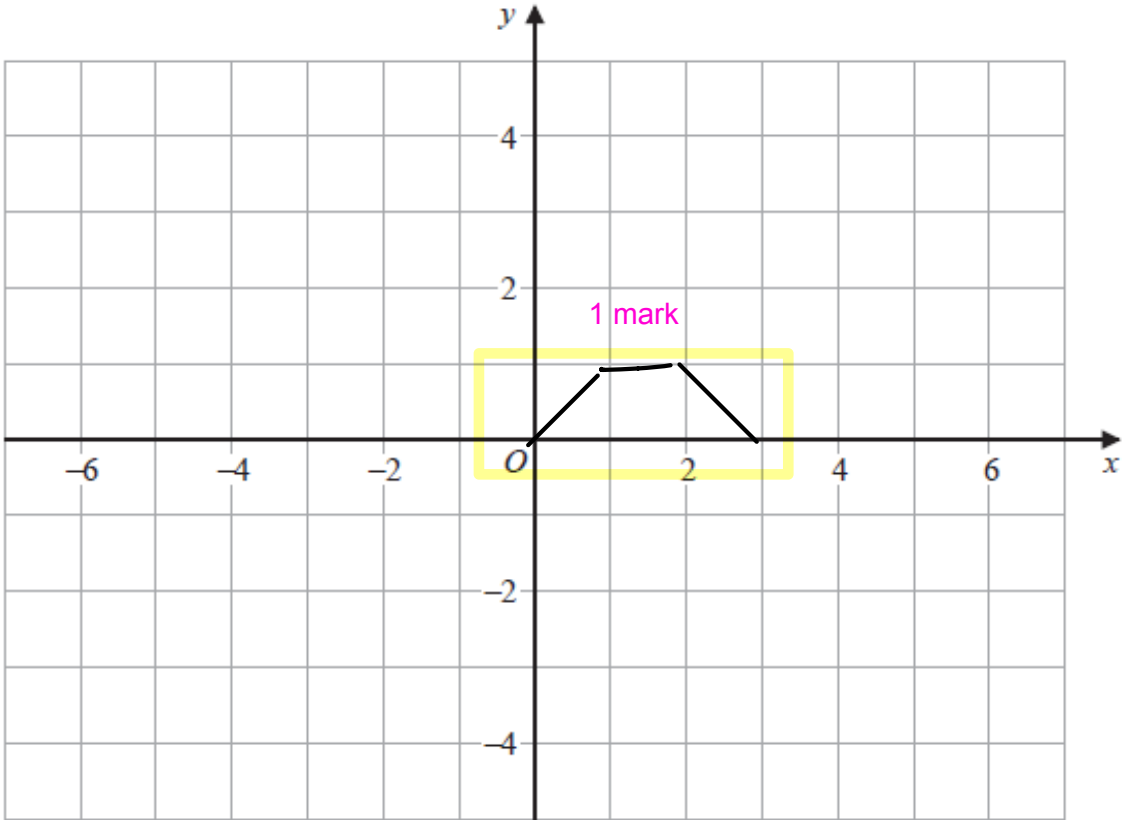
(1)

(Total for Question 2 is 4 marks)

3 Here is the graph of $y = f(x)$

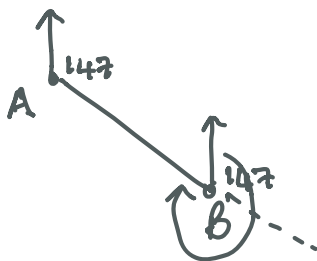


On the grid below, draw the graph of $y = f(-x)$



(Total for Question 3 is 1 mark)

- *4 The bearing of port B from port A is 147°
Work out the bearing of port A from port B .



1 mark

$$147 + 180 \\ = 327$$

Final mark

327

(Total for Question 4 is 2 marks)

- 5 $2a : 5c = 6 : 25$
 $4b : 7c = 20 : 21$

Show that $a + b : b + c = 17 : 20$

$$2a : 5c \\ 6 : 25$$

$$4b : 7c \\ 20 : 21$$

$$a : c \\ 3 : 5$$

1 mark

$$9 : 15 \quad \times 3$$

$$b : c$$

$$5 : 3$$

$$25 : 15$$

$\times 5$

$$a : b : c$$

1 mark

$$9 : 25 : 15$$

Final mark

$$a + b = 34$$

$$b + c = 40$$

$$34 : 40$$

$$= 17 : 20 \text{ as required.}$$

(Total for Question 5 is 3 marks)

- 6 Write $\frac{14}{3x-21} + \left[(x+4) \div \frac{2x^2-6x-56}{2x+3} \right]$ in the form $\frac{ax+b}{cx+d}$ where a, b, c and d are integers.

$$2x^2 - 6x - 56 = (x+4)(2x-14)$$

1 mark

$$\frac{14}{3x-21} + (x+4) \times \frac{2x+3}{2x^2-6x-56}$$

1 mark

$$= \frac{14}{3x-21} + \frac{\cancel{(x+4)}(2x+3)}{\cancel{(x+4)}(2x-14)}$$

$$= \frac{14(2x-14) + (2x+3)(3x-21)}{(3x-21)(2x-14)}$$

1 mark

$$= \frac{28x - 196 + 6x^2 - 42x + 9x - 63}{(3x-21)2(x-7)}$$

$$= \frac{6x^2 - 5x - 259}{2(3x-21)(x-7)}$$

$$= \frac{(6x+37)\cancel{(x-7)}}{2(3x-21)\cancel{(x-7)}}$$

$$= \frac{6x+37}{6x-42}$$

Final mark

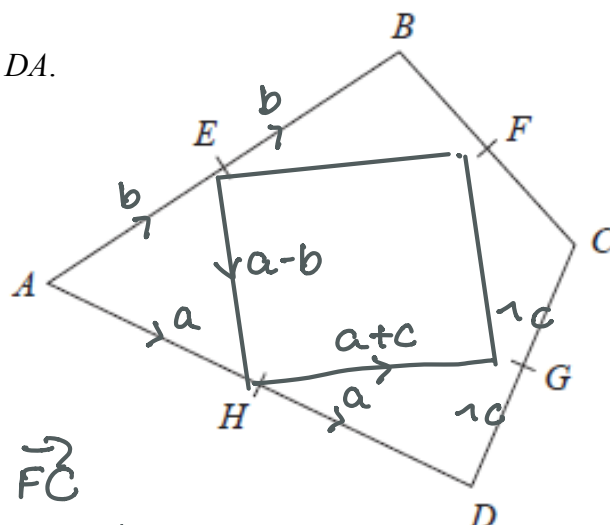
$$\frac{6x+37}{6x-42}$$

(Total for Question 6 is 4 marks)

- 7 $ABCD$ is a quadrilateral.
 E, F, G and H are the midpoints of AB, BC, CD and DA .

$$\vec{AH} = \mathbf{a} \quad \vec{AE} = \mathbf{b} \quad \vec{DG} = \mathbf{c}$$

Prove, using vectors, that $EFGH$ is a parallelogram.



1 mark

$$\vec{BC} = 2\mathbf{a} + 2\mathbf{c} - 2\mathbf{b}$$

$$\text{so } \vec{BF} = \vec{FC} \\ = \mathbf{a} + \mathbf{c} - \mathbf{b}$$

$$\vec{EH} = \mathbf{a} - \mathbf{b}$$

1 mark for
either of
these

$$\vec{HG} = \mathbf{a} + \mathbf{c}$$

$$\begin{aligned} \vec{FC} &= \vec{FB} + \vec{BC} \\ &= \mathbf{a} + \mathbf{c} - \mathbf{b} - \mathbf{c} \\ &= \mathbf{a} - \mathbf{b} \end{aligned}$$

1 mark for
either of
these

$$\begin{aligned} \vec{EF} &= \vec{EB} + \vec{BF} \\ &= \mathbf{b} + \mathbf{a} + \mathbf{c} - \mathbf{b} \\ &= \mathbf{a} + \mathbf{c} \end{aligned}$$

$$\text{so } \vec{EH} = \vec{FC} \quad \text{so } \vec{HG} = \vec{EF}$$

Final mark

$\therefore EFGH$ is a parallelogram

(Total for Question 7 is 4 marks)

- 8 Show that the equation $x^3 + 2x - 6 = 0$ has a solution between $x = 1$ and $x = 2$

$$x = 1 \quad 1^3 + 2 \times 1 - 6 = 1 + 2 - 6 = -3$$

1 mark for either of these

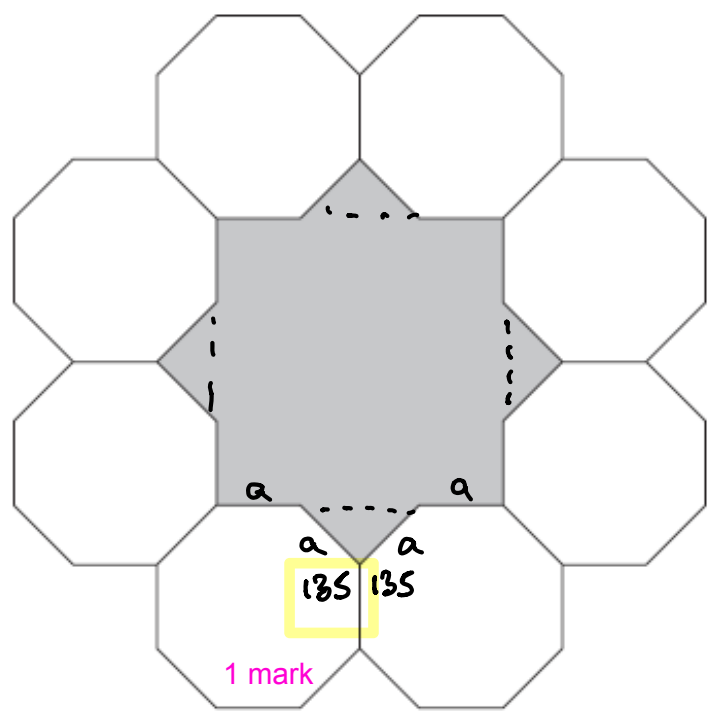
$$x = 2 \quad 2^3 + 2 \times 2 - 6 = 8 + 4 - 6 = 6$$

Final mark

since there is a change in sign a solution must lie between $x = 1$ and $x = 2$

(Total for Question 8 is 2 marks)

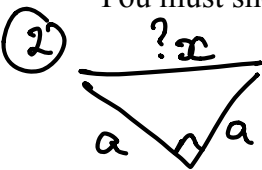
9 The diagram shows 8 identical regular octagons joined to enclose a shaded shape.



① $1080 \div 8$
 $= 135$
 $360 - 270$
 $= 90$
 so right angle $\triangle$

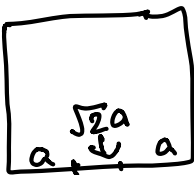
Each octagon has sides of length a .
 Find, in terms of a , an expression for the area of the shaded shape.
 Give your answer in the form $p(2 + \sqrt{2})a^2$ where p is an integer.

You must show all your working.



$x^2 = 2a^2$
 $x = \sqrt{2}a$

area of $\triangle$
 $= \frac{1}{2}a \times a = \frac{1}{2}a^2$



area of square 4 of these! = $2a^2$
 $= (2a + \sqrt{2}a)(2a + \sqrt{2}a)$
 $= 4a^2 + 4\sqrt{2}a^2 + 2a^2$
 $= 6a^2 + 4\sqrt{2}a^2$

Total = $6a^2 + 4\sqrt{2}a^2 + 2a^2 = 8a^2 + 4\sqrt{2}a^2$
 $= 4(2 + \sqrt{2})a^2$ as required

Final mark

(Total for Question 9 is 5 marks)

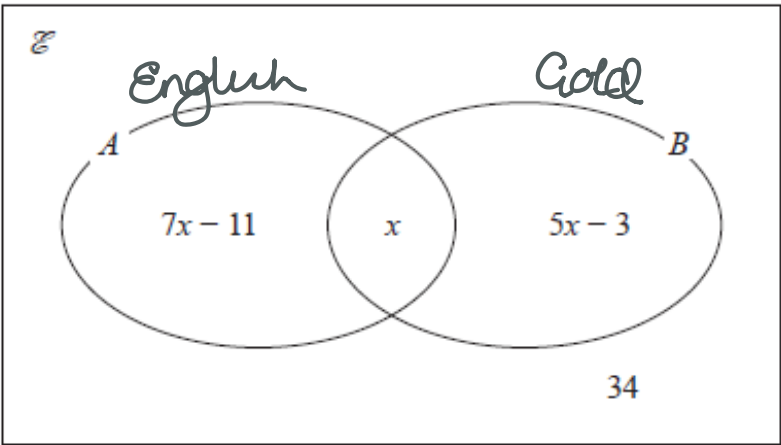
10 Vicky has a collection of medals.

The Venn diagram gives information about the number of medals in her collection where

$\mathcal{E} = \{\text{all medals}\}$

$A = \{\text{English medals}\}$

$B = \{\text{gold medals}\}$



Vicky is going to take at random a medal from her collection.

Given that the medal is gold, the probability that the medal is English is $\frac{2}{11}$

Work out the number of medals in Vicky's collection.

$$\mathcal{E} = 7x - 11 + x + 5x - 3 + 34$$
$$= 13x + 20$$

Given that the medal is gold $x + 5x - 3 = 6x - 3$

$$\frac{x}{6x - 3} = \frac{2}{11}$$

1 mark

$$11x = 2(6x - 3)$$

$$11x = 12x - 6$$

1 mark

$$x = 6 \quad \text{so medals} = 13 \times 6 + 20$$

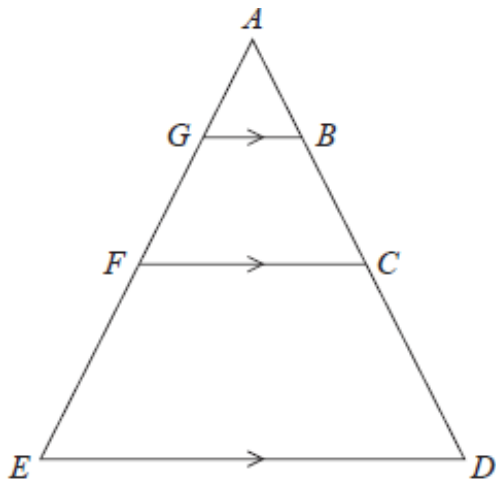
1 mark

Final mark

$$98$$

(Total for Question 10 is 4 marks)

11 Here are three similar triangles, ABG , ACF and ADE .

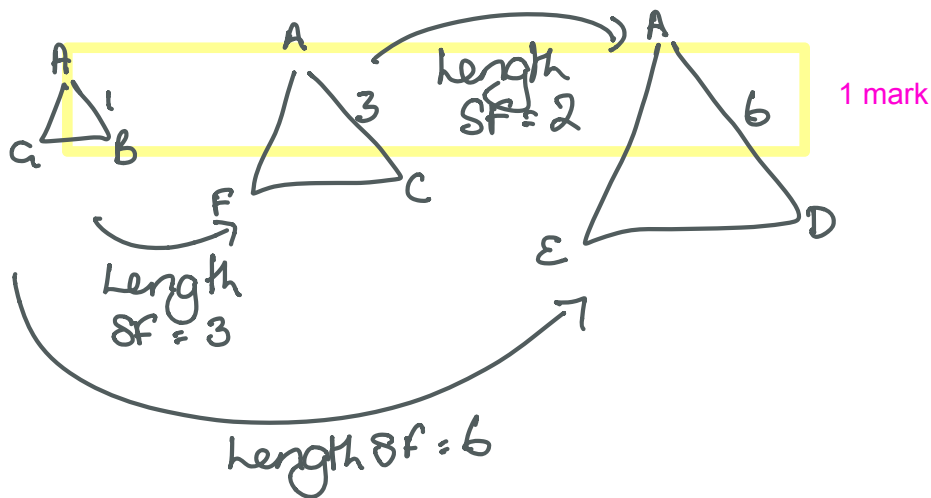


$ABCD$ and $AGFE$ are straight lines.

$$AB : BC : CD = 1 : 2 : 3$$

Show that

$$\text{area of } ABG : \text{area of } BCFG : \text{area of } CDEF = 1 : 8 : 27$$



$$BCFG = \triangle ACF - \triangle ABG$$

$$\text{area sf} = 3^2 = 9$$

$$= 9ABG - ABG$$

$$= 8ABG$$

$$CDEF = \triangle ADE - \triangle ACF$$

$$= 36ABG - 9ABG$$

$$= 27ABG$$

$$\therefore \text{ratio of area } 1 : 8 : 27$$

Final mark

(Total for Question 11 is 3 marks)

12 There are only blue pens and red pens in a box.

The number of blue pens is four times the number of red pens.

Rita takes at random one pen from the box.

She records the colour of the pen and then replaces it in the box.

Rita does this n times, where $n \geq 2$

Write down an expression, in terms of n , for the probability that Rita gets a blue pen at least once and a red pen at least once.

B
4R

R
R

$$P(B) = \frac{4R}{5R} = \frac{4}{5}$$

$$P(R) = \frac{R}{5R} = \frac{1}{5}$$

$$P(\text{all } B) = \left(\frac{4}{5}\right)^n$$

$$P(\text{all } R) = \left(\frac{1}{5}\right)^n$$

1 mark for either of these

Final mark

$$1 - \left(\frac{4}{5}\right)^n - \left(\frac{1}{5}\right)^n$$

(Total for Question 12 is 2 marks)

TOTAL FOR PAPER IS 36 MARKS

WEEK 5 TASK 2

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
		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	Factors of 126: 1, 2, 3, 6, 7, 9, 14, 18, 21, 42, 63, 126
		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. $560 \div 1.12 (= 500)$ or $20.16 \div 1.12 (= 18)$	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. $560 \times 3 (= 1680) + 20.16 \times 15 (= 302.4)$ or “500” $\times 3 (= 1500) + “18” \times 15 (= 270)$	
		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 $(3, -1), (4, -1), (4, -2), (3, -3)$	Award no marks if more than one transformation is given
		(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	
		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 (C1 for one statement eg from those above)	Ignore additional statements provided there is no contradiction
6	Yes (supported)	P1 C1	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. $(\text{"2.5"} - \text{"2.4"}) \div \text{"2.5"} \times 100 (= 4)$ or $\frac{100 + \text{"20"}}{100} \div \frac{100 + \text{"25"}}{100} (= 0.96)$ or for process to find change in width if 5% decrease, eg. $\text{"2.5"} \times 0.05 (= 0.125)$ and $(\text{"2.5"} - \text{"2.4"}) (= 0.1)$ 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	Ignore anything drawn to the left of the first point May be a cumulative frequency curve or a cumulative frequency polygon If histograms drawn, plots must be identified Accept any equivalent fraction, decimal or percentage ft
	(b)	cf graph	M1 for 4 or 5 of their points plotted correctly from a cf table	
			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	
	(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	
11		120 000	M1 for a correct use of 1.015, eg. $123\,627 \div 1.015 (= 121\,800)$ or $123\,627 \div 1.015^2 (= 120\,000)$	
			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 $(x + 5)(x - 3)$ First product must be quadratic but need not be simplified or may be simplified incorrectly
			M1 for method of multiplying out remaining products, (half of which are correct) ft their first product	
			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 $MCB = \text{angle } NBC$ since base angles of an <u>isosceles triangle</u> 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 $0.8 \times 0.3 (= 0.24)$ or $0.2 \times 0.05 (= 0.01)$	Accept fractions in working
		P1	for “0.24” + “0.01” (= 0.25) or “0.24” $\times$ 20 (= 4.8) or “0.01” $\times$ 20 (= 0.2)	
		A1	cao	

Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
17	35	P1 P1 P1 A1	for $\tan c = \frac{2}{3x}$ or $\cos d = \frac{3}{4x}$ 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 $x = 17 \div 18 (= 0.944\dots)$ (dep P2) for using their value of x to find c, eg. $c = \tan^{-1} \left(\frac{12}{17} \right)$ oe for angle between 35 and 36	
18	3, -2	M1 M1 A1	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; $a + b = 1$, $4a + 2b = 8$, $9a + 3b = 21$, $16a + 4b = 40$, $25a + 5b = 65$ Substituting $a = "3"$ into one of the above equations, eg. $a + b = 1$ 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 120.49 or 120.499... for f accept 25.649 or 25.499...
		M1	for a correct method to find one bound of T , eg $[\text{UB of } T] = [\text{UB of } m] \div [\text{LB of } f]$ or $[\text{LB of } T] = [\text{UB of } m] \div [\text{UB of } f]$	$120 < [\text{UB of } m] \leq 120.5$ $119.5 \leq [\text{LB of } m] < 120$ $25.6 < [\text{UB of } f] \leq 25.65$ $25.55 \leq [\text{LB of } f] < 25.6$
		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. $6 \div \sin 25 (= 14.197..)$	
		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 M1 A1	For using $x^0 = 1$ with the y-intercept to derive the equation $6 = a \times 1$ for $0.75 = 6 \times b^{-3}$ cao	
22	432.18	P1 P1 P1 P1 A1	for a process to find the ratio of height of A to B , eg. $\sqrt{24} \div 6 : \sqrt{54} \div 6$ ($= 2 : 3$) for a process to find the ratio of volume A to volume C , eg. $2^3 : 7^3$ ($= 8 : 343$) for process to find volume of C , eg. $72 \times \frac{343}{8}$ ($= 3087$) for “3087” $\times 0.14$ accept an answer in the range 432 to 432.2	
23	$3 < x < 4$, $-4 < x < -3$	M1 M1 M1 A1	for a correct method to begin rearranging to solve for x^2 , eg. $5 < x^2 - 4$ or $x^2 - 4 < 12$ for a set of critical values; at least two out of 3, 4, -3 , -4 for inequalities for one set of critical values, eg. $x > 3$ and $x < -3$ or $x < 4$ and $x > -4$ for $3 < x < 4$, $-4 < x < -3$	Accept incorrect inequality signs used or the use of equality signs Do not award marks for answer if not supported by working.

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) Factorise $a^2 - b^2$

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

1 mark

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

(1)

(b) Show that $2^{40} - 1$ is the product of two consecutive odd numbers.

$$a^2 - b^2 \quad \text{so} \quad (2^{20})^2 - 1^2$$

$$= (2^{20} - 1)(2^{20} + 1) \quad 1 \text{ mark}$$

$$2^{20} = \text{even} \quad 2^{20} - 1 = \text{odd}$$

so $2^{20} + 1$ is next consecutive odd number.

(2)

Final mark for correct explanation (Total for Question 1 is 3 marks)

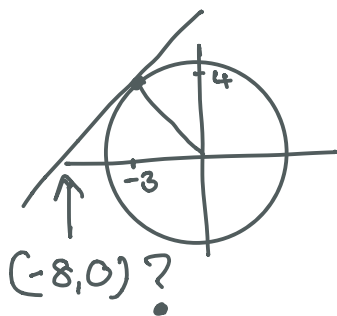
2 A circle has equation $x^2 + y^2 = 25$

The point P with coordinates $(-3, 4)$ lies on the circle.

Alex says that the tangent to the circle at P crosses the x -axis at the point $(-8, 0)$

Is Alex correct?

You must show how you get your answer.



$$x^2 + y^2 = 25 \text{ so radius} = 5$$

gradient of radius

$$= -\frac{4}{3} \quad 1 \text{ mark}$$

gradient of tangent

$$= \frac{3}{4} \quad 1 \text{ mark}$$

equation of tangent $y = \frac{3}{4}x + c$

$$\begin{matrix} (-3, 4) \\ x \quad y \end{matrix}$$

$$4 = \frac{3}{4} \times -3 + c$$

$$c = 4 + \frac{9}{4} = 6.25$$

so

$$y = 0.75x + 6.25 \quad 1 \text{ mark}$$

when $y = 0$

$$0.75x = -6.25$$

$$x = \frac{-6.25}{0.75} = -8\frac{1}{3}$$

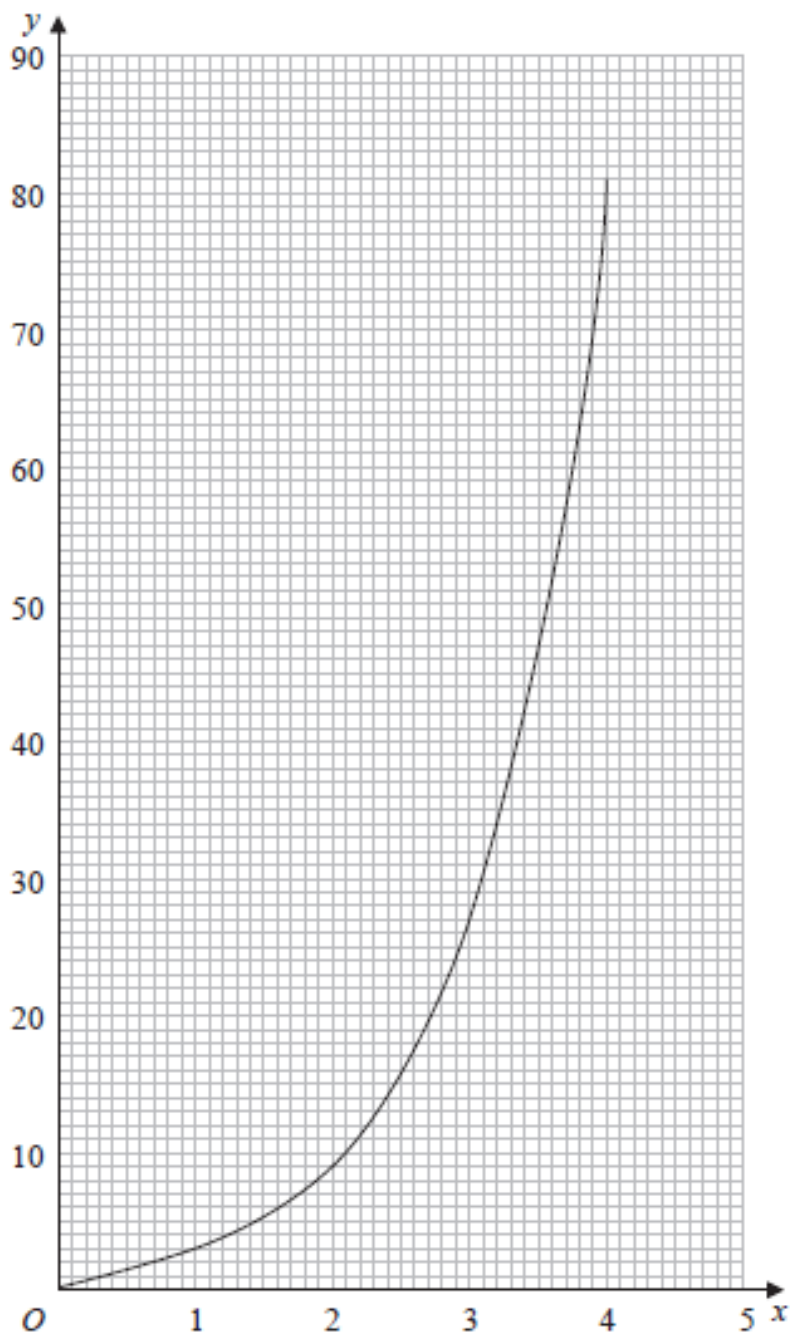
so Alex is not correct.

1 mark for correct conclusion

(Total for Question 2 is 4 marks)

3 Sana needs to draw the graph of $y = 3^x$ for $0 \leq x \leq 4$

She draws the graph shown on the grid.

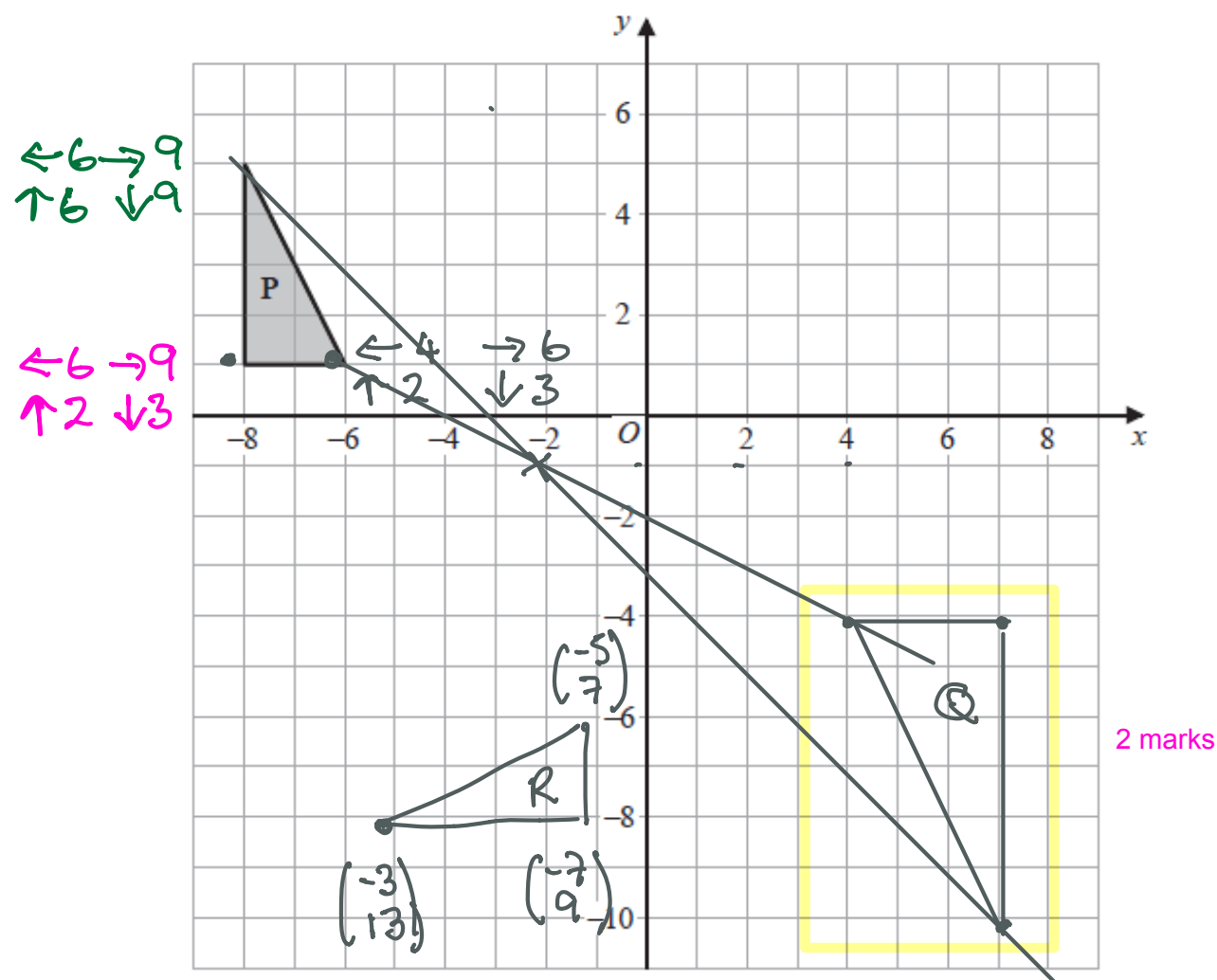


Write down one thing Sana has done wrong.

1 mark

When $x = 0$ $y = 3^0 = 1$ and not zero.
so the line should go through $(0, 1)$ not $(0, 0)$

(Total for Question 3 is 1 mark)



(a) Enlarge triangle **P** by scale factor $-1\frac{1}{2}$ with centre of enlargement $(-2, -1)$

Label your image **Q**.

(2)

Triangle **P** is transformed by a combined transformation of a rotation of 90° anticlockwise about the origin followed by a translation to give triangle **R**. Exactly one vertex of triangle **P** is invariant under the combined transformation.

1 mark for any one of these

(b) Find one possible column vector for the translation.

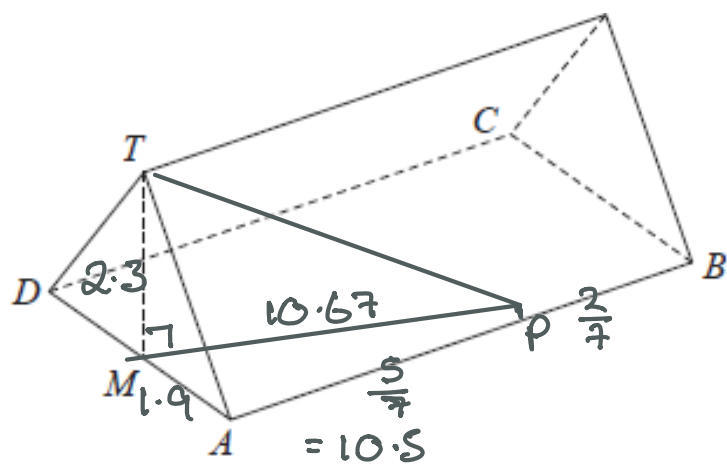
3 solutions possible

$$\begin{pmatrix} -3 \\ 13 \end{pmatrix} \begin{pmatrix} -7 \\ 9 \end{pmatrix} \text{ or } \begin{pmatrix} -5 \\ 7 \end{pmatrix}$$

(1)

(Total for Question 4 is 3 marks)

5 The diagram shows a triangular prism with a horizontal rectangular base $ABCD$.



M is the midpoint of AD .
 The vertex T of the prism is vertically above M .
 $AB = 14.7\text{ cm}$ $BC = 3.8\text{ cm}$ $MT = 2.3\text{ cm}$
 P is the point on AB such that
 $AP : PB = 5 : 2$

Calculate the size of the angle between TP and the base $ABCD$ of the prism.
 Give your answer correct to 1 decimal place.

$$AP = \frac{5}{7} \times 14.7 = 10.5$$

1 mark

$$MP^2 = \sqrt{10.5^2 + 1.9^2}$$

$$= \sqrt{113.86}$$

$$= 10.67$$

1 mark

$$\tan \angle TPM = \frac{2.3}{10.67}$$

1 mark

$$\angle TPM = \tan^{-1} \frac{2.3}{10.67}$$

$$= 12.1638\dots$$

Final mark

$$12.2$$

(Total for Question 5 is 4 marks)

- 6 An expression for the n th term of the sequence of triangular numbers is $\frac{n(n+1)}{2}$
Prove that the sum of any two consecutive triangular numbers is a square number.

$$\frac{n(n+1)}{2} + \frac{(n+1)(n+1+1)}{2} \quad 1 \text{ mark}$$

$$= \frac{n^2 + n}{2} + \frac{(n+1)(n+2)}{2} \quad 1 \text{ mark}$$

$$= \frac{n^2 + n + n^2 + 3n + 2}{2} = \frac{2n^2 + 4n + 2}{2}$$

$$= n^2 + 2n + 1 = (n+1)(n+1) = (n+1)^2 \quad \text{Final mark}$$

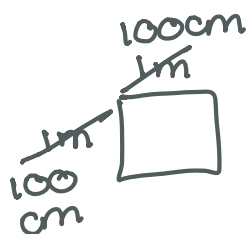
which is a square number.

(Total for Question 6 is 3 marks)

- 7 The floor plan of a house is drawn using a scale of 1 : 50
On the plan, a room in the house has a floor area of 48 cm^2
Work out the real area of the floor of this room.
Give your answer in m^2

$$\text{length SF} = 50 \quad 1 \text{ mark}$$

$$\text{so area SF} = 50^2 = 2500$$



$$48 \times 2500 = 120\,000 \text{ cm}^2$$

$$1 \text{ m}^2 = 10,000 \text{ cm}^2$$

$$\text{so } 120\,000 \text{ cm}^2 \div 10\,000 \text{ cm}^2 = 12 \quad 1 \text{ mark}$$

12

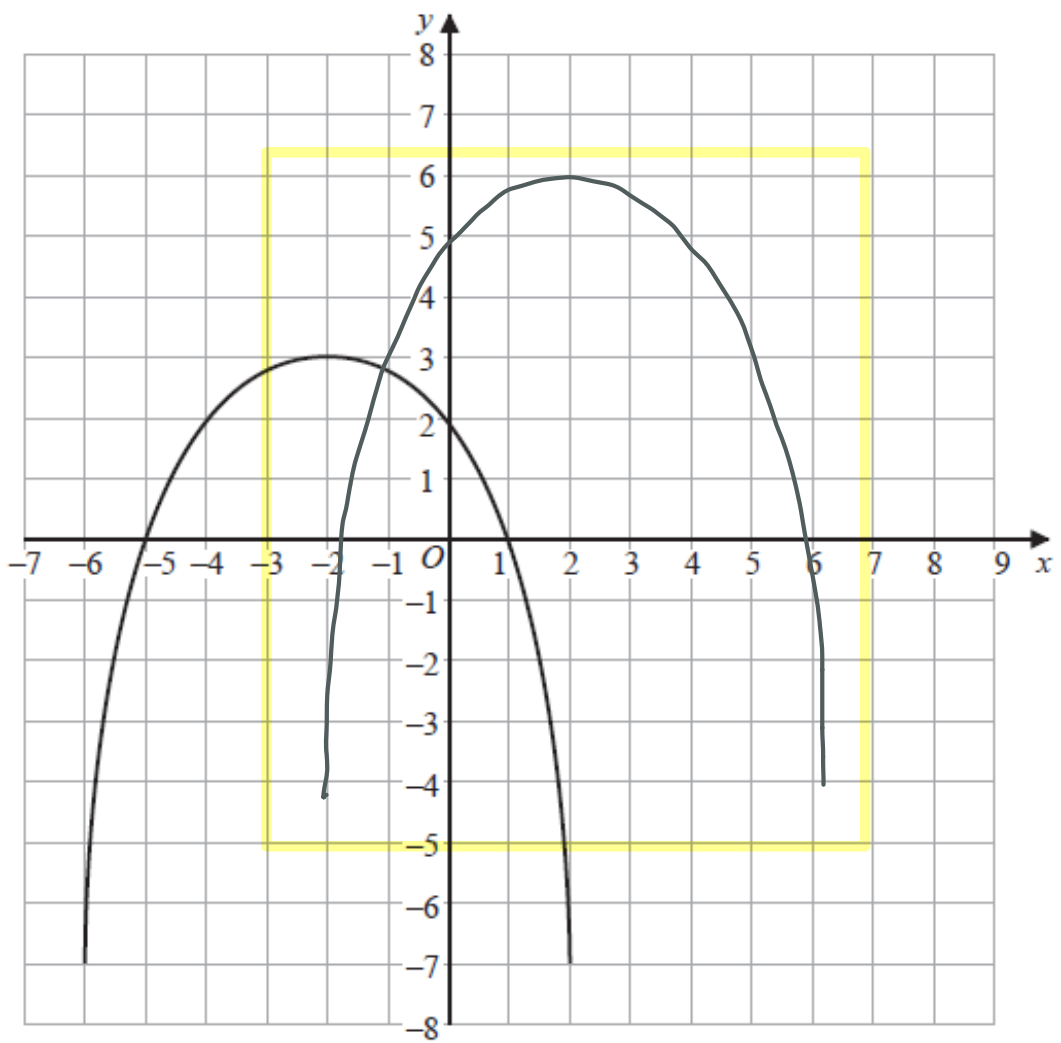
Final mark

m^2

(Total for Question 7 is 3 marks)

8 The graph of $y = f(x)$ is shown on the grid.

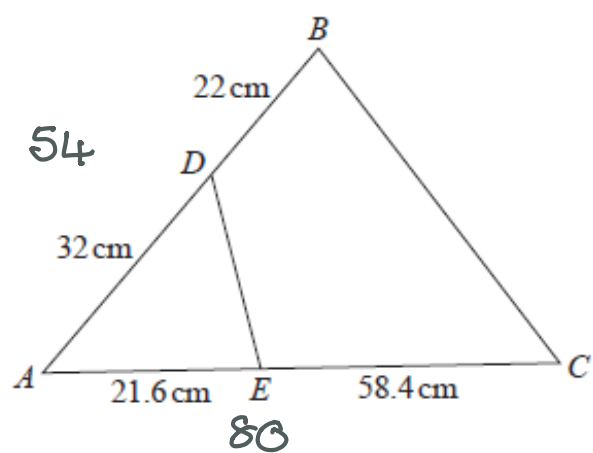
2 marks for correct sketch



On the grid, sketch the graph of $y = f(-x) + 3$

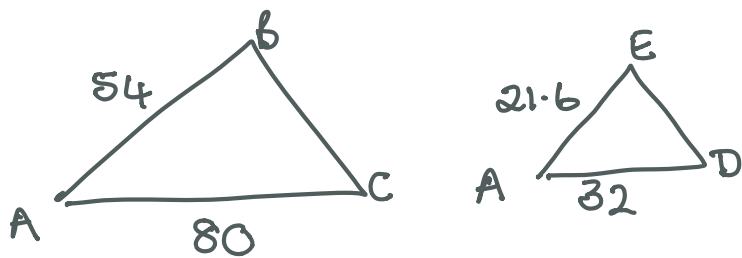
(Total for Question 8 is 2 marks)

9 The diagram shows triangle ABC and triangle AED .



Show that triangle ABC and triangle AED are similar.

Look at the order of the letters



$$80 \div 32 = 2.5$$

$$54 \div 21.6 = 2.5$$

1 mark

Both triangles share angle A and the sides have a common scale factor.

1 mark for correct conclusion and statement about sharing angle A

(Total for Question 9 is 2 marks)

10 There is a total of y counters in a box.
 There are x pink counters and 5 blue counters in the box.
 The rest of the counters are green.
 $x : y = 1 : 3$

1 mark

$$\frac{x}{y} = \frac{1}{3} \quad y = 3x$$

Freda takes at random two counters from the box.
 Find, in terms of x , an expression for the probability that Freda takes two counters of the same colour.

Give your answer as a fraction in the form $\frac{ax^2 + bx + c}{dx^2 + ex}$ where a, b, c, d and e are integers.

1 mark

Pink $\frac{x-1}{3x-1}$

$$PP = \frac{x}{3x} \times \frac{x-1}{3x-1}$$

1 mark

y $\swarrow$ Pink $\frac{x}{y} 3x$

$\searrow$ Blue $\frac{5}{y} 3x$

Blue $\frac{4}{3x-1}$

$$BB = \frac{5}{3x} \times \frac{4}{3x-1}$$

$\searrow$ Green $\frac{3x-x-5}{3x}$

Green $\frac{2x-6}{3x-1}$

$$GG = \frac{(2x-5)}{3x} \times \frac{2x-6}{3x-1}$$

$$P(\text{same}) = \frac{x^2 - x}{3x(3x-1)} + \frac{20}{3x(3x-1)} + \frac{(2x-5)(2x-6)}{3x(3x-1)}$$

1 mark

$$= \frac{x^2 - x + 20 + 4x^2 - 12x - 10x + 30}{9x^2 - 3x}$$

Final mark

$$= \frac{5x^2 - 23x + 50}{9x^2 - 3x}$$

$$\frac{5x^2 - 23x + 50}{9x^2 - 3x}$$

(Total for Question 10 is 5 marks)

11 Ebony makes some bracelets to sell.

The materials to make all the bracelets cost £190, correct to the nearest £5

Ebony sells all the bracelets for a total of £875, correct to the nearest £5

The total time taken to make and sell all these bracelets was 72 hours, correct to the nearest hour.

Ebony uses this method to calculate her hourly rate of pay

$$\text{Hourly rate of pay} = \frac{\text{total selling price} - \text{total cost of materials}}{\text{total time taken}}$$

The minimum hourly rate of pay for someone of Ebony’s age is £8.20

By considering bounds, determine if Ebony’s hourly rate of pay was definitely more than £8.20

You must show all your working.

materials

190 nearest £5

→ 192.50
→ 187.50

sells

875 nearest £5

→ 877.50
→ 872.50

time

72 hours nearest hour

→ 72.5
→ 71.5

1 mark for any one of these bounds

Looking for LB of hourly rate of pay .

1 mark

$$= \frac{872.50 - 192.50}{72.50}$$

1 mark

$$= 9.3751... \text{ so } £9.38$$

(Total for Question 11 is 4 marks)

Yes it is definitely more than £8.20 ,

Final mark

- 12 Given that the vector $a\begin{pmatrix} 2 \\ 6 \end{pmatrix} + b\begin{pmatrix} 8 \\ 2 \end{pmatrix}$ is parallel to the vector $\begin{pmatrix} 13 \\ 6 \end{pmatrix}$

find an expression for b in terms of a .

1 mark

$$\textcircled{1} \quad 6a + 2b = 6 \times 4$$

$$\textcircled{2} \quad 2a + 8b = 13$$

$$\textcircled{3} \quad 24a + 8b = 24$$

$$\textcircled{3} - \textcircled{2} \quad 22a = 11$$

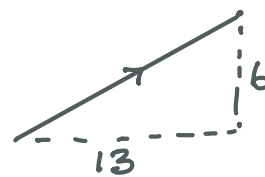
$$a = 0.5$$

1 mark

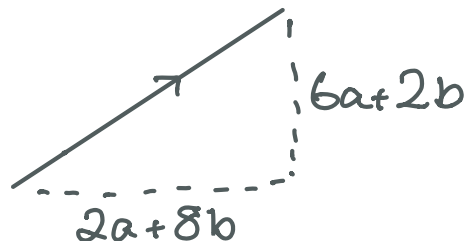
$$\text{sub in } \textcircled{2} \quad 1 + 8b = 13$$

$$8b = 12$$

$$b = \frac{3}{2} = 1.5$$



$$\text{gradient} = \frac{6}{13}$$



$$a = 0.5 \quad b = 1.5$$

$$\text{so } b = 3a$$

Final mark

$$b = 3a$$

(Total for Question 12 is 3 marks)

TOTAL FOR PAPER IS 37 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
		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	Factors of 126: 1, 2, 3, 6, 7, 9, 14, 18, 21, 42, 63, 126
		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. $560 \div 1.12 (= 500)$ or $20.16 \div 1.12 (= 18)$	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. $560 \times 3 (= 1680) + 20.16 \times 15 (= 302.4)$ or “500” $\times 3 (= 1500) + “18” \times 15 (= 270)$	
		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 $(3, -1), (4, -1), (4, -2), (3, -3)$	Award no marks if more than one transformation is given
		(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	
		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 (C1 for one statement eg from those above)	Ignore additional statements provided there is no contradiction
6	Yes (supported)	P1 P1 C1	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. $2 \div 8 \times 100 (= 25)$ for process to find percentage change in width, eg. $(\text{"2.5"} - \text{"2.4"}) \div \text{"2.5"} \times 100 (= 4)$ or $\frac{100 + \text{"20"}}{100} \div \frac{100 + \text{"25"}}{100} (= 0.96)$ or for process to find change in width if 5% decrease, eg. $\text{"2.5"} \times 0.05 (= 0.125)$ and $(\text{"2.5"} - \text{"2.4"}) (= 0.1)$ 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	Ignore anything drawn to the left of the first point May be a cumulative frequency curve or a cumulative frequency polygon If histograms drawn, plots must be identified Accept any equivalent fraction, decimal or percentage ft
	(b)	cf graph	M1 for 4 or 5 of their points plotted correctly from a cf table	
			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	
	(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	
11		120 000	M1 for a correct use of 1.015, eg. $123\,627 \div 1.015 (= 121\,800)$ or $123\,627 \div 1.015^2 (= 120\,000)$	
			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 $(x + 5)(x - 3)$ First product must be quadratic but need not be simplified or may be simplified incorrectly
			M1 for method of multiplying out remaining products, (half of which are correct) ft their first product	
			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 $MCB = \text{angle } NBC$ since base angles of an <u>isosceles triangle</u> 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 $0.8 \times 0.3 (= 0.24)$ or $0.2 \times 0.05 (= 0.01)$	Accept fractions in working
		P1	for “0.24” + “0.01” (= 0.25) or “0.24” $\times$ 20 (= 4.8) or “0.01” $\times$ 20 (= 0.2)	
		A1	cao	

Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
17	35	P1 P1 P1 A1	for $\tan c = \frac{2}{3x}$ or $\cos d = \frac{3}{4x}$ 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 $x = 17 \div 18 (= 0.944\dots)$ (dep P2) for using their value of x to find c, eg. $c = \tan^{-1} \left(\frac{12}{17} \right)$ oe for angle between 35 and 36	
18	3, -2	M1 M1 A1	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; $a + b = 1$, $4a + 2b = 8$, $9a + 3b = 21$, $16a + 4b = 40$, $25a + 5b = 65$ Substituting $a = "3"$ into one of the above equations, eg. $a + b = 1$ cao	

Paper: 1MA1/2H				
Question	Answer	Mark	Mark scheme	Additional guidance
19	4.7 (supported)	M1 M1 A1 C1	for one correct bound from, 119.5, 120.5, 25.55, 25.65 for a correct method to find one bound of T , eg $[\text{UB of } T] = [\text{UB of } m] \div [\text{LB of } f]$ or $[\text{LB of } T] = [\text{UB of } m] \div [\text{UB of } f]$ for 4.716.. and 4.658.. from correct working 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	for m accept 120.49 or 120.499... for f accept 25.649 or 25.499... $120 < [\text{UB of } m] \leq 120.5$ $119.5 \leq [\text{LB of } m] < 120$ $25.6 < [\text{UB of } f] \leq 25.65$ $25.55 \leq [\text{LB of } f] < 25.6$ Accept bounds rounded or truncated to at least 4 sf
20	10.7	P1 P1 P1 P1 A1	for the start of a process to find the radius, eg. $\sin 25 = \frac{6}{OC}$ for a complete process to find the radius, eg. $6 \div \sin 25 (= 14.197..)$ for process to find area of triangle OAC , eg. $0.5 \times "14.197.."^2 \times \sin 50$ or $6 \times 6 \div \tan 25 (= 77.20..)$ for process to find area of sector $OABC$, eg. $\frac{50}{360} \times \pi \times ("14.197..")^2 (= 87.947..)$ for answer in the range 10.6 to 10.9	For process marks accept figures rounded or truncated to one decimal place.

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

WEEK 1 TASKS

(Higher 7+)

Remember to mark your work when completed. This is a crucial part of revision in maths. Make a note of any topics that you need additional support with and ask for help.

You may find it useful to revisit the same questions a week later and check that you can then answer questions that you were previously unsure about or could not answer.

Remember: you can do this!



WEEK 1 TASK 1

Estimated completion time = 25 minutes.

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 There are only blue cubes, red cubes and yellow cubes in a box.

The table shows the probability of taking at random a blue cube from the box.

Colour	blue	red	yellow
Probability	0.2		

The number of red cubes in the box is the same as the number of yellow cubes in the box.

(a) Complete the table.

(2)

There are 12 blue cubes in the box.

(b) Work out the total number of cubes in the box.

(2)

(Total for Question 1 is 4 marks)

2 Deon needs 50 g of sugar to make 15 biscuits.

She also needs
three times as much flour as sugar
two times as much butter as sugar

Deon is going to make 60 biscuits.

(a) Work out the amount of flour she needs.

..... g
(3)

Deon has to buy all the butter she needs to make 60 biscuits.
She buys the butter in 250 g packs.

(b) How many packs of butter does Deon need to buy?

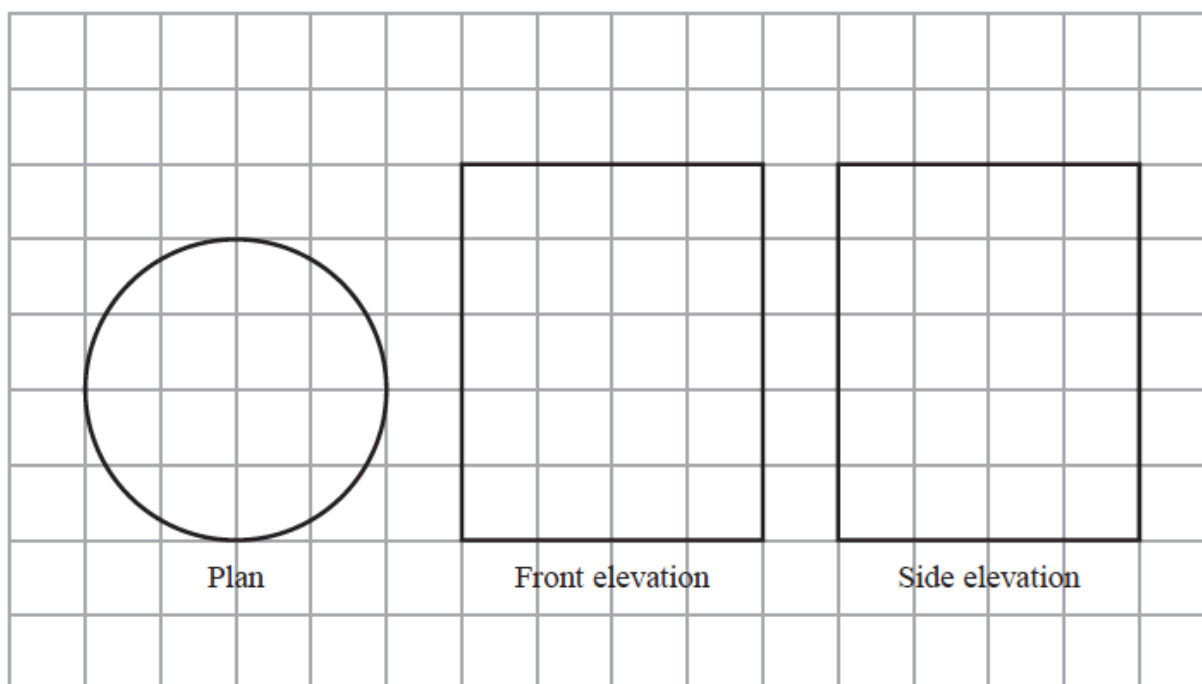
.....
(2)

(Total for Question 2 is 5 marks)

3 Find the highest common factor (HCF) of 72 and 90

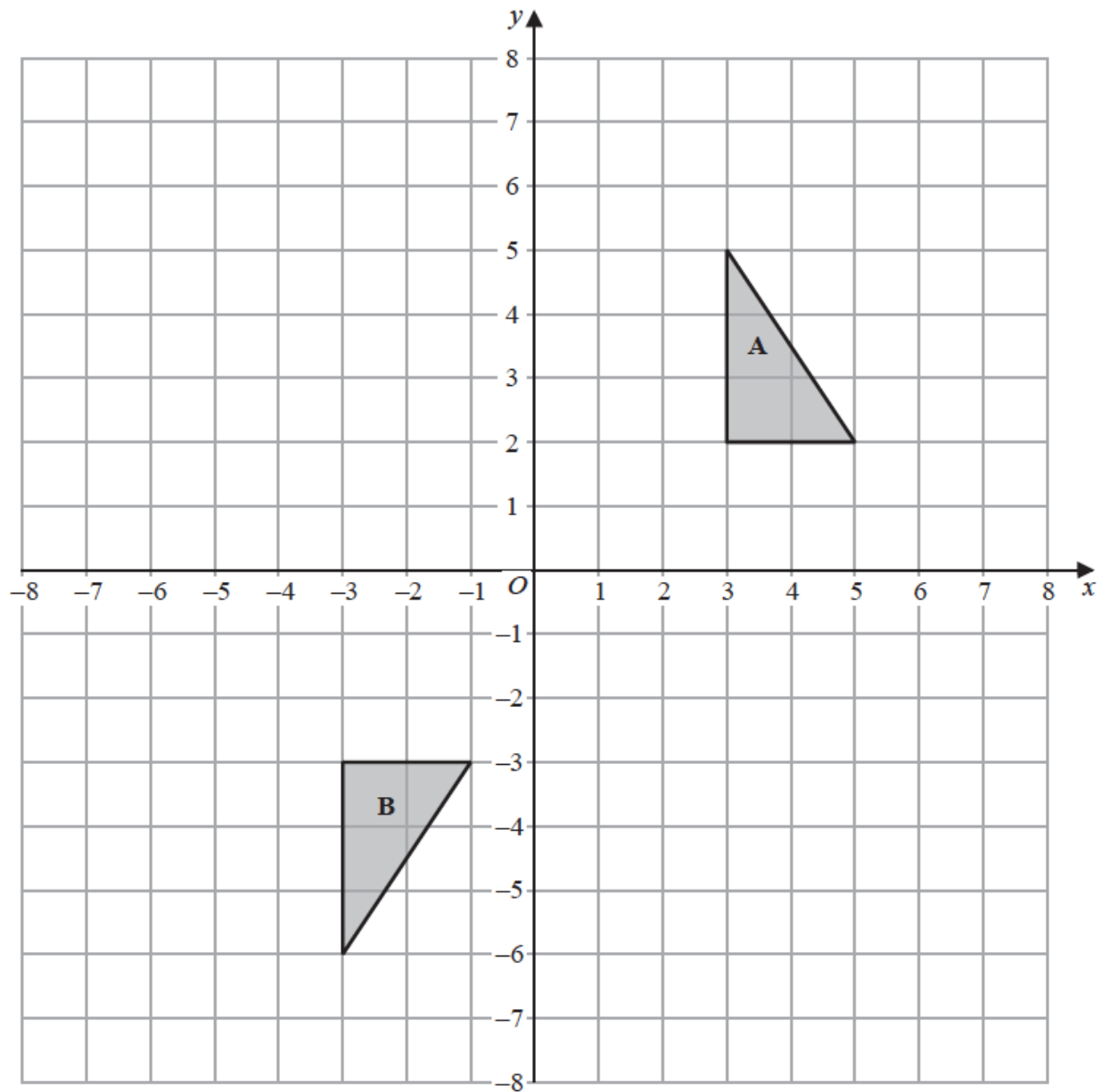
.....
(Total for Question 3 is 2 marks)

- 4 The diagram shows the plan, front elevation and side elevation of a solid shape, drawn on a centimetre grid.



In the space below, draw a sketch of the solid shape.
Give the dimensions of the solid on your sketch.

(Total for Question 4 is 2 marks)



Shape **A** can be transformed to shape **B** by a reflection in the x -axis followed by a translation $\begin{pmatrix} c \\ d \end{pmatrix}$

Find the value of c and the value of d .

$c = \dots\dots\dots$

$d = \dots\dots\dots$

(Total for Question 5 is 3 marks)

- 6 A shop sells packs of black pens, packs of red pens and packs of green pens.

There are

2 pens in each pack of black pens

5 pens in each pack of red pens

6 pens in each pack of green pens

On Monday,

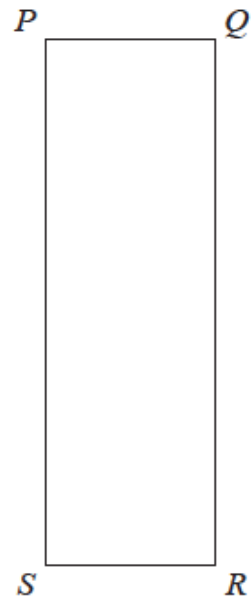
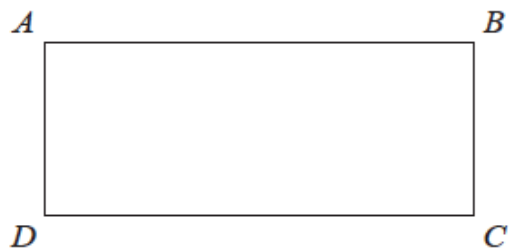
$$\begin{array}{ccc} \text{number of packs} & & \text{number of packs} \\ \text{of black pens sold} & : & \text{of red pens sold} \end{array} : \begin{array}{c} \text{number of packs} \\ \text{of green pens sold} \end{array} = 7 : 3 : 4$$

A total of 212 pens were sold.

Work out the number of green pens sold.

.....
(Total for Question 6 is 4 marks)

7 Here are two rectangles.



$QR = 10\text{ cm}$
 $BC = PQ$
The perimeter of $ABCD$ is 26 cm
The area of $PQRS$ is 45 cm^2
Find the length of AB .

..... cm

(Total for Question 7 is 4 marks)



WEEK 1 TASK 2

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** Write down the value of 5^{-2}

.....
(Total for Question 1 is 1 mark)

***2** The mean length of 5 sticks is 4.2 cm.
Nawal measured the length of one of the sticks as 7 cm.
(a) Work out the mean length of the other 4 sticks.

..... cm
(3)

Nawal made a mistake.
The stick was not 7 cm long.
It was 17 cm long.
(b) How does this affect your answer to part (a)?

.....
.....
.....
(1)
(Total for Question 2 is 4 marks)

- 3 Work out the value of $27^{\frac{2}{3}} + \left(\frac{1}{2}\right)^{-3}$

.....
(Total for Question 3 is 3 marks)

- *4 Mano has three shelves of books.
There are x books on shelf **A**.
There are $(3x + 1)$ books on shelf **B**.
There are $(2x - 5)$ books on shelf **C**.
There is a total of 44 books on the three shelves.
All the books have the same mass.
The books on shelf **B** have a total mass of 7500 g.
Work out the total mass of the books on shelf **A**.

..... g
(Total for Question 4 is 5 marks)

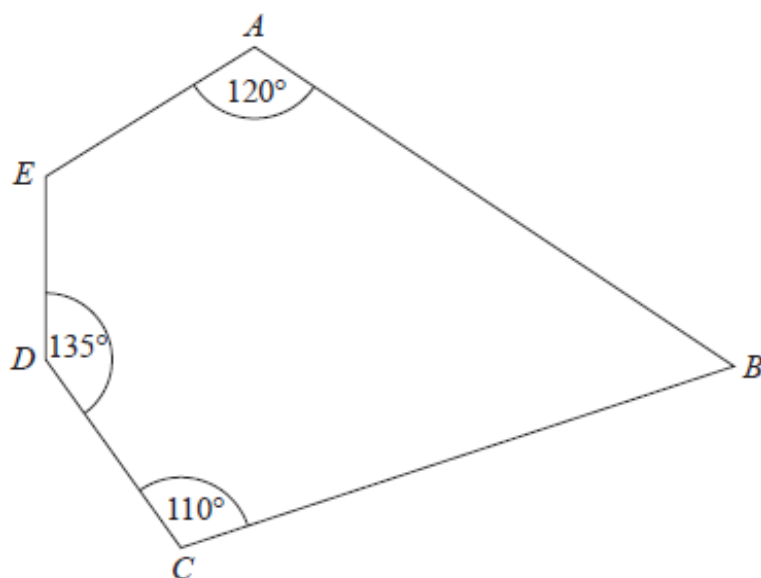
- *5** A cube has a total surface area of 150 cm^2
Work out the volume of the cube.

..... cm^3
(Total for Question 5 is 4 marks)

- 6** y is directly proportional to x .
 $y = 24$ when $x = 1.5$
Work out the value of y when $x = 5$

$y =$
(Total for Question 6 is 3 marks)

7 Here is a pentagon.



$$\text{Angle } AED = 4 \times \text{angle } ABC$$

Work out the size of angle AED .
You must show all your working.

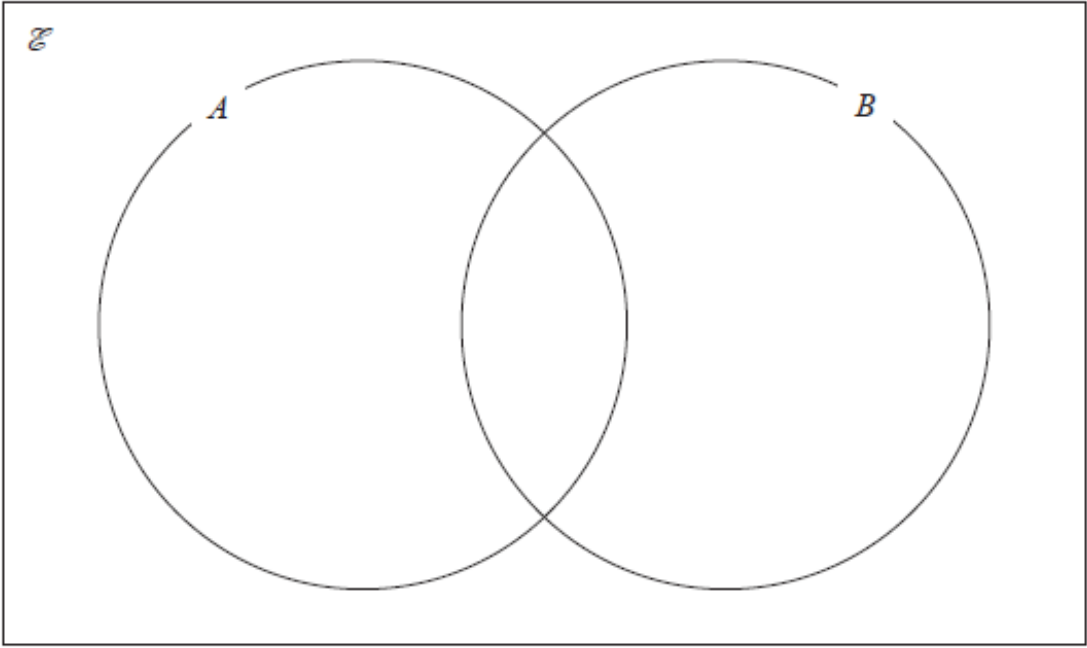
.....°
(Total for Question 7 is 4 marks)

***8** $\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$

$A = \{\text{odd numbers}\}$

$B = \{\text{square numbers}\}$

(a) Complete the Venn diagram for this information.



(3)

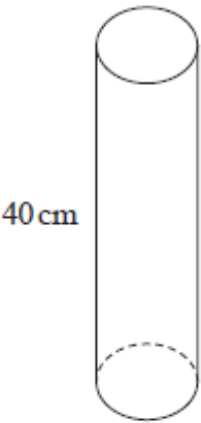
A number is chosen at random from the universal set $\mathcal{E}$

(b) Find the probability that this number is in the set B'

.....
(2)

(Total for Question 8 is 5 marks)

***9** The diagram shows a solid cylinder on a horizontal floor.



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

The cylinder has a
volume of 1200 cm³
height of 40 cm.

The cylinder exerts a force of 90 newtons on the floor.
Work out the pressure on the floor due to the cylinder.

..... newtons/cm²
(Total for Question 9 is 3 marks)



WEEK 1 TASK 3

Estimated completion time = 25 minutes.

Answer ALL questions.

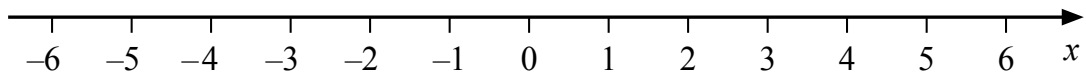
Write your answers in the spaces provided.

You must write down all the stages in your working.

1 (a) Solve $14n > 11n + 6$

.....
(2)

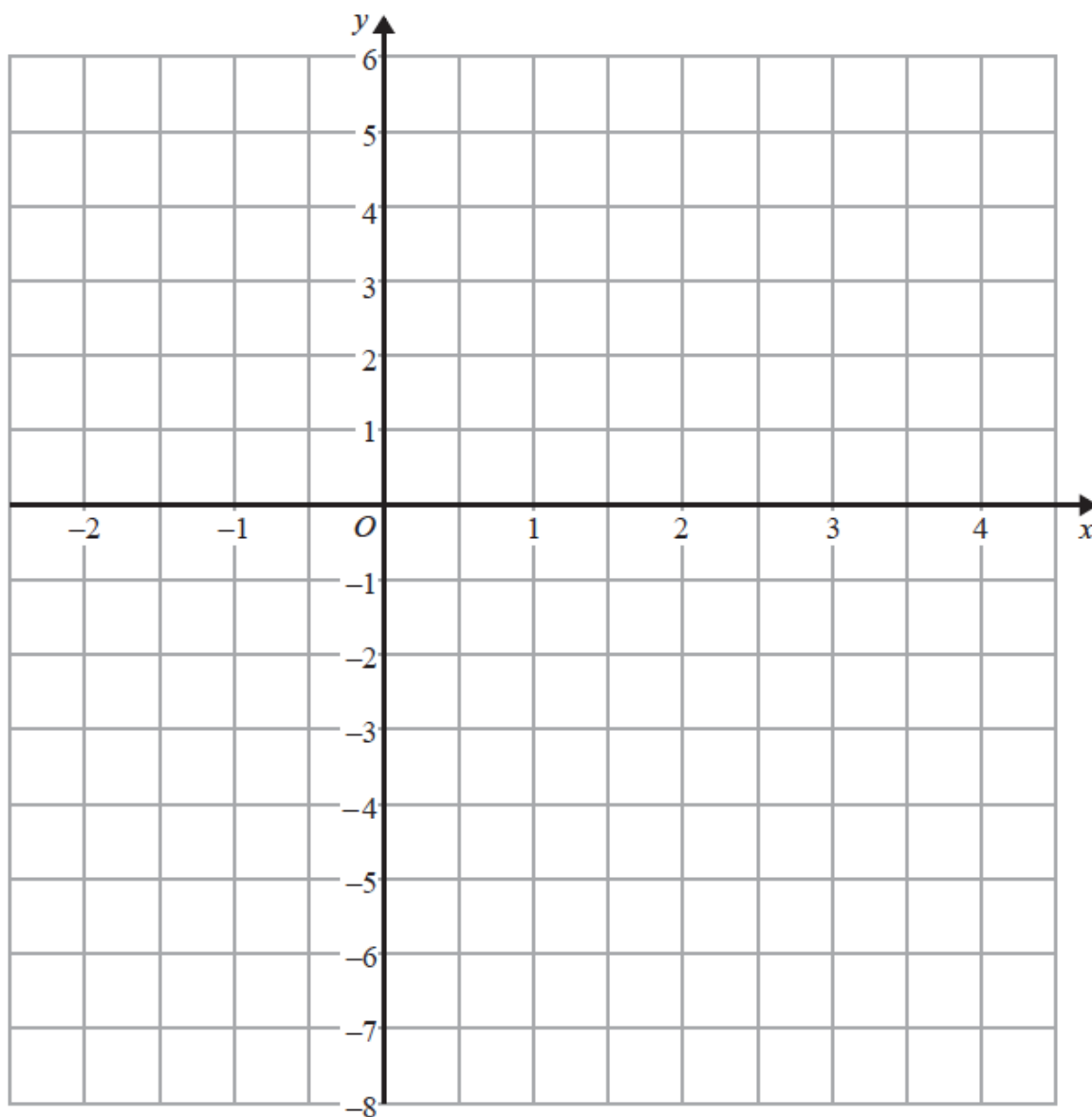
(b) On the number line below, show the set of values of x for which $-2 < x + 3 \leq 4$



(3)

(Total for Question 1 is 5 marks)

- 2 On the grid below, draw the graph of $y = 2x - 3$ for values of x from -2 to 4



(Total for Question 2 is 3 marks)

3 Hannah is planning a day trip for 195 students.

She asks a sample of 30 students where they want to go.
Each student chooses one place.

The table shows information about her results.

Place	Number of students
Theme Park	10
Theatre	5
Sports Centre	8
Seaside	7

(i) Work out how many of the 195 students you think will want to go to the Theme Park.

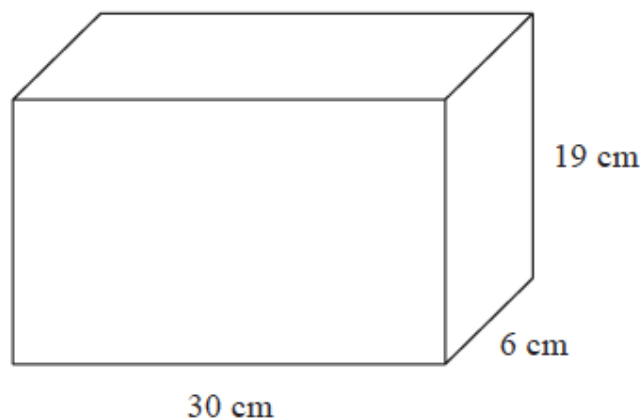
.....
(2)

(ii) State any assumption you made **and** explain how this may affect your answer.

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

(Total for Question 3 is 3 marks)

- 4 A container is in the shape of a cuboid.



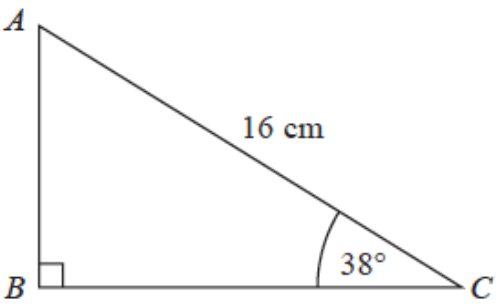
The container is $\frac{2}{3}$ full of water.

A cup holds 275 ml of water.

What is the greatest number of cups that can be completely filled with water from the container?

.....
(Total for Question 4 is 4 marks)

5 ABC is a right-angled triangle.



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

.....cm
(Total for Question 5 is 2 marks)

6 Sally used her calculator to work out the value of a number y .
The answer on her calculator display began
8.3
Complete the error interval for y .

..... $\leq y <$
(Total for Question 6 is 2 marks)

7 £360 is shared between Abby, Ben, Chloe and Denesh.

The ratio of the amount Abby gets to the amount Ben gets is 2 : 7

Chloe and Denesh each get 1.5 times the amount Abby gets.

Work out the amount of money that Ben gets.

£.....

(Total for Question 7 is 4 marks)

27/8 (a) Write 0.00562 in standard form.

.....
(1)

(b) Write 1.452×10^3 as an ordinary number.

.....
(1)

(Total for Question 8 is 2 marks)

TOTAL FOR PAPER IS 25 MARKS



WEEK 1 TASK 4

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 Shakir has to complete two tests.

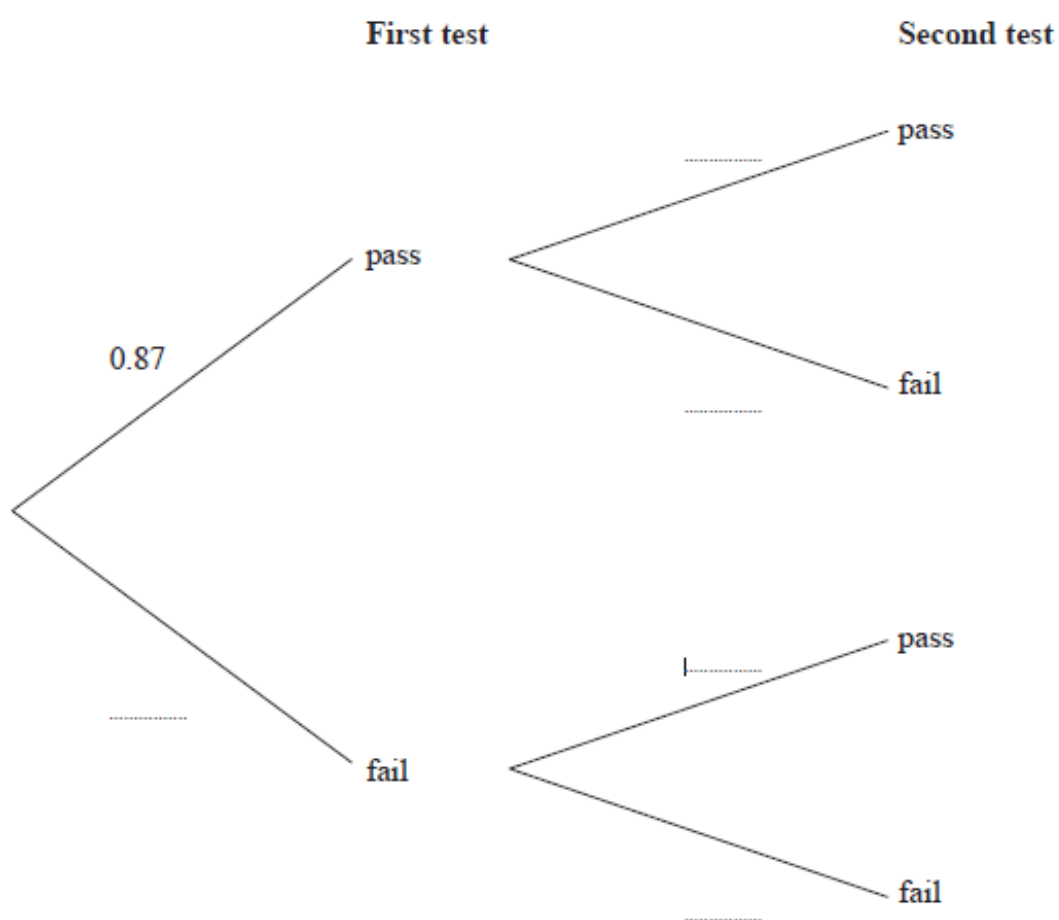
He can either pass or fail each test.

The probability that he will pass the first test is 0.87

If he passes the first test the probability he will pass the second test is 0.94

If he fails the first test the probability he will pass the second test is 0.73

(a) Complete the probability tree diagram for this information.



(2)

(b) Work out the probability that Shakir passes at least one of the tests.

(3)

(Total for Question 1 is 5 marks)

- *2** A number, d , is rounded to 1 decimal place.
The result is 12.7

Complete the error interval for d .

$$\dots\dots\dots \leq d < \dots\dots\dots$$

(Total for Question 2 is 2 marks)

- 3** A number x is written correct to 2 significant figures.
The result is 1.9
Complete the error interval for x .

$$\dots\dots\dots \leq x < \dots\dots\dots$$

(Total for Question 3 is 2 marks)

- 4** Expand and simplify $(x + 7)(x - 2)(x + 3)$

$$\dots\dots\dots$$

(Total for Question 4 is 3 marks)

5 Use algebra to solve the simultaneous equations

$$\begin{aligned}2x + 6y &= 5 \\ 3x - 4y &= -12\end{aligned}$$

$x =$

$y =$

(Total for Question 5 is 4 marks)

*6 $-2 \leq n < 5$
 n is an integer.

(a) Write down the greatest possible value of n .

.....
(1)

(b) Solve $\frac{2}{5}g - 4 < 6$

.....
(3)

(Total for Question 6 is 4 marks)

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

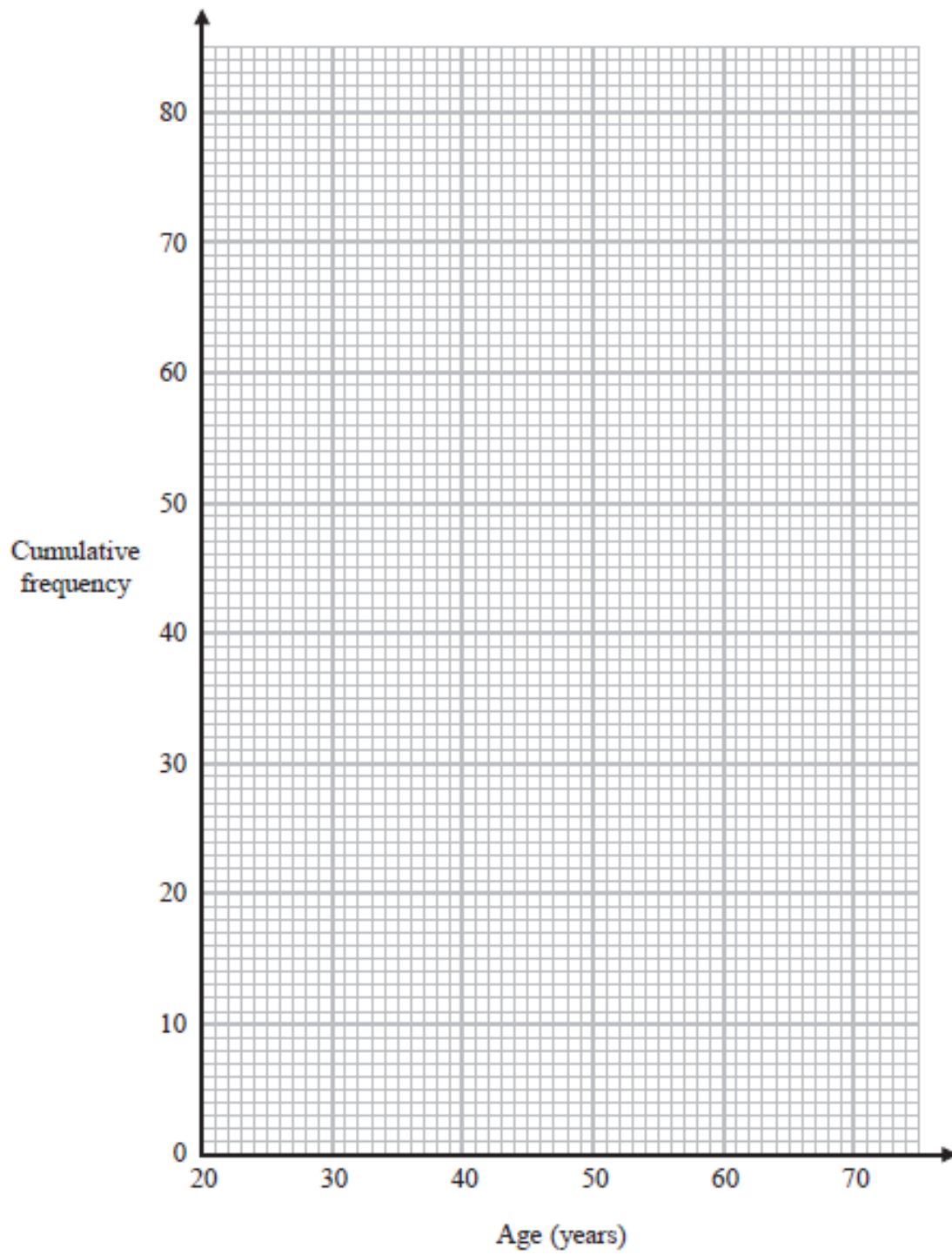
(Total for Question 7 is 1 mark)

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

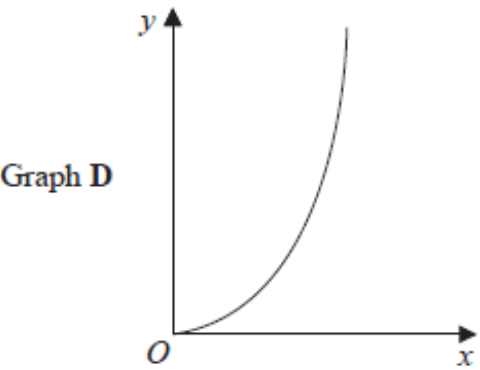
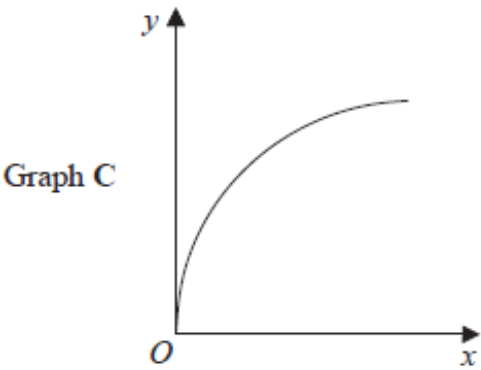
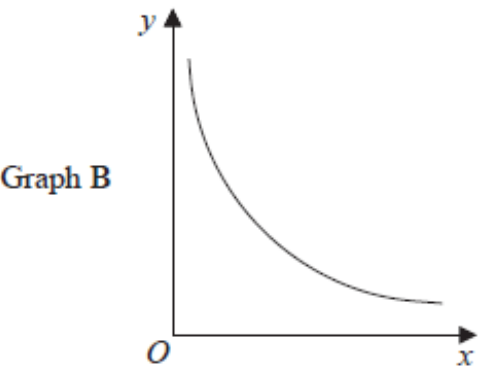
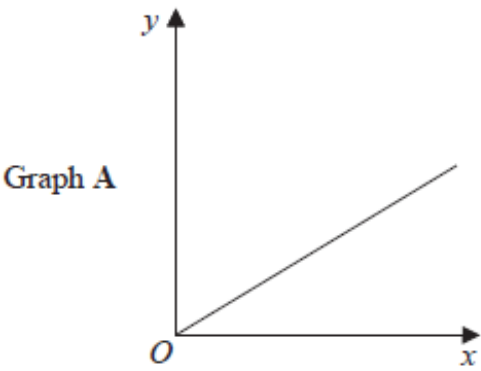
Age (a years)	Cumulative frequency
$20 < a \leq 30$	20
$20 < a \leq 40$	48
$20 < a \leq 50$	64
$20 < a \leq 60$	75
$20 < a \leq 70$	80

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

(2)



(Total for Question 8 is 2 marks)



The graphs of y against x represent four different types of proportionality.
Match each type of proportionality in the table to the correct graph.

Type of proportionality	Graph
$y \propto x^2$	
$y \propto x$	
$y \propto \frac{1}{x}$	
$y \propto \sqrt{x}$	

(Total for Question 9 is 2 marks)

10 The functions f and g are such that

$$f(x) = (2x + 3)^2 \quad \text{and} \quad g(x) = 2x - 1$$

Find $gf(-3)$

.....
(Total for Question 10 is 2 marks)

***11** Chris, Debbie and Errol share some money in the ratio 3 : 4 : 2

Debbie gets £120

Chris then gives some of his share to Debbie and some of his share to Errol.

The money that Chris, Debbie and Errol each have is now in the ratio 2 : 5 : 3

How much money did Chris give to Errol?

£.....
(Total for Question 11 is 4 marks)

TOTAL FOR PAPER IS 31 MARKS



WEEK 1 TASK 5

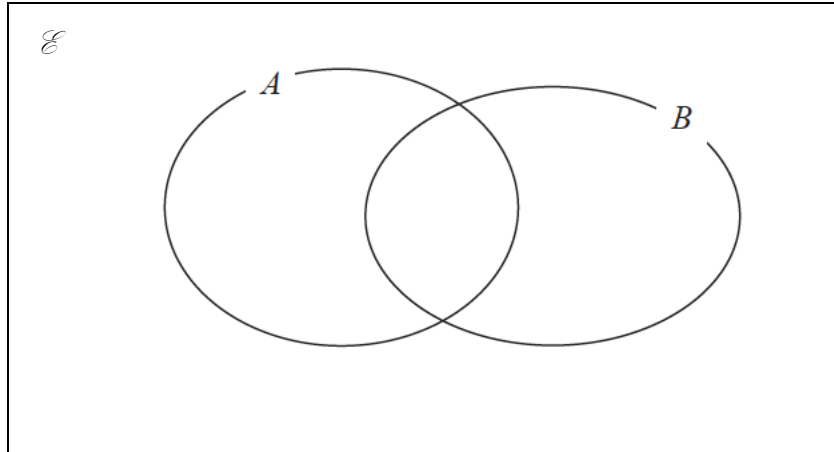
Estimated completion time = 25 minutes.

Answer ALL questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1** $\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9\}$
 $A = \{1, 5, 6, 8, 9\}$
 $B = \{2, 6, 9\}$



(a) Complete the Venn diagram to represent this information.

(3)

A number is chosen at random from the universal set $\mathcal{E}$.

(b) Find the probability that the number is in the set $A \cap B$

.....
(2)

(Total for Question 1 is 5 marks)

- 2** Katy invests £200 000 in a savings account for 4 years.
The account pays compound interest at a rate of 1.5 % per annum.
Calculate the total amount of interest Katy will get at the end of 4 years.

£.....

(Total for Question 2 is 3 marks)

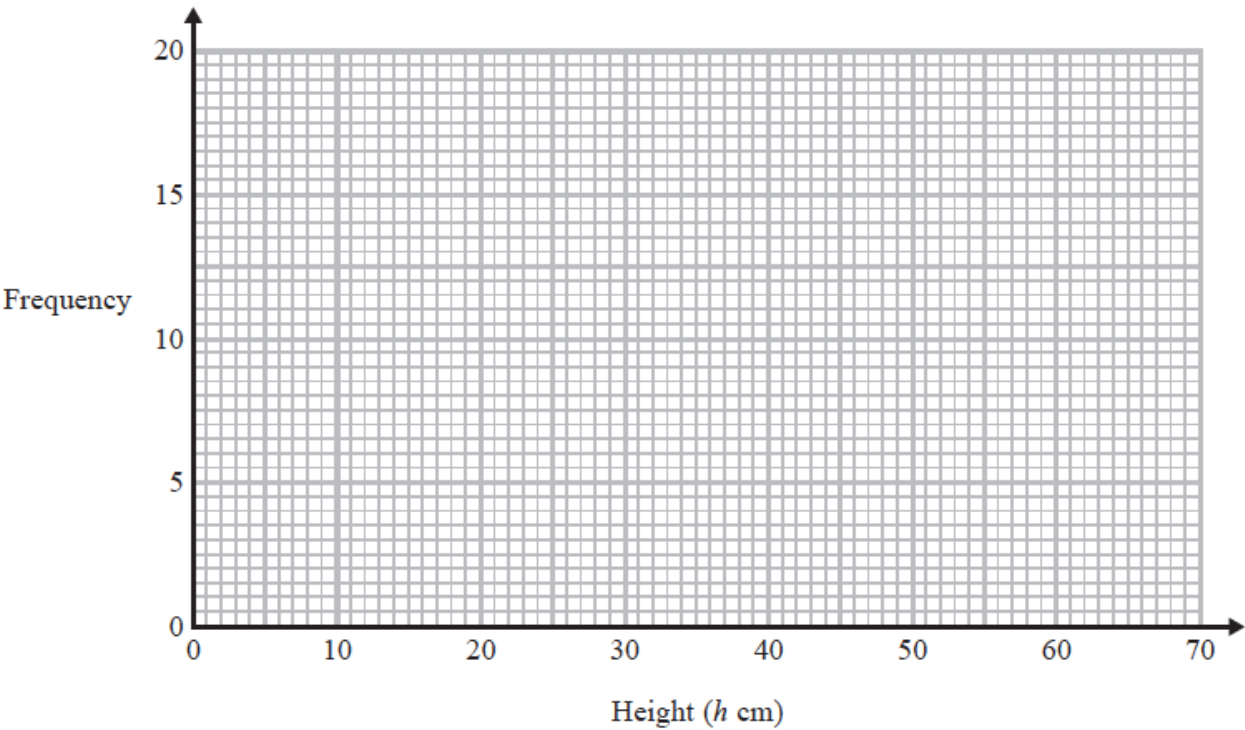
3 The table shows information about the heights of 80 plants.

Height (h cm)	Frequency
$10 < h \leq 20$	7
$20 < h \leq 30$	13
$30 < h \leq 40$	14
$40 < h \leq 50$	12
$50 < h \leq 60$	16
$60 < h \leq 70$	18

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

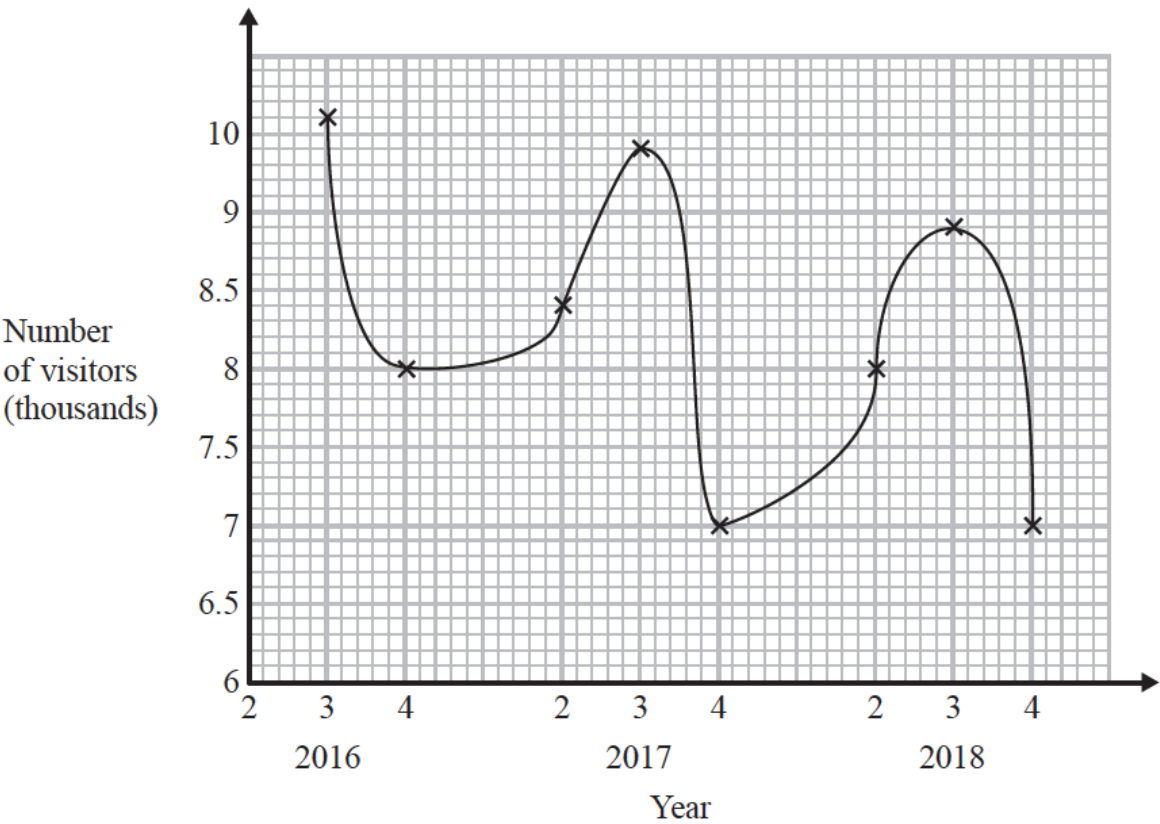
.....
(1)

(b) On the grid, draw a frequency polygon for the information in the table.



(2)
(Total for Question 3 is 3 marks)

4 Sean has drawn a time series graph to show the numbers, in thousands, of visitors to a fun park.

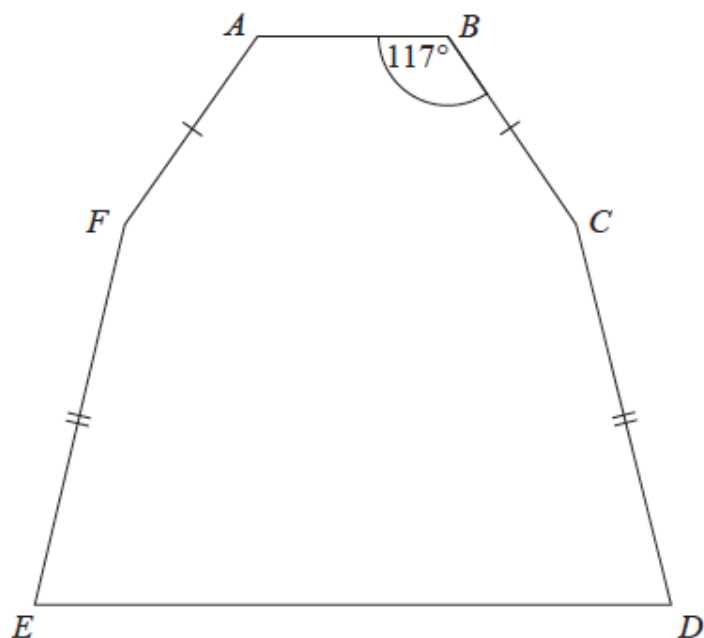


Write down two things that are wrong or could be misleading with this graph.

- 1
-
-
- 2
-
-

(Total for Question 4 is 2 marks)

- 5 The diagram shows a hexagon.
The hexagon has one line of symmetry.



$$FA = BC$$

$$EF = CD$$

$$\text{Angle } ABC = 117^\circ$$

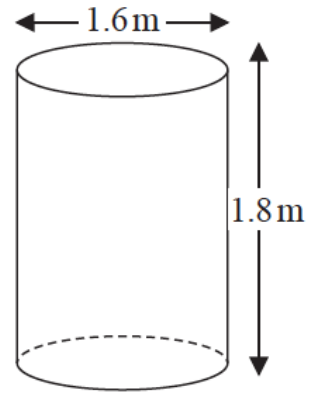
$$\text{Angle } BCD = 2 \times \text{angle } CDE$$

Work out the size of angle AFE .

You must show all your working.

.....°
(Total for Question 5 is 4 marks)

- 6 Jeremy has to cover 3 tanks completely with paint.
- Each tank is in the shape of a cylinder with a top and a bottom.
The tank has a diameter of 1.6 m and a height of 1.8 m.
- Jeremy has 7 tins of paint.
Each tin of paint covers 5 m^2
- Has Jeremy got enough paint to cover completely the 3 tanks?
You must show how you get your answer.



(Total for Question 6 is 5 marks)

TOTAL FOR PAPER IS 22 MARKS



WEEK 1

MARKSCHEMES

(Higher 7+)

WEEK 1 TASK 1

Question 1 (Total 4 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
(a)	$1 - 0.2 = 0.8$	P1	This mark is given for a method to solve the inequality
	0.4, 0.4	A1	This is mark is given for two correct answers (equivalent fractions acceptable)
(b)	$12 \div 0.2$	P1	This mark is given for a process to find the number of blue cubes in the box
	60	A1	This mark is given for the correct answer only

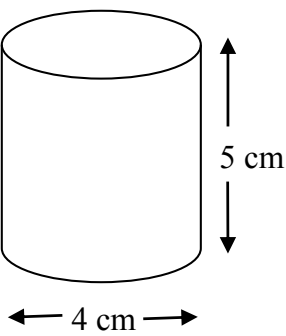
Question 2 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	For 15 biscuits: Flour needed = $3 \times 50 \text{ g} = 150 \text{ g}$	P1	This mark is given for a process to find the amount of flour needed for 15 biscuits
	For 60 biscuits: $\frac{60}{15} \times 150$	P1	This mark is given for a process to find the amount of flour needed for 60 biscuits
	600	A1	This mark is given for the correct answer only
(b)	For 15 biscuits: Butter needed = $2 \times 50 \text{ g} = 100 \text{ g}$ For 60 biscuits: $\frac{60}{15} \times 100 = 400$	P1	This mark is given for a process to find the amount of butter needed for 60 biscuits
	$\frac{400}{250} = 1.6$, so 2 packets needed	A1	This mark is given for the correct answer only

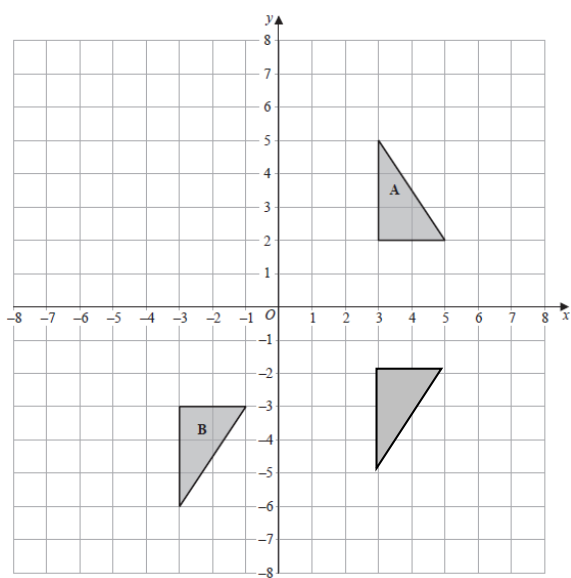
Question 3 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Prime factors of 72 are 2, 2, 2, 3, 3 Prime factors of 90 are 2, 3, 3, 5	M1	This mark is given for a method to find the prime factors of both 72 and 90
	$HCF = 2 \times 3 \times 3$ $= 18$	A1	This mark is given for the correct answer only

Question 4 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
		M1	This mark is given for sketch of a cylinder
		P1	This mark is given for sketch of a cylinder with dimensions shown

Question 5 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
		M1	This mark is given for a correct reflection of A shown on the diagram
	$c = -6$ $d = -1$	A1	This mark is given for a correct value for either c or d
		A1	This mark is given for a correct value for both c and d

Question 6 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$2 \times 7 : 5 \times 3 : 6 \times 4$ $14 : 15 : 24$	P1	This mark is given for a process to find the ratio of the number of pens of each colour sold
	$212 \div (14 + 15 + 24)$	P1	This mark is given for a process to find the proportion of green pens sold
	$\frac{212}{53} \times 24$	P1	This mark is given for a process to find the number of green pens sold
	96	A1	This mark is given for the correct answer only

Question 7 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$PQ = 45 \div 10 = 4.5$ $BC = 4.5$	P1	This mark is given for a process to use the area of $PQRS$ to find the lengths of PQ and BC
	$26 - (2 \times 4.5)$	P1	This mark is given for a process to use the perimeter of $ABCD$ to find the length AB
	$AB = 17 \div 2$	P1	This mark is given for a process to find the length AB
	8.5	A1	This mark is given for the correct answer only

WEEK 1 TASK 2

Answer all questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- *1 Write down the value of 5^{-2}

$$\frac{1}{5^2}$$

1 mark

$$\frac{1}{25}$$

or 0.04

(Total for Question 1 is 1 mark)

- *2 The mean length of 5 sticks is 4.2 cm.
Nawal measured the length of one of the sticks as 7 cm.
(a) Work out the mean length of the other 4 sticks.

$$\begin{array}{ccccccc} _ & _ & _ & _ & _ & = & 4.2 \text{ mean} \\ & & & & & \text{so total} = & 4.2 \times 5 = 21 \text{ cm} \end{array}$$

1 mark

$$\begin{array}{l} 21 - 7 = 14 \text{ cm} \\ 14 \div 4 = 3.5 \end{array}$$

1 mark

3.5

Final mark

cm
(3)

Nawal made a mistake.
The stick was not 7 cm long.
It was 17 cm long.

- (b) How does this affect your answer to part (a)?

1 mark

my answer would be smaller than 3.5; it would
(21 - 17 = 4 cm 4 ÷ 4 = 1) be 1 cm

(1)

(Total for Question 2 is 4 marks)

3 Work out the value of $27^{\frac{2}{3}} + \left(\frac{1}{2}\right)^{-3}$

$27^{2/3} = (\sqrt[3]{27})^2$
 $= 3^2 = 9$

$\left(\frac{1}{2}\right)^{-3} = \left(\frac{2}{1}\right)^3$
 $= \frac{2^3}{1^3} = 8$

1 mark for either of these

so $9 + 8$ 1 mark

17 Final mark

(Total for Question 3 is 3 marks)

*4 Mano has three shelves of books.
 There are x books on shelf **A**.
 There are $(3x + 1)$ books on shelf **B**.
 There are $(2x - 5)$ books on shelf **C**.
 There is a total of 44 books on the three shelves.
 All the books have the same mass.
 The books on shelf **B** have a total mass of 7500 g.
 Work out the total mass of the books on shelf **A**.

A

B

C

$x + 3x + 1 + 2x - 5 = 44$ 1 mark

$6x - 4 = 44$
 $6x = 48$ so $x = 8$

1 mark for either of these

A

B

C

8

$3 \times 8 + 1 = 25$

$2 \times 8 - 5 = 11$

$7500 \div 25 = 300$ 1 mark

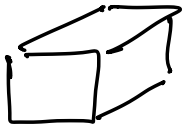
so shelf A = 8×300

1 mark

2400 Final mark g

(Total for Question 4 is 5 marks)

- *5 A cube has a total surface area of 150 cm^2
Work out the volume of the cube.



6 faces = 150 cm^2
so 1 face = 25 cm^2

$$150 \div 6 = 25$$

1 mark

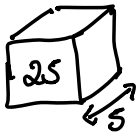


so side length

$$= \sqrt{25}$$

$$= 5$$

1 mark



Volume : $5 \times 5 \times 5 = 125$

1 mark

Final mark

125

cm^3

(Total for Question 5 is 4 marks)

- 6 y is directly proportional to x .
 $y = 24$ when $x = 1.5$
Work out the value of y when $x = 5$

$$y \propto x$$

1 mark

$$y = kx$$

$$24 = k \times 1.5$$

$$k = \frac{24}{1.5} = 16$$

so

$$y = 16x$$

$$y = 16 \times 5$$

$$= 80$$

1 mark

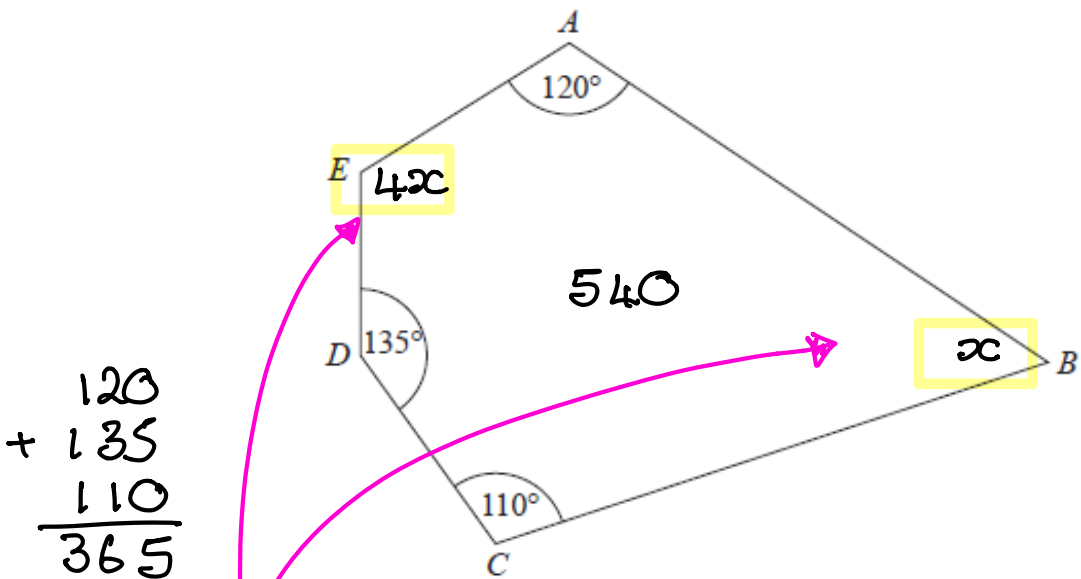
Final mark

80

$y =$

(Total for Question 6 is 3 marks)

7 Here is a pentagon.



$$\begin{array}{r} 120 \\ + 135 \\ + 110 \\ \hline 365 \end{array}$$

Angle AED = $4 \times$ angle ABC

Work out the size of angle AED.
You must show all your working.

1 mark for using
the ratio 1:4

$$\begin{array}{l} 3 \text{ sides} = 180 \\ 4 \text{ sides} = 360 \\ 5 \text{ sides} = \underline{540} \end{array}$$

1 mark

$$\begin{aligned} 5x + 365 &= 540 && \text{1 mark} \\ 5x &= 540 - 365 \\ &= 175 \end{aligned}$$

$$x = \frac{175}{5}$$

$$= 35 \quad \text{1 mark}$$

$$\begin{array}{r} 4 \overline{) 540} \\ - 365 \\ \hline 175 \end{array}$$

$$\begin{array}{r} 035 \\ 5 \overline{) 175} \end{array}$$

$$\begin{aligned} AED &= 4x = 4 \times 35 \\ &= 140 \end{aligned}$$

Final mark 140 .

(Total for Question 7 is 4 marks)

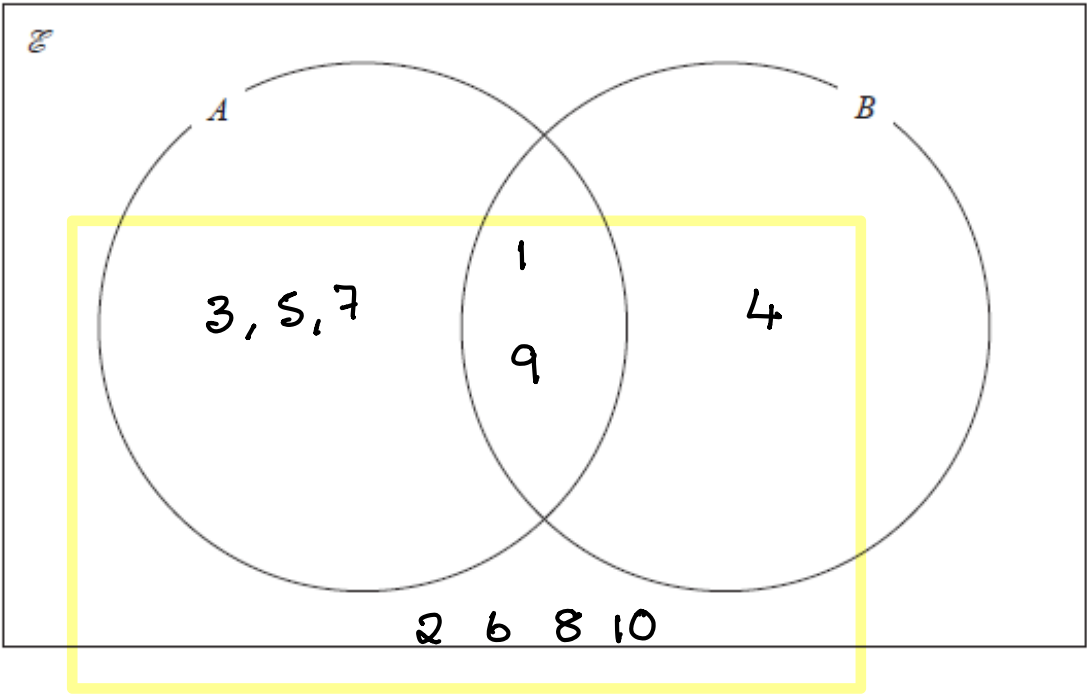
1 mark for one correct region

2 marks for two or three correct regions

3 marks for all correct

- *8

$\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
 $A = \{\text{odd numbers}\}$
 $B = \{\text{square numbers}\}$
(a) Complete the Venn diagram for this information.



(3)

- A number is chosen at random from the universal set $\mathcal{E}$
- (b) Find the probability that this number is in the set B' NOT B'

2 marks

$$\frac{7}{10}$$

(2)

(Total for Question 8 is 5 marks)

1 mark can be given for

$\frac{a}{10}$

'a' must be between 0 and 10 or

$\frac{7}{b}$

'b' must be greater than 7
or

7:10

*9 The diagram shows a solid cylinder on a horizontal floor.

$$\text{Volume} = \text{area} \times \text{height}$$

so

$$1200 = \text{area} \times 40$$

$$\text{area} = \frac{1200}{40} = 30 \text{ cm}^2$$

The cylinder has a

volume of 1200 cm^3 1 mark

height of 40 cm.

The cylinder exerts a force of 90 newtons on the floor.

Work out the pressure on the floor due to the cylinder.

$$\text{Pressure} = ? = p$$

$$\text{force} = 90 \text{ N}$$

$$\text{Area} = 30 \text{ cm}^2$$

$$p = \frac{90}{30}$$

1 mark

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

3

Final mark

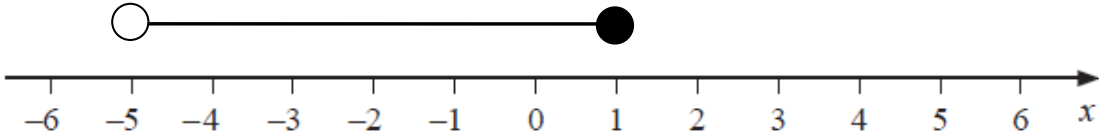
..... newtons/cm²

(Total for Question 9 is 3 marks)

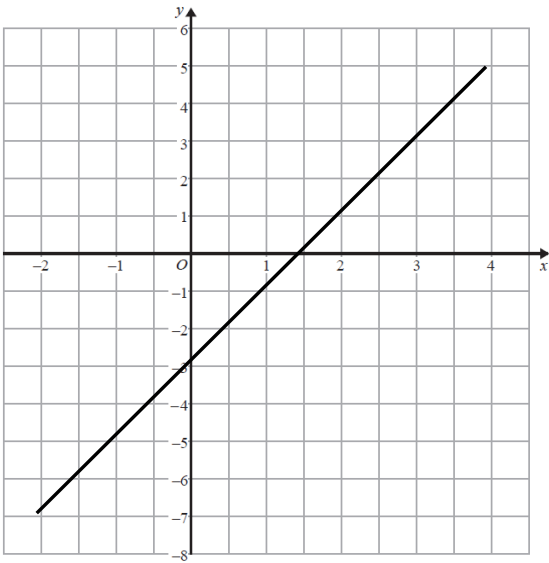
TOTAL FOR PAPER IS 32 MARKS

WEEK 1 TASK 3

Question 1 (Total 5 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
(a)	$14n - 11n > 6$ $3n > 6$	M1	This mark is given for a method to solve the inequality
	$n > 2$	A1	This mark is given for the correct answer only
(b)			
		M1	This mark is given for drawing a line from -5 to 1
		M1	This mark is given for an open circle drawn at -5 or a closed circle drawn at 1
		A1	This mark is given for a completely correct diagram

Question 2 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
		B3	These marks are given for a correct straight line between the points $(-2, -7)$ and $(4, 5)$ (B2 is given for a straight line segment through at least three of the points $(-2, -7)$, $(-1, 5)$, $(0, -3)$, $(1, -1)$, $(2, 1)$, $(3, 3)$ and $(4, 5)$) (B1 is give for at least two correct points stated or plotted or for a line drawn with gradient 2)

Question 3 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(i)	$\frac{10}{30} \times 195$	M1	This mark is given for a method to find an estimate of how many students will want to go to the Theme Park
	65	A1	This mark is given for the correct answer only
(ii)	The sample is representative of all 195 students; otherwise the estimate might be wrong	C1	This mark is given for a correct statement

Question 4 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$30 \times 6 \times 19 = 3420$	P1	This mark is given for a process to find the volume of the container
	$\frac{2}{3} \times 3420 = 2280$	P1	This mark is given for a process to find the volume of water in the container
	$2280 \div 275 = 8.29\dots$	P1	This mark is given for a process to find out how many cups can be filled
	8 cups	A1	This mark is given for the correct answer only

Question 5 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$AB = \sin 38^\circ \times 16$ $AB = 0.61566 \times 16$	M1	This mark is given for a method to find the length of AB
	9.85	A1	This mark is given for the correct answer only

Question 6 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$8.3 \leq y < 8.4$	B1	This mark is given for either 8.3 or 8.4 seen in the correct position
		B1	This mark is given for the correct answer only

Question 7 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Chloe and Denesh each receive 1.5×2	P1	This mark is given for a process to find out the proportion that Chloe and Denesh each share
	$A : B : C : D = 2 : 7 : 3 : 3$	P1	This mark is given for a process to find the ratio of money that each person shares
	$\frac{7}{2+7+3+3} \times 360 = \frac{7}{15} \times 360$	P1	This mark is given for a process to find the amount of money that Ben gets
	168	A1	This mark is given for the correct answer only

Question 8 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	5.62×10^{-3}	B1	This mark is given for the correct answer only
	1452	B1	This mark is given for the correct answer only

WEEK 1 TASK 4

Answer all questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Shakir has to complete two tests.

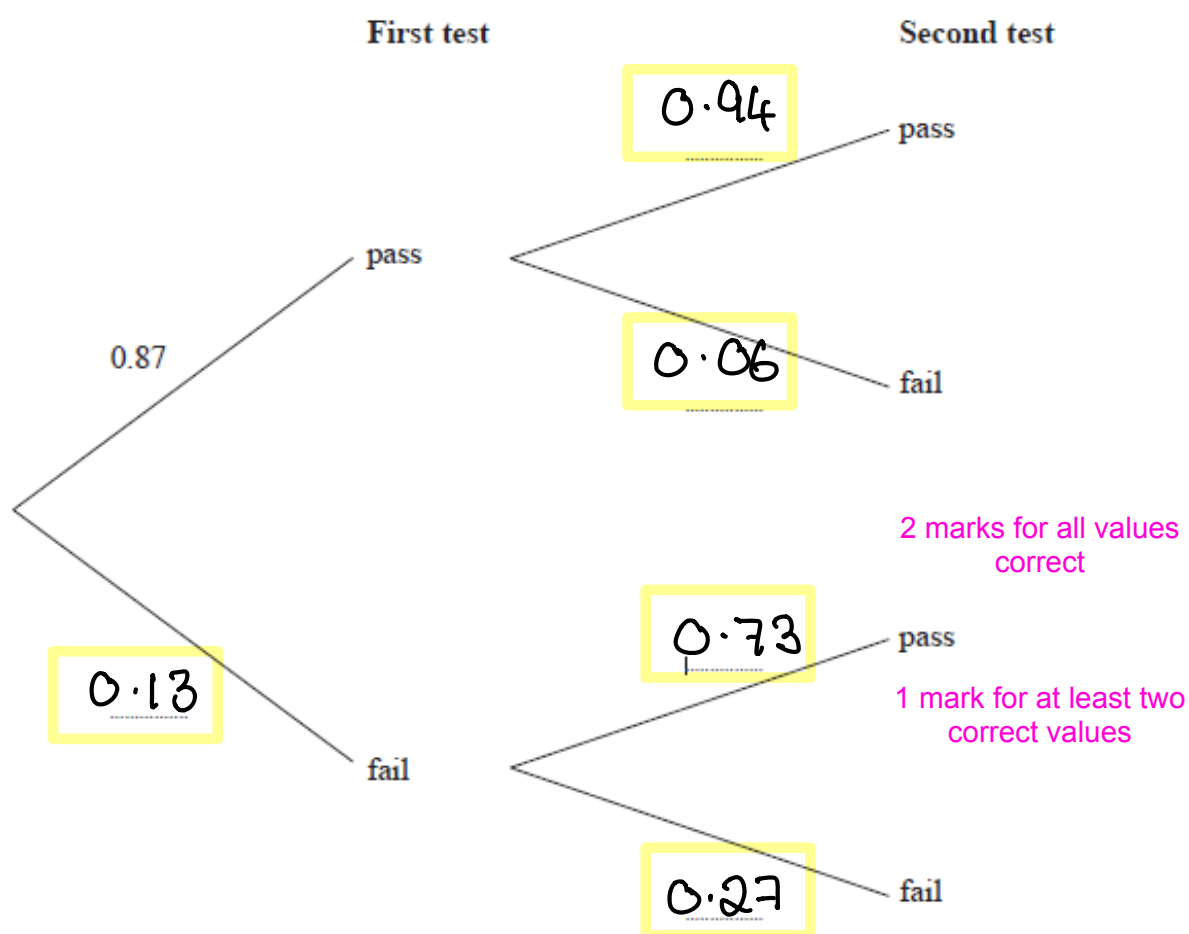
He can either pass or fail each test.

The probability that he will pass the first test is 0.87

If he passes the first test the probability he will pass the second test is 0.94

If he fails the first test the probability he will pass the second test is 0.73

(a) Complete the probability tree diagram for this information.



$$PP + PF + FP$$

(b) Work out the probability that Shakir passes at least one of the tests.

$$\begin{array}{l} 0.87 \times 0.94 \\ + \\ 0.87 \times 0.06 \\ + \\ 0.13 \times 0.73 \end{array} \left. \vphantom{\begin{array}{l} 0.87 \times 0.94 \\ + \\ 0.87 \times 0.06 \\ + \\ 0.13 \times 0.73 \end{array}} \right\} 0.9649$$

Final mark

0.9649

(2)

(3)

(Total for Question 1 is 5 marks)

- *2 A number, d , is rounded to 1 decimal place.
The result is 12.7

Complete the error interval for d .

12.6 12.7 12.8
 ↑ ↑

1 mark

1 mark

$$\boxed{12.65} \leq d < \boxed{12.75}$$

(Total for Question 2 is 2 marks)

- 3 A number x is written correct to 2 significant figures.
The result is 1.9
Complete the error interval for x .

1.8 1.9 2.0
 ↑ ↑

1 mark

1 mark

$$\boxed{1.85} \leq x < \boxed{1.95}$$

(Total for Question 3 is 2 marks)

- 4 Expand and simplify $(x + 7)(x - 2)(x + 3)$

$$\boxed{x^2 - 2x + 7x - 14} = x^2 + 5x - 14$$

1 mark

$$(x + 3)(x^2 + 5x - 14)$$

$$= \boxed{x^3 + 5x^2 - 14x + 3x^2 + 15x - 42}$$

1 mark

$$= x^3 + 8x^2 + x - 42$$

$$\boxed{x^3 + 8x^2 + x - 42}$$

Final mark

(Total for Question 4 is 3 marks)

5 Use algebra to solve the simultaneous equations

1 mark for
elimination of
'x' or 'y'

$$\begin{array}{l} 2x + 6y = 5 \quad (1) \quad \times 3 \\ 3x - 4y = -12 \quad (2) \quad \times 2 \end{array}$$

$$\begin{array}{l} 18 - -8 = 26 \\ 15 - -24 = 39 \end{array}$$

$$\begin{array}{r} 6x + 18y = 15 \quad (3) \\ 6x - 8y = -24 \quad (4) \\ \hline - \quad \quad \quad 26y = 39 \\ y = \frac{39}{26} = 1.5 \end{array}$$

1 mark for
 $y=1.5$ or $x=-2$

1 mark for
substitution of
'x' or 'y'

$$\begin{array}{l} \text{sub into (1)} \quad 2x + 6(1.5) = 5 \\ 2x = -4 \\ x = -2 \end{array}$$

$$\begin{array}{l} x = \dots\dots\dots -2 \\ y = \dots\dots\dots 1.5 \end{array}$$

Final mark

(Total for Question 5 is 4 marks)

- *6 $-2 \leq n < 5$
 n is an integer.
(a) Write down the greatest possible value of n .

$$-2, -1, 0, 1, 2, 3, 4$$

$$\dots\dots\dots 4 \dots\dots\dots$$

1 mark

(1)

- (b) Solve $\frac{2}{5}g - 4 < 6$
1 mark for '+ 4'
to both sides

$$\begin{array}{l} \frac{2}{5}g - 4 < 6 \\ +4 \quad +4 \\ \hline \frac{2}{5}g < 10 \\ \times 5 \quad \times 5 \\ \hline 2g < 50 \end{array}$$

1 mark for 'x 5'
to both sides

$$g < \frac{50}{2}$$

$$\dots\dots\dots g < 25 \dots\dots\dots$$

Final mark

(3)

(Total for Question 6 is 4 marks)

7 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

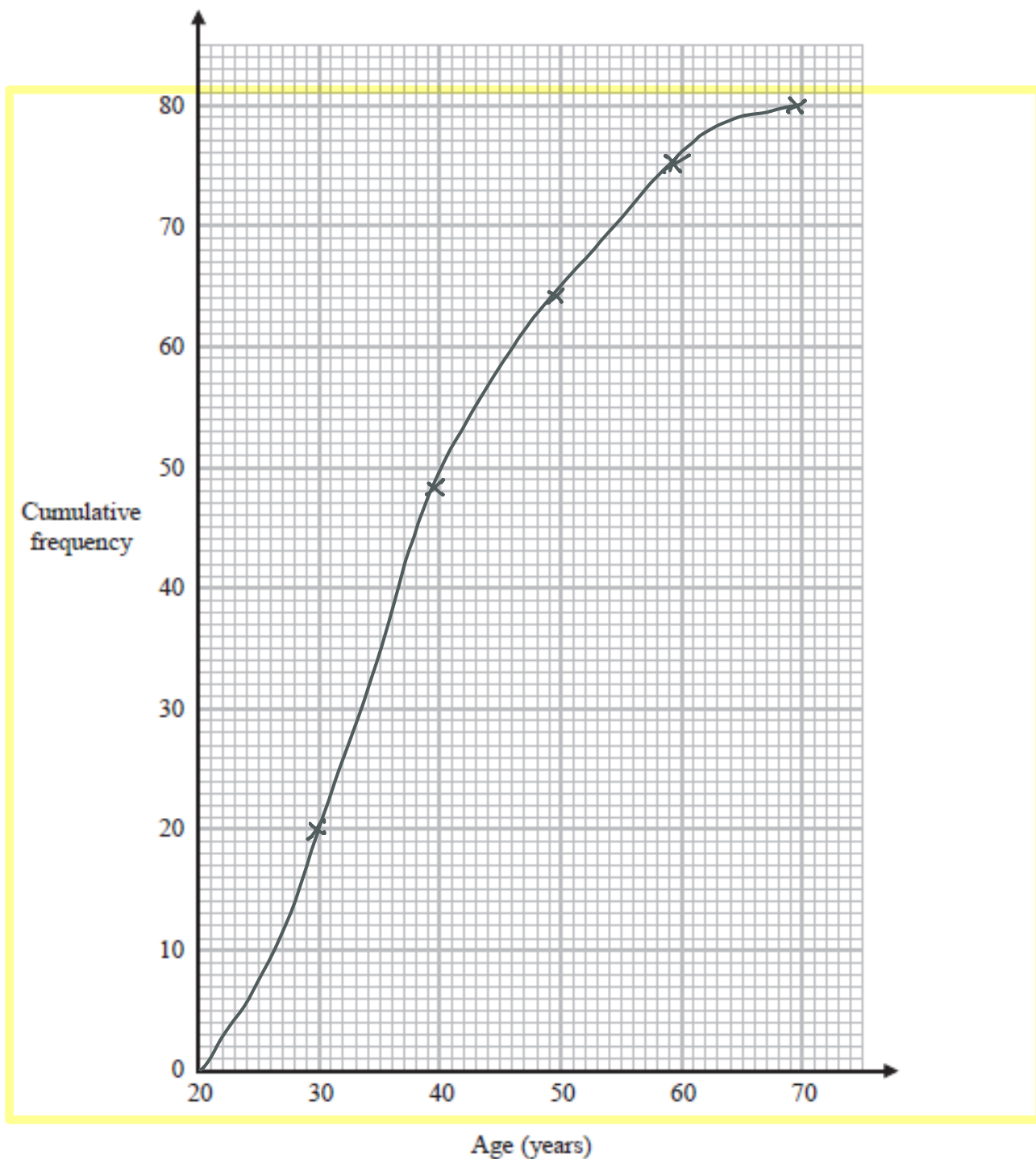
(Total for Question 7 is 1 mark)

8 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

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

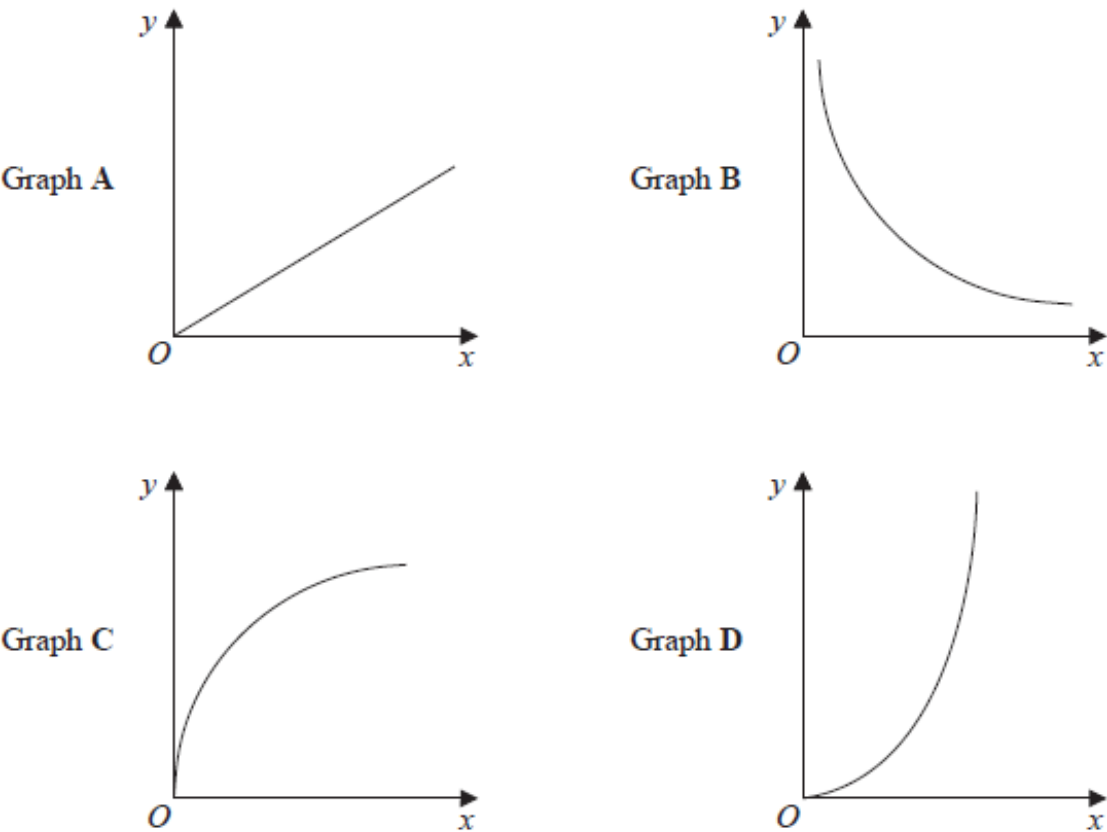
(2)



2 marks for correct graph

(Total for Question 8 is 2 marks)

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



The graphs of y against x represent four different types of proportionality.
Match each type of proportionality in the table to the correct graph.

Type of proportionality	Graph
$y \propto x^2$	D
$y \propto x$	A
$y \propto \frac{1}{x}$	B
$y \propto \sqrt{x}$	C

2 marks for all values correct

1 mark for at least two correct values

(Total for Question 9 is 2 marks)

10 The functions f and g are such that

$f(x) = (2x + 3)^2$ and $g(x) = 2x - 1$

Find $gf(-3)$

$$\begin{aligned} gf(-3) &= 2(2x+3)^2 - 1 \\ &= 2(2 \times -3 + 3)^2 - 1 \quad \text{1 mark} \\ &= 2(-3)^2 - 1 \\ &= 2 \times 9 - 1 = 17 \end{aligned}$$

Final mark

17

(Total for Question 10 is 2 marks)

*11 Chris, Debbie and Errol share some money in the ratio 3 : 4 : 2
Debbie gets £120
Chris then gives some of his share to Debbie and some of his share to Errol.
The money that Chris, Debbie and Errol each have is now in the ratio 2 : 5 : 3
How much money did Chris give to Errol?

C	D	E
3	4	2
$\downarrow$	$\downarrow \times 30$	$\downarrow$
$\times 30$	£120	$\times 30$
£90		£60

1 mark

Total = £270

C	D	E
2	5	3

Total = £270

$270 \div 10 = 27$ 1 mark

2×27	5×27	3×27
= £54	= £135	= £81

1 mark

£81 - 60 = £21

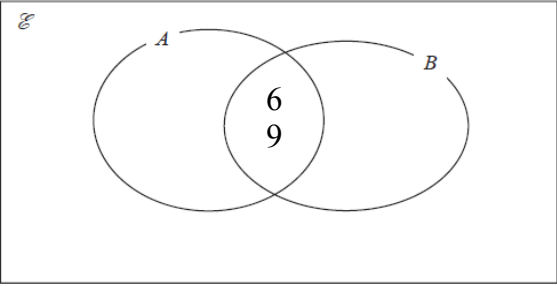
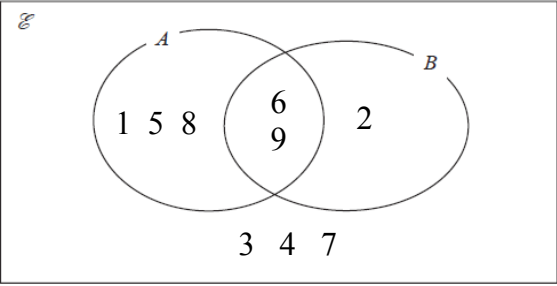
21 Final mark

£.....
(Total for Question 11 is 4 marks)

TOTAL FOR PAPER IS 31 MARKS

WEEK 1 TASK 5

Question 1 (Total 5 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
(a)		M1	This mark is given for placing numbers 6 and 9 in the intersection of A and B
		M1	This mark is given for placing numbers 1, 5 and 8 in set A only or the number 2 in set B only or the numbers 3, 4 7 outside $A \cup B$
		C1	This mark is given for a fully correct Venn diagram
(b)	There are 2 numbers in $A \cap B$ There are 9 numbers in the universal set	M1	This mark is given for one of these two statements seen
	$\frac{2}{9}$	A1	This mark is given for a correct answer only

Question 2 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$200\,000 \times 1.015 = 203\,000$	M1	This mark is given for a method to show the amount that will be in the savings account after one year
	$200\,000 \times (1.015)^4 = 212\,272.71$	M1	This mark is given for a method to show the amount that will be in the savings account after four years
	$212\,272.71 - 200\,000 = 12\,272.71$	A1	This mark is given for a correct answer (in the range 12 272.70 to 12 272.72)

Question 3 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$40 < h \leq 50$	B1	This mark is given for the correct answer only
(b)		B2	This mark is given for a correct polygon with points plotted at midpoints (B1 is given for one point incorrect)

Question 4 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	For example: Points should be joined by straight lines, not curved lines The first quarter not shown 9.5 is missing from the vertical axis The vertical axis does not start from zero	B1	This mark is given for a first correct statement
		B1	This mark is given for a second correct statement

Question 5 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$(6 - 2) \times 180 = 720$	M1	This mark is given for a method to find the sum of the interior angles of a hexagon
	Letting the angles AFE and $BCD = x$ and the angles FED and $CDE = 2x$, then $720 - 117 - 117 = 6x$	M1	This mark is given for a method to find the missing angles of the hexagon
	$x = \frac{486}{6} = 81$	M1	This mark is given for a method to find the value of x
	Thus angle $CDE = 2x = 162$	C1	This mark is given for the correct answer only following from correct working

Question 6 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$2 \times \pi \times 0.8^2 = 4.021$	P1	This mark is given for a process to find the area of the top and bottom of the tank
	$2\pi \times 0.8 \times 1.8 = 9.047$	P1	This mark is given for a process to find the curved surface area of the tank
	$4.021 + 9.047\ldots = 13.069$	P1	This mark is given for a process to find the total surface area of the tank
	$3 \times 13.068 = 39.204$	P1	This mark is given for a process to find the total surface area of three tanks
	Jeremy only has enough paint to cover 35 m^2 so Jeremy does not enough paint to completely cover 3 tanks	C1	This mark is given for a correct conclusion supported by correct working



WEEK 1

MARKSCHEMES

(Higher 7+)

WEEK 1 TASK 1

Question 1 (Total 4 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
(a)	$1 - 0.2 = 0.8$	P1	This mark is given for a method to solve the inequality
	0.4, 0.4	A1	This is mark is given for two correct answers (equivalent fractions acceptable)
(b)	$12 \div 0.2$	P1	This mark is given for a process to find the number of blue cubes in the box
	60	A1	This mark is given for the correct answer only

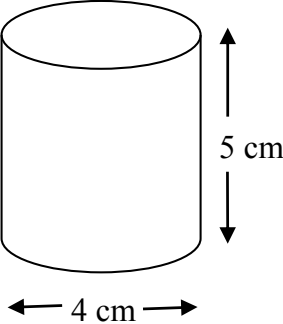
Question 2 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	For 15 biscuits: Flour needed = $3 \times 50 \text{ g} = 150 \text{ g}$	P1	This mark is given for a process to find the amount of flour needed for 15 biscuits
	For 60 biscuits: $\frac{60}{15} \times 150$	P1	This mark is given for a process to find the amount of flour needed for 60 biscuits
	600	A1	This mark is given for the correct answer only
(b)	For 15 biscuits: Butter needed = $2 \times 50 \text{ g} = 100 \text{ g}$ For 60 biscuits: $\frac{60}{15} \times 100 = 400$	P1	This mark is given for a process to find the amount of butter needed for 60 biscuits
	$\frac{400}{250} = 1.6$, so 2 packets needed	A1	This mark is given for the correct answer only

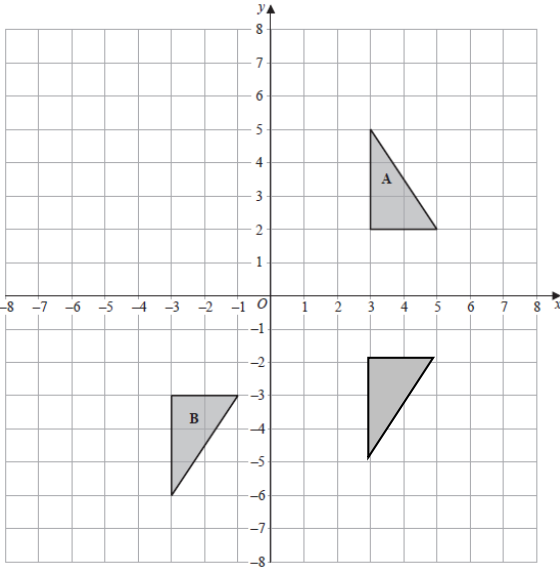
Question 3 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Prime factors of 72 are 2, 2, 2, 3, 3 Prime factors of 90 are 2, 3, 3, 5	M1	This mark is given for a method to find the prime factors of both 72 and 90
	HCF = $2 \times 3 \times 3$ = 18	A1	This mark is given for the correct answer only

Question 4 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
		M1	This mark is given for sketch of a cylinder
		P1	This mark is given for sketch of a cylinder with dimensions shown

Question 5 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
		M1	This mark is given for a correct reflection of A shown on the diagram
		A1	This mark is given for a correct value for either c or d
		A1	This mark is given for a correct value for both c and d

Question 6 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$2 \times 7 : 5 \times 3 : 6 \times 4$ $14 : 15 : 24$	P1	This mark is given for a process to find the ratio of the number of pens of each colour sold
	$212 \div (14 + 15 + 24)$	P1	This mark is given for a process to find the proportion of green pens sold
	$\frac{212}{53} \times 24$	P1	This mark is given for a process to find the number of green pens sold
	96	A1	This mark is given for the correct answer only

Question 7 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$PQ = 45 \div 10 = 4.5$ $BC = 4.5$	P1	This mark is given for a process to use the area of $PQRS$ to find the lengths of PQ and BC
	$26 - (2 \times 4.5)$	P1	This mark is given for a process to use the perimeter of $ABCD$ to find the length AB
	$AB = 17 \div 2$	P1	This mark is given for a process to to find the length AB
	8.5	A1	This mark is given for the correct answer only

WEEK 1 TASK 2

Answer all questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- *1 Write down the value of 5^{-2}

$$\frac{1}{5^2}$$

1 mark

$$\frac{1}{25} \text{ or } 0.04$$

(Total for Question 1 is 1 mark)

- *2 The mean length of 5 sticks is 4.2 cm.
Nawal measured the length of one of the sticks as 7 cm.
(a) Work out the mean length of the other 4 sticks.

$$\begin{array}{ccccccc} _ & _ & _ & _ & _ & = & 4.2 \text{ mean} \\ & & & & & \text{so total} = & 4.2 \times 5 = 21 \text{ cm} \end{array}$$

1 mark

$$\begin{array}{l} 21 - 7 = 14 \text{ cm} \\ 14 \div 4 = 3.5 \end{array}$$

1 mark

3.5 Final mark
cm
(3)

Nawal made a mistake.
The stick was not 7 cm long.
It was 17 cm long.

- (b) How does this affect your answer to part (a)?

1 mark

my answer would be smaller than 3.5; it would
(21 - 17 = 4 cm 4 ÷ 4 = 1) be 1 cm

(1)

(Total for Question 2 is 4 marks)

3 Work out the value of $27^{\frac{2}{3}} + \left(\frac{1}{2}\right)^{-3}$

$$27^{2/3} = (\sqrt[3]{27})^2$$

$$= 3^2 = 9$$

1 mark for either of these

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

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

so $9 + 8$ 1 mark

17 Final mark

(Total for Question 3 is 3 marks)

*4 Mano has three shelves of books.
 There are x books on shelf **A**.
 There are $(3x + 1)$ books on shelf **B**.
 There are $(2x - 5)$ books on shelf **C**.
 There is a total of 44 books on the three shelves.
 All the books have the same mass.
 The books on shelf **B** have a total mass of 7500 g.
 Work out the total mass of the books on shelf **A**.

A	B	C
x	$3x + 1$	$2x - 5$

$$x + 3x + 1 + 2x - 5 = 44$$

1 mark

$$6x - 4 = 44$$

$$6x = 48 \quad \text{so } x = 8$$

1 mark for either of these

A	B	C
8	$3 \times 8 + 1$	$2 \times 8 - 5$
	$= 25$	$= 11$

so shelf A = 8×300

1 mark

$$7500 \div 25$$

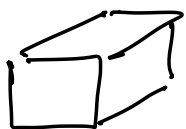
$$25 \overline{) 7500}$$

300

2400 Final mark g

(Total for Question 4 is 5 marks)

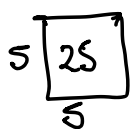
- *5 A cube has a total surface area of 150 cm^2
Work out the volume of the cube.



6 faces = 150 cm^2
so 1 face = 25 cm^2

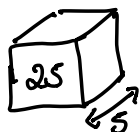
$$150 \div 6 = 25$$

1 mark



so side length = $\sqrt{25}$
= 5

1 mark



Volume : $5 \times 5 \times 5 = 125$

1 mark

Final mark

125

cm^3

(Total for Question 5 is 4 marks)

- 6 y is directly proportional to x .
 $y = 24$ when $x = 1.5$
Work out the value of y when $x = 5$

$y \propto x$

1 mark

$$y = kx$$

$$24 = k \times 1.5$$

$$k = \frac{24}{1.5} = 16$$

so

$$y = 16x$$

$$y = 16 \times 5$$

$$= 80$$

1 mark

Final mark

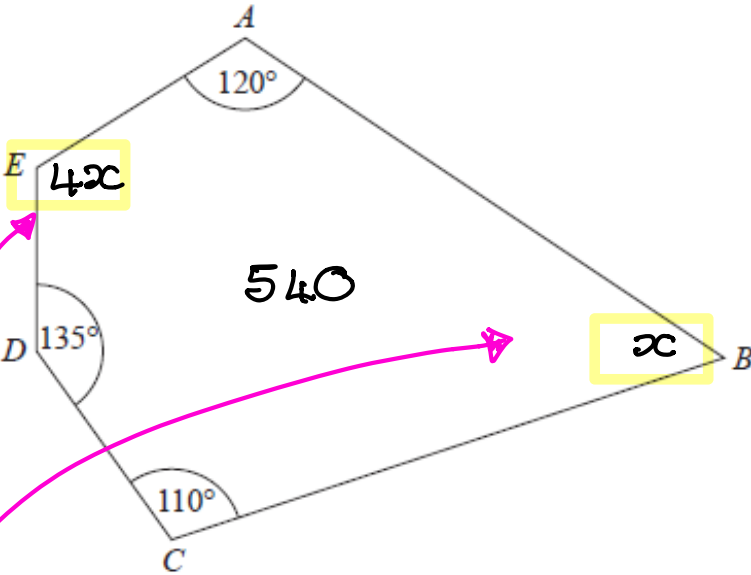
80

$y =$

(Total for Question 6 is 3 marks)

7

Here is a pentagon.



$$\begin{array}{r} 120 \\ + 135 \\ \hline 255 \end{array}$$

$$\text{Angle } AED = 4 \times \text{angle } ABC$$

Work out the size of angle AED .

You must show all your working.

1 mark for using the ratio 1:4

$$3\text{sides} = 180$$

4 sides = 360

$$S_{\text{sides}} = \underline{540}$$

1 mark

5x + 365 = 540 1 mark

$$S_x = 540 - 365$$

$$= 175$$

$$x = \frac{1.75}{5}$$

= 35

1 mark

$$AED = 4x = 4 \times 35 = 140$$

$$\begin{array}{r} 4 \overline{) 540} \\ - 365 \\ \hline 175 \end{array}$$

$$\begin{array}{r} 0.35 \\ 5 \overline{) 1.75} \end{array}$$

Final mark

140

(Total for Question 7 is 4 marks)

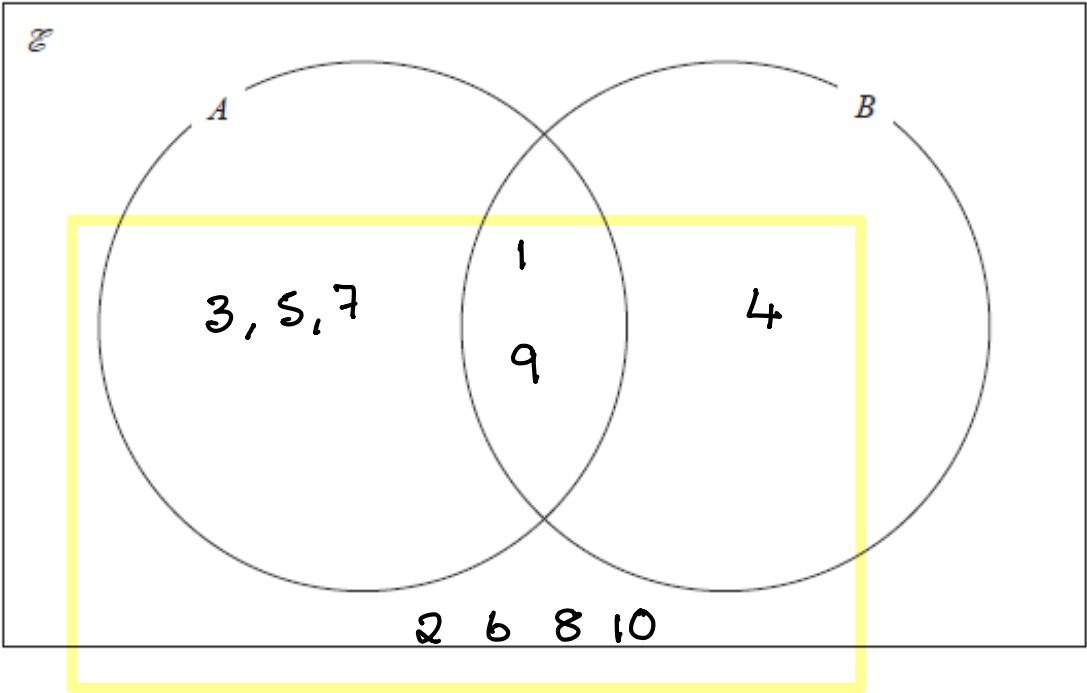
1 mark for one correct region

2 marks for two or three correct regions

3 marks for all correct

- *8

$\mathcal{E} = \{1, 2, 3, 4, 5, 6, 7, 8, 9, 10\}$
 $A = \{\text{odd numbers}\}$
 $B = \{\text{square numbers}\}$
(a) Complete the Venn diagram for this information.



(3)

- A number is chosen at random from the universal set $\mathcal{E}$
- (b) Find the probability that this number is in the set B' NOT B'

2 marks

$$\frac{7}{10}$$

(2)

(Total for Question 8 is 5 marks)

1 mark can be given for

$\frac{a}{10}$

'a' must be between 0 and 10 or

$\frac{7}{b}$

'b' must be greater than 7
or

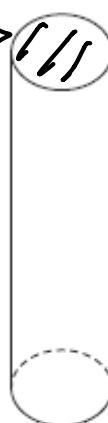
7:10

*9 The diagram shows a solid cylinder on a horizontal floor.

$$\text{Volume} = \text{area} \times \text{height}$$
 so

$$1200 = \text{area} \times 40$$

$$\text{area} = \frac{1200}{40} = 30 \text{ cm}^2$$



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

The cylinder has a
 volume of 1200 cm^3 1 mark
 height of 40 cm .

The cylinder exerts a force of 90 newtons on the floor.
 Work out the pressure on the floor due to the cylinder.

Pressure : ? = p
 force = 90 N
 Area = 30 cm^2

$$p = \frac{90}{30}$$
 1 mark

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

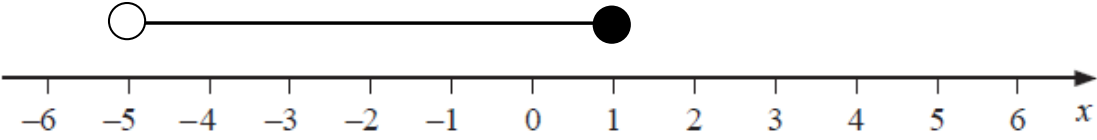
3

Final mark
 newtons/cm²

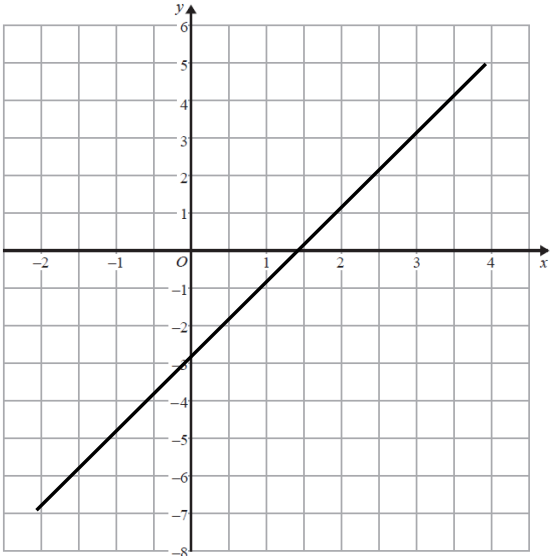
(Total for Question 9 is 3 marks)

WEEK 1 TASK 3

Question 1 (Total 5 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
(a)	$14n - 11n > 6$ $3n > 6$	M1	This mark is given for a method to solve the inequality
	$n > 2$	A1	This mark is given for the correct answer only
(b)			
		M1	This mark is given for drawing a line from -5 to 1
		M1	This mark is given for an open circle drawn at -5 or a closed circle drawn at 1
		A1	This mark is given for a completely correct diagram

Question 2 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
		B3	These marks are given for a correct straight line between the points $(-2, -7)$ and $(4, 5)$ (B2 is given for a straight line segment through at least three of the points $(-2, -7)$, $(-1, -5)$, $(0, -3)$, $(1, -1)$, $(2, 1)$, $(3, 3)$ and $(4, 5)$) (B1 is give for at least two correct points stated or plotted or for a line drawn with gradient 2)

Question 3 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(i)	$\frac{10}{30} \times 195$	M1	This mark is given for a method to find an estimate of how many students will want to go to the Theme Park
	65	A1	This mark is given for the correct answer only
(ii)	The sample is representative of all 195 students; otherwise the estimate might be wrong	C1	This mark is given for a correct statement

Question 4 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$30 \times 6 \times 19 = 3420$	P1	This mark is given for a process to find the volume of the container
	$\frac{2}{3} \times 3420 = 2280$	P1	This mark is given for a process to find the volume of water in the container
	$2280 \div 275 = 8.29\dots$	P1	This mark is given for a process to find out how many cups can be filled
	8 cups	A1	This mark is given for the correct answer only

Question 5 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$AB = \sin 38^\circ \times 16$ $AB = 0.61566 \times 16$	M1	This mark is given for a method to find the length of AB
	9.85	A1	This mark is given for the correct answer only

Question 6 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$8.3 \leq y < 8.4$	B1	This mark is given for either 8.3 or 8.4 seen in the correct position
		B1	This mark is given for the correct answer only

Question 7 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	Chloe and Denesh each receive 1.5×2	P1	This mark is given for a process to find out the proportion that Chloe and Denesh each share
	$A : B : C : D = 2 : 7 : 3 : 3$	P1	This mark is given for a process to find the ratio of money that each person shares
	$\frac{7}{2+7+3+3} \times 360 = \frac{7}{15} \times 360$	P1	This mark is given for a process to find the amount of money that Ben gets
	168	A1	This mark is given for the correct answer only

Question 8 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	5.62×10^{-3}	B1	This mark is given for the correct answer only
	1452	B1	This mark is given for the correct answer only

WEEK 1 TASK 4

Answer all questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Shakir has to complete two tests.

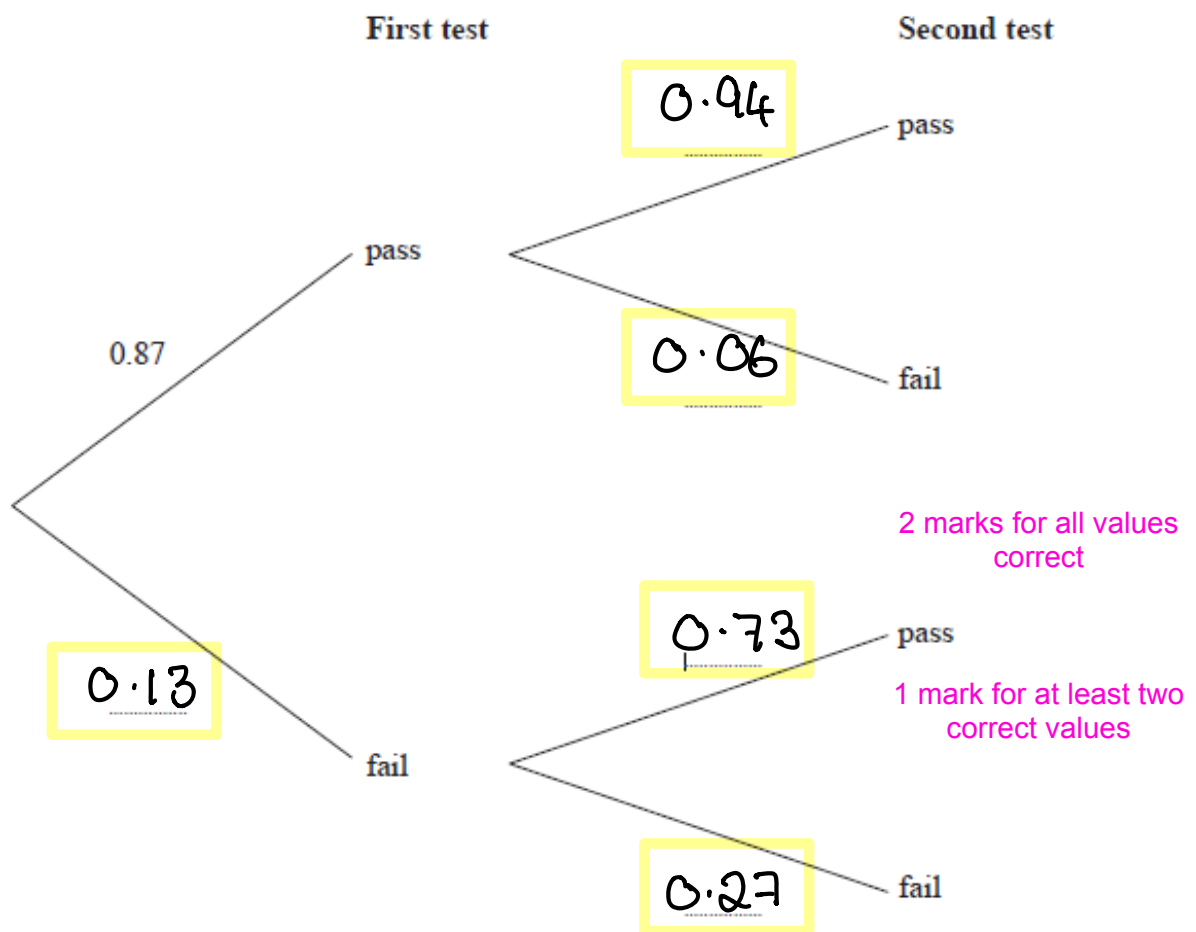
He can either pass or fail each test.

The probability that he will pass the first test is 0.87

If he passes the first test the probability he will pass the second test is 0.94

If he fails the first test the probability he will pass the second test is 0.73

(a) Complete the probability tree diagram for this information.



$$PP + PF + FP$$

(b) Work out the probability that Shakir passes at least one of the tests.

(2)

$$\begin{array}{l} 0.87 \times 0.94 \\ + \\ 0.87 \times 0.06 \\ + \\ 0.13 \times 0.73 \end{array} \left. \vphantom{\begin{array}{l} 0.87 \times 0.94 \\ + \\ 0.87 \times 0.06 \\ + \\ 0.13 \times 0.73 \end{array}} \right\} 0.9649$$

1 mark

Final mark

0.9649

(3)

(Total for Question 1 is 5 marks)

- *2 A number, d , is rounded to 1 decimal place.
The result is 12.7

Complete the error interval for d .

12.6 12.7 12.8
 ↑ ↑

1 mark

1 mark

$$\boxed{12.65} \leq d < \boxed{12.75}$$

(Total for Question 2 is 2 marks)

- 3 A number x is written correct to 2 significant figures.
The result is 1.9
Complete the error interval for x .

1.8 1.9 2.0
 ↑ ↑

1 mark

1 mark

$$\boxed{1.85} \leq x < \boxed{1.95}$$

(Total for Question 3 is 2 marks)

- 4 Expand and simplify $(x + 7)(x - 2)(x + 3)$

$$\boxed{x^2 - 2x + 7x - 14} = x^2 + 5x - 14$$

1 mark

$$(x + 3)(x^2 + 5x - 14)$$

$$= \boxed{x^3 + 5x^2 - 14x + 3x^2 + 15x - 42}$$

1 mark

$$= x^3 + 8x^2 + x - 42$$

$$\boxed{x^3 + 8x^2 + x - 42}$$

Final mark

(Total for Question 4 is 3 marks)

5 Use algebra to solve the simultaneous equations

1 mark for
elimination of
'x' or 'y'

$18 - -8 = 26$
 $15 - -24 = 39$

$2x + 6y = 5$ ① $\times 3$
 $3x - 4y = -12$ ② $\times 2$

$6x + 18y = 15$ ③
 $6x - 8y = -24$ ④
 $-$
 $26y = 39$
 $y = \frac{39}{26} = 1.5$

1 mark for
 $y = 1.5$ or $x = -2$

sub into ① $2x + 6(1.5) = 5$

1 mark for
substitution of
'x' or 'y'

$2x = -4$
 $x = -2$

$x = -2$ Final mark
 $y = 1.5$

(Total for Question 5 is 4 marks)

*6 $-2 \leq n < 5$

n is an integer.

(a) Write down the greatest possible value of n .

$-2, -1, 0, 1, 2, 3, 4$

4 1 mark
(1)

(b) Solve $\frac{2}{5}g - 4 < 6$

1 mark for '+ 4'
to both sides

$\frac{2}{5}g - 4 < 6$
 $+4$ $+4$
 $\frac{2}{5}g < 10$

1 mark for 'x 5'
to both sides

$\times 5$ $\times 5$
 $2g < 50$

$g < \frac{50}{2}$

$g < 25$ Final mark
(3)

(Total for Question 6 is 4 marks)

7 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

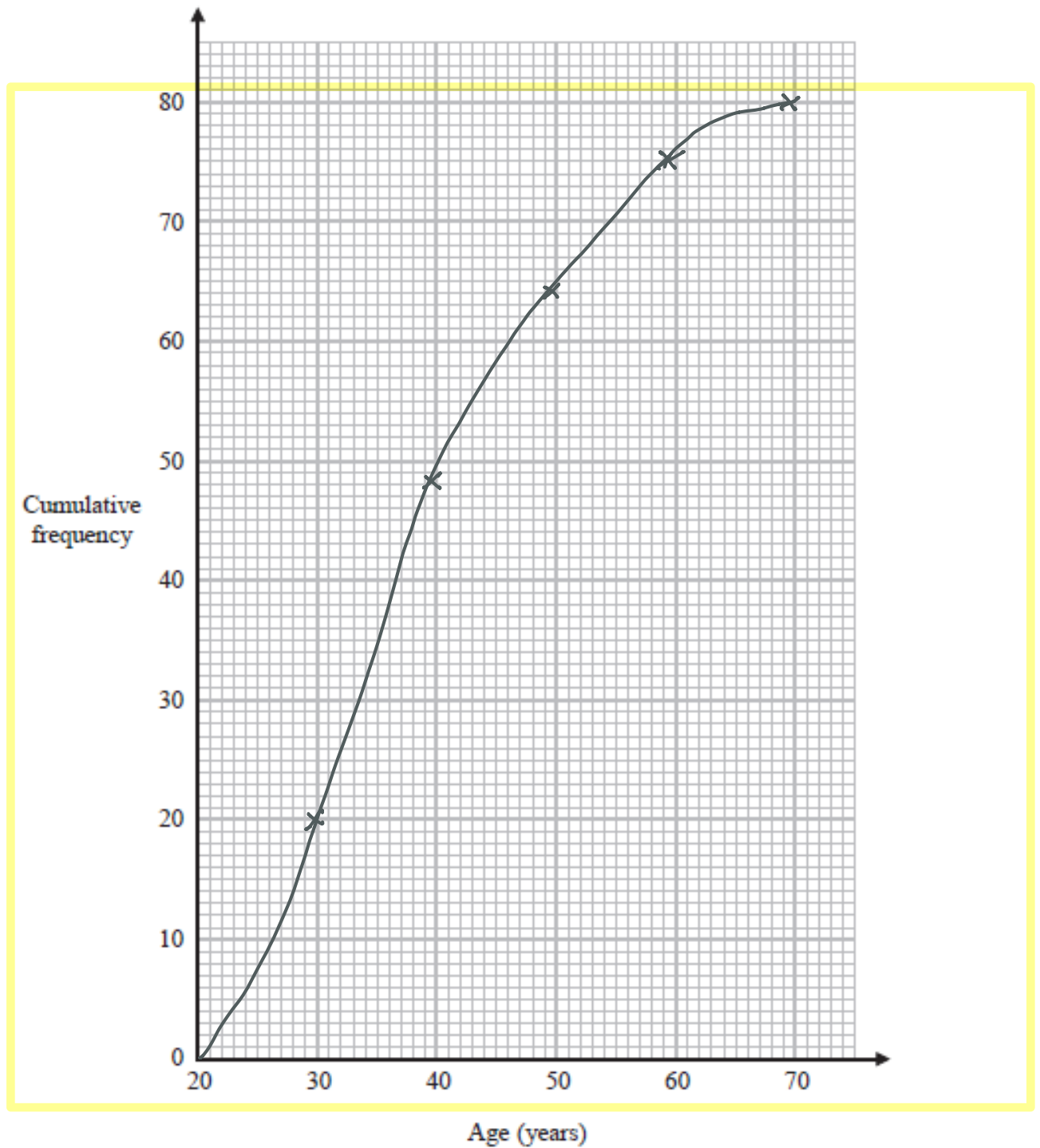
(Total for Question 7 is 1 mark)

8 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

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

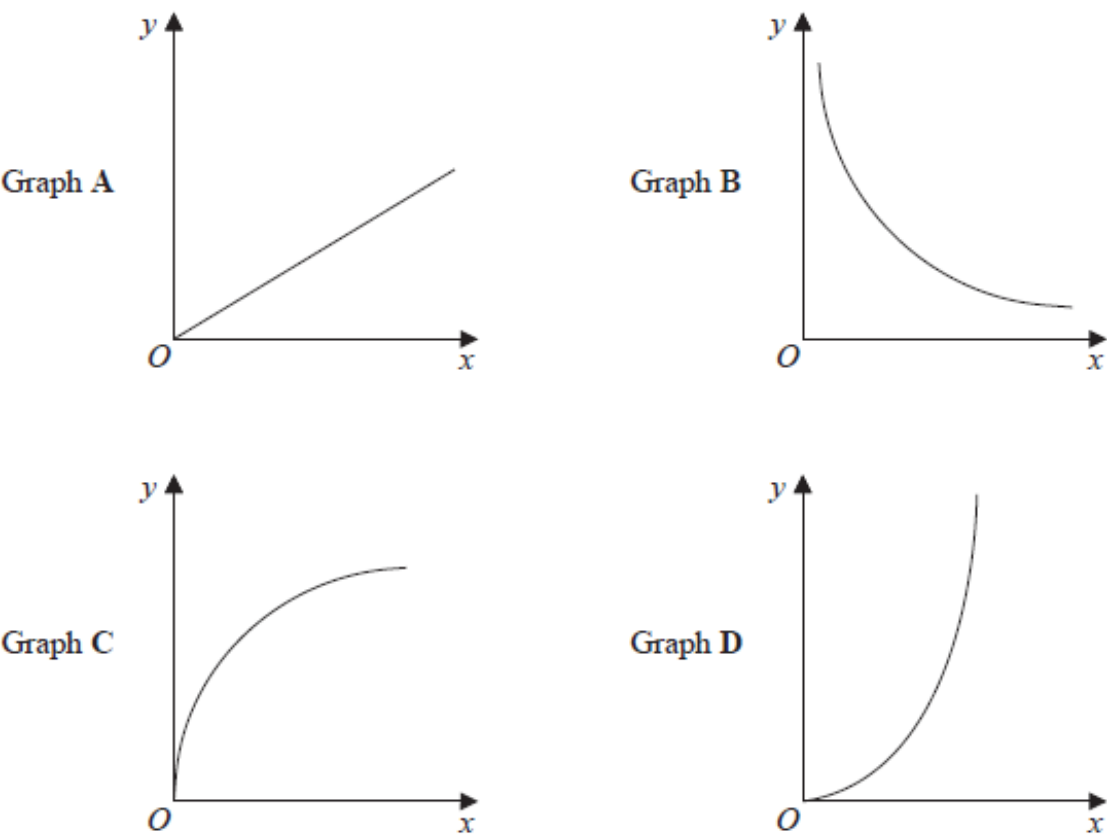
(2)



2 marks for correct graph

(Total for Question 8 is 2 marks)

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



The graphs of y against x represent four different types of proportionality.
Match each type of proportionality in the table to the correct graph.

Type of proportionality	Graph
$y \propto x^2$	D
$y \propto x$	A
$y \propto \frac{1}{x}$	B
$y \propto \sqrt{x}$	C

2 marks for all values correct

1 mark for at least two correct values

(Total for Question 9 is 2 marks)

10 The functions f and g are such that

$f(x) = (2x + 3)^2$ and $g(x) = 2x - 1$

Find $gf(-3)$

$$\begin{aligned} gf(-3) &= 2(2x+3)^2 - 1 \\ &= 2(2 \times -3 + 3)^2 - 1 \quad \text{1 mark} \\ &= 2(-3)^2 - 1 \\ &= 2 \times 9 - 1 = 17 \end{aligned}$$

Final mark

17

(Total for Question 10 is 2 marks)

*11 Chris, Debbie and Errol share some money in the ratio 3 : 4 : 2
Debbie gets £120
Chris then gives some of his share to Debbie and some of his share to Errol.
The money that Chris, Debbie and Errol each have is now in the ratio 2 : 5 : 3
How much money did Chris give to Errol?

C	D	E
3	4	2
↓	↓ × 30	↓
× 30	£120	× 30
£90		£60

1 mark

Total = £270

C	D	E
2	5	3

Total = £270

$270 \div 10 = 27$ 1 mark

2×27	5×27	3×27
= £54	= £135	= £81

1 mark

$£81 - 60$
 $= £21$

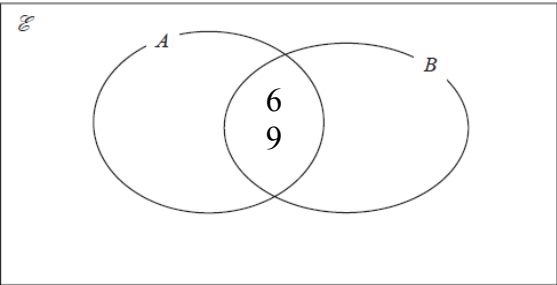
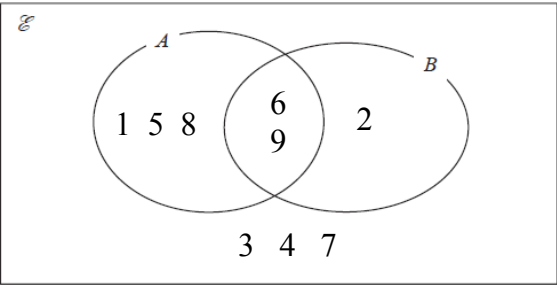
21 Final mark

£.....
(Total for Question 11 is 4 marks)

TOTAL FOR PAPER IS 31 MARKS

WEEK 1 TASK 5

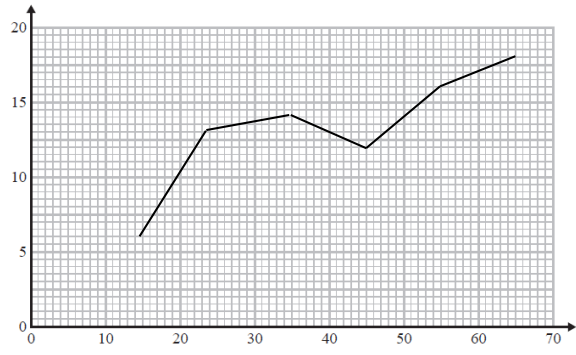
Question 1 (Total 5 marks)

Part	Working an or answer examiner might expect to see	Mark	Notes
(a)		M1	This mark is given for placing numbers 6 and 9 in the intersection of A and B
		M1	This mark is given for placing numbers 1, 5 and 8 in set A only or the number 2 in set B only or the numbers 3, 4 7 outside $A \cup B$
		C1	This mark is given for a fully correct Venn diagram
(b)	There are 2 numbers in $A \cap B$ There are 9 numbers in the universal set	M1	This mark is given for one of these two statements seen
	$\frac{2}{9}$	A1	This mark is given for a correct answer only

Question 2 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$200\,000 \times 1.015 = 203\,000$	M1	This mark is given for a method to show the amount that will be in the savings account after one year
	$200\,000 \times (1.015)^4 = 212\,272.71$	M1	This mark is given for a method to show the amount that will be in the savings account after four years
	$212\,272.71 - 200\,000 = 12\,272.71$	A1	This mark is given for a correct answer (in the range 12 272.70 to 12 272.72)

Question 3 (Total 3 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
(a)	$40 < h \leq 50$	B1	This mark is given for the correct answer only
(b)		B2	This mark is given for a correct polygon with points plotted at midpoints (B1 is given for one point incorrect)

Question 4 (Total 2 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	For example: Points should be joined by straight lines, not curved lines The first quarter not shown 9.5 is missing from the vertical axis The vertical axis does not start from zero	B1	This mark is given for a first correct statement
		B1	This mark is given for a second correct statement

Question 5 (Total 4 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$(6 - 2) \times 180 = 720$	M1	This mark is given for a method to find the sum of the interior angles of a hexagon
	Letting the angles AFE and $BCD = x$ and the angles FED and $CDE = 2x$, then $720 - 117 - 117 = 6x$	M1	This mark is given for a method to find the missing angles of the hexagon
	$x = \frac{486}{6} = 81$	M1	This mark is given for a method to find the value of x
	Thus angle $CDE = 2x = 162$	C1	This mark is given for the correct answer only following from correct working

Question 6 (Total 5 marks)

Part	Working or answer an examiner might expect to see	Mark	Notes
	$2 \times \pi \times 0.8^2 = 4.021$	P1	This mark is given for a process to find the area of the top and bottom of the tank
	$2\pi \times 0.8 \times 1.8 = 9.047$	P1	This mark is given for a process to find the curved surface area of the tank
	$4.021 + 9.047... = 13.069$	P1	This mark is given for a process to find the total surface area of the tank
	$3 \times 13.068 = 39.204$	P1	This mark is given for a process to find the total surface area of three tanks
	Jeremy only has enough paint to cover 35 m ² so Jeremy does not enough paint to completely cover 3 tanks	C1	This mark is given for a correct conclusion supported by correct working



WEEK 2

MARKSCHEMES

(Higher 7+)

WEEK 2 TASK 1

Answer all questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1 Show that $(x-1)(x+3)(x-5)$ can be written in the form $ax^3 + bx^2 + cx + d$ where a , b , c and d are integers.

$$(x-1)(x+3) \quad 1 \text{ mark}$$
$$= x^2 + 3x - x - 3 = x^2 + 2x - 3$$

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

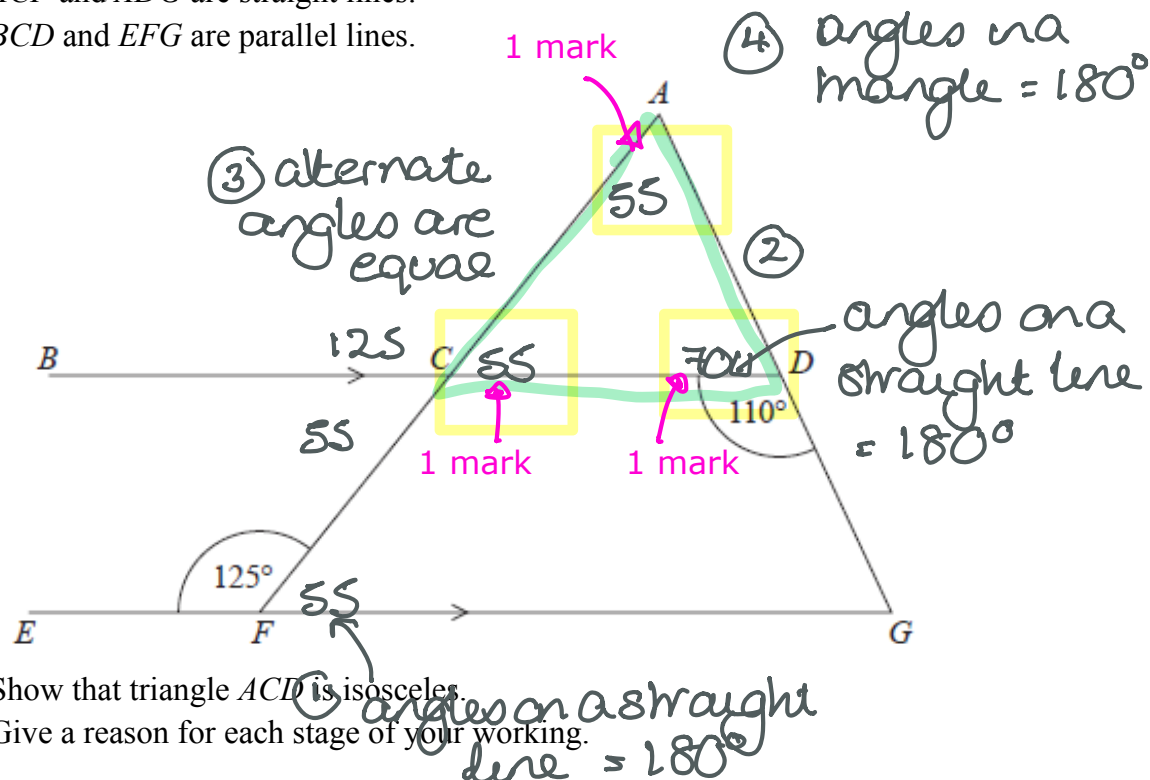
$$= x^3 - 5x^2 + 2x^2 - 10x - 3x + 15 \quad 1 \text{ mark}$$

$$= x^3 - 3x^2 - 13x + 15 \quad \text{Final mark}$$

$$\begin{aligned} \text{where } a &= 1 \\ b &= 3 \\ c &= -13 \\ d &= 15 \end{aligned}$$

(Total for Question 1 is 3 marks)

- *2** ACF and ADG are straight lines.
 BCD and EFG are parallel lines.

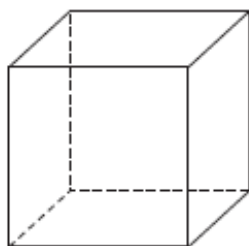


Triangle ACD is isosceles as it has two angles that are the same size.

Final 2 marks are for correct reasons. One linked to parallel lines and one other valid reason.

(Total for Question 2 is 5 marks)

- *3 The diagram shows a solid cube placed on a horizontal table.



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

$$A = \frac{F}{p}$$

The pressure on the table due to the cube is 3.5 newtons/cm^2

The force exerted by the cube on the table is 504 newtons.

Show that the total surface area of the cube is less than 900 cm^2

$$P = 3.5 \text{ n/cm}^2$$

$$F = 504 \text{ N}$$

$$A = A$$

$$\text{Area} = \frac{504}{3.5} \quad 1 \text{ mark}$$

$$= 144 \text{ cm}^2$$

$$\text{Total surface area} = 144 \times 6 \quad 1 \text{ mark}$$

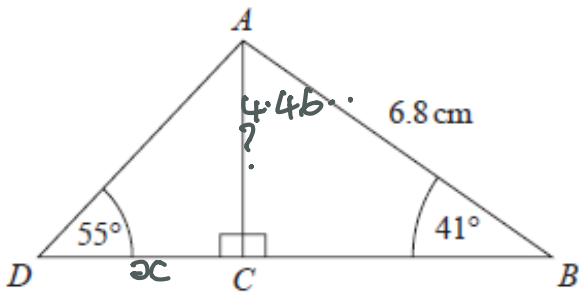
$$= 864 \text{ cm}^2$$

$$864 \text{ cm}^2 < 900 \text{ cm}^2$$

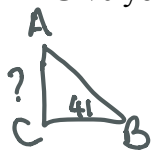
Final mark

(Total for Question 3 is 3 marks)

- 4 ABD is a triangle.
 C is a point on BD .



Work out the length of DC .
 Give your answer correct to 1 decimal place.

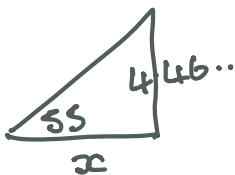


$$\sin 41 = \frac{AC}{6.8}$$

1 mark

$$AC = 6.8 \times \sin 41$$

$$= 4.46120 \dots$$



1 mark

$$\tan 55 = \frac{4.46}{x}$$

$$x = \frac{4.46}{\tan 55}$$

$$= 3.1237 \dots$$

Final mark

$$= 3.1 \text{ (1dp)} \text{ cm}$$

Range accepted 3.1 to 3.2 (Total for Question 4 is 3 marks)

- *5 Lava flows from a volcano at a constant rate of $11.9 \text{ m}^3/\text{s}$
 How many days does it take for $67\,205\,600 \text{ m}^3$ of lava to flow from the volcano?
 Give your answer correct to the nearest day.

1 mark

$$67205600 \div 11.9 = 5,647,529.412 \text{ seconds}$$

1 mark for
 dividing by 86400
 OR sight of
 '86400'

$$\begin{array}{l} \div 60 \text{ minutes} \\ \div 60 \text{ hours} \\ \div 24 \text{ days} \end{array}$$

$$= 65.36492 \dots$$

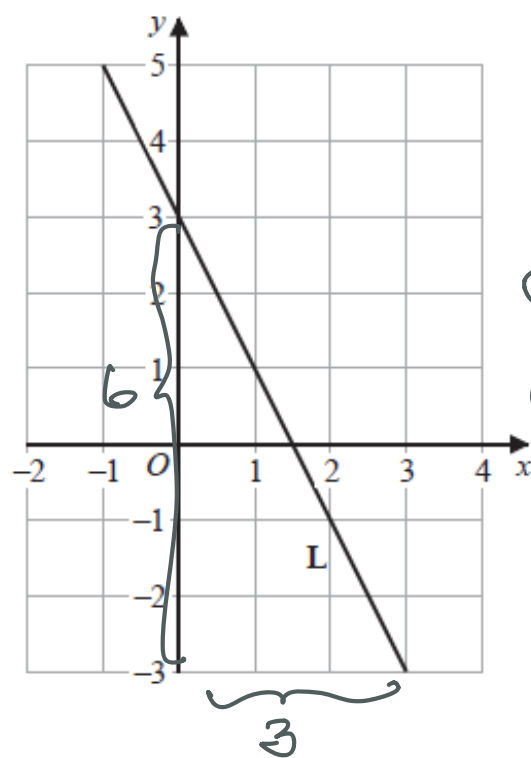
65 nearest day

Final mark

$$= 65 \text{ days}$$

(Total for Question 5 is 3 marks)

*6 The line **L** is shown on the grid.



1 mark

y intercept = 3

gradient
 $= -\frac{6}{3} = -2$

1 mark

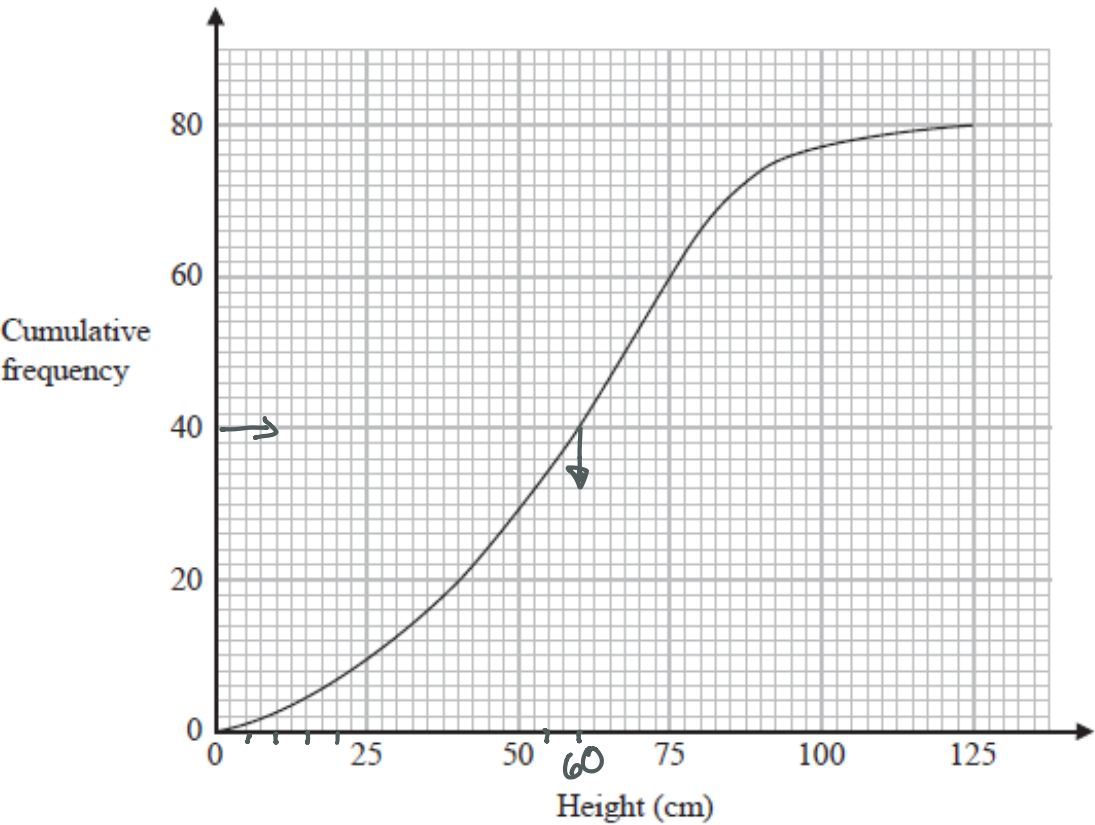
Find an equation for **L**.

Final mark

$y = -2x + 3$

(Total for Question 6 is 3 marks)

- 7 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 median height.

1 mark

60

..... cm

Range accepted 58.5 to 61.5 (Total for Question 7 is 1 mark)

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

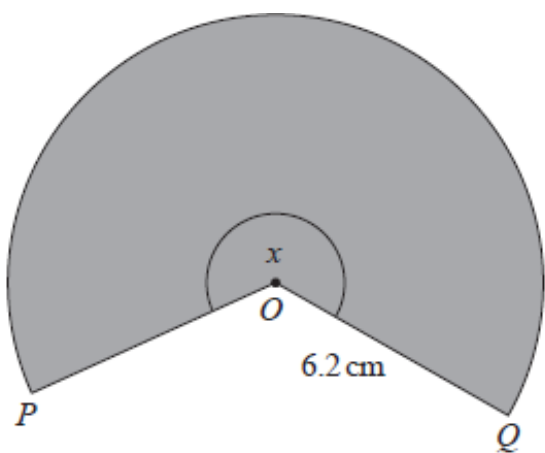
$(x - 4)^2 - 16 + 3$
so $(x - 4)^2 - 13$

Final mark

$(x - 4)^2 - 13$

(Total for Question 8 is 2 marks)

9 The diagram shows a shaded sector POQ of a circle with centre O and radius 6.2 cm.



The area of the shaded sector is 82.6 cm²
 Calculate the size of angle x .
 Give your answer correct to 3 significant figures.
 1 mark

$$\frac{x}{360} \times \pi \times 6.2^2 = 82.6$$

$$x = \frac{82.6 \times 360}{\pi \times 6.2^2} = 246.2347...$$

246

Final mark

Answers accepted in the range 246 to 247

(Total for Question 9 is 2 marks)

*10 A and B are numbers such that

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

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

Find the highest common factor (HCF) of A and B .

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

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

$$\begin{aligned} \text{HCF} &= 3 \times 3 \times 7 \\ &= 9 \times 7 \\ &= 63 \end{aligned}$$

1 mark

63

(Total for Question 10 is 1 mark)

*11 Work out the greatest integer that satisfies the inequality
 $5y - 7 < 16$

$$5y < 23$$

$$y < \frac{23}{5}$$

$$y < 4.6$$

1 mark

4

Final mark

(Total for Question 11 is 2 marks)

12 Prove algebraically that $0.1\dot{2}\dot{3}$ can be written as $\frac{61}{495}$

$$100x = 12.323...$$

$$x = 0.1232323...$$

1 mark. Accept 10x, 1000x etc

$$99x = 12.2$$

$$x = \frac{12.2}{99}$$

1 mark

$$\frac{12.2}{99} = \frac{122}{990}$$

$$\frac{122}{990} = \frac{61}{495}$$

Final mark

(Total for Question 12 is 3 marks)

TOTAL FOR PAPER IS 31 MARKS

WEEK 2 TASK 2

Qn	Working	Answer	Mark	Notes
1 (a)		0.45	1	B1 oe eg $\frac{9}{20}, \frac{45}{100}, 45\%$
(b)	eg $1 - (0.25 + 0.2 + 0.2) (= 0.35)$ or $1 - ("0.45" + 0.2) (= 0.35)$ or $300 \times (0.25 + 0.2 + 0.2) (= 195)$		3	M1 allow use of their "0.45" from part (a), check the table
	eg $300 \times "0.35"$ or $300 - "195"$			M1 for a complete method
		105		A1 cao (award $\frac{105}{300}$ M2 only)
				Total 4 marks

Qn	Working	Answer	Mark	Notes
2		$3c^4 + 12c^3$	2	B2 for $3c^4 + 12c^3$ (B1 for $3c^4$ or $12c^3$)
				Total 2 marks

Qn	Working	Answer	Mark	Notes
3	$\frac{8}{3}(+)\frac{15}{4}$ or $(2)\frac{8}{12}(+)(3)\frac{9}{12}$ or $(2)\frac{8a}{12a}(+)(3)\frac{9a}{12a}$		3	M1 for correct improper fractions or fractional part of numbers written correctly over a common denominator
	eg $\frac{8 \times 4 + 15 \times 3}{3 \times 4}$ or $\frac{32}{12} + \frac{45}{12}$ or $\frac{32a}{12a} + \frac{45a}{12a}$ or $2\frac{8}{12} + 3\frac{9}{12} = 5\frac{17}{12}$ oe			M1 for correct fractions with a common denominator of 12 or a multiple of 12
	$\frac{32}{12} + \frac{45}{12} = \frac{77}{12} = 6\frac{5}{12}$ or $5\frac{17}{12} = 6\frac{5}{12}$ or if shows $6\frac{5}{12} = \frac{77}{12}$ at the beginning then show that the addition comes to $\frac{77}{12}$	Shown		A1 dep on M2 for a correct answer from fully correct working or shows that $RHS = \frac{77}{12}$ and fully correct working shows $LHS = \frac{77}{12}$
				Total 3 marks

Qn	Working	Answer	Mark	Notes
4	Elimination eg $9x - 15y = 75$ $20x + 15y = 70$ + $(29x = 145)$ or $12x - 20y = 100$ $12x + 9y = 42$ - $(-29y = 58)$	Substitution eg $4\left(\frac{25 + 5y}{3}\right) + 3y = 14$ or $4x + 3\left(\frac{25 - 3x}{-5}\right) = 14$ or $3\left(\frac{14 - 3y}{4}\right) - 5y = 25$ or $3x - 5\left(\frac{14 - 4x}{3}\right) = 25$		4 M1 for a correct method to eliminate x or y : coefficients of x or y the same and correct operation to eliminate selected variable (condone 1 arithmetical error) or for correctly writing x or y in terms of the other variable and correctly substituting
				A1 dep on M1 for $x = 5$ or $y = -2$
	eg $3x - 5 \times "-2" = 25$ or $4x + 3 \times "-2" = 14$ or $3 \times "5" - 5y = 25$ or $4 \times "5" + 3y = 14$			M1 dep on M1 for substitution of found variable or repeating the steps in first M1 for the second variable
		$x = 5$ $y = -2$		A1 cao, dep on M1 a correct answer without working scores no marks
				Total 4 marks

Qn	Working	Answer	Mark	Notes
5 (a)			2	M1 for $(x \pm 9)(x \pm 1)$ or for $(x + a)(x + b)$ with $ab = -9$ or $a + b = 8$
		$(x + 9)(x - 1)$		A1 for correct factors
(b)		-9, 1	1	B1 ft dep on factorising in the form $(x + p)(x + q)$
				Total 3 marks

Qn	Working	Answer	Mark	Notes
6		1	1	B1
				Total 1 mark

Qn	Working	Answer	Mark	Notes
7	$3 \div 2 (=1.5 \text{ or } \frac{3}{2})$ or eg $\frac{5 - -1}{4(-0)}$ or $c = -1$		3	M1 for correct method to find gradient or the correct value of c for gradient, may see a correct calculation or $\frac{3}{2}$ oe or $1.5x (+ c)$ oe for value of c , allow $c = -1, y = -1, (L =) mx - 1$ oe
	$y = "1.5"x (+ c)$ or $y = mx - 1$ or eg $y - 5 = m(x - 4)$			M1 for use of $y = mx + c$ with either m or c correct (NB: $m \neq 0$) or for $(L =) 1.5x - 1$ oe
		$y = \frac{3}{2}x - 1$		A1 oe eg $y = 1.5x - 1$
				Total 3 marks

Qn	Working	Answer	Mark	Notes
8	$(3x-1)(x+2) = 3x^2 + 6x - x - 2 (= 3x^2 + 5x - 2)$ or $(3x-1)(3x+1) = 9x^2 + 3x - 3x - 1 (= 9x^2 - 1)$ or $(x+2)(3x+1) = 3x^2 + x + 6x + 2 (= 3x^2 + 7x + 2)$		3	M1 for a correct intention to multiply all 3 factors by multiplying 2 factors only, allow one error
	$[(3x^2 + 5x - 2)(3x + 1) =] 9x^3 + 15x^2 - 6x + 3x^2 + 5x - 2$ or $[(9x^2 - 1)(x + 2) =] 9x^3 + 18x^2 - x - 2$ or $[(3x^2 + 7x + 2)(3x - 1) =] 9x^3 + 21x^2 + 6x - 3x^2 - 7x - 2$			M1 (dep)ft for expanding by the third factor, allow one error
		$9x^3 + 18x^2 - x - 2$		A1
	ALTERNATIVE			
	$9x^3 + 3x^2 + 18x^2 + 6x - 3x^2 - x - 6x - 2$		3	M2 for a complete expansion with 8 terms present, at least 4 of which must be correct
		$9x^3 + 18x^2 - x - 2$		A1
				Total 3 marks

Qn	Working	Answer	Mark	Notes
9		$5cd^2(2c^2 + 3d^2)$	2	B2 for $5cd^2(2c^2 + 3d^2)$ B1 for a correct partial factorisation eg $5(2c^3d^2 + 3cd^4)$ or $cd^2(10c^2 + 15d^2)$ or $5d^2(2c^3 + 3cd^2)$ or $5c(2c^2d^2 + 3d^4)$ $5cd(2c^2d + 3d^3)$ etc or $5cd^2$ (a 2 term expression with just one error)
				Total 2 marks

Qn	Working	Answer	Mark	Notes
10		$\frac{y^2}{2x}$	2	B2 for $\frac{y^2}{2x}$ oe eg $\frac{0.5y^2}{x}$, $0.5y^2x^{-1}$, $\frac{y^2x^{-1}}{2}$, $\frac{1}{2xy^{-2}}$ oe If not B2, award B1 for 2 of number, x, y correct eg $\frac{ky^2}{x}$ where $k \neq \frac{1}{2}$ or $\frac{y^2}{2x^m}$ where $m \neq 1$ or $0.5y^2$ or $\frac{y^p}{2x}$ where $p \neq 2$) oe [one term can be missing with 2 correct for B1]
				Total 2 marks

Qn	Working	Answer	Mark	Notes
11 (a)	<i>If a graph is ascending you can fit for the marks in parts (b), (c) and (d) – method should be shown by way of marks on the axes for all but the median in part (b)</i>	Correct cf graph	2	B2 (use overlay) Fully correct cf graph – points at ends of intervals and joined with curve or line segments. B1 for for 6 or 7 points plotted correctly at ends of intervals not joined OR for 6 or 7 points from table plotted consistently within each interval (eg at lower bound of interval or midpoint of interval) at their correct heights and joined with smooth curve or line segments. ignore the curve < age 20
(b)		26 – 28	1	B1 ft If out of range fit their graph
(c)	e.g. readings at 15 and 45 from the vertical axis eg LQ = 19 – 21 eg UQ = 45 - 47 (the reading at 45 is 45/46 so be careful with the award of this mark)		2	M1 ft For use of 15 and 45, or 15.25 and 45.75 (eg reading of 21 and 46 stated or indicated by marks on horizontal axis that correspond to 15 (or 15.25) and 45 (or 45.75) on the vertical axis or correct readings fit their cf graph provided method to show readings is shown)
		24 - 28		A1 ft Any value in range (if out of range fit their cf graph reading across at 15 and 45 oe but method must be shown)
(d)	eg reading of 49 or 50 from cf axis		2	M1 ft For correct reading at 55 eg 50 (ft from incorrect graph if method shown (lines up and across))
	must be a whole number	10 or 11		A1 ft If out of range fit their cf curve if method shown
				Total 7 marks

Qn	Working	Answer	Mark	Notes
12		C, F, D, H	3	B3 for all 4 correct (B2 for 2 or 3 correct) (B1 for 1 correct)
				Total 3 marks

Qn	Working	Answer	Mark	Notes
13	eg $x = 0.34545\dots$ and $100x = 34.545\dots$ with intention to subtract OR $10x = 3.4545\dots$ and $1000x = 345.45\dots$ with intention to subtract Must include algebra as the question asked for ‘using algebra’		2	M1 for 2 recurring decimals (they must identify or show the pair they are using) that when subtracted give a whole number or terminating decimal eg $100x = 34.545\dots$ and $x = 0.34545\dots$ OR $1000x = 345.45\dots$ and $10x = 3.4545\dots$ with intention to subtract. (If recurring dots not shown then showing at least the digits 34545, i.e. 5sf for one of the numbers that they are using) OR $0.3 + 0.0454545\dots$ and Eg $10x = 0.454545\dots$ and $1000x = 45.4545\dots$
	eg $100x - x = 34.545\dots - 0.34545\dots$ and $99x = 34.2$ and $\frac{34.2}{99} = \frac{19}{55}$ oe OR $1000x - 10x = 345.45\dots - 3.4545\dots$ and $990x = 342$ and $\frac{342}{990} = \frac{19}{55}$ oe OR $0.3 + \dots$ and $(1000x - 100x = 990x = 45)$ and $0.3 + \frac{45}{990} = \frac{3 \times 99 + 45}{990} = \frac{19}{55}$ oe	shown		A1 for completion to $\frac{19}{55}$
				Total 2 marks

Qn	Working	Answer	Mark	Notes
14 (a)	enlargement, enlarge, enlarged	Enlargement	3	B1 for enlargement with no mention of translate, reflect, rotate, move, flip
	scale factor 3, SF 3, $\times 3$, factor of 3, 'three' times	Scale factor 3		B1 for (scale factor $\Rightarrow$) 3 with no mention of a vector, line of symmetry or angle
	allow (3, 0) 3, 0	Centre (3, 0)		B1 for (centre $\Rightarrow$) (3, 0)
(b)		Triangle drawn at (1, 4) (1, 6) (2, 4)	1	B1 condone missing label
				Total 4 marks

Qn	Working	Answer	Mark	Notes
15	$-4x \leq 11 - 3$ or $-4x \leq 8$ or $-x \leq 2$ or $3 - 11 \leq 4x$ or $-8 \leq 4x$		2	M1 allow equals sign or condone incorrect inequality sign for M1 only
		$x \geq -2$		A1 allow $-2 \leq x$ SCB1 for x and -2 with an incorrect sign between them or -2 as an answer
				Total 2 marks

Qn	Working	Answer	Mark	Notes	
16	eg $(BV^2 \Rightarrow) 3^2 + 6^2 (= 45)$ or $(CT^2 \Rightarrow) 3^2 + 6^2 (= 45)$ or $(DH^2 \Rightarrow) 6^2 + 6^2 (= 72)$ or $(MV^2 \Rightarrow) 3^2 + 3^2 (= 18)$		4	M1 a correct expression for eg BV^2 or CT^2 or DH^2 or MV^2 where M is the midpoint of DC or a correct expression for [length] ² for any length in the cube using Pythagoras	M3 for $(VT \Rightarrow) \sqrt{6^2 + 3^2 + 3^2}$ $(= 3\sqrt{6}$ or 7.34...) (M2 for $(VT^2 \Rightarrow) 6^2 + 3^2 + 3^2 (= 54)$)
	eg $(BV \Rightarrow) \sqrt{3^2 + 6^2} (= \sqrt{45}$ or $3\sqrt{5}$ or 6.70...) or $(CT \Rightarrow) \sqrt{3^2 + 6^2} (= \sqrt{45}$ or $3\sqrt{5}$ or 6.70...) or $(DH \Rightarrow) \sqrt{6^2 + 6^2} (= \sqrt{72}$ or $6\sqrt{2}$ or 8.48...) or $(MV \Rightarrow) \sqrt{3^2 + 3^2} (= \sqrt{18}$ or $3\sqrt{2}$ or 4.24...)			M1 for a complete method for eg BV or CT or DH or MV or any length in the cube using Pythagoras	
	$(VT \Rightarrow) \sqrt{45 + 3^2}$ or $\sqrt{\left(\frac{\sqrt{72}}{2}\right)^2 + 6^2}$ or $\sqrt{18 + 6^2}$ or $3\sqrt{6}$ or 7.34...			M1 for a correct expression for VT (condone missing brackets around $3\sqrt{5}$ or $3\sqrt{2}$ or $\frac{\sqrt{72}}{2}$)	
		$\sqrt{54}$		A1 if $\sqrt{54}$ seen and answer then given as $3\sqrt{6}$ isw and award full marks	
				Total 4 marks	

Qn	Working	Answer	Mark	Notes
17	$\left(\frac{8xy^2}{2x^5}\right)^2$ or $\left(\frac{x^4}{4y^2}\right)^{-2}$ or $\left(\frac{4x^{10}}{64x^2y^4}\right)^{-1}$		3	M1 for one of reciprocating or simplifying or squaring
	$\left(\frac{4y^2}{x^4}\right)^2$ or $\left(\frac{x^8}{16y^4}\right)^{-1}$ or $\frac{64x^2y^4}{4x^{10}}$ or $\frac{\frac{1}{4}x^{-10}}{\frac{1}{64}x^{-2}y^{-4}}$			M1 for two of reciprocating or simplifying or squaring
		$\frac{16y^4}{x^8}$		A1 accept $16y^4x^{-8}$ or $\frac{16}{y^{-4}x^8}$ or $\frac{16x^{-8}}{y^{-4}}$ oe
	ALTERNATIVE			
			3	M2 for 2 correct terms (M1 for 1 correct term)
		$\frac{16y^4}{x^8}$		A1 accept $16y^4x^{-8}$ or $\frac{16}{y^{-4}x^8}$ or $\frac{16x^{-8}}{y^{-4}}$ oe
				Total 3 marks

Qn	Working	Answer	Mark	Notes
18	$2(x^2 - 6x) + 3$ or $2(x^2 - 6x + \frac{3}{2})$		3	M1 or for one of a , b or c correct OR expanding $a(x^2 + 2bx + b^2) + c$
	$2\left[(x-3)^2 - 9\right] + 3$ or $2\left[(x-3)^2 - 3^2 + \frac{3}{2}\right]$ oe			M1 or for two of a , b or c correct OR $-12 = 2ab$ or $3 = ab^2 + c$
		$2(x-3)^2 - 15$		A1 accept $a = 2$, $b = -3$, $c = -15$
				Total 3 marks

Qn	Working	Answer	Mark	Notes
19	eg $(fg(x)) = (2x+1)^2 - 4$		4	M1 for finding $fg(x)$
	eg $4x^2 + 4x - 3 (> 0)$ or $4x^2 + 4x - 3 (= 0)$ or $(2x+1)^2 > 4$ or $(2x+1)^2 = 4$			M1 For a correct expansion and $fg(x)$ written as a 3 term quadratic or a start to write quadratic in correct form for completing square
	$-\frac{3}{2}$ oe (and) $\frac{1}{2}$ oe			A1 for finding the two correct critical values (dep on previous M1) (values seen with any signs between)
		$x < -\frac{3}{2}, x > \frac{1}{2}$		A1 two fully correct inequalities, oe (dep on 2nd M1)
				Total 4 marks

Qn	Working	Answer	Mark	Notes	
20	$(3+2y)^2 - y^2 + 2(3+2y) = 10$	$x^2 - \left(\frac{x-3}{2}\right)^2 + 2x = 10$	5	M1	for using correct substitution of a linear equation into the quadratic – all terms shown correctly
	eg $3y^2 + 16y + 5 (= 0)$	eg $3x^2 + 14x - 49 (= 0)$ $3x^2 + 14x = 49$		A1	for a correct 3 term quadratic
	eg $(3y+1)(y+5)(=0)$ or $\frac{-16 \pm \sqrt{16^2 - 4 \times 3 \times 5}}{2 \times 3}$ or $3 \left[\left(y + \frac{8}{3}\right)^2 - \left(\frac{8}{3}\right)^2 \right] + 5 = 0$ (should give $(y =) -\frac{1}{3}, -5$)	eg $(3x-7)(x+7)(=0)$ or $\frac{-14 \pm \sqrt{14^2 - 4 \times 3 \times (-49)}}{2 \times 3}$ or $3 \left[\left(x + \frac{7}{3}\right)^2 - \left(\frac{7}{3}\right)^2 \right] - 49 = 0$ (should give $(x =) \frac{7}{3}, -7$)		M1	dep on M1 method to solve their 3 term quadratic using any correct method (allow one sign error and some simplification – allow as far as eg $\frac{-16 \pm \sqrt{256 - 60}}{6}$ or $\frac{-14 \pm \sqrt{196 + 588}}{6}$ or if factorising allow brackets which expanded give 2 out of 3 terms correct) or correct values for x or correct values for y
	eg $x = 3 + 2 \times -5$ and $x = 3 + 2 \times -\frac{1}{3}$	eg $\frac{7}{3} - 2 \times y = 3$ $-7 - 2 \times y = 3$		M1ft	dep on previous M1 for substituting their 2 found values of x or y in a suitable equation (use 2dp or better for substitution) or fully correct values for the other variable (correct labels for x / y)
		$x = \frac{7}{3}, y = -\frac{1}{3}$ $x = -7, y = -5$		A1	dep on M1 (allow coordinates) must be paired correctly allow $x = -7, y = -5$ $x = 2.33(3...), y = -0.33(3...)$
					Total 5 marks

Qn	Working	Answer	Mark	Notes
21	eg $\frac{20}{x^2-36} - \frac{2(x+6)}{x^2-36}$ oe or $\frac{20}{(x-6)(x+6)} - \frac{2(x+6)}{(x-6)(x+6)}$ oe or $\frac{20(x-6)}{(x^2-36)(x-6)} - \frac{2(x+6)(x-6)}{(x^2-36)(x-6)}$ or $\frac{20-2(x+6)}{(x^2-36)(4-x)}$ oe		3	M1 for writing the first two fractions with a common denominator (may be a single denominator) or multiplying both fractions by $\frac{1}{4-x}$ and writing over a common denominator
	eg $\frac{8-2x}{x^2-36} \times \frac{1}{4-x}$ or $\frac{8-2x}{(x-6)(x+6)} \times \frac{1}{4-x}$ or $\frac{20x-2x^2-48}{(x^2-36)(x-6)} \times \frac{1}{4-x}$ oe $\frac{8-2x}{(x^2-36)(4-x)}$ oe			M1 for simplifying first 2 fractions to a single fraction and expanding and simplifying numerator – must be correct, and showing intention to multiply by $\frac{1}{4-x}$ or expanding the numerator of the full solution and writing as a single fraction
		$\frac{2}{x^2-36}$		A1 oe eg $\frac{2}{(x-6)(x+6)}$
				Total 3 marks

Qn	Working	Answer	Mark	Notes
22	$(4^n =)(2^2)^n$ or $(4^n =)2^{2n}$ oe eg $2^k \div 2^{2n} = 2^x$ or $2^k = 4^{\frac{1}{2}k}$ and $2^x = 4^{\frac{1}{2}x}$ oe eg $\frac{4^{\frac{1}{2}k}}{4^n} = 4^{\frac{1}{2}x}$		2	M1 for writing 4^n as $(2^2)^n$ or 2^{2n} or for writing each term in terms of 4 ie $2^k = 4^{\frac{1}{2}k}$ and $2^x = 4^{\frac{1}{2}x}$ If these things are seen in working, award this mark even if followed by incorrect working – if not a choice of methods
		$k - 2n$		A1 allow 2^{k-2n}
				Total 2 marks

Qn	Working	Answer	Mark	Notes
23 (a)(i)		$(-3, -1)$	1	B1
(ii)		$(-3, 7)$	1	B1
(b)		$(p+c, -q)$	2	B2 for $(p+c, -q)$ (B1 for $p+c$ or $-q$ in the correct place)
				Total 4 marks

Qn	Working	Answer	Mark	Notes
24	$(\sqrt{2}-1)^2 = 2 - \sqrt{2} - \sqrt{2} + 1 (= 3 - 2\sqrt{2})$	$\frac{(3+\sqrt{8})}{(\sqrt{2}-1)^2} \times \frac{(\sqrt{2}+1)^2}{(\sqrt{2}+1)^2}$		4 M1 expand the denominator (accept $2 - 2\sqrt{2} + 1$ - must see expansion) OR method to rationalise using $(\sqrt{2}+1)^2$
	$\frac{(3+\sqrt{8})}{(3-2\sqrt{2})} \times \frac{(3+2\sqrt{2})}{(3+2\sqrt{2})}$	$(\sqrt{2}-1)^2 = 2 - \sqrt{2} - \sqrt{2} + 1 (= 3 - 2\sqrt{2})$ or $(\sqrt{2}+1)^2 = 2 + \sqrt{2} + \sqrt{2} + 1 (= 3 + 2\sqrt{2})$ or $(\sqrt{2}-1)(\sqrt{2}+1) = 2 - \sqrt{2} + \sqrt{2} - 1 (= 1)$		M1 oe ft $3 - 2\sqrt{2}$ method to rationalise OR expansion of $(\sqrt{2}-1)^2$ (accept $2 - 2\sqrt{2} + 1$) or $(\sqrt{2}+1)^2$ (accept $2 + 2\sqrt{2} + 1$) or $(\sqrt{2}-1)(\sqrt{2}+1)$
	eg $\frac{9+6\sqrt{2}+3\sqrt{8}+8}{9-6\sqrt{2}+6\sqrt{2}-8}$ or $\frac{9+12\sqrt{2}+8}{9-8}$ or $\frac{9+6\sqrt{2}+3\sqrt{8}+8}{1}$ or $\frac{9+12\sqrt{2}+8}{1}$			M1 dep on 2nd M1 correct expansion of brackets
			17 + $\sqrt{288}$	A1 or $p=17, q=288$ answer from fully correct working with intermediate steps of working seen
				Total 4 marks

Qn	Working	Answer	Mark	Notes
25	$\text{eg } \left(\frac{1}{2}\right)^4 \left(= \frac{1}{16} \text{ or } 0.0625\right)$ $\text{or } 4\left(\frac{1}{2}\right)^4 \left(= \frac{4}{16} \text{ or } \frac{1}{4} \text{ or } 0.25\right) \text{ or}$ $6\left(\frac{1}{2}\right)^4 \left(= \frac{6}{16} \text{ or } \frac{3}{8} \text{ or } 0.375\right) \text{ oe}$		3	M1 for finding the probability of one correct combination eg calculation for oooo or eeee or $4 \times eooo$ or $4 \times eeeo$ or $6 \times eooo$
	$\text{eg } 1 - \left(\frac{1}{2}\right)^4 \text{ or } 4\left(\frac{1}{2}\right)^4 + 6\left(\frac{1}{2}\right)^4 + 4\left(\frac{1}{2}\right)^4 + \left(\frac{1}{2}\right)^4$ or $(e + oe + ooe + oooo)$ $\frac{1}{2} + \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} + \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2} \times \frac{1}{2}$ $\left(= \frac{1}{2} + \frac{1}{4} + \frac{1}{8} + \frac{1}{16}\right) \text{ oe}$			M1 for a complete method
		$\frac{15}{16}$		A1 oe eg 0.9375 (allow 0.937 or 0.938)
Total 3 marks				

WEEK 2 TASK 3

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.

$$\begin{array}{lcl}
 60\% & = & 660 \\
 \div 60 & & \div 60 \\
 \hline
 1\% & = & \pounds 11 \\
 \times 100 & & \times 100 \\
 \hline
 100\% & = & \pounds 1100
 \end{array}$$

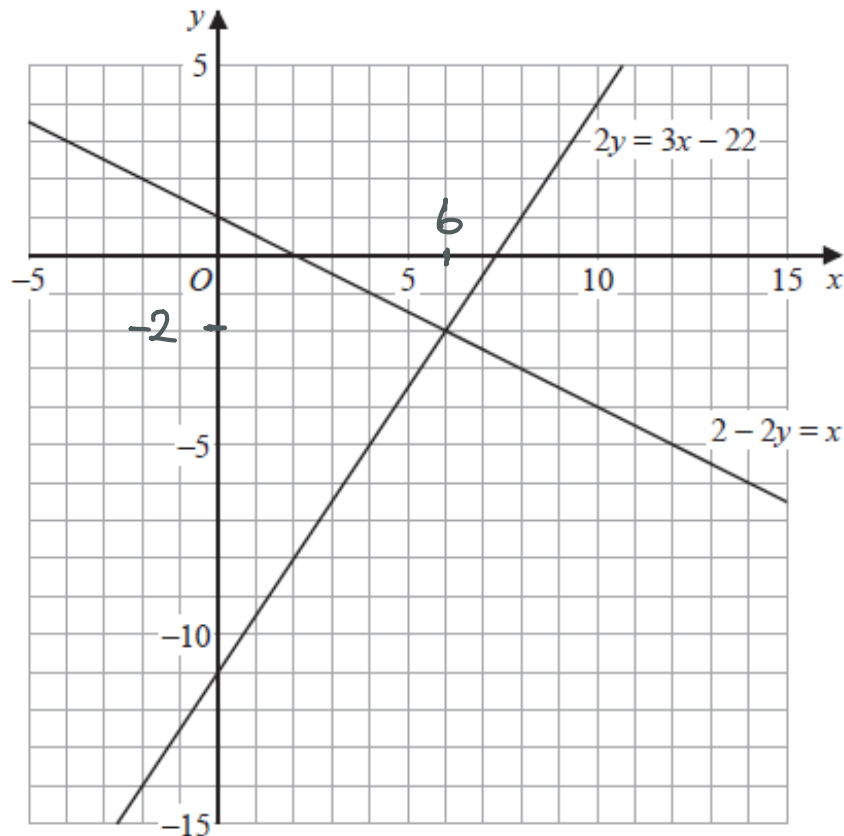
1 mark

$$\begin{array}{l}
 100\% \\
 60\% \quad 40\% \\
 \hline
 660
 \end{array}$$

$$\pounds \boxed{1100} \text{ Final mark}$$

£
 (Total for Question 1 is 2 marks)

*2



Use these graphs to solve the simultaneous equations

$$\begin{array}{l}
 2 - 2y = x \\
 2y = 3x - 22
 \end{array}$$

$$\begin{array}{l}
 x = \boxed{6} \\
 y = \boxed{-2}
 \end{array}$$

1 mark

(Total for Question 2 is 1 mark)

- 3 Write $\frac{(6x^5y^3)^2}{3x^2y^7 \times 4xy^{-3}}$ in the form ax^by^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:

$$\frac{36x^{10}y^6}{12x^3y^4}$$

1 mark

$$3x^7y^2$$

Final mark

(Total for Question 3 is 3 marks)

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

$$16 = 4^2 \quad \frac{1}{4^2} = 4^{-2}$$

$$4^{-2}$$

1 mark

(1)

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

$$8^{\frac{5}{3}} \rightarrow \sqrt[3]{8^5} = 2^5 = 32$$

1 mark for either of these

$$9^{\frac{3}{2}} \rightarrow \sqrt{9^3} = 3^3 = 27$$

$$32 - 27 = 5$$

$$32 - 27 = 5$$

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

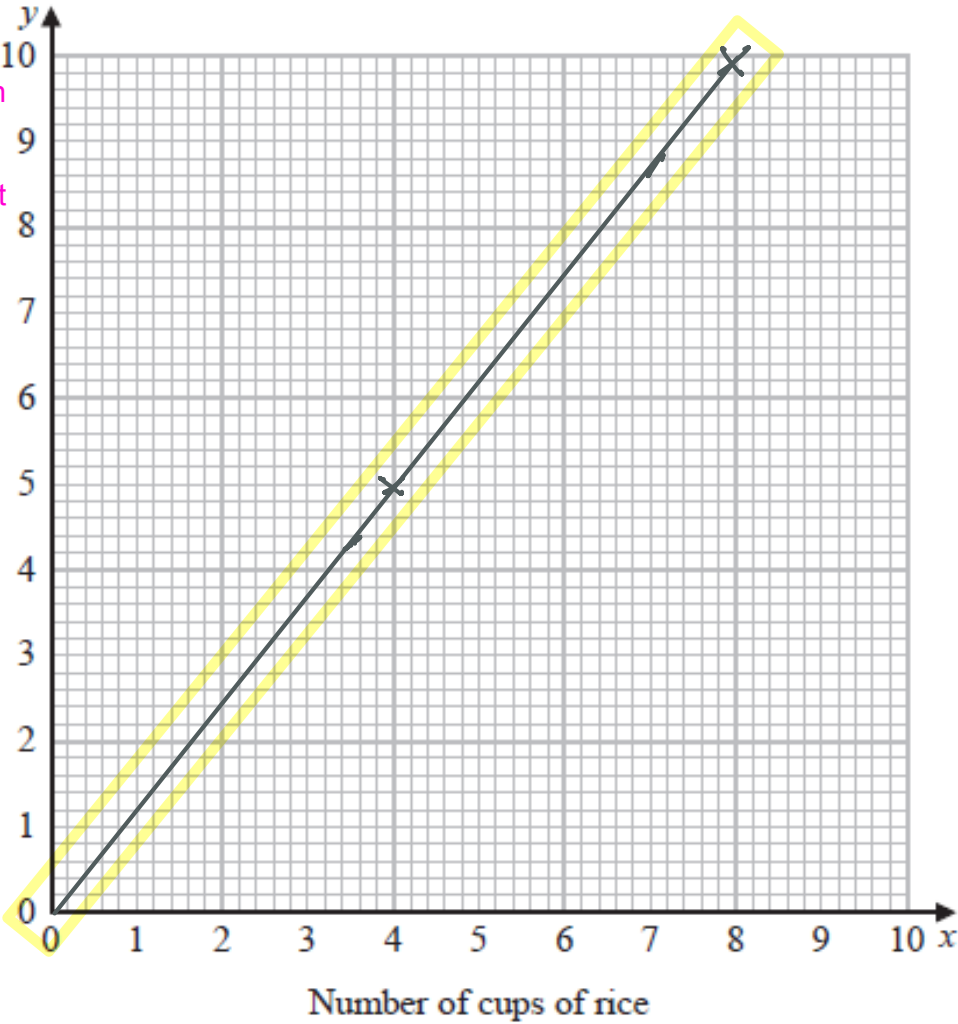
(a) Use this information to draw a graph to show the relationship between the number of cups of rice and the number of cups of water needed to cook rice.

2 marks for correct line drawn

1 mark for plotting two correct points on the line

Number of cups of water

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

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

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

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 $6x^2 - 5x - 4$

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

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

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

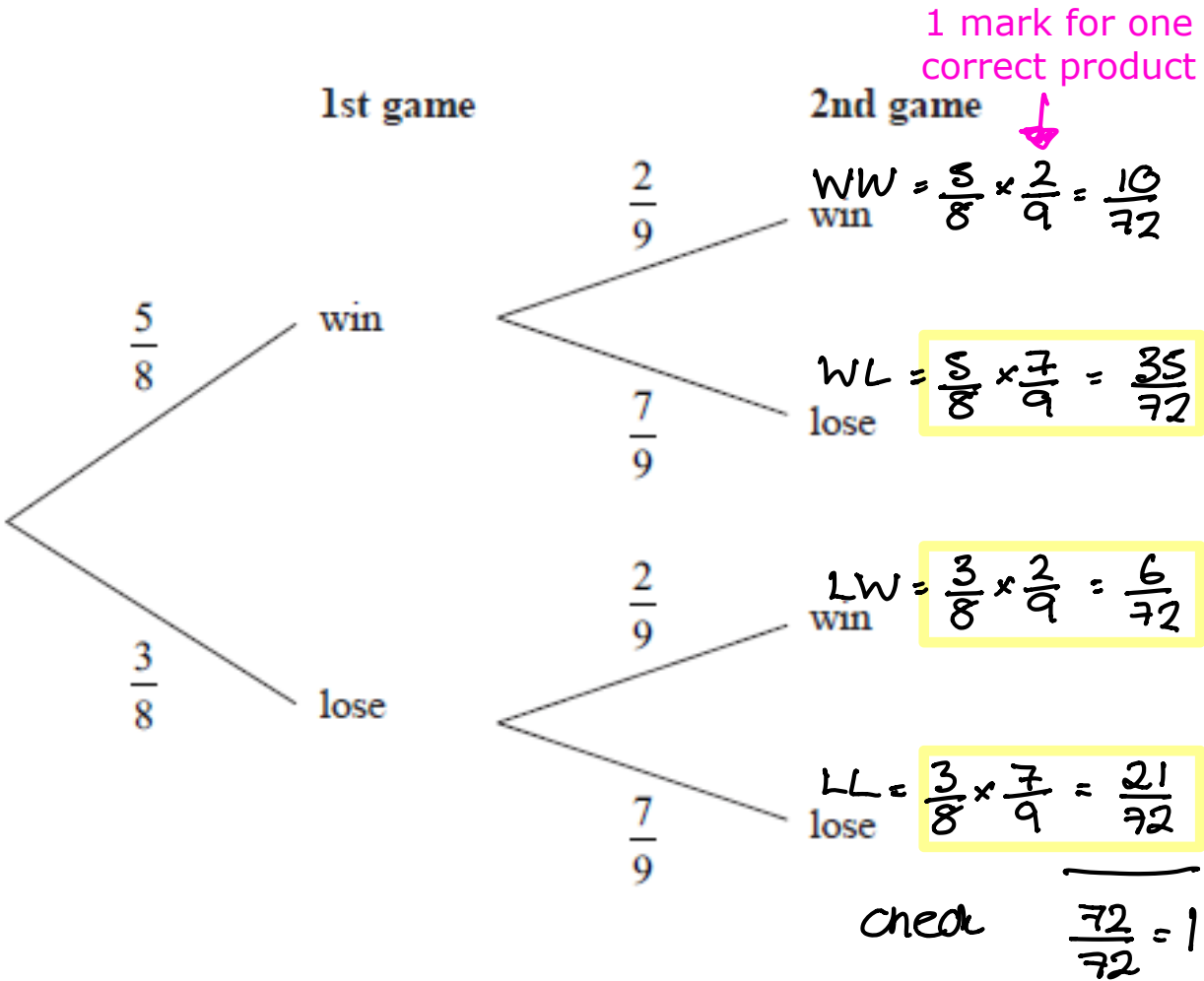
$$(3x-4)(2x+1)$$

2 marks

1 mark may be awarded if not fully correct for $(3x-4)(2x+1)$ (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.



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

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

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

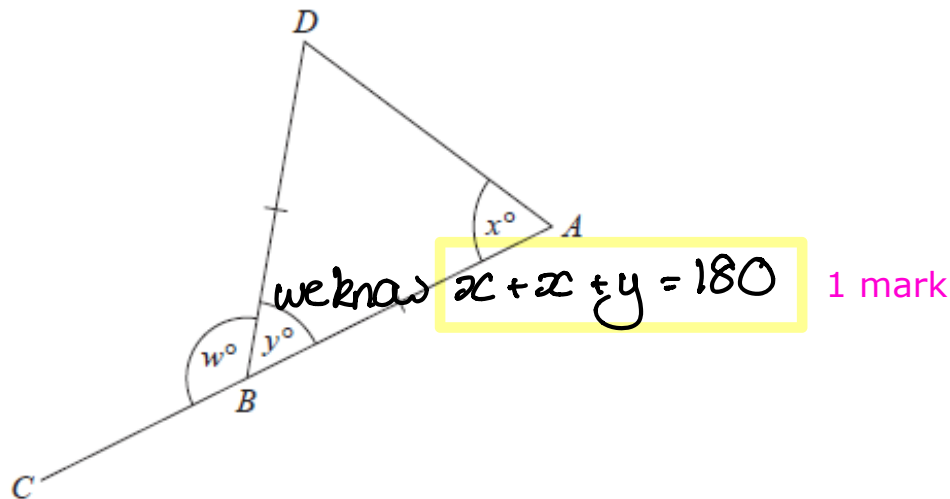
1 mark

Final mark

$$\frac{62}{72}$$

(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 .

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

so using $x + x + y = 180$

$2y + 2y + y = 180$

$5y = 180$

$y = 180 \div 5$

$y = 36$

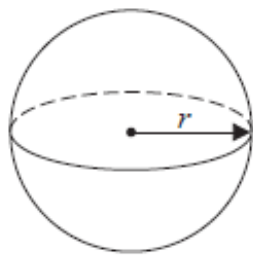
$$\begin{array}{r} 36 \\ 5 \overline{) 180} \\ \underline{15} \\ 30 \\ \underline{30} \\ 0 \end{array}$$

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 $75\pi \text{ cm}^2$

Find the diameter of the sphere.

Give your answer in the form $a b$ where a is an integer and b is a prime number.

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

$$25\pi \times 8 = 200\pi$$
 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
$$= 5\sqrt{2}$$

$$\text{so diameter} = 10\sqrt{2}$$

$$10\sqrt{2}$$

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.

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

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

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

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

1 mark for either of these

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

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

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

$$\frac{1}{3}$$

Final mark

(Total for Question 11 is 4 marks)

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

2 marks for fully correct diagram

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

1 mark may be given if:

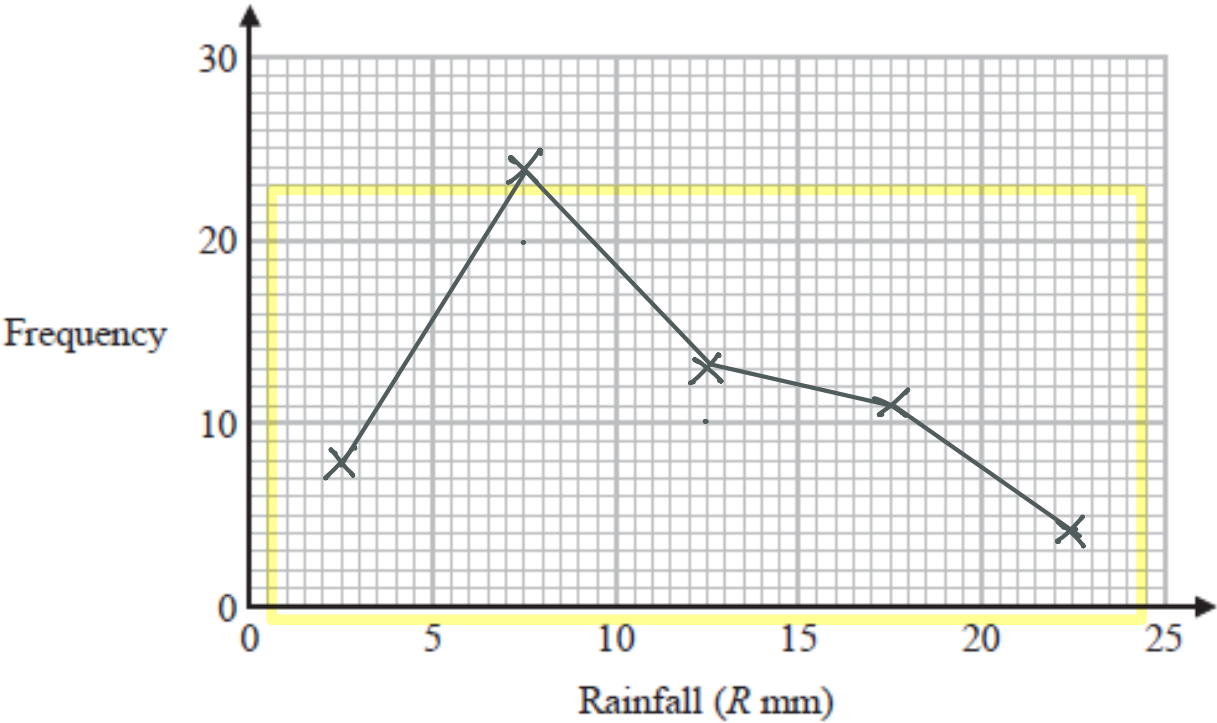
Points correct but not joined, or

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 2 TASK 4

Qn	Working	Answer	Mark	Notes
1	$5 \times 12 (= 60)$ or $\frac{15+7-2+23+x}{5} = 12$ oe or $\frac{x + "43"}{5} = 12$		3	M1 for a method to find the total of the 5 numbers or setting up an equation in x “43” comes from $15 + 7 - 2 + 23$
	$x + 15 + 7 - 2 + 23 = "60"$ or $x + "43" = "60"$ or “60” – $(15 + 7 - 2 + 23)$			M1 for forming an equation with their 60 or for a complete calculation to find the value of x “43” comes from $15 + 7 - 2 + 23$
		17		A1
				Total 3 marks

Qn	Working	Answer	Mark	Notes
2 (a)		8 800 000	1	B1
(b)		Barcelona	1	B1 accept 5.5×10^6
(c)	$3.7 \times 10^7 - 7.7 \times 10^6$ or 29 300 000 oe or 37 000 000 – 7 700 000 or 29 000 000 oe or $0.29(3) \times 10^8$ or $29(.3) \times 10^6$		2	M1 allow $2.9(3) \times 10^n$ ($n \neq 7$)
		2.9×10^7		A1 accept -2.9×10^7 accept 2.93×10^7 or -2.93×10^7
				Total 4 marks

Qn	Working	Answer	Mark	Notes
3	eg $10p = 3p - 5$ or $p = \frac{3p}{10} - \frac{5}{10}$ oe eg $p = 0.3p - 0.5$		3	M1 for a correct first step – multiplying both sides by 10 correctly or writing the RHS as 2 terms each over 10 or each term as a decimal [must be in a correct equation]
	eg $10p - 3p = -5$ or $7p = -5$ or $p - \frac{3p}{10} = -\frac{5}{10}$ or $0.7p = -0.5$			M1ft (ft a 3 term equation) for collecting terms in p on one side and number the other
		$-\frac{5}{7}$		A1 (dep on at least M1) for $-\frac{5}{7}$ oe, accept $-0.71(4\dots)$ allow -0.7 if you have seen $-\frac{5}{7}$ or $-5 \div 7$
				Total 3 marks

Qn	Working	Answer	Mark	Notes																
4	eg $2 \times 2 \times 300$ $2 \times 5 \times 120$ $2 \times 3 \times 200$ $3 \times 5 \times 80$ or eg 1200 2 600 3 200 or <table><tr><td>2</td><td>1200</td></tr><tr><td>3</td><td>600</td></tr><tr><td></td><td>200</td></tr></table>	2	1200	3	600		200		3	M1 for at least 2 correct stages in prime factorisation which give 2 prime factors – may be in a factor tree or a table or listed eg 2, 2, 300 (allow no more than one mistake ft (eg <i>one mistake</i> with 2 prime factors ft $1200 = 20 \times 600 = 2 \times 10 \times 3 \times 200$))										
2	1200																			
3	600																			
	200																			
	2, 2, 2, 2, 3, 5, 5 or 1200 2 600 3 200 2 100 5 20 5 10 2 2 2 5 2 5 oe <table><tr><td>2</td><td>1200</td></tr><tr><td>3</td><td>600</td></tr><tr><td>2</td><td>200</td></tr><tr><td>5</td><td>100</td></tr><tr><td>2</td><td>20</td></tr><tr><td>5</td><td>10</td></tr><tr><td>2</td><td>2</td></tr><tr><td></td><td>(1)</td></tr></table>	2	1200	3	600	2	200	5	100	2	20	5	10	2	2		(1)			M1 for finding the correct prime factors condone inclusion of 1 (may be seen in a fully correct factor tree or ladder)
2	1200																			
3	600																			
2	200																			
5	100																			
2	20																			
5	10																			
2	2																			
	(1)																			
		$2^4 \times 3 \times 5^2$		A1 (dep on M2 as working requested) Can be in any order (allow $2^4 \cdot 3 \cdot 5^2$) but must be in index form as asked for.																
				Total 3 marks																

Qn	Working	Answer	Mark	Notes	
5	18000×0.15 (= 2700) oe or 18000×0.85 (= 15 300) oe		3	M1 for finding 15% or 85% of 18 000	M2 for 18000×0.85 ⁴ oe or 18000×0.85 ⁵ (= 7986.(69...)) oe
	eg 18000×0.85 ⁴ oe or "15300"×0.85×0.85×0.85 oe or "15300"×0.85(=13005) oe and "13005"×0.85(=11054.25) oe and "11054.25"×0.85 oe			M1 (dep) for a complete method	
		9396		A1 awrt 9396	
				If no marks awarded, award SCB1 for or 18000 × 0.85 ² (= 13 005) oe or 18000×0.85 ³ (= 11 054.(25)) oe or 18 000 × 0.4 (= 7200) oe or 18 000 × 1.15 (= 20700) oe or 18 000 × 1.15 ⁴ (= 31482.(1125)) oe	
				Total 3 marks	

Qn	Working	Answer	Mark	Notes
6	$1 + 0.12 (= 1.12)$ oe or $100(\%) + 12(\%) (=112(\%))$ or $\frac{18.20}{112} (= \frac{13}{80} = 0.1625)$ or $x + 0.12x = 18.2(0)$ or $x \times 1.12 = 18.2(0)$		3	M1
	eg $18.2(0) \div "(1 + 0.12)"$ oe or $\frac{18.2(0)}{"112"} \times 100$ oe			M1 for a complete method
		16.25		A1
				Total 3 marks

Qn	Working	Answer	Mark	Notes
7	$(AB^2 =) 7.5^2 - 6^2 (= 20.25)$ or $\text{eg } (BAC =) \sin^{-1}\left(\frac{6}{7.5}\right) (= 53.1\dots)$ or $\cos(BCA) = \frac{6}{7.5} (= 0.8)$		6	M1 for a correct first step to find AB or a complete method to find angle BAC or a correct first step to find angle BCA
	$(AB =) \sqrt{7.5^2 - 6^2} (= 4.5)$ or $(AB =) \frac{6}{\tan "53.1"} (= 4.5\dots)$ or $(AB =) 7.5 \cos "53.1" (= 4.5\dots)$ or $(BCA =) \cos^{-1}\left(\frac{6}{7.5}\right) (= 36.8\dots)$			M1 for a complete method to find AB or angle BCA
	$(\text{Area } ABC =) \frac{1}{2} \times 6 \times "4.5" (= 13.5)$ or $(\text{Area } ABC =) \frac{1}{2} \times 6 \times 7.5 \times \sin("36.8") (= 13.47\dots \text{ or } 13.5)$			M1 ft [their labelled AB] or [their labelled BCA] eg for $\frac{1}{2} \times 6 \times$ [their labelled AB] or $\frac{1}{2} \times 6 \times 7.5 \times \sin$ [their labelled BCA]
	$(\text{Area } DAC =) 31.5 - "13.5" (= 18)$ or $"13.5" + 0.5 \times 7.5 \times AD = 31.5$ oe			M1 ft (dep on previous M1) allow $31.5 -$ [their area]
	$(AD =) ("18" \div 7.5) \div 0.5$ oe			M1 for a complete method to find AD , dependent on correct working
		4.8		A1 accept 4.78 – 4.81
				Total 6 marks

Qn	Working	Answer	Mark	Notes
8	eg ($V=$) $\pi \times \left(\frac{18}{2}\right)^2 \times 3.5$ (= 890.(64...) or $\frac{567}{2}\pi$)		3	M1 correct method to calculate volume
	eg $(7.04 \times 1000) \div \text{"890.64"}$			M1 correct method to calculate density (if volume is incorrect, their value can be used if clearly labelled) accept use of 7.04 or an incorrect conversion from kg to g for mass
		7.9		A1 accept 7.9 – 7.92
				Total 3 marks

Qn	Working	Answer	Mark	Notes
9	$\sqrt{36} (= 6) \text{ or } 6 \text{ or } 6 \times 6$		4	M1 for method to find the length of the square – may be seen in later working
	eg $\pi \times \left(\frac{[\text{their } 6]}{2} \right)^2 \div 2 (= 14.1... \text{ or } 4.5\pi \text{ or } \frac{9}{2}\pi)$ or $\pi \times \left(\frac{[\text{their } 6]}{2} \right)^2 (= 28.2... \text{ or } 9\pi)$			M1 for method to find the area of one semicircle or circle or the incorrect number of semicircles or circles provided correct area of circle formula is seen for [their 6] allow any value if there is a clear implication this is their side length of square.
	eg $4 \times "14.1" (= 56.5... \text{ or } 18\pi)$ or $2 \times "28.2" (= 56.5... \text{ or } 18\pi)$			M1 ft dep on previous M1 for a complete method to find the total area of the semicircles [if the pupil multiplies again and uses the incorrect number of circles or semicircles this mark is not awarded]
		92.5		A1 accept 92.4 – 92.6 (not in terms of π)
				Total 4 marks

Qn	Working	Answer	Mark	Notes
10	eg $\tan BAP = \frac{2}{5}$ or $\sin BAP = \frac{2}{\sqrt{5^2 + 2^2}}$ or $\frac{\sin BAP}{2} = \frac{\sin 90}{\sqrt{5^2 + 2^2}}$ $\cos BAP = \frac{5}{\sqrt{5^2 + 2^2}}$ or $\cos BAP = \frac{5^2 + (\sqrt{5^2 + 2^2})^2 - 2^2}{2 \times 5 \times \sqrt{29}}$		5	M1 for setting up a trig equation for angle BAP
	eg $(BAP =) \tan^{-1}\left(\frac{2}{5}\right) (= 21.8\dots)$ or $(BAP =) \sin^{-1}\left(\frac{2}{\sqrt{5^2 + 2^2}}\right)$ or $(BAP =) \sin^{-1}\left(\frac{2 \sin 90}{\sqrt{5^2 + 2^2}}\right)$ $(BAP =) \cos^{-1}\left(\frac{5}{\sqrt{5^2 + 2^2}}\right)$ or $BAP = \cos^{-1}\left(\frac{5^2 + (\sqrt{5^2 + 2^2})^2 - 2^2}{2 \times 5 \times \sqrt{5^2 + 2^2}}\right)$			M1 for a complete method to find angle BAP ($= 21.8\dots$) [M2 for $90 - \tan^{-1} \frac{5}{2}$ ie $90 - 68.2$]
	eg (int angle $=$) $(6 - 2) \times 180 \div 6 (= 120)$ or (ext angle $=$) $360 \div 6 (= 60)$			M1 Indep for a method to find the size of one interior or one exterior angle in a regular hexagon – could be seen on diagram
	eg “120” – “21.8” or 180 – “60” – “21.8”			M1 for a complete method to find angle PAF where all values have come from a correct method
		98.2		A1 accept 98.1 – 98.3
				Total 5 marks

Qn	Working	Answer	Mark	Notes
11 (a)		$3^2 \times 5 \times 7$	1	B1 accept $3 \times 3 \times 5 \times 7$ oe or 315
(b)		$3^{11} \times 5^7 \times 7^5$	2	B2 fully correct answer (allow $x = 11, y = 7, z = 5$) (B1 for an answer in the form $3^p \times 5^q \times 7^r$ where one or two of p, q or r are correct)
				Total 3 marks

Qn	Working	Answer	Mark	Notes
12	eg $0.45 \times 180 (= 81)$ oe OR $\frac{15}{180} \left(= \frac{1}{12} \text{ or } 0.0833... \right)$ OR $\frac{15}{180} \times 100 (= 8.3(33...) \%)$		4	M1 for a method to find the number of students studying German OR the number of students studying French as a fraction or decimal of the total students OR a method to find the percentage of students studying French 81 may be seen as part of an equation
	eg $180 - 15 - "81" (= 84)$ or $"81" + 15 (= 96)$ OR $1 - \left(\frac{1}{12} + \frac{45}{100} \right) = \left(\frac{7}{15} \text{ or } 0.466... \right)$ or $\frac{1}{12} + \frac{45}{100} = \left(\frac{8}{15} \text{ or } 0.533... \right)$ OR $100 - ("8.3" + 45) (= 46.6(66...) \text{ or } 46.7 \%)$ or $"8.3" + 45 (= 53.3(33...) \text{ or } 53.3 \%)$			M1 for a method to find the number of students studying Italian/Spanish or French/German OR a method to find the fraction or decimal of students studying Italian/Spanish or French/German OR a method to find the percentage of students studying Italian/Spanish or French/German 84 or 96 may be seen as part of an equation
	eg $\frac{"84"}{180 - "84"} (\times 100) \left(= \frac{7}{8} \text{ or } 0.875 \right)$ or $\frac{"84"}{"96"} (\times 100) \left(= \frac{7}{8} \text{ or } 0.875 \right)$ or $\frac{7}{15} "÷" \frac{8}{15} " \left(= \frac{7}{8} \text{ or } 0.875 \right)$ or $\frac{46.6}{53.3} " (\times 100) (= 0.872...)$			M1 for a complete method to find the fraction or decimal or percentage of Italian/Spanish to French/German
		87.5		A1 accept 87.2 – 87.7

Qn	Working	Answer	Mark	Notes
13	$PRS = 90$ or $PQS = 90$ or $PSR = 180 - 136 (= 44)$		3	M1 may be seen on diagram. Must be labelled on diagram or identified using 3 letter notation.
	$RPS = 180 - 90 - "44"$ oe or $RQS = 136 - 90 (= 46)$			M1 for a complete method
		46		A1
				Total 3 marks

Qn	Working	Answer	Mark	Notes
14	eg $2 \times \pi \times 5.2 (= 32.6... \text{or } \frac{52}{5} \pi)$ oe		3	M1 for finding the whole circumference or the arc length
	$\frac{67}{360} \times 2 \times \pi \times 5.2 (= 6.08... \text{or } \frac{871}{450} \pi)$ oe			
	$\frac{67}{360} \times 2 \times \pi \times 5.2 + 2 \times 5.2$ oe			M1 for a complete method
		16.5		A1 accept 16.4 - 16.5 (not in terms of π)
				Total 3 marks

Qn	Working	Answer	Mark	Notes
15	eg $\frac{158+C}{2} = 160$ or $(C =) 160 + (160 - 158) (= 162)$ oe or $C = 162$		3	M1 for method to find Candela's height or Candela's height or Candela's height in the wrong place on the answer line
	eg $(D =) 175 - 21 (= 154)$ oe			M1 indep for method to find Diana's height or Diana's height or Diana's height in the wrong place on the answer line
		Candela 162 Diana 154		A1 Correctly attributed If no marks awarded, SCB1 for Candela's height 179
				Total 3 marks

Qn	Working	Answer	Mark	Notes
16	$\frac{1}{2} \times 6 \times 11 \times \sin 118 (= 29.1...)$		3	M1 for the area of half of the kite
	eg $2 \times \frac{1}{2} \times 6 \times 11 \times \sin 118$			M1 for a complete method
		58.3		A1 accept 58.2 – 58.3
				Total 3 marks

Qn	Working	Answer	Mark	Notes
17 (a)	eg $6 \times 2.4 + 5 \times 3.5$		2	M1
		31.9		A1 oe
(b)	$(W =) 5.9n$ or $(W =) 5.9(n - 1) + 2.4$ or $(W =) 2.4n + 3.5(n - 1)$		2	M1 for $2.4n + 3.5n$ or $5.9n$ seen
		$5.9n - 3.5$		A1 oe but must be in simplest form eg $-3.5 + 5.9n$
				Total 4 marks

Qn	Working	Answer	Mark	Notes
18	77.5 or 82.5 or 2.65 or 2.75 or 32.5 or 33.5 or 0.95 or 1.05 or 77500 or 82500 or 159 or 165 or 32500 or 33500 or 57 or 63		4	B1 For a UB or LB for one of the distances or times in hours or in minutes
	eg $82.5 \div 2.65 (= 31.13\dots)$ or $82500 \div 159 (= 518.867\dots)$ or km/min or m/h			M1 for a method to find the upper bound of Kaidan's average speed eg $UB_K \div LB_K$ where $80 < UB_K \leq 82.5$ and $2.65 \leq LB_K < 2.7$ or use of m/min to find upper bound for Kaidan's average speed eg $UB_K \div LB_K$ where $80000 < UB_K \leq 82500$ and $159 \leq LB_K < 162$ can use km/min or m/h
	eg $32.5 \div 1.05 (= 30.95\dots)$ or $32500 \div 63 (= 515.873\dots)$ or km/min or m/h			M1 indep for a method to find the lower bound of Sonja's average speed eg $LB_S \div UB_S$ where $32.5 \leq LB_S < 33$ and $1 < UB_S \leq 1.05$ or use of m/min to find lower bound for Sonja's average speed $LB_S \div UB_S$ where $32500 \leq LB_S < 33000$ and $60 < UB_S \leq 63$ can use km/min or m/h
	$UB K = 31132\dots$ m/h $LB S = 30952\dots$ m/h $UB K = 0.51886\dots$ km/min $LB S = 0.51587\dots$ km/min	Shown		A1 shown with accurate figures in the same units – sufficient figures for comparison (can be truncated) but must be from correct working and UB for Kaidan and LB for Sonja selected eg UB Kaidan = 31.13... (km/h) and LB Sonja = 30.95... (km/h) or UB Kaidan = 518.867...(m/min) and LB Sonja = 515.873...(m/min) (dep on correct method)
				Total 4 marks

Qn	Working	Answer	Mark	Notes
19	(area $PQS = \frac{1}{2} \times 6.1 \times 3.8 \times \sin P = 9$ or (area $PQRS = 6.1 \times 3.8 \times \sin P = 18$	$\frac{1}{2} \times 6.1 \times SX = 9$ or $(SX =) \frac{9}{\frac{1}{2} \times 6.1} (= 2.95...)$ or $6.1 \times SX = 18$ or $(SX =) 18 \div 6.1 (= 2.95...)$	5	M1 correct equation for the area of the triangle or parallelogram or a calculation to find the height of the parallelogram (where X is the point vertically below S on PQ)
	eg $(\sin P =) \frac{9}{\frac{1}{2} \times 6.1 \times 3.8} (= 0.776... \text{ or } \frac{900}{1159})$ or $(\sin P =) \frac{18}{6.1 \times 3.8} (= 0.776... \text{ or } \frac{900}{1159})$	$(PX^2 =) 3.8^2 - "2.95..."^2 (= 5.73...)$ or $(PX =) \sqrt{3.8^2 - "2.95..."^2} (= 2.39...)$		M1 correct expression for $\sin P$ OR for start of Pythagoras method to find length of PX (where X is the point vertically below S on PQ)
	$(P =) \sin^{-1} "0.776..." (= 50.9...)$	$(QX =) 6.1 - \sqrt{5.73"} (= 3.70...)$ or $(QX =) 6.1 - "2.39" (= 3.70...)$		M1 for complete method to find angle P OR for method to find length of QX
	$(QS^2 =) 3.8^2 + 6.1^2 - 2 \times 3.8 \times 6.1 \times \cos("50.9") (= 22.4...)$ or $(QS =) \sqrt{3.8^2 + 6.1^2 - 2 \times 3.8 \times 6.1 \times \cos("50.9")}$	$(QS^2 =) "2.95..."^2 + "3.70..."^2 (= 22.4...)$ or $(QS =) \sqrt{"2.95..."^2 + "3.70..."^2}$		M1 correct expression for QS^2 (or QS)
		4.74		A1 accept 4.73 – 4.74
				Total 5 marks

Qn	Working	Answer	Mark	Notes
20	eg $(x =) 4 - (6 - 4) (= 2)$ $(y =) 7 - (11 - 7) (= 3)$ or $(2, 3)$		4	M1 for a method to find the coordinates of P (accept coordinates of P informally eg separately or as a vector)
	eg $\frac{11-7}{6-4} (= 2)$ or $\frac{11-[3]}{6-[2]} (= 2)$ oe or $\frac{[3]-7}{[2]-4} (= 2)$ oe			M1 (indep if using coordinates of A & O) for a method to find the gradient of AOP (can use their coordinates of P)
	eg $-1 \div [2] (= -0.5)$ oe			M1ft for a method to find the gradient of the tangent ft their stated gradient of AOP (or OA or OP) (could be embedded)
		$y - 3 = -0.5(x - 2)$		A1 oe eg $y = -\frac{1}{2}x + 4$
				Total 4 marks

Qn	Working	Answer	Mark	Notes
21	eg $(7.5+2.5) - 6 = 4$ large squares represents 8 trees or $5 \times 37.5 + 5 \times 12.5 - 10 \times 15 = 100$ small squares represents 8 trees $200 - 250 = 10$ $250 - 300 = 8$ $300 - 400 = 12$ $400 - 450 = 15$ $450 - 600 = 15$ (or $450 - 500 = 5$ or $500 - 600 = 10$) $600 - 800 = 4$		3	M1 oe eg 1 large square represents 2 trees or 12.5 small squares represents 1 tree or a frequency density axis scale where one large square vertically is FD of 0.04 with no contradictions or a correct frequency for any bar (could be seen on the diagram)
	$5 \times 2 + 2 \times 2$ or $\frac{10 \times 12.5 + 20 \times 2.5}{100} \times 8$ oe or $100 \times 0.1 + 200 \times 0.02$			M1 for a correct method to find the total number of trees greater than 500 cm.
		14		A1
				Total 3 marks

WEEK 3 TASKS

(Higher 7+)

Remember that you will have one paper in which you cannot use a calculator and two papers where a calculator is allowed. It is important that you are comfortable with using a calculator and know when it is appropriate to do so.

Don't forget to take your calculator to the calculator exams and don't forget to actually use it!



WEEK 3 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** (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 $x_{n+1} = \frac{6}{x^2 + 2}$ 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 n th term of this sequence.

.....
(Total for Question 3 is 3 marks)

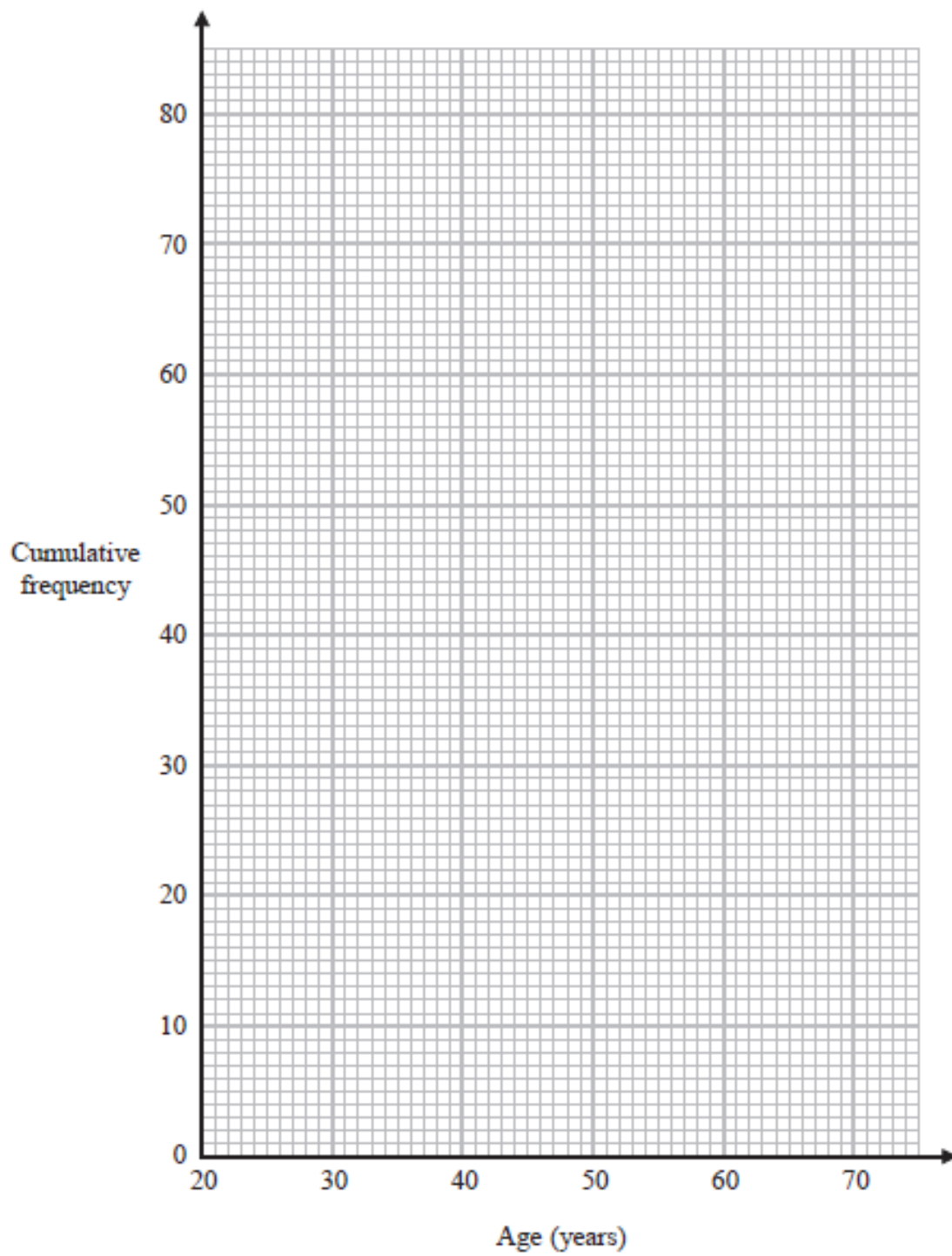
4 The cumulative frequency table gives information about the ages of 80 people working for a company.

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)

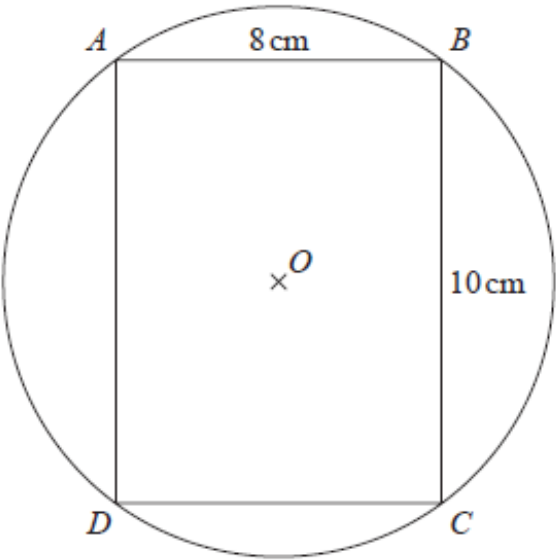
(b) Use your graph to find an estimate for the median age.

..... years (1)



(Total for Question 4 is 3 marks)

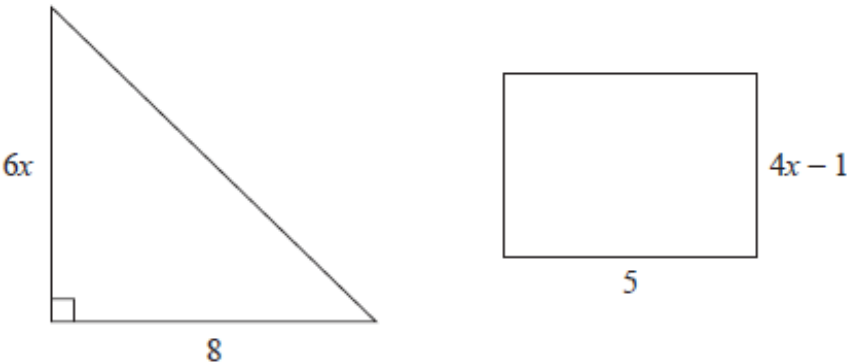
***5** The points A , B , C and D lie on a circle, centre O .
 $ABCD$ is a rectangle.



$AB = 8\text{ cm}$ $BC = 10\text{ cm}$
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 .

$x = \dots\dots\dots$
(Total for Question 6 is 4 marks)

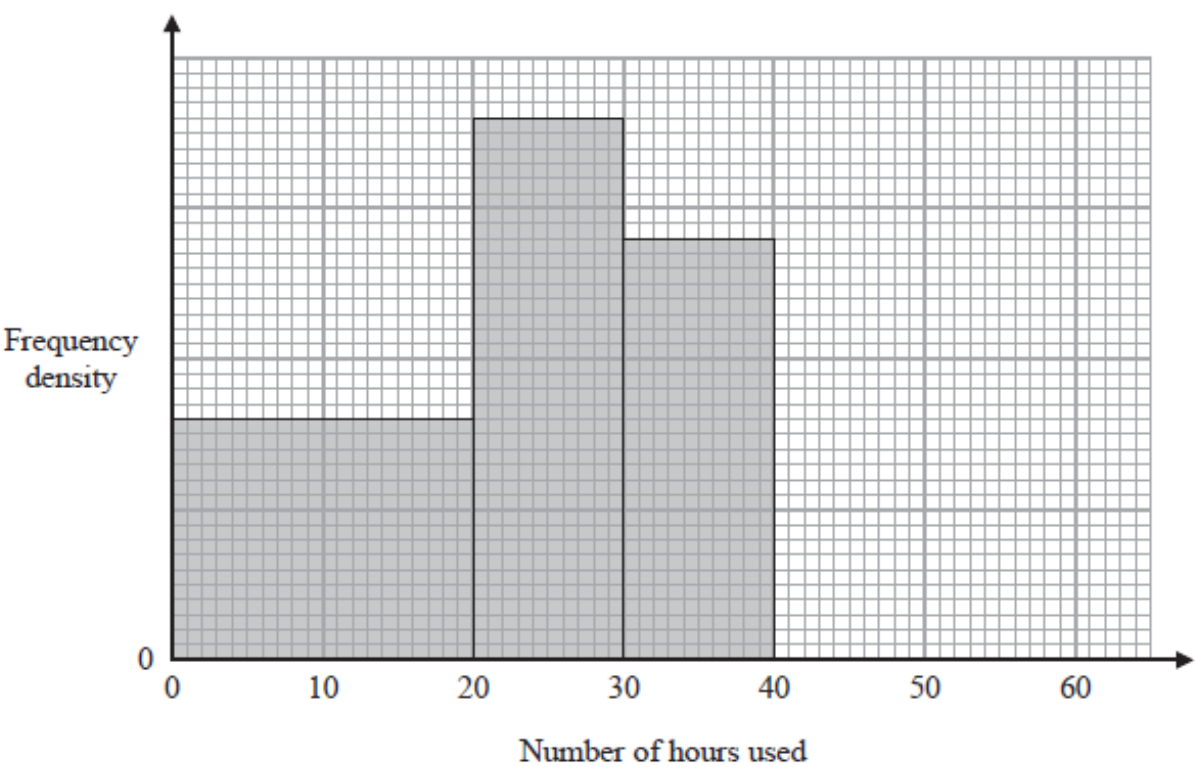
7 A biased dice is thrown 60 times.
The table shows information about the number that the dice lands on each time.

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.

$\dots\dots\dots$
(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 3 TASK 2

Estimated completion time = 90 minutes.

Answer ALL TWENTY ONE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 Solve $3(2 - 4x) = 5 - 8x$

Show clear algebraic working.

$x = \dots\dots\dots$

(Total for Question 1 is 3 marks)

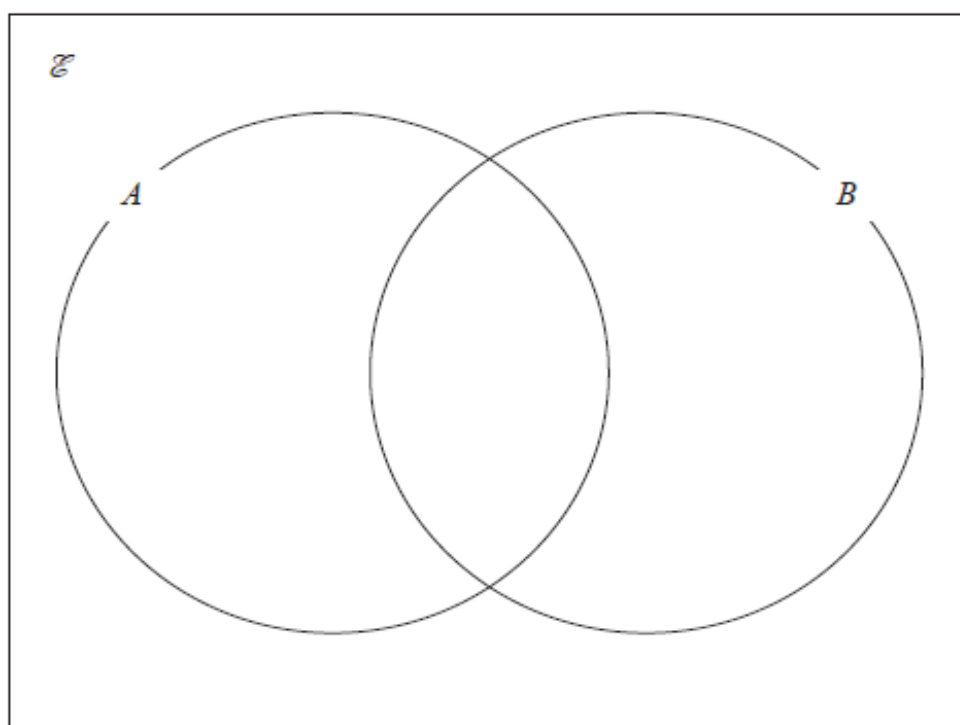
2 $\mathcal{E} = \{11, 12, 13, 14, 15, 16, 17, 18, 19, 20\}$

$A = \{\text{even numbers}\}$

$A \cap B = \{12, 16, 20\}$

$(A \cup B)' = \{17, 19\}$

Complete the Venn diagram for the sets $\mathcal{E}$, A and B



(Total for Question 2 is 3 marks)

3 Solve the simultaneous equations

$$5x + 4y = -2$$

$$2x - y = 4.4$$

Show clear algebraic working.

$x =$

$y =$

(Total for Question 3 is 3 marks)

4 $3^{\frac{1}{2}} \times 3^{\frac{2}{5}} = 3^m$

(a) Work out the value of m

$$m = \text{.....}$$

(1)

$$5^{-10} \div 5^{-4} = 5^n$$

(b) Work out the value of n

$$n = \text{.....}$$

(1)

(Total for Question 4 is 2 marks)

5 Here are 9 cards. Each card has either a number on it or a letter on it.

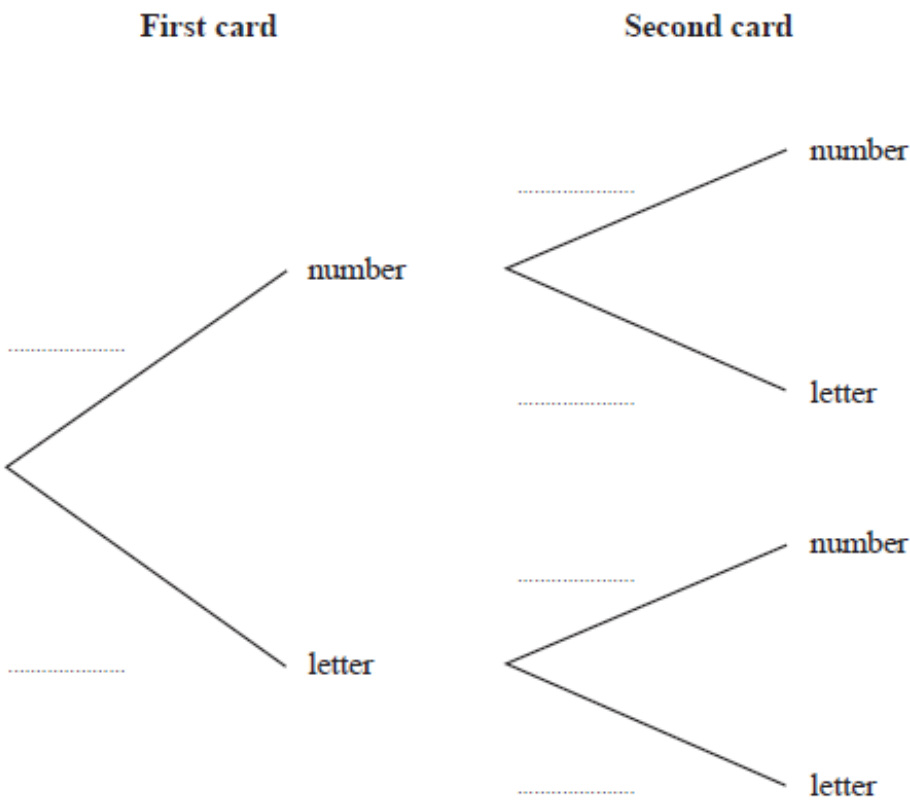


Tomas is playing a game.

Tomas takes at random one of the cards and keeps it.

Tomas then takes at random another card and keeps it.

(a) Complete the probability tree diagram.



(b) Work out the probability that each of the two cards has a number on it.

.....
(2)

(c) Work out the probability that there will be one card with a number on it and one card with a letter on it.

.....
(3)

(Total for Question 5 is 7 marks)

6 Show that $3\frac{5}{7} \div 1\frac{5}{8} = 2\frac{2}{7}$

(Total for Question 6 is 3 marks)

7 (a) Write down the value of $(m + 2)^0$ where m is a positive integer.

.....
(1)

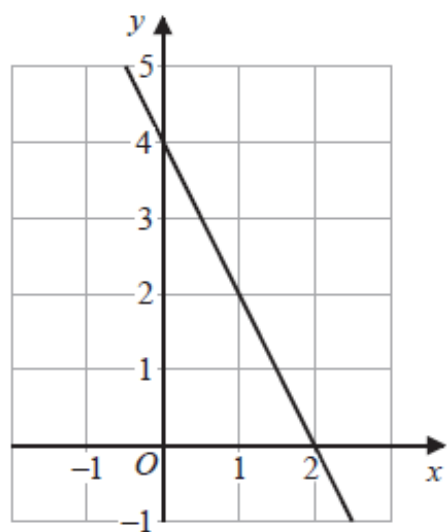
(b) Simplify $(3a^2b^4)^3$

.....
(2)

(c) Factorise fully $14x^2y^4 + 21x^3y^2$

.....
(2)

The diagram shows a straight line drawn on a grid.



(d) Write down an equation of the line.

.....
(2)

(Total for Question 7 is 7 marks)

8 The diagram shows an isosceles triangle, with base length 24 cm.

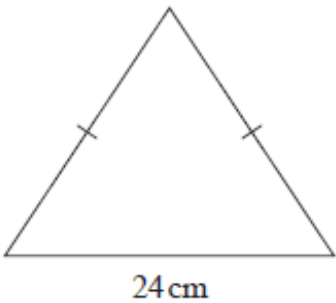


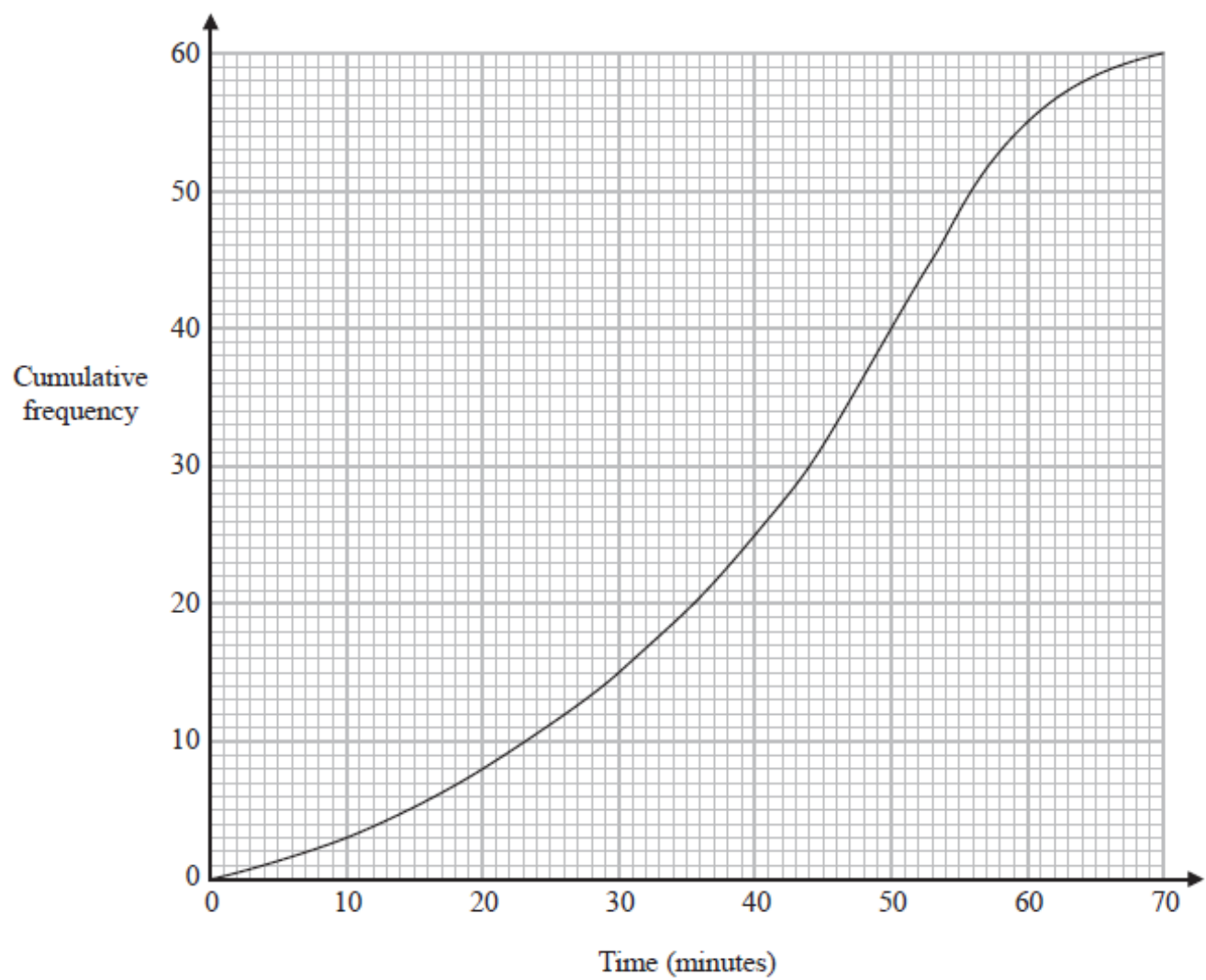
Diagram NOT
accurately drawn

The perimeter of the triangle is 54 cm.
Work out the area of the triangle.

..... cm²

(Total for Question 8 is 5 marks)

9 The cumulative frequency graph gives information about the time, in minutes, each of 60 people took to shop in a market.



(a) Use the graph to find an estimate for the median time people took to shop in the market.

..... minutes
(1)

(b) Use the graph to find an estimate for the number of people who took longer than 55 minutes to shop in the market.

.....
(2)

- (c) Use the graph to complete the frequency table to give information about the time, in minutes, each of the 60 people took to shop in the market.

Time taken to shop in the market (m minutes)	Frequency
$0 < m \leq 10$	3
$10 < m \leq 20$	5
$20 < m \leq 30$	
$30 < m \leq 40$	
$40 < m \leq 50$	
$50 < m \leq 60$	
$60 < m \leq 70$	

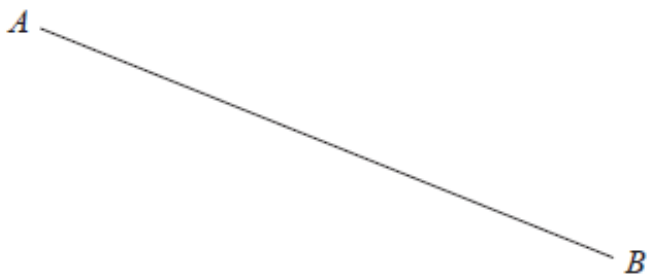
(2)

(Total for Question 9 is 5 marks)

- 10 Expand and simplify $3x(2x - 5)^2$
 Show clear algebraic working.

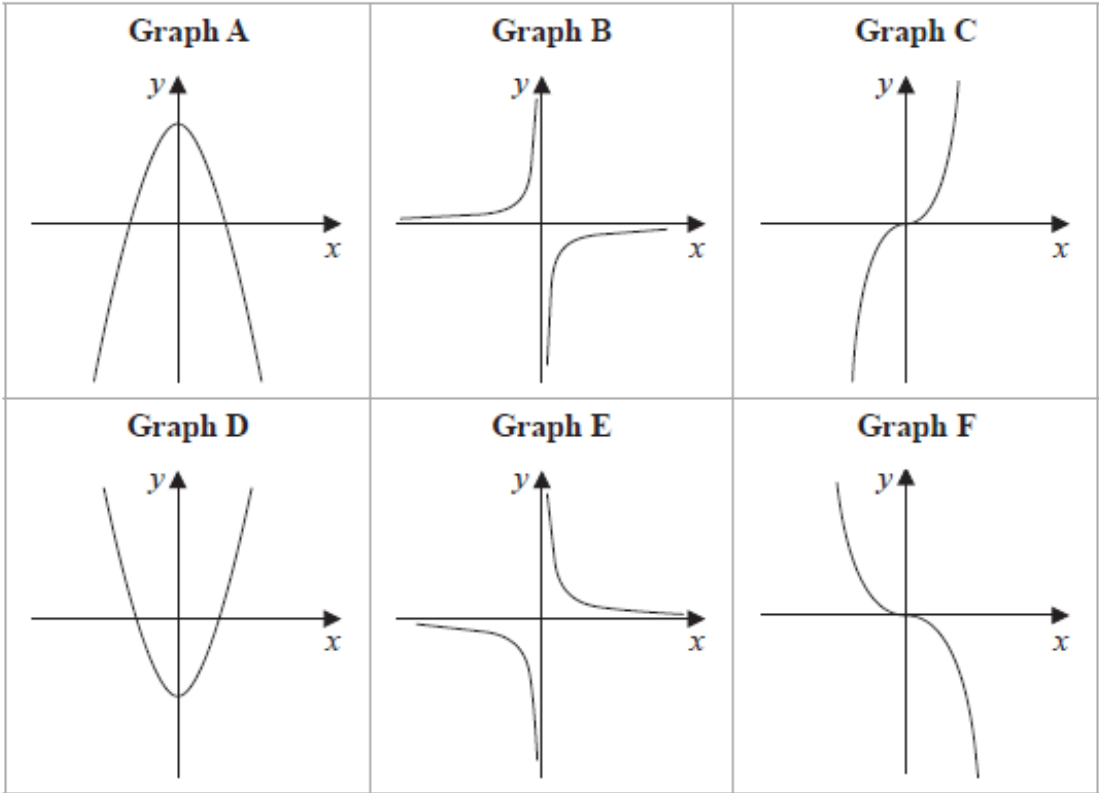
(Total for Question 10 is 3 marks)

- 11** Use ruler and compasses only to construct the perpendicular bisector of line AB
You must show all your construction lines.



(Total for Question 11 is 2 marks)

12 Here are six graphs.



Complete the table below with the letter of the graph that could represent each given equation.

Write your answers on the dotted lines.

Equation	Graph
$y = -\frac{2}{x}$	
$y = 5 - x^2$	
$y = -2x^3$	

(Total for Question 12 is 3 marks)

13 Solve the simultaneous equations

$$\begin{aligned}y &= 7 - 2x \\ x^2 + y^2 &= 34\end{aligned}$$

Show clear algebraic working.

.....
(Total for Question 13 is 5 marks)

14 Use algebra to show that $0.4\dot{3}\dot{8} = \frac{217}{495}$

(Total for Question 14 is 2 marks)

- 15** y is inversely proportional to $\sqrt{x}$
 $y = c^4$ when $x = c^2$ where c is a positive constant.

Find a formula for y in terms of x and c
Give your answer in its simplest form.

(Total for Question 15 is 3 marks)

- 16** Solve the inequality $6x^2 + 37x \leq 35$
Show clear algebraic working.

.....
(Total for Question 16 is 3 marks)

17 Given that $8\sqrt{m} + \sqrt{49m} - \sqrt{9m} = k\sqrt{m}$
where k is an integer and m is a prime number,

(a) work out the value of k

$k = \dots\dots\dots$
(1)

(b) Show that $\frac{5 - \sqrt{18}}{1 - \sqrt{2}}$ can be written in the form $a + b\sqrt{2}$ where a and b are integers.

Show each stage of your working clearly.

(3)

(Total for Question 17 is 4 marks)

18 The function f is such that $f(x) = \frac{k}{x}$ where $x \neq 0$ and k is an integer.

(a) Express the inverse function f^{-1} in the form $f^{-1}(x) = \dots$

$f^{-1}(x) = \dots\dots\dots$
(1)

The function g is such that $g(x) = 2 - 3x^4$ where $x \neq 0$

The function h is such that $h(x) = \frac{3x}{2-x}$ where $x \neq 2$

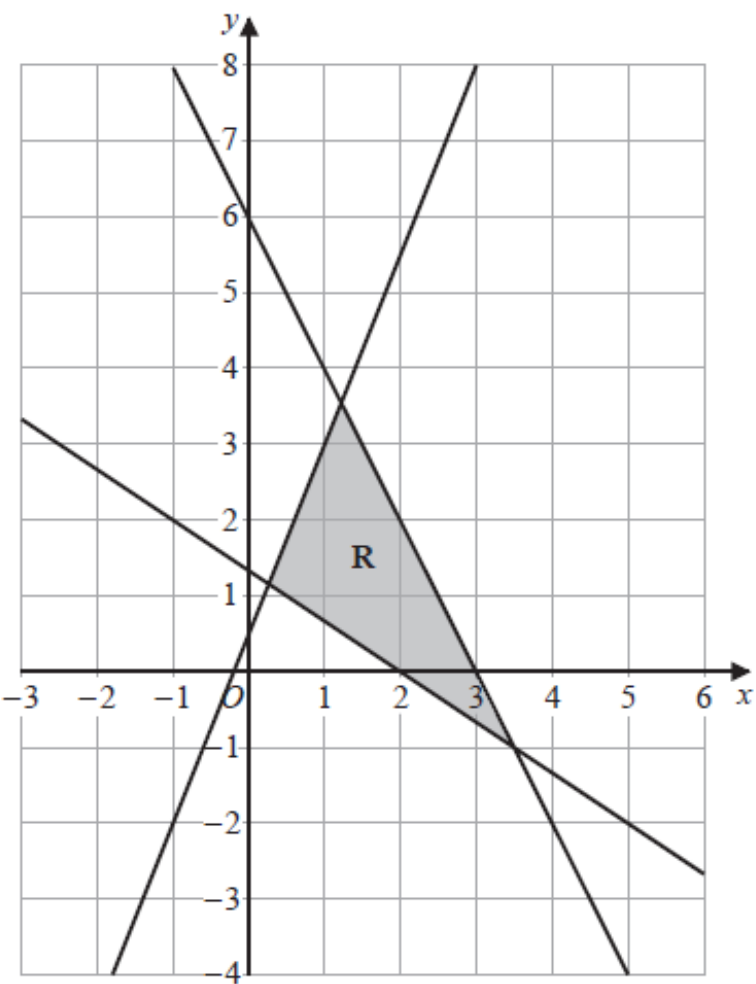
(b) (i) Find $g(-2)$

$\dots\dots\dots$
(1)

(ii) Express the composite function hg in the form $hg(x) = \dots$
Give your answer in its simplest form.

$hg(x) = \dots\dots\dots$
(2)

(Total for Question 18 is 4 marks)



The region **R**, shown shaded in the diagram, is bounded by the straight lines with equations

$2x + y = 6$

$2y = 5x + 1$

$3y + 2x = 4$

Write down the three inequalities that define **R**

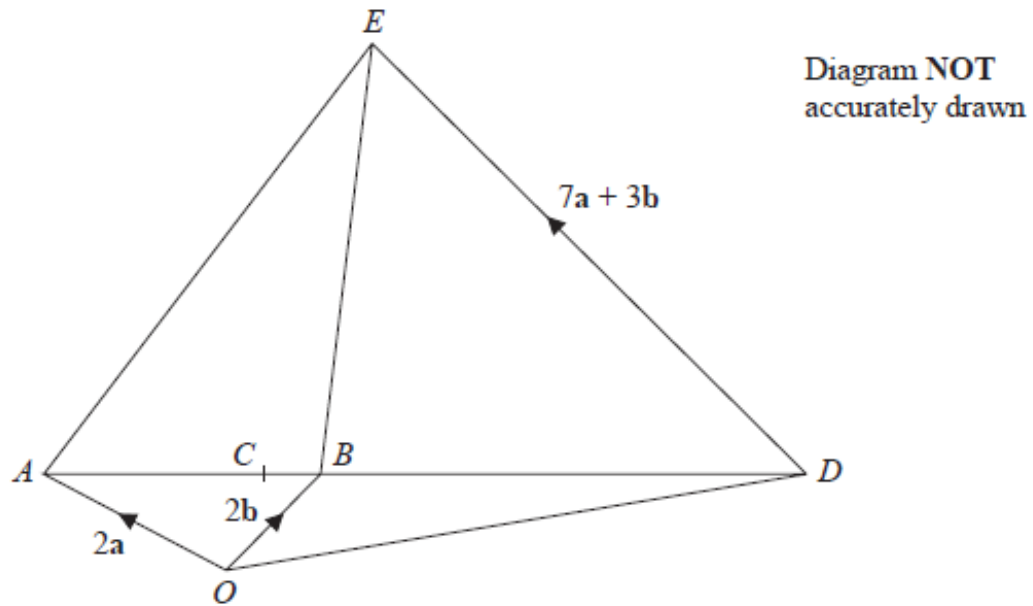
.....

.....

.....

(Total for Question 20 is 3 marks)

$OAED$ is a quadrilateral.



$$\overrightarrow{OA} = 2\mathbf{a} \quad \overrightarrow{OB} = 2\mathbf{b} \quad \overrightarrow{DE} = 7\mathbf{a} + 3\mathbf{b}$$

$$AB : BD = 1 : 2$$

The point C on AB is such that OCE is a straight line.

Use a vector method to find the ratio of $OC : CE$

(Total for Question 21 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS



WEEK 3 TASK 3

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.

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

$$k = 2 \text{ or } k = -4$$

- (c) What mistake has Alex made?

.....
.....
.....

(1)

(Total for Question 1 is 7 marks)

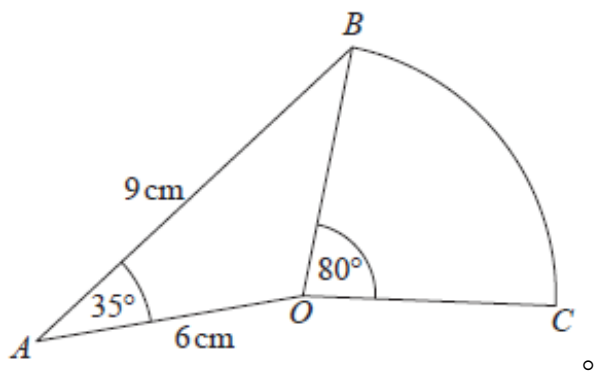
2 Make m the subject of $k = p + \frac{2m}{5}$

.....
(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 .

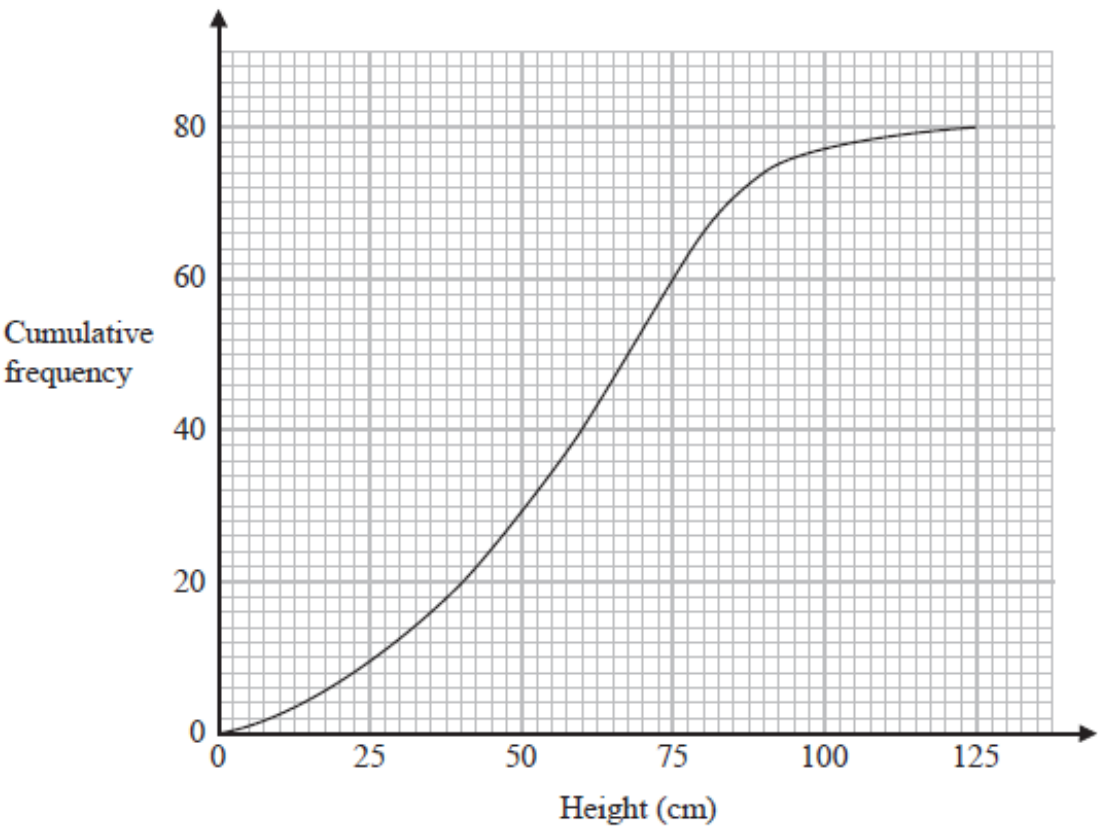


Calculate the area of OBC .
Give your answer correct to 3 significant figures.

..... cm²
(Total for Question 4 is 4 marks)

5 Alan grew 80 plants of the same type outside.

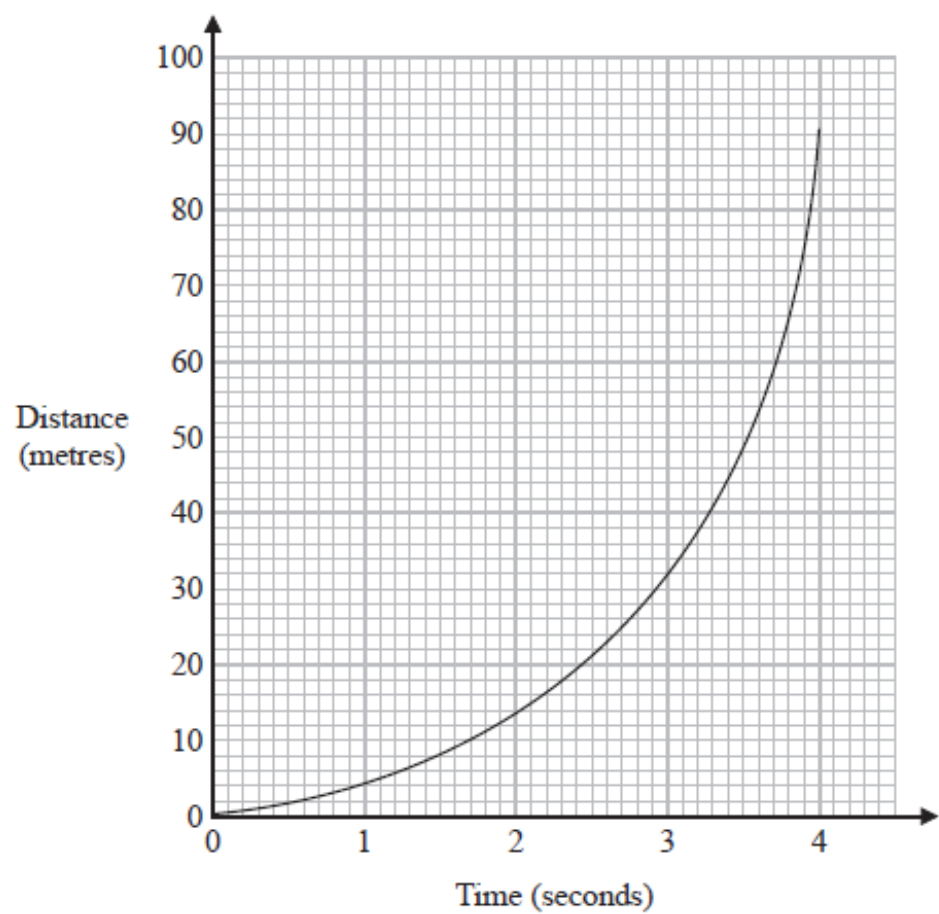
The cumulative frequency graph shows information about the heights, in cm, of these plants.



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.

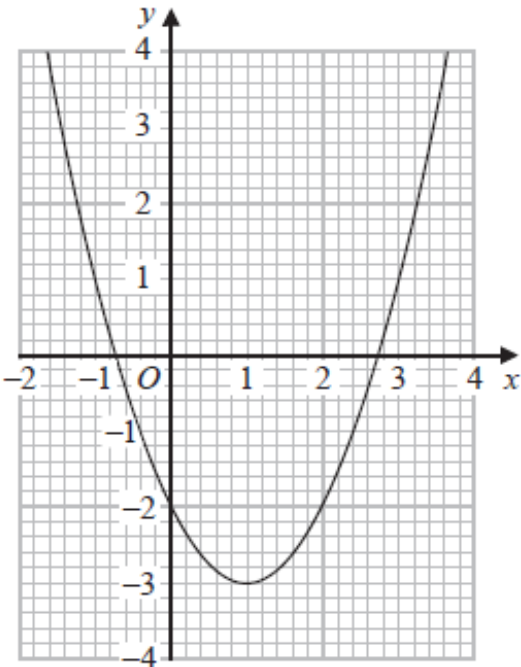
The table gives information about the temperature, $T^{\circ}\text{C}$, at midday for each of 50 cities in the UK on Tuesday.

Temperature ($T^{\circ}\text{C}$)	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.

..... $^{\circ}\text{C}$
(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.

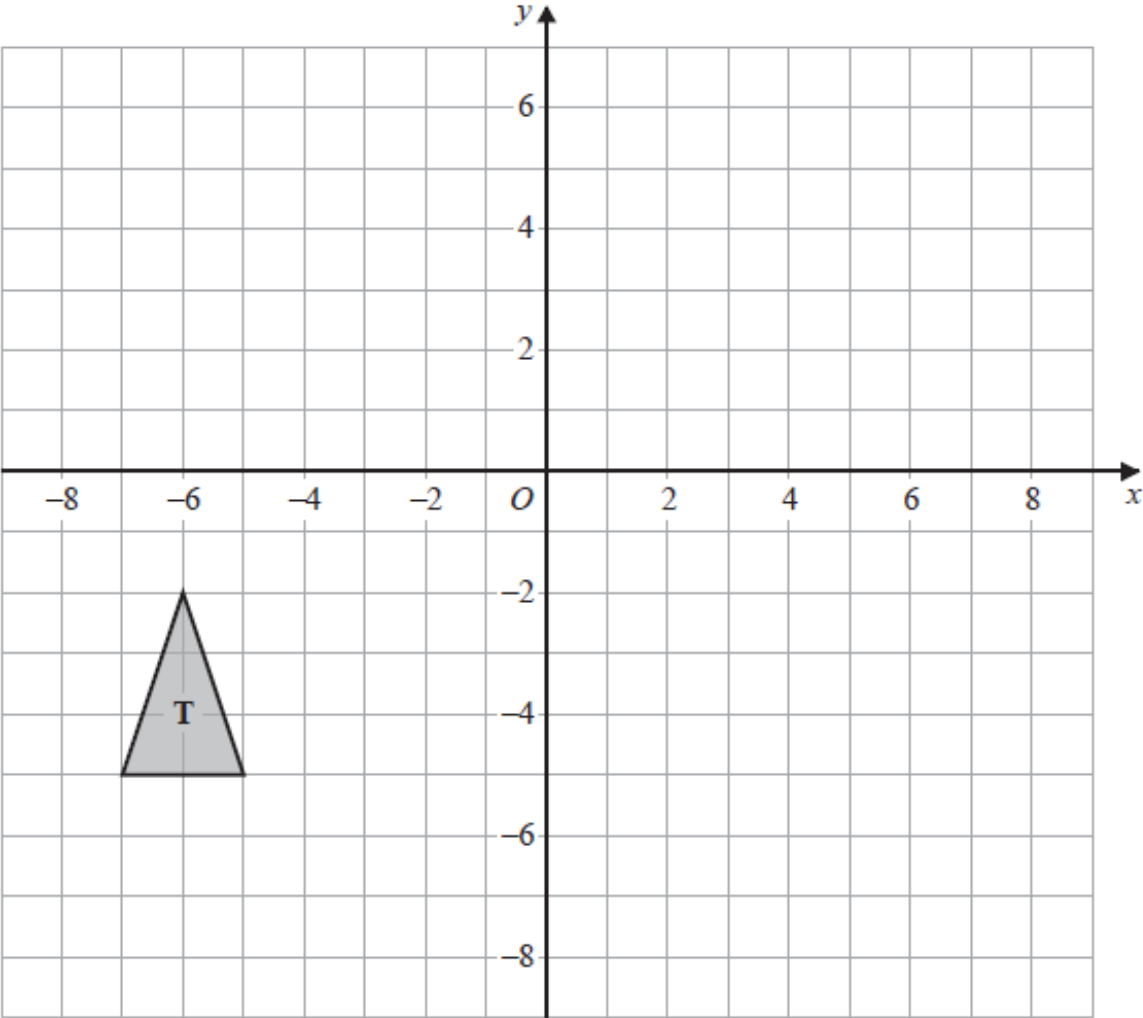
5 11 21 35 53 75

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

.....
(Total for Question 10 is 2 marks)

11 Factorise $a^2 - b^2$

.....
(Total for Question 11 is 1 mark)



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

(Total for Question 12 is 2 marks)



WEEK 3 TASK 4

Estimated completion time = 90 minutes.

Answer ALL TWENTY ONE questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1** (a) Write 6.25×10^{-4} as an ordinary number.

.....
(1)

- (b) Work out $(2.4 \times 10^{12}) \div (9.6 \times 10^4)$
Give your answer in standard form.

.....
(2)

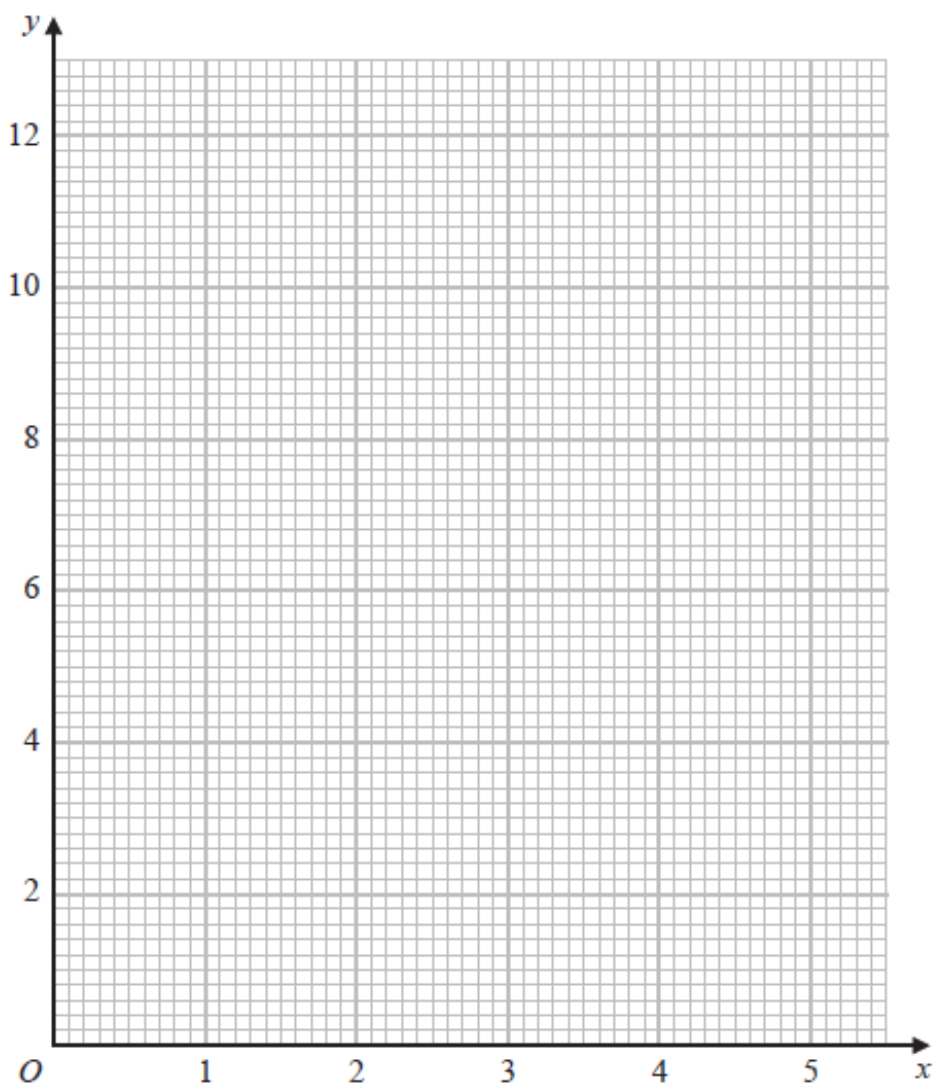
(Total for Question 1 is 3 marks)

2 (a) Complete the table of values for $y = \frac{2}{x}\left(5 - \frac{1}{x}\right)$

x	0.5	1	2	3	4	5
y	12			3.1	2.4	1.9

(1)

(b) On the grid, draw the graph of $y = \frac{2}{x}\left(5 - \frac{1}{x}\right)$ for $0.5 \leq x \leq 5$



(2)

(Total for Question 2 is 3 marks)

3 The diagram shows a pentagon.

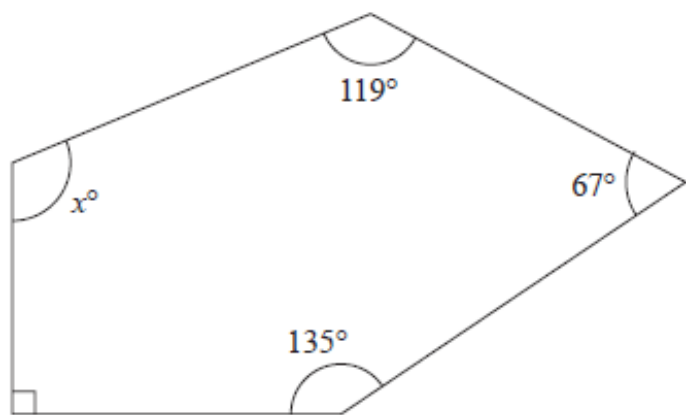


Diagram **NOT**
accurately drawn

Work out the value of x

$x =$

(Total for Question 3 is 3 marks)

4 Some members of a library were asked to name the type of book that they each liked to read the best.

One of the members is chosen at random.
The table shows information about the probability of the type of book that this member answered.

Type of book	comedy	romance	mystery	thriller
Probability	0.24	0.40	$3x$	x

48 members answered comedy books.

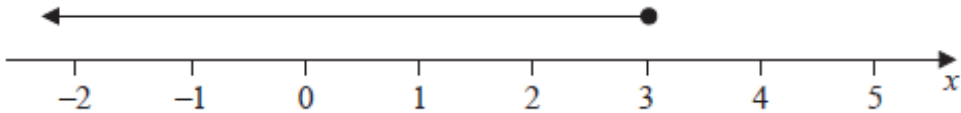
Work out how many of the members answered mystery books.

.....
(Total for Question 4 is 4 marks)

5 (a) Factorise $y^2 - 2y - 48$

.....
(2)

(b) Write down the inequality shown on the number line



.....
(1)

(c) Solve the inequality $7w + 6 > 12w + 14$

.....
(3)

(Total for Question 5 is 6 marks)

6 Matteo is going to invest £5000 for two years.
He can invest his money in Bank G or in Bank H.

Bank G

1.6% per year
compound interest

Bank H

2.9% interest added after
two years

The total amount of interest Matteo would receive at the end of two years from Bank G is more than the amount of interest Matteo would receive at the end of two years from Bank H.

How much more?

£.....
(Total for Question 6 is 4 marks)

7 Shane bought a car.

The amount Shane paid for the car was £32 000

Theresa also bought a car. To pay for this car, Theresa paid a deposit of £18 000 together with 14 monthly payments of £1160

Theresa paid more for her car than Shane paid for his car.

(a) Work out how much more Theresa paid as a percentage of the amount Shane paid.

.....%
(4)

Kylie bought a van.

After 1 year, the value of the van was £39 865
During this year, the value of the van decreased by 15%

(b) Work out the value of the van when Kylie bought it.

£.....
(3)

(Total for Question 7 is 7 marks)

8 Change a speed of 90 kilometres per hour to a speed in metres per second.
Show your working clearly.

..... m/s

(Total for Question 8 is 3 marks)

9 Solve $\frac{x+3}{4} - \frac{7-x}{5} = 4.3$

Show clear algebraic working.

$x =$

(Total for Question 9 is 3 marks)

10 Given that the surface area of a sphere is $49\pi \text{ cm}^2$, find the volume of the sphere.
Give your answer correct to the nearest integer.

..... cm^3
(Total for Question 10 is 3 marks)

11 80 students entered a dancing competition.
The table gives information about the length of time, in minutes, for which each student spent dancing.

Frequency	Time (<i>m</i>)
$0 < m \leq 12$	11
$12 < m \leq 24$	25
$24 < m \leq 36$	23
$36 < m \leq 48$	15
$48 < m \leq 60$	6

Work out an estimate for the mean length of time the students spent dancing.

..... minutes

(Total for Question 11 is 4 marks)

12 The diagram shows rectangle $ABCD$

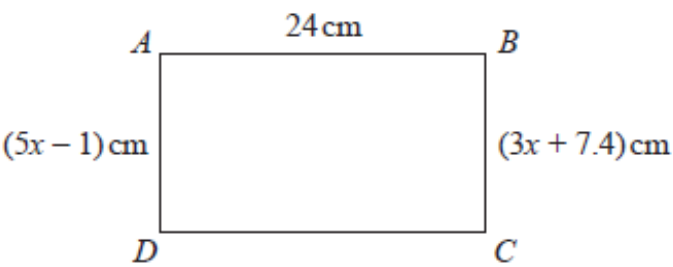


Diagram NOT
accurately drawn

Work out the perimeter of the rectangle.
Show your working clearly.

..... cm

(Total for Question 12 is 4 marks)

13 The weight of a cake is 2.75 kg, correct to 2 decimal places.

(a) Write down the lower bound of the weight of the cake.

..... kg
(1)

(b) Write down the upper bound of the weight of the cake.

..... kg
(1)

Penny has worked out $\frac{81.3 \times 59.2}{1.9^2}$.

Her answer is 13 332.299 17

Penny’s answer is not sensible.

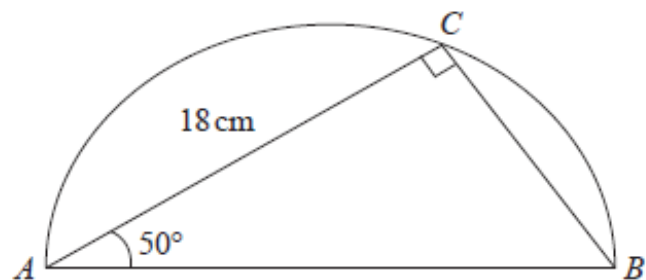
(c) By rounding each number to one significant figure, work out a suitable estimate to show that her answer is not sensible.
Show your working clearly.

(2)

(Total for Question 13 is 4 marks)

14 The diagram shows a triangle ABC inside a semicircle.

Diagram NOT
accurately drawn



A , B and C are points on the semicircle.

AB is the diameter of the semicircle.

Angle $ACB = 90^\circ$

Angle $BAC = 50^\circ$

$AC = 18\text{ cm}$

Work out the perimeter of the semicircle.

Give your answer correct to 2 significant figures.

..... cm

(Total for Question 14 is 5 marks)

15 In a box, there are only green sweets, orange sweets and yellow sweets.

There are 280 sweets in the box so that

the number of green sweets : the number of orange sweets = 2 : 3

and

the number of orange sweets : the number of yellow sweets = 1 : 5

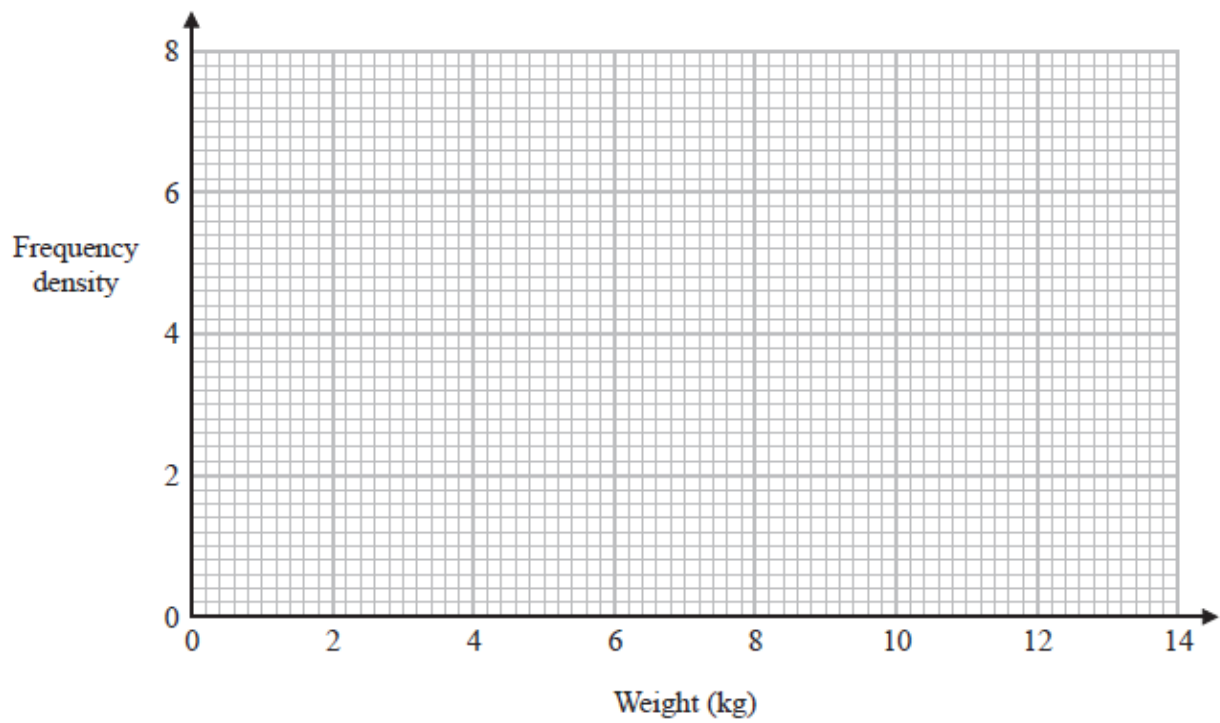
Work out how many green sweets there are in the box.

.....
(Total for Question 15 is 3 marks)

16 The table gives information about the weights, in kg, of the parcels that Pedro delivers on Monday.

Weight (w kg)	Frequency
$0 < w \leq 2$	12
$2 < w \leq 3$	7
$3 < w \leq 6$	15
$6 < w \leq 9$	12
$9 < w \leq 14$	9

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



(3)

One of the parcels that Pedro delivered on Monday is chosen at random.

(b) Using the information in the table, find an estimate for the probability that this parcel weighs more than 7 kg.

(2)

(Total for Question 16 is 5 marks)

17 The points A and B are on a coordinate grid.

The coordinates of A are $(6, 4)$

The coordinates of B are $(17, j)$ where j is a constant.

The midpoint of AB has coordinates $(k, 15)$ where k is a constant.

Find the value of j and the value of k

$$j = \dots\dots\dots$$

$$k = \dots\dots\dots$$

(Total for Question 17 is 3 marks)

18 Here is a list giving the numbers of runs scored last week by the eleven members of cricket team **A**.

2 3 4 6 21 26 27 32 34 61 72

The interquartile range of the numbers of runs scored last week by the eleven members of cricket team **B** was 42

Using a suitable calculation, write down one comparison between the numbers of runs scored by the members of cricket team **A** and the members of cricket team **B**.

Show your working clearly.

.....

.....

(Total for Question 18 is 3 marks)

19 The acceleration, a , of an object is given by

$$a = \frac{v - u}{t}$$

where

$v = 45.23$ correct to 2 decimal places

$u = 5.12$ correct to 2 decimal places

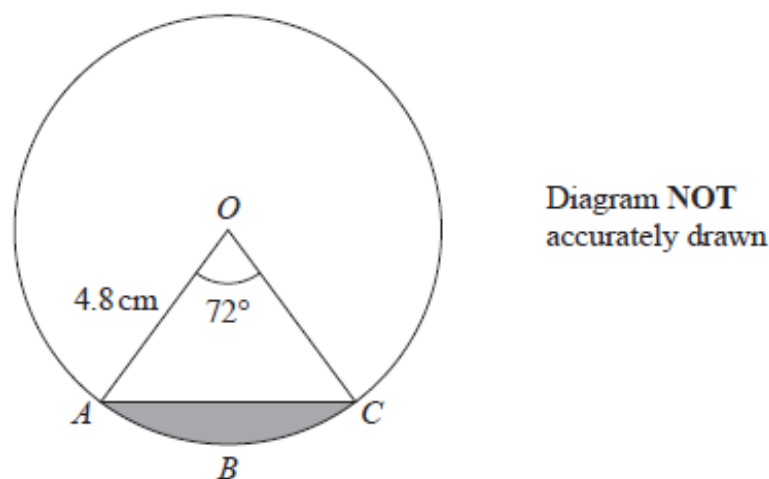
$t = 8.5$ correct to 2 significant figures

By considering bounds, work out the value of a to a suitable degree of accuracy.
Show your working clearly and give a reason for your answer.

$a = \dots\dots\dots$

(Total for Question 19 is 5 marks)

20 The diagram shows the cross section of a circular water pipe.



OAC is a sector of the circle, centre O

The shaded region in the diagram represents the water flowing in the pipe.

The water flows at 14 cm/s in the pipe.

Work out the volume of water that has flowed through the pipe in 3 minutes.
Give your answer in cm^3 correct to 3 significant figures.

..... cm³

(Total for Question 20 is 5 marks)

TOTAL FOR PAPER IS 80 MARKS



WEEK 3 TASK 5

Estimated completion time = 40 minutes.

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

- 1** 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.

- (a) Work out the population of the species at the start of year 3

..... million
(3)

At the start of year 5 the value of k is increased by 0.3 to a new constant value.
Louise thinks that from the start of year 5 the population of the species would increase year on year.

- (b) Is Louise correct? You must give a reason for your answer.

.....
.....
.....

(1)

(Total for Question 1 is 4 marks)

***2** (a) Factorise $6x^2 - 5x - 4$

.....
(2)

(b) Hence, or otherwise, solve $6x^2 - 5x - 4 < 0$

.....
(2)

(Total for Question 2 is 4 marks)

3 The straight line **L** has equation $2y = 3x - 7$

Find an equation of the straight line perpendicular to **L** that passes through $(6, -5)$

.....
(Total for Question 3 is 3 marks)

4 The circumference of a circle is 10 m.
Work out the area of the circle.
Give your answer in terms of π .

..... m²
(Total for Question 4 is 3 marks)

5 Make x the subject of the formula $y = \frac{4(2x - 7)}{5x + 3}$

.....
(Total for Question 5 is 4 marks)

6 For $x \geq 0$, the functions f and g are such that

$f(x) = 3x + 4$

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

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

$g^{-1}(x) = \dots\dots\dots$

(2)

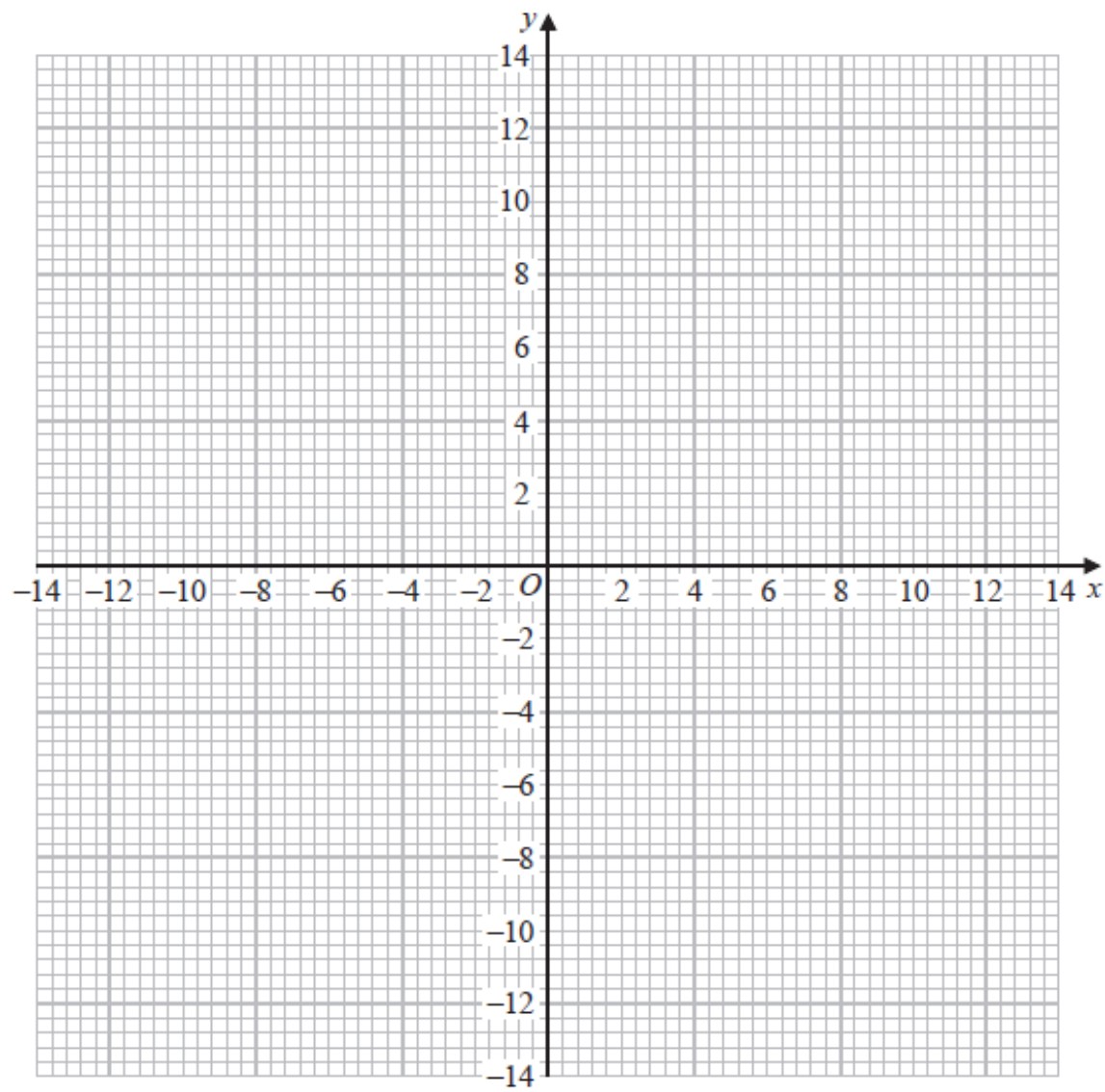
(b) Solve $gf(x) = 3$

$x = \dots\dots\dots$

(3)

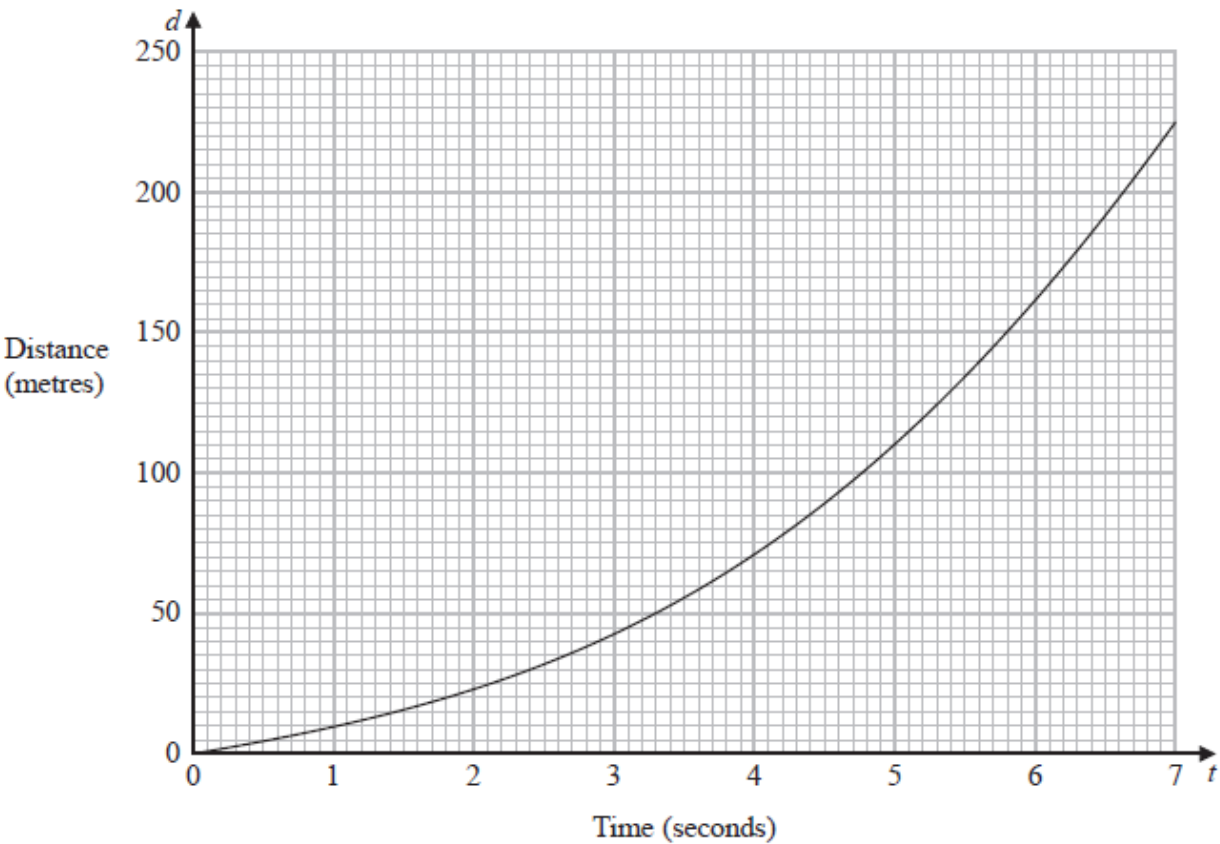
(Total for Question 6 is 5 marks)

7 On the grid, draw the graph of $x^2 + y^2 = 169$



(Total for Question 7 is 2 marks)

- 8 An object falls from rest.
Here is the distance-time graph for the distance (d metres) fallen by the object t seconds after it starts to fall.



Work out an estimate for the gradient of the graph at $t = 3$
You must show how you get your answer.

.....
(Total for Question 8 is 3 marks)

- 9 The equation of line L_1 is $y = 2x - 5$
The equation of line L_2 is $6y + kx - 12 = 0$

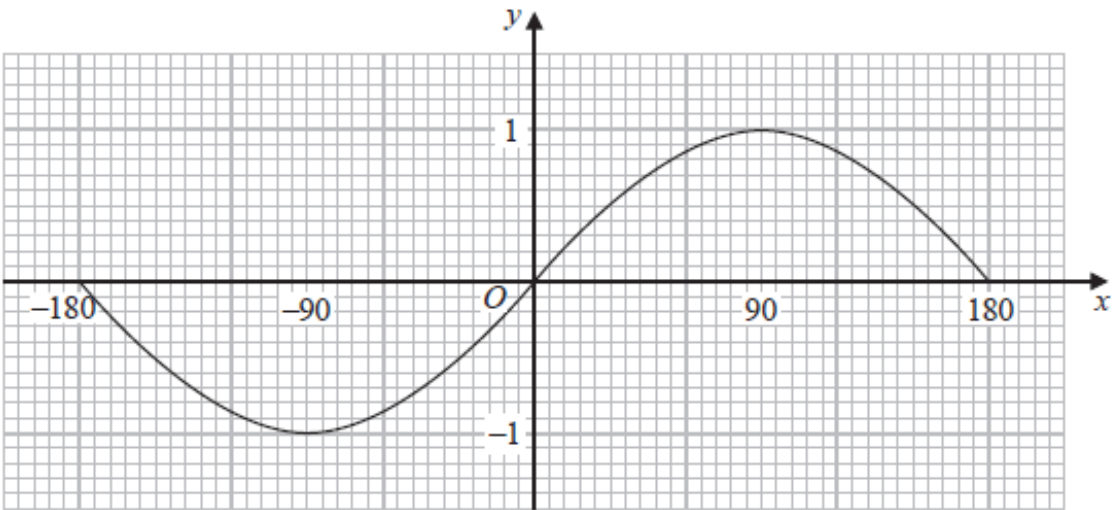
L_1 is perpendicular to L_2

Find the value of k .
You must show all your working.

$k =$

(Total for Question 9 is 3 marks)

- 10 Here is the graph of $y = \sin x^\circ$ for $-180 \leq x \leq 180$



(a) Use the graph to find estimates for the solutions of

$$y = \sin x^\circ = 0.3 \text{ for } -180 \leq x \leq 180$$

(2)

(b) Write down a value of x such that

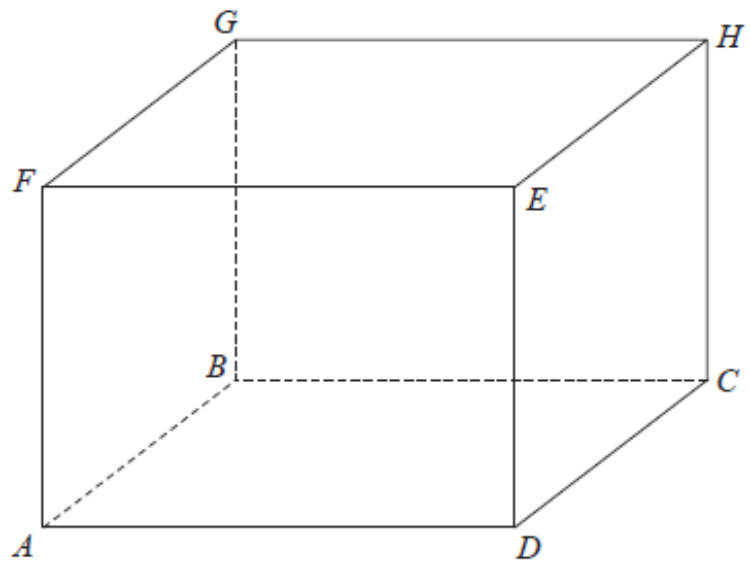
$$\sin(x + 20)^\circ = 0 \text{ for } -180 \leq x \leq 180$$

$x = \dots\dots\dots$

(1)

(Total for Question 10 is 3 marks)

11 $ABCDEFGH$ is a cuboid.



$$AF = 6.8 \text{ cm}$$

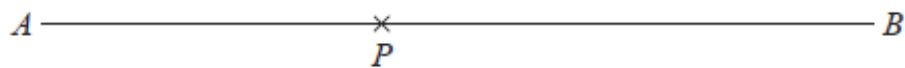
$$FC = 13.6 \text{ cm}$$

Work out the size of the angle between FC and the plane $ABCD$.

$\dots\dots\dots^\circ$

(Total for Question 11 is 2 marks)

- *12** The point P lies on the line AB .
Use ruler and compasses to construct an angle of 90° at P .
You must show all your construction lines.



(Total for Question 12 is 2 marks)

TOTAL FOR PAPER IS 38 MARKS



WEEK 4

MARKSCHEMES

(Higher 7+)

WEEK 4 TASK 1

Answer all questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

- 1 The incomplete table and the incomplete histogram give information about the times taken by some students to run a race.

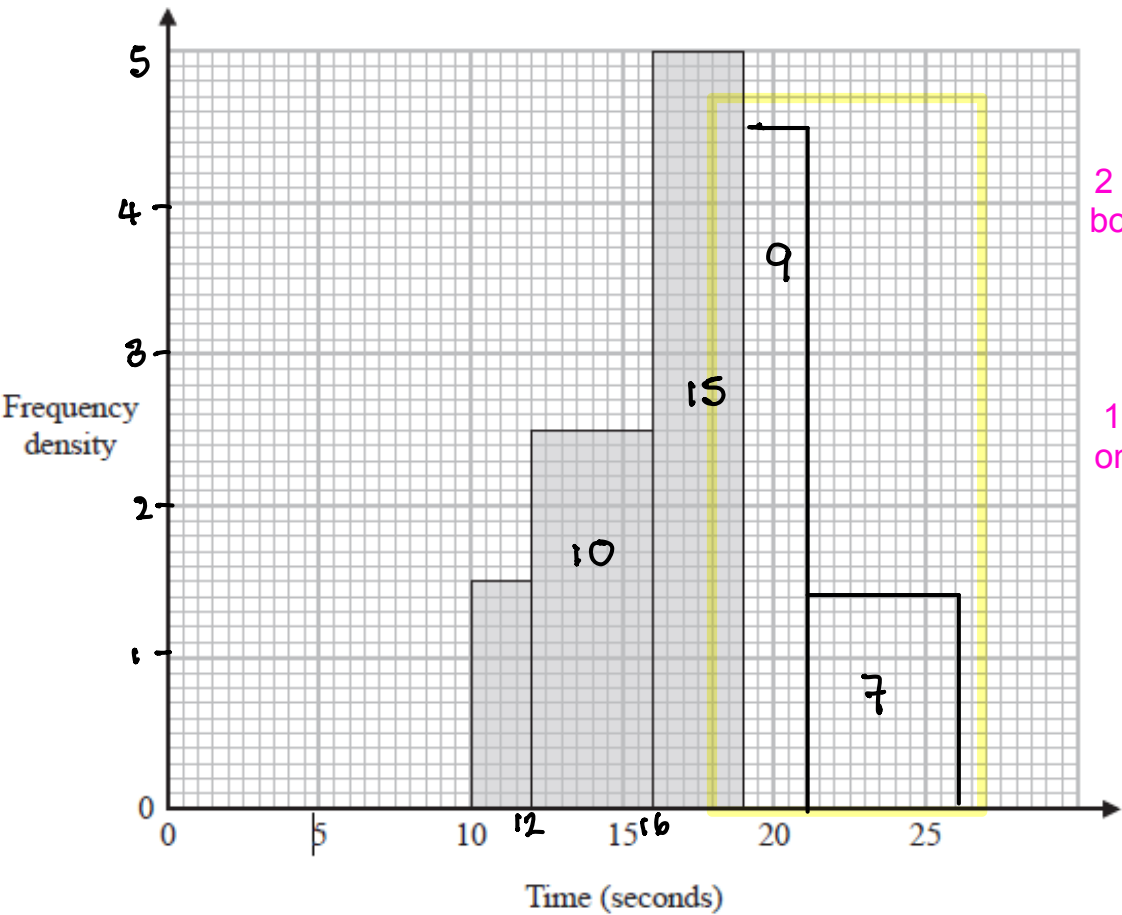
Freq. density

$10 \div 4 = 2.5$
 $15 \div 3 = 5$
 $9 \div 2 = 4.5$
 $7 \div 5 = 1.4$

Time (t seconds)	Frequency
$10 < t \leq 12$	3
$12 < t \leq 16$	10
$16 < t \leq 19$	15
$19 < t \leq 21$	9
$21 < t \leq 26$	7

1 mark

$1.5 \times 2 = 3$



None of these students had a time for the race such that $t < 10$ or $t > 26$

- (a) Use the histogram to complete the table. (1)
- (b) Use the table to complete the histogram. (2)

(Total for Question 1 is 3 marks)

- 2 Show that $\frac{x^2 - x - 6}{2x^2 - 5x - 3}$ can be written in the form $\frac{ax + b}{cx + d}$ where a, b, c and d are integers.

$$x^2 - x - 6 = (x - 3)(x + 2) \quad 1 \text{ mark}$$

$$2x^2 - 5x - 3 = (2x + 1)(x - 3) \quad 1 \text{ mark}$$

$$\frac{(x - 3)(x + 2)}{(2x + 1)(x - 3)} = \frac{x + 2}{2x + 1}$$

1 mark

$$\begin{aligned} a &= 1 \\ b &= 2 \\ c &= 2 \\ d &= 1 \end{aligned}$$

(Total for Question 2 is 3 marks)

- 3 ABC is a triangle.

Calculate the size of angle BAC .

Give your answer correct to 1 decimal place.

$$\frac{\sin 70}{18} = \frac{\sin BCA}{15} \quad 1 \text{ mark}$$

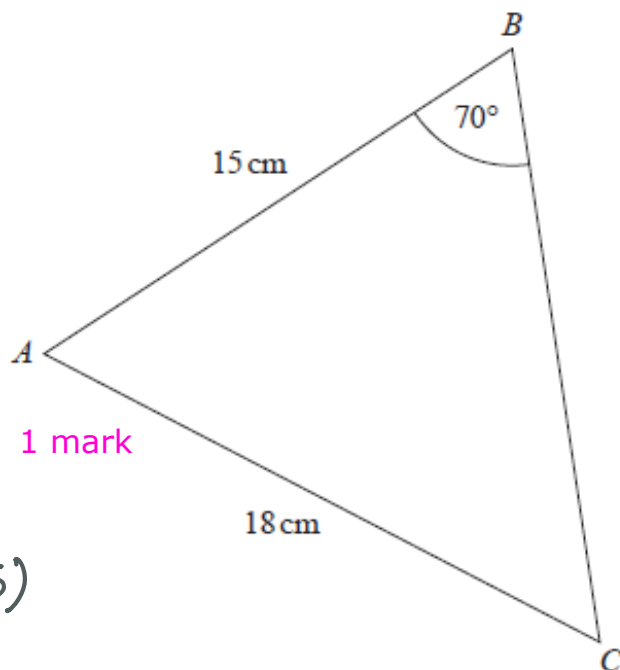
$$\text{so } \sin BCA = \frac{15 \sin 70}{18} \quad 1 \text{ mark}$$

$$BCA = \sin^{-1} \left(\frac{\sin 70}{18} \times 15 \right)$$

$$= 51.54 \dots \quad 1 \text{ mark}$$

$$BAC = 180 - (70 + 51.54 \dots)$$

$$= 58.4568 \dots$$



Final mark. **58.5**

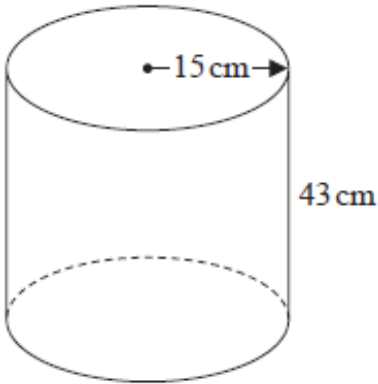
(Total for Question 3 is 4 marks)

Answer in the range 58.4 to 58.5

*6 The diagram shows an empty tank in the shape of a cylinder.

The cylinder has radius 15 cm and height 43 cm.

Water flows into the tank at a rate of 0.47 litres per minute.



Calculate the number of minutes it will take to completely fill the tank.
Give your answer correct to the nearest minute.

$$\text{Volume} = \pi \times 15^2 \times 43$$

1 mark

$$= 30394.90892 \text{ cm}^3$$

1 mark

$$1 \text{ litre} = 1000 \text{ cm}^3 \quad \text{so} \quad 30.394908... \text{ litres.}$$

$$30.394... \div 0.47 = 64.6700... \text{ minutes}$$

1 mark

65 to nearest minute.

$$\dots\dots\dots \boxed{65} \dots\dots\dots \text{Final mark} \dots\dots\dots \text{minutes}$$

(Total for Question 6 is 4 marks)

7 The functions f and g are such that

$$f(x) = (2x + 3)^2 \quad \text{and} \quad g(x) = 2x - 1$$

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

$$y = 2x - 1$$

$$y + 1 = 2x$$

$$2x = y + 1$$

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

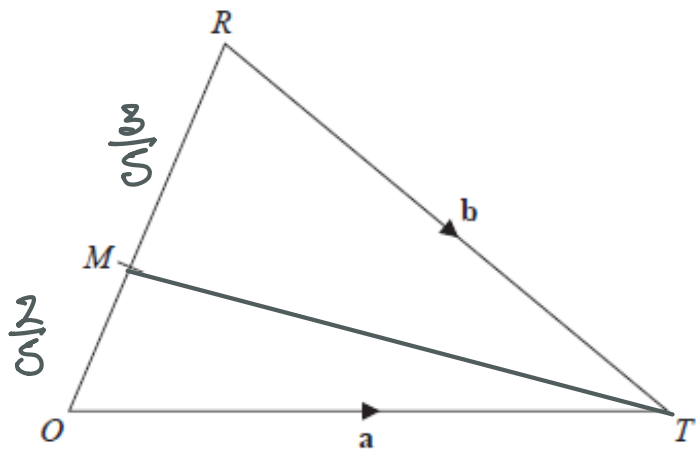
1 mark

$$\therefore g^{-1}(x) = \frac{x + 1}{2}$$

$$g^{-1}(x) = \dots\dots\dots \boxed{\frac{x + 1}{2}} \dots\dots\dots \text{Final mark}$$

(Total for Question 7 is 2 marks)

8 ORT is a triangle.



$\vec{OT} = \mathbf{a}$ $\vec{RT} = \mathbf{b}$

M is the point on OR such that $OM : MR = 2 : 3$

Express $\vec{MT}$ in terms of $\mathbf{a}$ and $\mathbf{b}$.
Give your answer in its simplest form.

$\vec{OR} = \boxed{a - b}$ 1 mark

$\vec{MT} = \vec{MR} + \vec{RT}$
 $= \boxed{\frac{3}{5}(a - b)} + b$ 1 mark

1 mark

$= \frac{3}{5}a - \frac{3}{5}b + b$

$= \frac{3}{5}a + \frac{2}{5}b$
 $= \boxed{\frac{1}{5}(3a + 2b)}$

Final mark for
either of these

$\frac{1}{5}(3a + 2b)$

.....
(Total for Question 8 is 4 marks)

9 Prove algebraically that $0.0\dot{7}2\dot{3}$ can be written as $\frac{241}{3330}$

$$1000x = 72.3723\dots$$

$$x = 0.0723723\dots$$

1 mark

$999x = 72.3$

$$x = \frac{72.3}{999}$$

1 mark

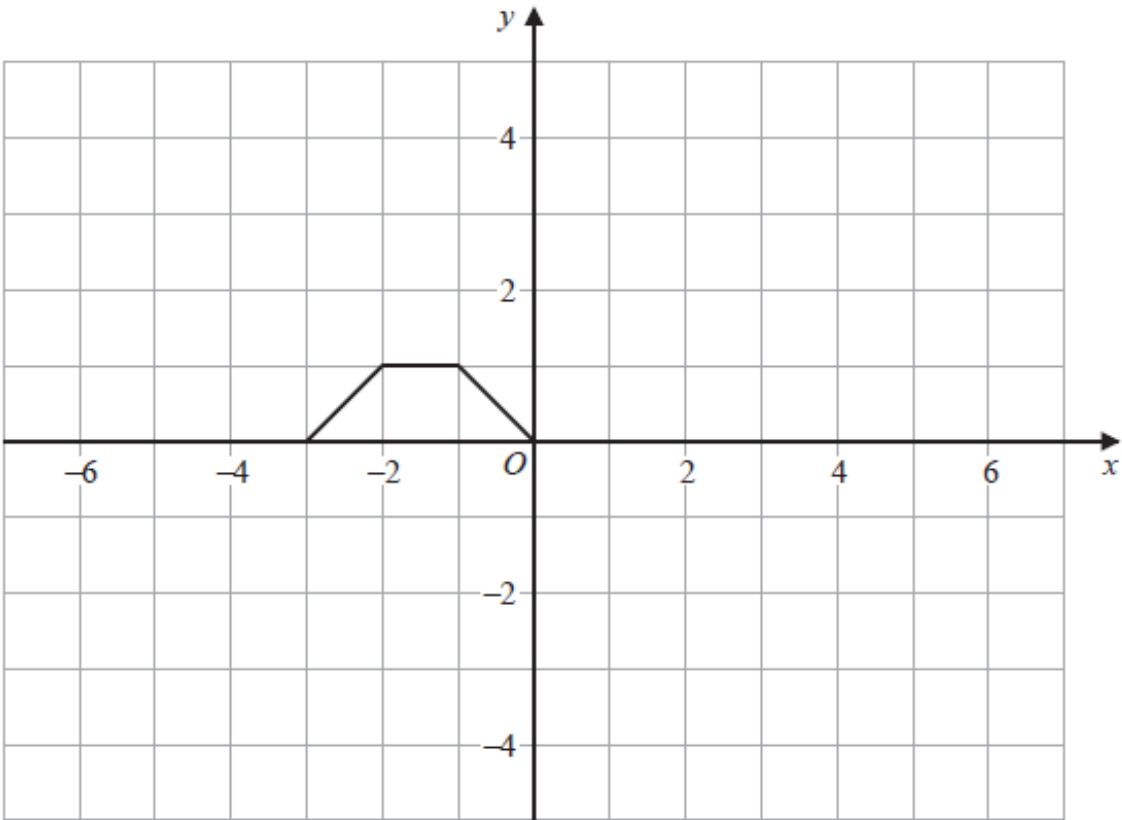
$$\frac{72.3}{999} = \frac{723}{9990}$$

$$\frac{723}{9990} \div 3 = \frac{241}{3330}$$

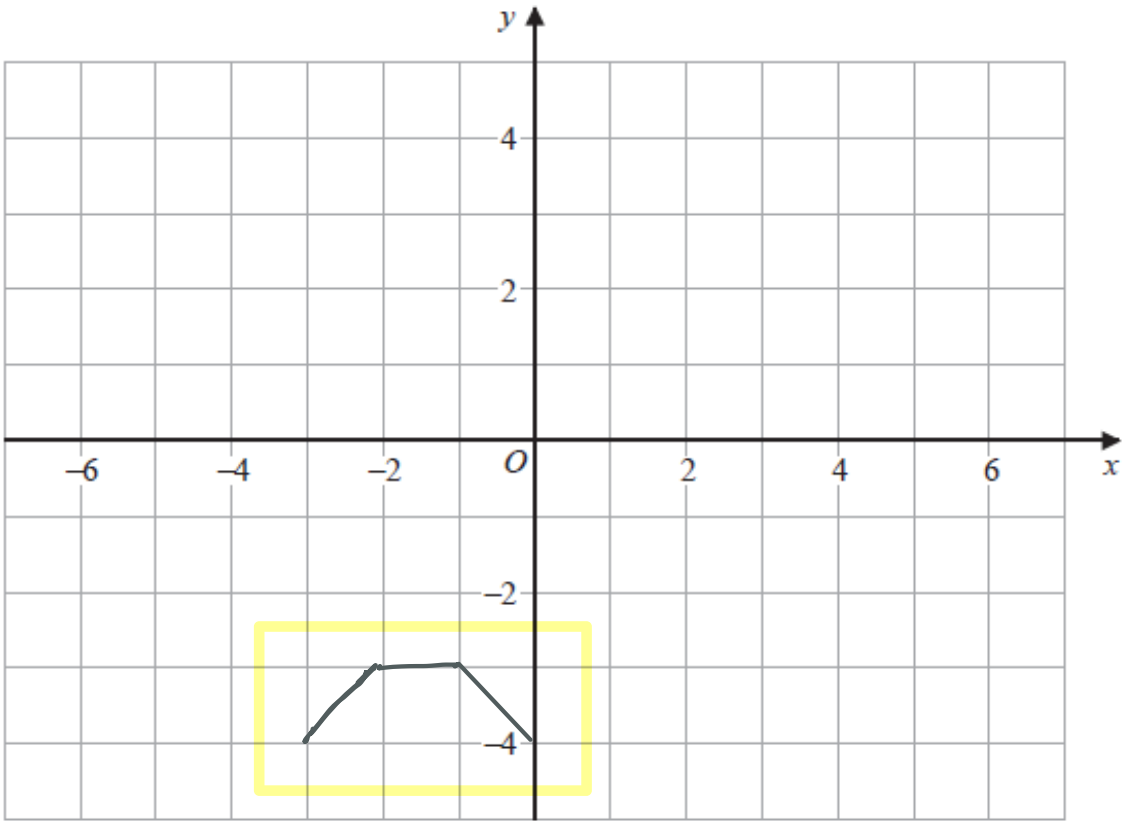
Final mark

(Total for Question 9 is 3 marks)

10 Here is the graph of $y = f(x)$



On the grid below, draw the graph of $y = f(x) - 4$



1 mark

(Total for Question 10 is 1 mark)

*11 Work out the value of the reciprocal of 0.625

$$\frac{1}{0.625}$$
$$= \frac{8}{5} = 1\frac{3}{5}$$

1 mark

1.6

(Total for Question 11 is 1 mark)

12 $ABCD$ is a trapezium.

AD is parallel to BC .

Calculate the area of triangle BCD .

Give your answer correct to 1 decimal place.

$$\frac{BD}{\sin 112} = \frac{7.9}{\sin 42}$$

1 mark

$$BD = \frac{7.9}{\sin 42} \times \sin 112$$

1 mark

$$= 10.9...$$

$$\text{area } BCD = \frac{1}{2} \times 10.9.. \times 15.3 \times \sin 42$$

1 mark

$$= 56.0343...$$

$$\text{so } 56.0 \text{ (1dp)}$$

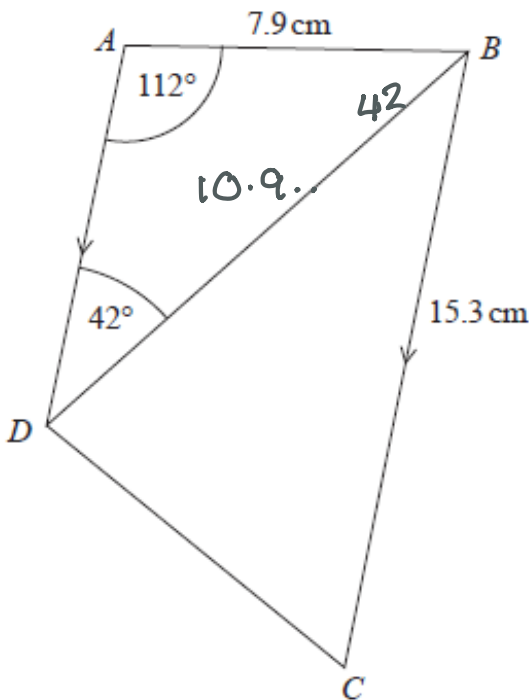
56.0

Final mark

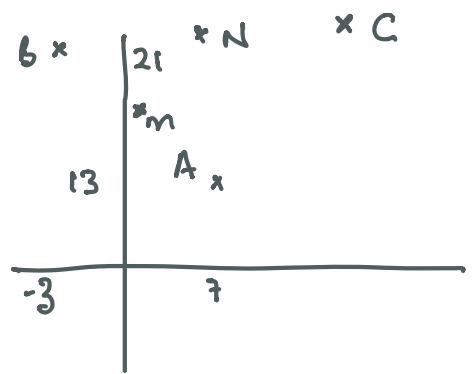
cm²

(Total for Question 12 is 4 marks)

Answers in the range 56.0 to 56.035 accepted



- 13 A is the point with coordinates $(7, 13)$
 B is the point with coordinates $(-3, 21)$
 C is the point with coordinates $(15, 23)$
 M is the midpoint of AB .
 N is the midpoint of BC .
Work out the distance between M and N .
Give your answer correct to 1 decimal place.



$$\begin{array}{ccc} & m & \\ A & & B \\ (7, 13) & & (-3, 21) \end{array}$$

$$\begin{array}{ccc} & N & C \\ B & & \\ (-3, 21) & & (15, 23) \end{array}$$

$$\frac{7-3}{2}, \frac{13+21}{2}$$

1 mark for either of these

$$\frac{-3+15}{2}, \frac{21+23}{2}$$

$$M = (2, 7)$$

$$N = (6, 22)$$

$$MN = \sqrt{(22-7)^2 + (6-2)^2}$$

1 mark

$$= \sqrt{5^2 + 4^2} = \sqrt{41}$$

$$= 6.403...$$

$$6.4$$

Final mark

(Total for Question 13 is 3 marks)

Answers in the range 6.4 to 6.41 accepted

TOTAL FOR PAPER IS 36 MARKS

WEEK 4 TASK 2

Qn	Working	Answer	Mark	Notes
1	eg $4x + 8y = 60$ or $3x + 6y = 45$ $- \underline{4x - 6y = 4}$ $+ \underline{4x - 6y = 4}$ $(14y = 56)$ $(7x = 49)$ eg $4x - 6\left(\frac{15-x}{2}\right) = 4$ or $4(15-2y) - 6y = 4$ oe		3	M1 Correct method to eliminate x or y : coefficients of x or y the same and correct operator to eliminate selected variable (condone any one arithmetic error in multiplication) or correctly writing x or y in terms of the other variable and correctly substituting.
	eg $x + 2 \times 4 = 15$ or $7 + 2 \times y = 15$			M1 dep correct method to find second variable using their value from a correct method to find first variable or for repeating above method to find second variable.
	<i>Working required</i>	$x = 7, y = 4$		A1 dep on M1
				Total 3 marks

Qn	Working	Answer	Mark	Notes
2 (b) (i)	eg $(y \pm 6)(y \pm 3)$ or $y(y + 3) - 6(y + 3)$ or $y(y - 6) + 3(y - 6)$ [allow use of x rather than y]	$(y - 6)(y + 3)$	2	M1 or $(y + a)(y + b)$ where $ab = -18$ or $a + b = -3$ or factorisation which expands to give 2 out of 3 correct terms
				A1
(ii)		6, -3	1	B1 ft must come from their factors in (b)(i)
				Total 3 marks

Qn	Working								Answer	Mark	Notes
3	x	-2	-1	0	1	2	3	4	Correct line	3	B3 for a correct line between $x = -2$ and $x = 4$ If not B3 then award B2 for a line segment through at least 3 of $(-2, 10), (-1, 7.5), (0, 5), (1, 2.5), (2, 0), (3, -2.5), (4, -5)$ or all points plotted correctly If not B2 then award B1 for at least 2 correct points plotted or stated (may be seen in a table) or for a line drawn with a negative gradient through $(0, 5)$ or for a line with a gradient of -2.5
	y	10	7.5	5	2.5	0	-2.5	-5			
											Total 3 marks

Qn	Working	Answer	Mark	Notes
4 (a)		2	1	B1
(b)		$8a^3$	2	B2 for $8a^3$ If not B2 then B1 for $8a^k$ where $k \neq 3$ or ka^3 where $k \neq 8$
				Total 3 marks

Qn	Working	Answer	Mark	Notes
5 (a)		$3c^2(6cd^2 - 7)$	2	B2 fully correct or B1 for a correct partial factorisation with at least two terms outside the bracket ie $3c(6c^2d^2 - 7c)$ or $c^2(18cd^2 - 21)$ or the fully correct factor outside the bracket with two terms inside the bracket and at most one mistake $3c^2(\dots\dots\dots)$
				Total 2 marks

Qn	Working	Answer	Mark	Notes
6		$(x =) 3$	3	B1
		$(y =) 6$		B1
		$(z =) 10$		B1
				Total 3 marks

Qn	Working	Answer	Mark	Notes
7 (c)	$5x(3x+4) = 15x^2 + 20x$ or $5x(2x-1) = 10x^2 - 5x$ or $(3x+4)(2x-1) = 6x^2 - 3x + 8x - 4$ $(= 6x^2 + 5x - 4)$		3	M1 for a correct intention to multiply all 3 factors by multiplying 2 factors only, allow one error
	$(15x^2 + 20x)(2x-1) = 30x^3 - 15x^2 + 40x^2 - 20x$ oe $(10x^2 - 5x)(3x+4) = 30x^3 + 40x^2 - 15x^2 - 20x$ oe $5x(6x^2 + 5x - 4) = 30x^3 + 25x^2 - 20x$ oe			M1 (dep)ft for expanding by the third factor, allow one error (some may do the expansion in one stage and will get to $30x^3 - 15x^2 + 40x^2 - 20x$ without firstly expanding two factors – this gains M2, allow one error)
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	$30x^3 + 25x^2 - 20x$		A1 isw correct factorisation $(30x^3 + 25x^2 - 20x)$ must be seen previously to award 3 marks) eg $5(6x^3 + 5x^2 - 4x)$ $x(30x^2 + 25x - 20)$ $5x(6x^2 + 5x - 4)$ do not isw incorrect simplification eg $30x^3 + 25x^2 - 20x = 6x^3 + 5x^2 - 4x$ gets M2A0
				Total 3 marks

Qn	Working	Answer	Mark	Notes
8	$2^{-4x} = 2^5$ or $-4x = 5$ or $-\frac{4}{5}x = 1$ oe		2	M1
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	$-\frac{5}{4}$		A1 oe allow eg $\frac{5}{-4}$
				Total 2 marks

Qn	Working	Answer	Mark	Notes
9 (a)		0.000 0932	1	B1
(b)		2.4×10^5	2	B2 If not B2, then B1 for 240 000 or 24×10^4 oe or 2.4×10^a $a \neq 5$
(c)		1.8×10^{121}	2	B2 If not B2, then B1 for 18×10^{120} or 1.8×10^b $b \neq 121$
				Total 5 marks

Qn	Working	Answer	Mark	Notes
10	eg $\frac{14}{3}$ and $\frac{11}{6}$		3	M1 for both mixed numbers expressed as improper fractions
	eg $\frac{14}{3} \times \frac{6}{11}$ or $\frac{28}{6} \div \frac{11}{6}$ or $\frac{28n}{6n} \div \frac{11n}{6n}$			M1 seeing this stage gains M2
	eg $\frac{14}{3} \times \frac{6}{11} = \frac{84}{33} = \frac{28}{11} = 2 \frac{6}{11}$ or $\frac{14}{3} \times \frac{6}{11} = \frac{84}{33} = 2 \frac{18}{33} = 2 \frac{6}{11}$ or $\frac{14}{3^1} \times \frac{6^2}{11} = \frac{28}{11} = 2 \frac{6}{11}$ or $\frac{14}{3} \div \frac{11}{6} = \frac{28}{6} \div \frac{11}{6} = \frac{28}{11} = 2 \frac{6}{11}$ or correct working to $\frac{28}{11}$ and writing $2 \frac{6}{11} = \frac{28}{11}$ <i>Working required</i>	Shown		A1 dep on M2 for conclusion to $2 \frac{6}{11}$ from correct working – either sight of result of multiplication eg $\frac{84}{33}$ must be seen or correct cancelling to $\frac{28}{11}$ or complete method using division and common denominators
				Total 3 marks

Qn	Working	Answer	Mark	Notes
11 (a)		Triangle drawn at $(-1, -3)$ $(-1, -4)$ $(-3, -3)$	2	B2 for a correct triangle with correct orientation and position If not B2 then award B1 for a correct triangle drawn with correct orientation in wrong position or triangle drawn with 2 out of 3 correct vertices
(b)		Triangle drawn at $(-4, 4)$ $(-4, 5)$ $(-2, 4)$	1	B1 cao
				Total 3 marks

Qn	Working	Answer	Mark	Notes
12 (a)		-0.5	1	B1 oe eg $-\frac{1}{2}, \frac{-1}{2}, \frac{1}{-2}, -1/2$
(b)	$(3x-5)y=2$ or $(3y-5)x=2$ or $3xy-5y=2$ or $3xy-5x=2$ oe or $3y-5=\frac{2}{x}$ or $3x-5=\frac{2}{y}$ oe		2	M1 remove denominator or get to the stage $3y-5=\frac{2}{x}$ or $3x-5=\frac{2}{y}$ A1oe eg $\frac{2}{3x}+\frac{5}{3}$ or $\frac{\frac{2}{x}+5}{3}$ must be in terms of x
(c)	$5(x^2-4x)\dots\dots\dots$ or $5(x^2-4x\dots\dots\dots)$ or $5(x-2)^2\dots$ $5[(x-2)^2-(-2)^2]\dots\dots\dots$ or $5[(x-2)^2-(-2)^2\dots\dots\dots]$ or $5(x-2)^2-20\dots\dots\dots$ or $5[(x-2)^2+\frac{3}{5}]$ Correct answer scores full marks (unless from obvious incorrect working)	$\frac{2+5x}{3x}$ $5(x-2)^2+3$	3	M1 M1 $(-2)^2$ can be 2^2 or 4 or $(\pm\frac{4}{2})^2$ A1
				Total 6 marks
Alternative mark scheme for 12(c)				
	$ax^2-2abx+ab^2+c$		3	M1 for multiplying out $a(x-b)^2+c$ to obtain $ax^2-2abx+ab^2+c$ oe
	2 of: $a=5$ $2ab=20$ oe $ab^2+c=23$ oe			M1 for equating coefficients and making 2 correct statements
		$5(x-2)^2+3$		A1

Qn	Working	Answer	Mark	Notes
13	eg $-\begin{pmatrix} -5 \\ 4 \end{pmatrix} + \begin{pmatrix} 9 \\ 1 \end{pmatrix}$ or $\begin{pmatrix} 5 \\ -4 \end{pmatrix} + \begin{pmatrix} 9 \\ 1 \end{pmatrix}$ or $\begin{pmatrix} 14 \\ a \end{pmatrix} a \neq -3$ or $\begin{pmatrix} b \\ -3 \end{pmatrix} b \neq 14$		2	M1 or an answer of $\begin{pmatrix} -14 \\ 3 \end{pmatrix}$
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	$\begin{pmatrix} 14 \\ -3 \end{pmatrix}$		A1
				Total 2 marks

Qn	Working	Answer	Mark	Notes
14 (a)		-3, -2, -1, 0, 1	2	B2 for -3, -2, -1, 0, 1 If not B2 then award B1 for 4 correct values and no incorrect values (eg -3, -2, -1, 0) or for 6 values with no more than one incorrect value (eg -4, -3, -2, -1, 0, 1)
(b)		$x > -1$	1	B1 accept $-1 < x$
				Total 3 marks

Qn	Working		Answer	Mark	Notes
15	eg $2(-3-2x)^2 + x^2 = -6x + 42$	eg $2y^2 + \left(\frac{-3-y}{2}\right)^2 = -6\left(\frac{-3-y}{2}\right) + 42$		5	M1 substitution of $y = \pm 3 \pm 2x$ (or $x = \frac{\pm 3 \pm y}{2}$) into $2y^2 + x^2 = -6x + 42$ to obtain an equation in x only (or y only)
	eg $9x^2 + 30x - 24 (=0)$ or $3x^2 + 10x - 8 (=0)$ allow eg $3x^2 + 10x = 8$	eg $\frac{9}{4}y^2 - \frac{3}{2}y - \frac{195}{4} (=0)$ or $9y^2 - 6y - 195 (=0)$ or $3y^2 - 2y - 65 (=0)$ allow eg $3y^2 - 2y = 65$			M1 ft (dep on previous M1) for multiplying out and collecting terms, forming a three term quadratic in any form of $ax^2 + bx + c (=0)$ where at least 2 coefficients (a or b or c) are correct
	eg $(3x-2)(x+4)(=0)$ or $\frac{-10 \pm \sqrt{10^2 - 4 \times 3 \times -8}}{2 \times 3}$ or $3\left[\left(x + \frac{5}{3}\right)^2 - \left(\frac{5}{3}\right)^2\right] = 8$ oe (should give $(x =) \frac{2}{3}, -4$)	eg $(3y+13)(y-5)(=0)$ or $\frac{2 \pm \sqrt{(-2)^2 - 4 \times 3 \times -65}}{2 \times 3}$ or $3\left[\left(y - \frac{1}{3}\right)^2 - \left(\frac{1}{3}\right)^2\right] = 65$ oe (should give $(y =) -\frac{13}{3}, 5$)			M1 ft (dep on M1) method to solve their 3 term quadratic using any correct method (allow one sign error and some simplification – allow as far as eg $\frac{-10 \pm \sqrt{100+96}}{6}$ or $\frac{2 \pm \sqrt{4+780}}{6}$) or if factorising allow brackets which expanded give 2 out of 3 terms correct) or correct values for x (allow 0.66(6...) or 0.67) or correct values for y (allow -4.33(3...))
	eg $2\left(\frac{2}{3}\right) + y = -3$ and $2(-4) + y = -3$	eg $2x + \frac{13}{3} = -3$ and $2x + 5 = -3$			M1 (dep on previous M1) for substituting their 2 found values of x or y in a suitable equation (use 2dp or better for substitution) or fully correct values for the other variable (correct labels for x/y)
	Working required		$x = -4, y = 5$ and $x = \frac{2}{3}, y = -\frac{13}{3}$	A1	oe (dep on M1) and a correct quadratic (allow coordinates) allow $x = 0.66(6...)$ or 0.67, $y = -4.33(3...), x = -4, y = 5$
				Total 5 marks	

Qn	Working	Answer	Mark	Notes
16	eg $10\,000x = 3818.18\ldots$ $\underline{100x = 38.18\ldots}$ or $1000x = 381.818\ldots$ $\underline{10x = 3.818\ldots}$ or $100x = 38.1818\ldots$ $\underline{x = 0.3818\ldots}$ oe		2	M1 For selecting 2 correct recurring decimals that when subtracted give a whole number or terminating decimal (37.8 or 378 or 3780 etc) eg $10\,000x = 3818.18\ldots$ and $100x = 38.1818\ldots$ or $1000x = 381.818\ldots$ and $10x = 3.81818\ldots$ or $100x = 38.1818\ldots$ and $x = 0.381818\ldots$ with intention to subtract. (if recurring dots not shown then showing at least one of the numbers to at least 5 sf) or $0.38 + 0.001\ddot{8}$ and eg $100x = 0.1818\ldots$, $10000x = 18.1818\ldots$ with intention to subtract.
	eg $10\,000x - 100x = 3818.18\ldots - 38.1818\ldots = 3780$ $(9900x = 3780)$ and $\frac{3780}{9900} = \frac{21}{55}$ or eg $1000x - 10x = 381.818\ldots - 3.81818\ldots = 378$ $(990x = 378)$ and $\frac{378}{990} = \frac{21}{55}$ or eg $100x - x = 38.1818\ldots - 0.381818\ldots = 37.8$ $(99x = 37.8)$ and $\frac{37.8}{99} = \frac{21}{55}$ or eg $10\,000x - 100x = 18.1818\ldots - 0.181818\ldots = 18$ and $0.38 + \frac{18}{9900} = \frac{38 \times 99 + 18}{9900} = \frac{3780}{9900} = \frac{21}{55}$ oe	shown		A1 for completion to $\frac{21}{55}$ dep on M1 <i>(NB: this is a “use algebra to show that…” question, so we need to see algebra as well as seeing all the stages of working to award full marks)</i>
				Total 2 marks

Qn	Working								Answer	Mark	Notes
17 (a)		x	-2	-1	-0.5	0	1	1.5	2	2	B2 0, 2, 4 (B1 for 1 or 2 correct)
		y	0	4	3.4	2	0	0.9	4		
(b)									correct curve	2	B2 For correct smooth curve. (there is an overlay for the curve – check the line now for (c)) If not B2, then B1 for at least 5 points plotted correctly ft from table dep on B1 or B2 in (a)
(c)	$2x^3 - 6x + 4 = -3x$ or $x^3 - 3x + 2 = -\frac{3}{2}x$ or $y = -\frac{3}{2}x$ seen (allow $-\frac{3}{2}x$)									3	M1
	$y = -\frac{3}{2}x$ allow a correct line that intercepts with the curve eg of points on line (0, 0), (-1, 1.5), (-1.5, 2.25), (-2, 3)										M1 a correct line that intercepts with the curve (a correct line drawn implies M2)
	Answer dependent on a correct line being drawn								(x=) -1.6		A1ft accept -1.6 or -1.7 or ft their curve/line intercept dep on a correct line being drawn NB: if y value given as well then M2 only
											Total 7 marks

Qn	Working	Answer	Mark	Notes
18	eg $2n, 2n+2, 2n+4$ or $2n-2, 2n, 2n+2$ etc		3	M1 for 3 consecutive even numbers in algebraic form (any letter can be used)
	eg $(2n)^2 + (2n+4)^2 = 4n^2 + 4n^2 + 16n + 16 = 8n^2 + 16n + 16$ or $2(2n+2)^2 = 2(4n^2 + 8n + 4) = 8n^2 + 16n + 8$ or $2(2n+2)^2 + 8 = 2(4n^2 + 8n + 4) + 8 = 8n^2 + 16n + 16$			M1 for the sum of the squares of the largest and smallest even numbers and adding or the square of the middle even number multiplied by 2 (no need to expand or simplify for this mark)
	eg $(2n)^2 + (2n+4)^2 = 8n^2 + 16n + 16$ and $2(2n+2)^2 + 8 = 8n^2 + 16n + 16$ or $(2n)^2 + (2n+4)^2 = 8n^2 + 16n + 16$ and $2(2n+2)^2 = 8n^2 + 16n + 8$ and $8n^2 + 16n + 16 - (8n^2 + 16n + 8) = 8$ or $(2n)^2 + (2n+4)^2 = 8n^2 + 16n + 16$ and $8n^2 + 16n + 16 = 8n^2 + 16n + 8 + 8 = 2(2n+2)^2 + 8$ or $2(2n+2)^2 + 8 = 8n^2 + 16n + 16$ and $8n^2 + 16n + 16 = 4n^2 + 4n^2 + 16n + 16 = (2n)^2 + (2n+4)^2$ <i>Working required</i>	Correctly shown		A1 dep on M2 for use of algebra to show correct conclusion (SCB1 for eg $(p+4)^2 + p^2$ or $2(p+2)^2$ or $2(p+2)^2 + 8$) (SCB2 for use of eg $(p+4)^2 + p^2 = 2p^2 + 8p + 16$ and $2(p+2)^2 + 8 = 2p^2 + 8p + 16$ If the student shows this and also says "it is true for all numbers, so it must be true for even numbers" oe or defines $p, p+2, p+4$ as even numbers, then this would gain M2A1
				Total 3 marks

Qn	Working	Answer	Mark	Notes
19	$\sqrt{3}x - x = 6 + 2\sqrt{3}$ oe or $x - x\sqrt{3} = -6 - 2\sqrt{3}$ (allow $-2\sqrt{9}$ or $-2(\sqrt{3})^2$ for -6 or $2\sqrt{9}$ or $2(\sqrt{3})^2$ for 6)		4	M1 expanding bracket and collecting terms. Condone one error
	$(x =) \frac{6+2\sqrt{3}}{\sqrt{3}-1}$ oe eg $\frac{-6-2\sqrt{3}}{1-\sqrt{3}}$			A1 oe must be a correct fraction with irrational numerator and denominator
	$(x =) \frac{(6+2\sqrt{3})}{(\sqrt{3}-1)} \times \frac{(\sqrt{3}+1)}{(\sqrt{3}+1)}$ or $\frac{(6+2\sqrt{3})(\sqrt{3}+1)}{2}$ oe or $\frac{(6+2\sqrt{3})}{(-1+\sqrt{3})} \times \frac{(-1-\sqrt{3})}{(-1-\sqrt{3})}$ oe or $\frac{(-6-2\sqrt{3})(1+\sqrt{3})}{(1-\sqrt{3})(1+\sqrt{3})}$ oe			M1 (indep) Multiplying the numerator and denominator of their fraction by $\sqrt{3}+1$ oe or showing 2 or -2 as the denominator and multiplying the numerator by $\sqrt{3}+1$ oe or rationalising their denominator, so long as it is of the form $p+q\sqrt{3}$ where p and q are non zero integers (condone missing brackets provided meaning is clear)
	Working required	$6+4\sqrt{3}$		A1 dep on M1A1M1 with no errors seen
				Total 4 marks

Qn	Working	Answer	Mark	Notes
20	eg $\frac{(4x+3)(x-5)}{2x-1} \times \frac{(2x-1)(x-3)}{(x+5)(x-5)}$ or eg $\frac{(4x+3)(x-3)}{x+5} + (29-4x)$		4	M2 for factorising at least 2 of the quadratics correctly – could be implied by 2 factors cancelled correctly (M1 for factorising at least 1 of the 3 quadratics correctly)
	eg $\frac{(4x+3)(x-3) + (29-4x)(x+5)}{x+5}$ oe or eg $\frac{4x^2 - 9x - 9 + 145 + 9x - 4x^2}{x+5}$ oe			M1 for writing the correct fractions over a common denominator of $(x+5)$ with or without brackets removed – need not be in simplest form. Could be written as 2 separate fractions.
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	$\frac{136}{x+5}$		A1
				Total 4 marks

Qn	Working	Answer	Mark	Notes
21 (a)	$P = \frac{k}{y^2}$		3	M1 oe (the constant term, k , can be any other letter apart from a or P or y)
	eg $a = \frac{k}{4^2}$ or $k = 16a$			M1 oe
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	$P = \frac{16a}{y^2}$		A1 oe eg $P = 16ay^{-2}$ or $P = \frac{4^2 a}{y^2}$
(b)	$\sqrt{\frac{16a}{4a}} = c\sqrt{a}$ oe eg $\frac{16a}{4a} = c^2 a$ or $4a = \frac{16a}{c^2 a}$ or $4a \times c^2 a = 16a$ oe or (when $P = 4a$) $y^2 = \frac{16a}{4a}$ or $y^2 = 4$ or $y = \sqrt{\frac{16a}{4a}} (= 2)$ oe		3	M1 ft a correct formula involving the constant term (c used here) and a or ft for an expression or value of y^2 or y given for when $P = 4a$
	$c = \sqrt{\frac{4}{a}}$ or $c = \frac{\pm 2}{\sqrt{a}}$ or $c = \frac{\pm 2\sqrt{a}}{a}$ oe allow the constant term squared eg $c^2 = \frac{16a}{4a^2} \left(= \frac{4}{a} \right)$			M1 (implies previous M1) a correct value, in terms of a , for the constant term or the constant term squared – need not be simplified
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	$P = \frac{4a^2}{x}$		A1 oe eg $P = \frac{16a}{\frac{4x}{a}}$ or $P = \frac{16a^2}{4x}$
				Total 6 marks

Qn	Working	Answer	Mark	Notes
22 (a)	$\overrightarrow{ON} = \mathbf{b} + \frac{2}{5}(\mathbf{a} - \mathbf{b})$ oe or $\overrightarrow{ON} = \mathbf{a} + \frac{3}{5}(\mathbf{b} - \mathbf{a})$ oe		2	M1
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	$\frac{2}{5}\mathbf{a} + \frac{3}{5}\mathbf{b}$		A1 oe eg $\frac{1}{5}(2\mathbf{a} + 3\mathbf{b})$ but must be one term in a and one in b
(b)	$\overrightarrow{ME} = \frac{8}{5}\mathbf{a} - \frac{4}{5}\mathbf{b}$ $\overrightarrow{NE} = \frac{6}{5}\mathbf{a} - \frac{3}{5}\mathbf{b}$ (all oe but simplified) $\overrightarrow{MN} = \frac{2}{5}\mathbf{a} - \frac{1}{5}\mathbf{b}$		3	M1 ft for one of $\overrightarrow{ME}$, $\overrightarrow{NE}$ or $\overrightarrow{MN}$ or one of $\overrightarrow{EM}$, $\overrightarrow{EN}$ or $\overrightarrow{NM}$ ft (dep on M1 in (a)) their expression for $\overrightarrow{ON}$ for this mark only [$\overrightarrow{ME} = \overrightarrow{ON} + \frac{6}{5}\mathbf{a} - \frac{7}{5}\mathbf{b}$ $\overrightarrow{MN} = \overrightarrow{ON} - \frac{4}{5}\mathbf{b}$, $\overrightarrow{NE} = -\overrightarrow{ON} + \frac{11}{3}\mathbf{a}$]
	$\overrightarrow{ME} = \frac{8}{5}\mathbf{a} - \frac{4}{5}\mathbf{b}$ $\overrightarrow{NE} = \frac{6}{5}\mathbf{a} - \frac{3}{5}\mathbf{b}$ (all oe but simplified) $\overrightarrow{MN} = \frac{2}{5}\mathbf{a} - \frac{1}{5}\mathbf{b}$			M1 for two of $\overrightarrow{ME}$, $\overrightarrow{NE}$ or $\overrightarrow{MN}$ or two of $\overrightarrow{EM}$, $\overrightarrow{EN}$ or $\overrightarrow{NM}$ must be correct
	<i>Evidence of a vector method needed</i>	shown		A1 eg $\overrightarrow{ME} = 4 \times \overrightarrow{MN}$ or $\overrightarrow{NE} = 3 \times \overrightarrow{MN}$ or $\overrightarrow{ME} = \frac{4}{3} \times \overrightarrow{NE}$ or showing they are multiples of the same vector eg $\overrightarrow{MN} = \frac{1}{5}(2\mathbf{a} - \mathbf{b})$ and $\overrightarrow{NE} = \frac{3}{5}(2\mathbf{a} - \mathbf{b})$
				Total 5 marks

WEEK 4 TASK 3

Answer all questions.

Write your answers in the spaces provided.

You must write down all the stages in your working.

1 The table shows some information about the heights of a group of adults.

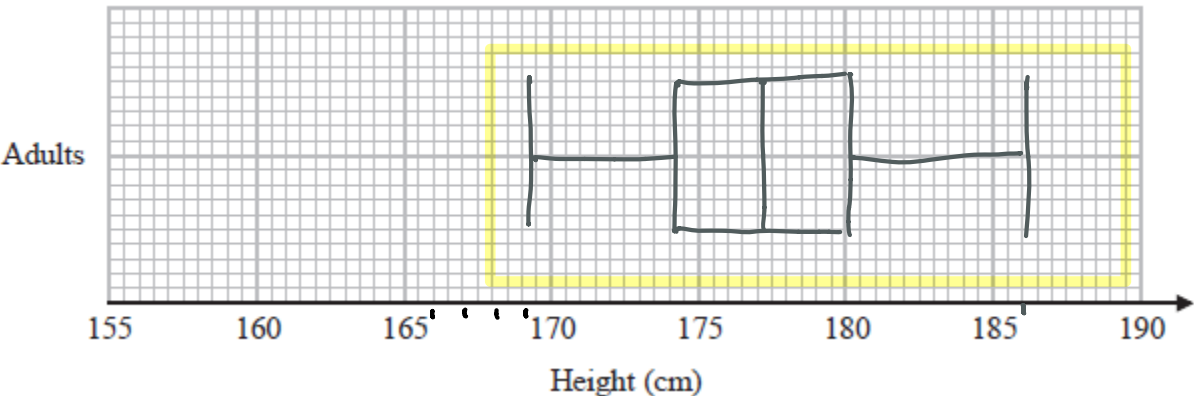
2 marks at least
three correct
points drawn

1 mark for at
least two correct
points drawn

least height	169 cm
greatest height	186 cm
median	177 cm
lower quartile	174 cm
upper quartile	180 cm

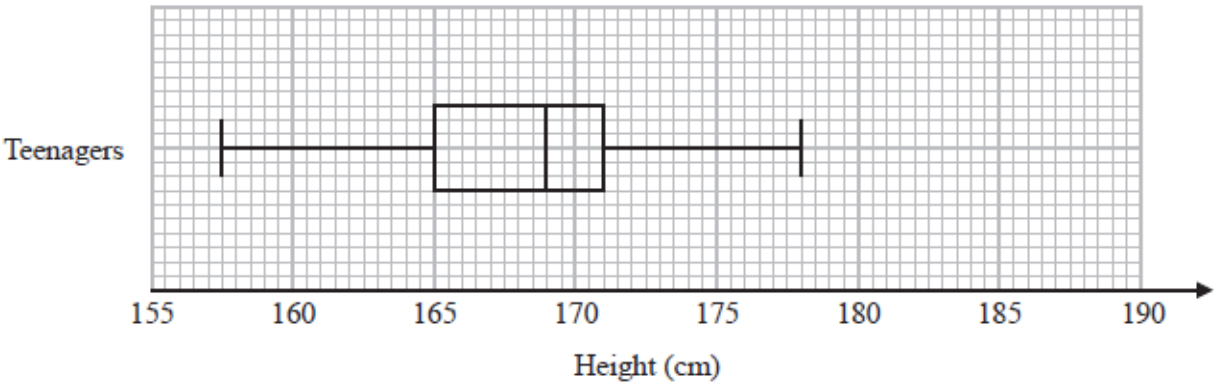
3 marks for fully
correct box plot

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



(3)

The box plot below shows the distribution of the heights of a group of teenagers.



(b) Compare the distribution of the heights of the adults with the distribution of the heights of the teenagers.

1 mark for correct comparison of medians

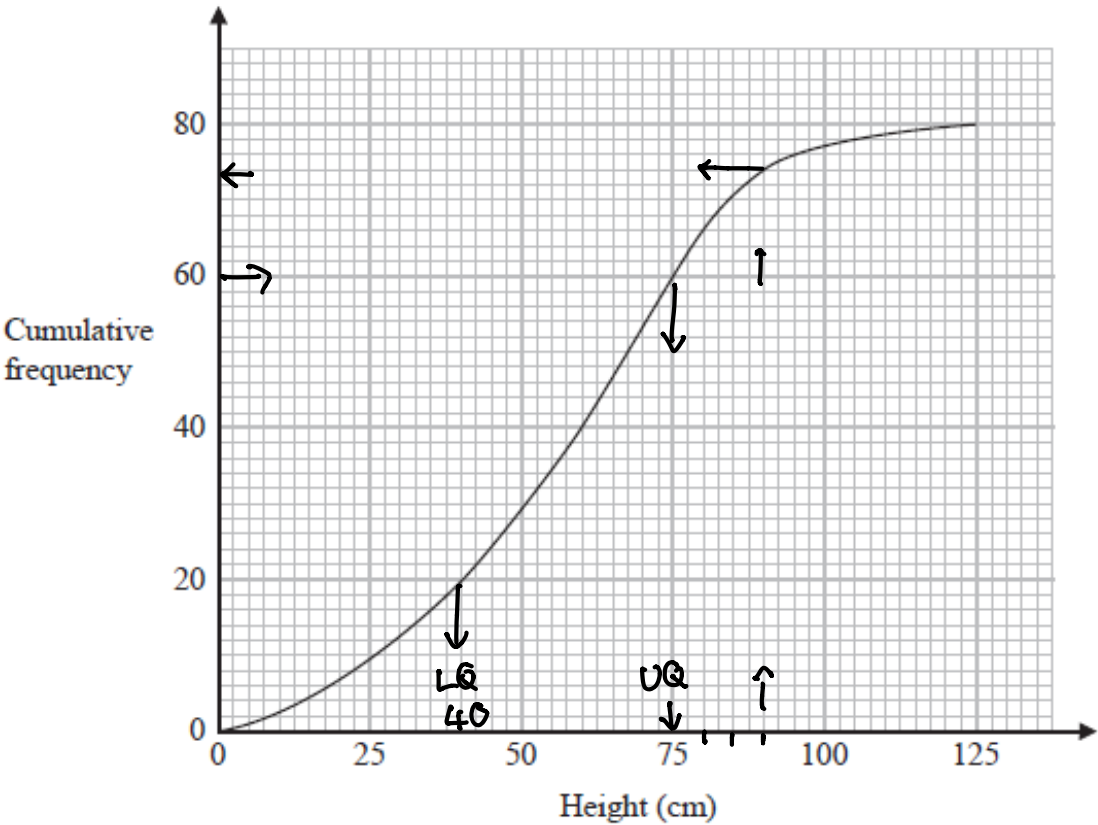
The median for adults is greater so on average they are taller.
The IQR of both groups is the same so they have similar spread of heights

1 mark for correct comparison of spread (IQR or range)

(2)

(Total for Question 1 is 5 marks)

- 2 Alan grew 80 plants of the same type outside.
- The cumulative frequency graph shows information about the heights, in cm, of these plants.



- One of the plants is chosen at random.
- (a) Find an estimate for the probability that this plant will have a height greater than 90 cm.

1 mark

$$80 - 74 = 6$$

6

80

Final mark

(2)

- (b) Use the graph to find an estimate for the interquartile range of the heights.

1 mark for either of these

LQ = 40

UQ = 75

75 - 40

35

Final mark

cm

(2)

- Alan also grew plants of the same type inside.
- The interquartile range of the heights of these plants is 30 cm.
- (c) Give one comparison between the distribution of the heights of the plants grown inside with the distribution of the heights of the plants grown outside.

The inside plants have more consistent heights (30 is smaller than 35) as the IQR is smaller.

1 mark for suitable comparison of the IQR

(1)

(Total for Question 2 is 5 marks)

***3** 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

Seija says,

“The median temperature is 22.5 °C because 22.5 is the middle number in the middle group.”

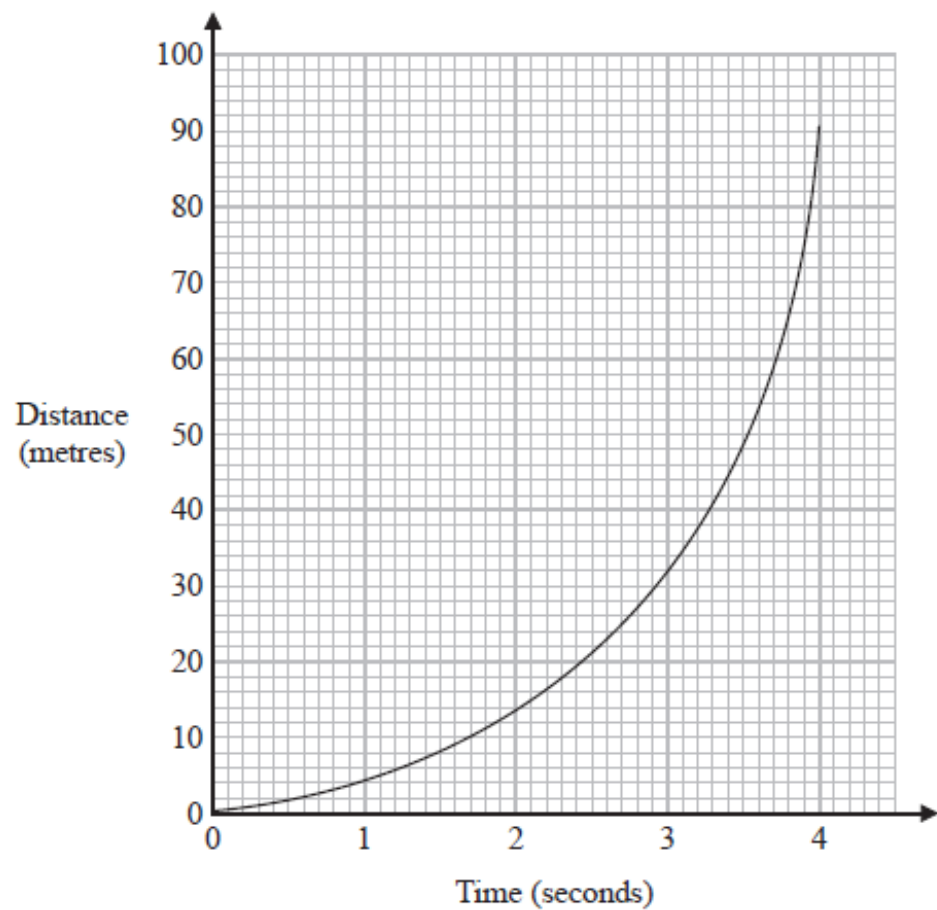
Is Seija correct? Give a reason for your answer.

No, the 25th (middle) temperature would be in $25 < T \leq 30$

1 mark for 'no' with acceptable reason

(Total for Question 3 is 1 mark)

4 Here is a distance-time graph.



What does the gradient of the graph represent?

Speed (or velocity)

1 mark

(Total for Question 4 is 1 mark)

5 Solve $\frac{1}{x+4} + \frac{3}{2-2x} = 1$

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

1 mark

$$2 - 2x + 3x + 12 = 2x - 2x^2 + 8 - 8x$$

$$x + 14 = -6x + 8 - 2x^2$$

1 mark

$$2x^2 + 7x + 6 = 0$$

$$2 \times 6 = 12$$

$$\begin{array}{r} 1, 12, \\ 2, 6 \\ \hline 3, 4 \end{array}$$

$$2x^2 + 4x + 3x + 6 = 0$$

$$2x(x + 2) + 3(x + 2) = 0$$

$$(2x + 3)(x + 2) = 0$$

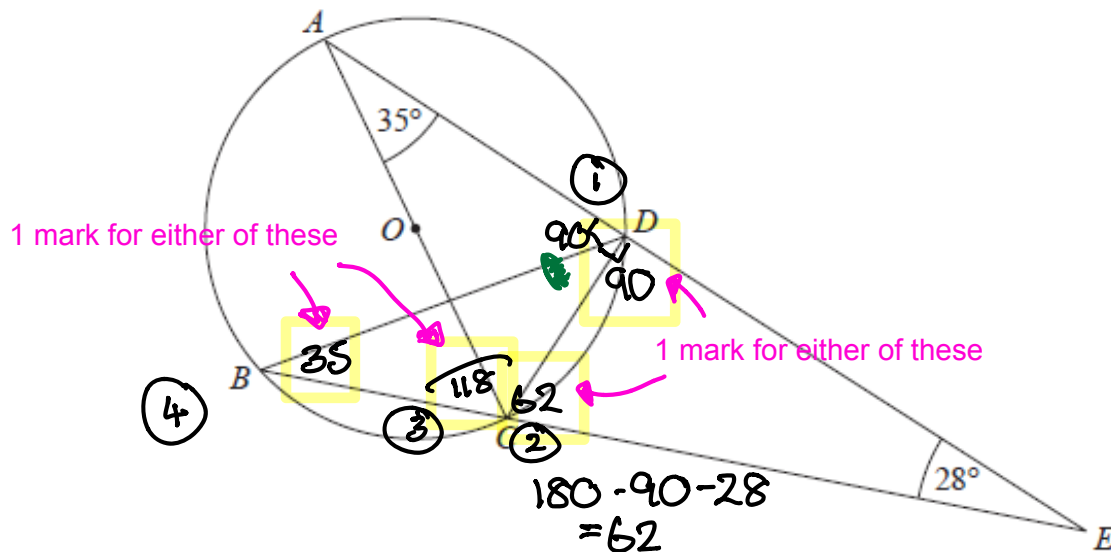
1 mark

$$x = -\frac{3}{2} \quad x = -2$$

Final mark

$$x = -1.5 \quad x = -2$$

(Total for Question 5 is 4 marks)



A, B, C and D are points on the circumference of a circle, centre O .
 AC is a diameter of the circle.
 ADE and BCE are straight lines.
 Work out the size of angle BDC .
 Write down any circle theorems that you use.

① angle in a semicircle = 90° $\widehat{ADC} = 90$
 so $CDE = 90$ so $\widehat{DCE} = 62^\circ$ angles in a triangle
 add up to 180° Final mark for an answer of 27 and one correct circle
 theorem used ie either of these

③ $\widehat{BCD} = 180 - 62 = 118$ angles on a straight line = 180

④ $\widehat{BAC} = 35^\circ$ angles in the same segment are equal

$$\begin{aligned} \text{so } \widehat{BDC} &= 180 - 35 - 118 \\ &= 180 - 153 = 27 \end{aligned}$$

27

1 mark

(Total for Question 6 is 4 marks)

- 7 Given that $\frac{2x^2 + y^2}{4x^2 - y^2} = \frac{43}{11}$ where $x > 0$ and $y > 0$

find, in its simplest form, the ratio $x : y$

$$11(2x^2 + y^2) = 43(4x^2 - y^2) \quad 1 \text{ mark}$$

$$22x^2 + 11y^2 = 172x^2 - 43y^2$$

$$54y^2 = 150x^2 \quad 1 \text{ mark}$$

$$y^2 = \frac{150}{54}x^2$$

$$y^2 = \frac{25}{9}x^2$$

$$\text{so } y = \frac{5}{3}x \quad 1 \text{ mark}$$

$$\text{or } x = \frac{3}{5}y$$

$$x : y$$

$$0.6 : 1$$

$$\times 5 \quad \times 5$$

$$3 : 5$$

Final mark

$$3:5$$

(Total for Question 7 is 4 marks)

- 8 The turning point on the graph of $y = g(x)$ has coordinates $(-3, 6)$

Write down the coordinates of the turning point on the graph of $y = g(x - 7)$

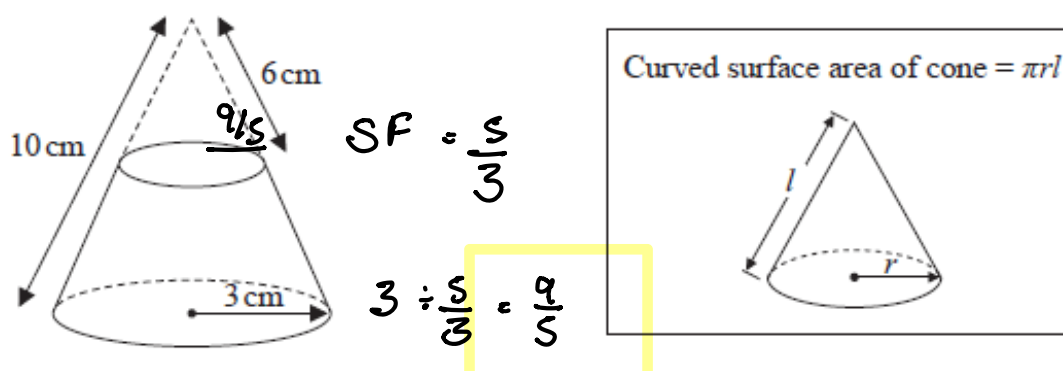
1 mark

$$4 \quad 6$$

(.....,)

(Total for Question 8 is 1 mark)

- 9 A solid frustum is made by removing a small cone from a large cone as shown in the diagram.



1 mark

The slant height of the small cone is 6 cm.

The slant height of the large cone is 10 cm.

The radius of the base of the large cone is 3 cm.

Calculate the total surface area of the frustum.

Give your answer correct to 3 significant figures.

1 mark for either of these

$$\text{Base} = \pi \times 3^2 = 9\pi \quad \text{Top} = \pi \times \left(\frac{9}{5}\right)^2 = \frac{81}{25}\pi$$

$$\text{Curved area} = \pi \times 3 \times 10 - \pi \times \frac{9}{5} \times 6 \quad 1 \text{ mark}$$

$$= 30\pi - \frac{54}{5}\pi$$

$$= \frac{96}{5}\pi$$

$$\text{Total} = \frac{96}{5}\pi + 9\pi + \frac{81}{25}\pi \quad 1 \text{ mark}$$

$$= \frac{786}{25}\pi$$

$$= 98.771\dots$$

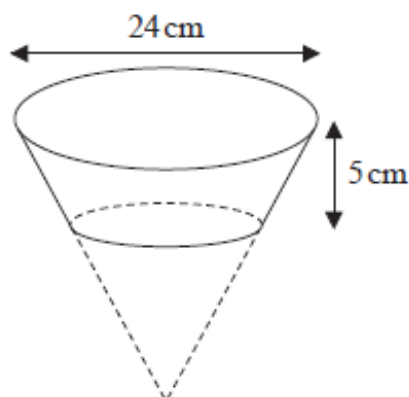
Final mark

$$98.8 \text{ (3 s.f.)}$$

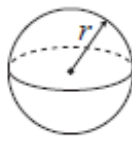
cm²

(Total for Question 9 is 5 marks)

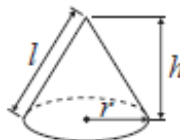
Range accepted 98.7 to 98.8



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



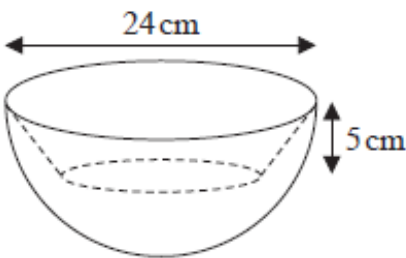
Volume of cone = $\frac{1}{3} \pi r^2 h$



The diagram above shows a frustum **F** of a cone.

The frustum is made by removing a cone with height 10 cm from a solid cone with height 15 cm and base diameter 24 cm.

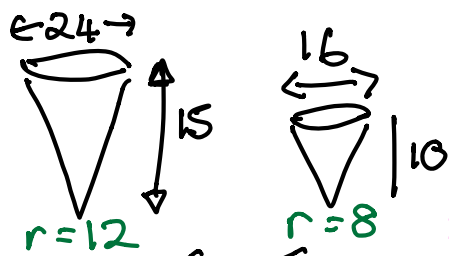
The solid **S** is made by removing **F** from a solid hemisphere as shown in the diagram below.



The hemisphere has diameter 24 cm.

Calculate the volume of solid **S**.

Give your answer correct to 3 significant figures.



$24 \div 1.5 = 16$

1 mark

length SF = 1.5

1 mark for either of these

Volume of frustum = $\frac{1}{3} \pi \times 12^2 \times 15 - \frac{1}{3} \pi \times 8^2 \times 10$

= 1591.740278

1 mark

$$\text{Volume of solid} = \frac{1}{2} \times \frac{4}{3} \times \pi \times 12^3 - 1591.74 \dots$$

$$\begin{aligned} &= 2027.3744 \dots \\ \text{3 s.f.} &= 2030 \end{aligned}$$

Final mark

2030

..... cm³

(Total for Question 10 is 4 marks)

Answers accepted in the range 2026 to 2030

11 Zia has to set a 4-digit security passcode on her phone.

Each digit of the passcode is a number from 1 to 9

She can use each number more than once. LOOK

Zia tells her friend Amber that

the first digit is a cube number

the second digit is a prime number

the third digit is greater than 6

the fourth digit is an odd number.

1, 8

2, 3, 5, 7,

7, 8, 9

1, 3, 5, 7, 9

1 mark for any two of these lists

The diagram shows one possible 4-digit passcode.



Amber is going to have one attempt at guessing Zia's passcode.

Work out the probability that Amber guesses Zia's passcode on the first attempt.

Number of combinations

1 mark

$$= 2 \times 4 \times 3 \times 5 = 120$$

1 attempt = $\frac{1}{120}$

Final mark

$$\frac{1}{120}$$

(Total for Question 11 is 3 marks)

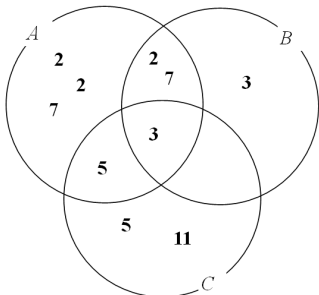
WEEK 4 TASK 4

Qn	Working	Answer	Mark	Notes
1	$55 \times 32 (= 1760)$ or $52 \times 28 (= 1456)$ or $55 \times 32 + 52 \times 28 (= 3216)$		3	M1 for one correct product or method to find the total mark for both classes
	eg $\frac{"1760"+"1456"}{32+28}$ or $\frac{3216}{60}$			M1 for a complete method
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	53.6		A1
				Total 3 marks

Qn	Working	Answer	Mark		Notes	
2 (a)	for 0.04×2000 oe (= 80) or 1.04×2000 oe (= 2080)	OR 2000×1.04^3 oe		3	M1 for finding 4% or 104% of 2000	OR M2 for 2000×1.04^3 oe or 2000×1.04^4 oe (= 2339.72)
	$1.04 \times$ “2080” oe (= 2163.2) $1.04 \times$ “2163.2” oe				M1 for completing method to find total amount in the account at the end of 3 years	
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>		2250		A1 accept 2249 – 2250	
					SC: if no other marks gained award M1 for 0.12×2000 oe or 240 or 1.12×2000 oe or 2240 accept $(1 + 0.04)$ as equivalent to 1.04 throughout	
(b)	eg $1365 \div (1 - 0.09)$ or $1365 \div 0.91$			3	M2 for a complete method	
					(M1) for $1365 \div (100 - 9)$ (= 15) or $(100 - 9)\% = 1365$ or $91\% = 1365$ or eg $(1 - 0.09)T = 1365$ or eg $T - 0.09T = 1365$	
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>		1500		A1	
					Total 6 marks	

Qn	Working	Answer	Mark	Notes
3	$1600 \times 0.16 (= 256)$ oe or $1 - 0.16 (= 0.84)$ oe		4	M1
	$1600 - "256"$ or $1600 \times "0.84" (= 1344)$			M1
	$\frac{"1344"}{1400} (= 0.96)$ or $\frac{1400 - "1344"}{1400} (= 0.04)$ or $\frac{"1344"}{1400} \times 100 (= 96)$ or $\frac{1400 - "1344"}{1400} \times 100$			M1
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	4		A1 SCB1 for 1856 seen if no other marks awarded
				Total 4 marks

Qn	Working	Answer	Mark	Notes
4	eg $\pi \times 3^2 \times 7 (= 63\pi$ or $197.9\dots)$		3	M1 for method to find the volume of Solid A
	eg $\frac{2000}{[\text{vol A}]}$ or $\frac{3375}{450} (= 7.5)$ oe or $\frac{2000 + 3375}{[\text{vol A}] + 450}$			M1 (indep) for method to find the density of Solid A , B or C , allow use of their volume for Solids A and C
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	8.3		A1 accept 8.29 – 8.31
				Total 3 marks

Qn	Working	Answer	Mark	Notes												
5 (a)	$2 \times 2 \times 2 \times 5 \times 5$ or 2, 2, 2, 5, 5 or $2 \times 2 \times 3 \times 5 \times 7$ or 2, 2, 3, 5, 7 or eg <table><tr><td>2</td><td>200</td><td>420</td></tr><tr><td>2</td><td>100</td><td>210</td></tr><tr><td>5</td><td>50</td><td>105</td></tr><tr><td></td><td>10</td><td>21</td></tr></table>	2	200	420	2	100	210	5	50	105		10	21		2	M1 for one number written as a product of prime factors or prime factors listed – numbers may be at end of factor trees or on ‘ladder diagrams’ or in a table or in a Venn diagram or at least two factors for each (excluding 1, 200, 420)
2	200	420														
2	100	210														
5	50	105														
	10	21														
	Correct answer scores full marks (unless from obvious incorrect working)	20		A1 or $2^2 \times 5$ oe												
(b)			2	M1 for $2^m \times 3^n \times 5^p \times 7^q \times 11^r$ with at least three of $m = 3, n = 2, p = 2, q = 2, r = 1$ (all 5 terms should be seen) or omission of one term with others fully correct OR prime factors seen in a Venn diagram – if so must be fully correct												
	Correct answer scores full marks (unless from obvious incorrect working)	$2^3 \times 3^2 \times 5^2 \times 7^2 \times 11$		A1 allow 970 200 oe												
Total 4 marks																

Qn	Working	Answer	Mark	Notes	
6	$390 \div (8 - 2) (= 65)$ or $\frac{8}{15} - \frac{2}{15} = 390$ or $\frac{8}{15}x - \frac{2}{15}x = 390$ or $\frac{6}{15} = 390$ or $\frac{6}{15}x = 390$ oe		3	M1	M2 for $\frac{390 \times 15}{6}$ oe
	“65” $\times (2 + 5 + 8)$ oe or $\frac{1}{15} = 65$ or $\frac{1}{15}x = 65$ or $\frac{1}{5} = 195$ or $\frac{1}{5}x = 195$			M1 or for 975 seen with further work and a different answer	
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	975		A1	SCB1 for 52, 130, 208 or 390, 975, 1560 (or 2925) or 97.5, 243.75, 390 (or 731.25)
				Total 3 marks	

Qn	Working	Answer	Mark	Notes
7 (a)		$48 < S \leq 54$	1	B1 Allow 48 – 54 oe
(b)	$(33 \times 4) + (39 \times 14) + (45 \times 18) + (51 \times 19) + (57 \times 5)$ or $132 + 546 + 810 + 969 + 285 (= 2742)$ [lower bound products are: 120, 504, 756, 912, 270] [upper bound products are: 144, 588, 864, 1026, 300]		4	M2 M2 for at least 4 correct products added (need not be evaluated) or If not M2 then award: M1 for consistent use of value within interval (including end points) for at least 4 products which must be added or correct midpoints used for at least 4 products and not added
	$\frac{2742}{60}$			M1 dep on M1 Allow division by their Σf provided addition or total under column seen
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	45.7		A1oe $45\frac{7}{10}$ or $\frac{457}{10}$ (accept 46 from correct working)
				Total 5 marks

Qn	Working	Answer	Mark	Notes
8	eg $\frac{x+7}{80} = \frac{1}{4}$ or $4(x+7) = 80$ or $x+7 = 20$		4	M1 for setting up a correct equation in terms of x only
	eg $x = 80 \times \frac{1}{4} - 7 (=13)$ or $4x+28=80$ and $x = \frac{80-28}{4} (=13)$ or $x = 13$			M1 for a complete method to find the value of x or $x = 13$. Award of this mark implies M2.
	eg $80 - ("13" + 7 + "13" - 11 + 3 \times "13") (=19)$ or $\frac{"13" + 7 + "13" - 11 + 3 \times "13"}{80} \left(= \frac{61}{80} \right)$			M1 for a method to find the number of yellow counters or P(R or B or G)
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	$\frac{19}{80}$		A1 oe eg accept 0.2375 or 23.75% or 0.237 or 23.7% or 0.238 or 23.8% or 0.24 or 24%
				Total 4 marks

Qn	Working	Answer	Mark	Notes
9			3	M1 For area of 2 different faces (ie not 2 triangles)
	$0.5 \times 4.8 \times 3.6 (= 8.64)$ oe or 4.8×3.6 if clear intention for this to be 2 triangles $7 \times 3.6 (= 25.2)$ $7 \times 4.8 (= 33.6)$ $7 \times 6 (= 42)$ (all measurements with intention to add)			M1 For adding together 5 areas , at least 4 of which are correct NB: $(3.6 + 4.8 + 6) \times 7 (= 100.8)$ is 3 faces
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	118		A1 118.1 or 118.08
				Total 3 marks

Qn	Working	Answer		Mark
10	$\frac{1}{2} \times 7 \times h = 42$ oe or $(h =) \frac{42 \times 2}{7}$ (= 12) oe or $3.5^2 + h^2 = y^2$ or $h = \sqrt{y^2 - 3.5^2}$ oe		4	M1 A correct equation involving the height or a correct expression for height – could be in terms of y
	$y^2 = \left(\frac{7}{2}\right)^2 + ("12")^2$ oe or $\frac{1}{2} \times 7 \times \sqrt{y^2 - 3.5^2} = 42$ oe			M1 (indep) use of <i>their</i> height (any found value that they have called 'height')
	$y = \sqrt{\left(\frac{7}{2}\right)^2 + ("12")^2}$ oe			M1 all values must come from a correct method
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	12.5		A1 oe eg $\frac{25}{2}$
				Total 4 marks

Qn	Working	Answer	Mark	Notes
11 (a)		7, 17, 32, 64, 80	1	B1 values seen in table
(b)			2	M1ft for at least 4 points plotted correctly at end of interval or for all points plotted consistently within each interval of the associated frequency table (eg at 5, 15, 25, 35, 45 or 0, 10, 20, 30, 40) at the correct height. ft their table dep on one error only in the table
	(NB: a 'bar chart' type graph scores zero marks)	correct cf graph		A1 All points plotted correctly at end of interval (tolerance 1 small square – there is an overlay) and joined with a curve or line segments accept curve that is not joined at (0, 0).
(c)	<i>Accept a single value in the range OR ft their cf graph</i>	33	1	B1ft Accept a single value in range 32 – 34 or ft their cf graph
(d)	NB: readings are 21 - 23 and 37 - 39 (but for this M1 these do not have to be correct if correct working is shown – eg lines or marks indicating use of CF 20 (or 20.25) and CF 60 (or 60.75) with an indication on the Time axis at the correct points (or they can just show the correct readings))		2	M1ft For correct use of LQ and UQ and subtraction, ft from a cum freq graph provided method is shown – eg a line horizontally to the graph from readings of CF 20 and CF 60 to meet the graph and then a vertical line to the Time axis (even if wrongly read scale) or clear marks on the graph and Time axis that correspond to the correct readings or correct values from the Time axis
	<i>Accept a single value in the range OR ft their cf graph</i>	16		A1ft Accept a single value in range 15 to 17 or ft from their cumulative frequency graph provided method is shown eg subtraction of values that would be correct for their graph
				Total 6 marks

Qn	Working	Answer	Mark	Notes
12	$\frac{0.515}{6.25}$		2	M1 For either bound correct (used or seen)
	<i>Working required</i>	0.0824		A1 dep on M1 Allow $\frac{103}{1250}$
				Total 2 marks

Qn	Working	Answer	Mark	Notes
13		Fully correct angle bisector with all relevant arcs shown	2	B2 for a fully correct angle bisector with all relevant arcs shown If not B2 then B1 for all arcs and no angle bisector drawn or for a correct angle bisector within the guidelines but no correct arcs or insufficient correct arcs
				Total 2 marks

Qn	Working	Answer	Mark	Notes	
14	$SCD = 128^\circ$ or $BCS = 32^\circ$ or $TSC = 180 - 128 (= 52)$		4	M1 angles need to be identified or may be seen marked on the diagram	M2 for $(BCD \Rightarrow) 128 + 32 (= 160)$ or $(DCV \Rightarrow) 52 - 32 (= 20)$ (may be seen marked on the diagram). To award these marks 160 or 20 must be clearly used or identified as the interior or exterior angle.
	eg (int $\angle \Rightarrow$) $128 + 32 (= 160)$ or (ext $\angle \Rightarrow$) $180 - (128 + 32) (= 20)$ or (ext $\angle \Rightarrow$) $52 - 32 (= 20)$			M1 (dep on previous M1) for method to find the size of one interior or exterior angle, may be seen marked on the diagram.	
	eg $180(n - 2) = 160$ or $360 \div 20$			M1 for setting up an equation for the sum of interior angles or $360 \div 20$	
	<i>Working required</i>	18		A1 dep on M2	
				Total 4 marks	

Qn	Working	Answer	Mark	Notes
15	$(AD =) \frac{2.2}{\tan 18} (= 6.77\dots)$ or $(EA =) \frac{2.2}{\sin 18} (= 7.11\dots)$		4	M1 a correct method to find AD or AE
	$(DB =) \sqrt{("6.77\dots")^2 + 6^2} (= 9.04\dots)$ or $(EB =) \sqrt{6^2 + "7.11\dots"^2} (= 9.31\dots)$ or $(EB =) \sqrt{6^2 + "6.77\dots"^2 + 2.2^2} (= 9.31\dots)$			M1 a correct method to find DB or EB
	$\tan DBE = \frac{2.2}{"9.04\dots"}$ or $\sin DBE = \frac{2.2}{"9.31\dots"}$ or $\sin DBE = \frac{2.2 \sin 90}{"9.31\dots"}$ $\cos DBE = \frac{"9.04\dots"}{"9.31\dots"}$ or use of cosine rule			M1 complete method to find one of $\tan DBE$ or $\sin DBE$ or $\cos DBE$ – NB: if using cosine, the student will need to have found DB and EB previously
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	13.7		A1 Allow answers in range 13.59 – 13.8
				Total 4 marks

Qn	Working	Answer	Mark	Notes
16	eg $1.2 \times 0.65 (= 0.78)$ or $1.2L \times 0.65W (= 0.78LW)$ or $1.2 \times 0.65 \times 100 (= 78)$ or $1.2L \times 0.65W \times 100 (= 78LW)$		3	M1 allow use of other variables to L and W as long as clearly labelled as length and width allow $(1 + 0.2)$ as their 1.2 and $(1 - 0.35)$ as their 0.65
	eg $(1 - "0.78") \times 100$ or $(LW - "0.78LW") \times 100 (= 22LW)$ or $100 - "78"$ or $100LW - "78LW" (= 22LW)$			M1 method to find the percentage reduction, allow the subtraction to be written the other way around eg $"78" - 100$
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	22		A1 allow -22
				Total 3 marks

ALTERNATIVE Q16 mark scheme (using values for L and W)

Qn	Working	Answer	Mark	Notes
16	eg $1.2 \times x$ and $0.65 \times y$ where x and y are positive numbers		3	M1 accept any positive values for x and y allow $(1 + 0.2)$ as their 1.2 and $(1 - 0.35)$ as their 0.65
	eg $\left(1 - \frac{1.2x \times 0.65y}{xy}\right) \times 100$ or $\left(\frac{xy - 1.2x \times 0.65y}{xy}\right) \times 100$			M1 method to find the percentage reduction, allow the subtraction to be written the other way around eg $\left(\frac{1.2x \times 0.65y}{xy} - 1\right) \times 100$
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	22		A1 allow -22
				Total 3 marks

Qn	Working	Answer		Mark
17	$12 = \frac{1}{2} \times 4.6 \times 8.3 \times \sin ABC$ or $\frac{4.6h}{2} = 12$ ($h = 5.217\dots$)		5	M1 a correct equation for the area to find angle ABC or to find the perpendicular height of the triangle.
	$ABC = \sin^{-1} \left(\frac{12}{\frac{1}{2} \times 4.6 \times 8.3} \right)$ ($= 38.947\dots$) oe or $ABC = \sin^{-1}(0.6286)$ ($= 38.947\dots$) or $ABC = \sin^{-1} \left(\frac{5.217\dots}{8.3} \right)$ ($= 38.947\dots$) or $BM^2 = 8.3^2 - 5.217\dots^2$			M1 A correct method to find angle ABC or a correct method to find BM where CMB is 90°
	$AC^2 = 4.6^2 + 8.3^2 - 2 \times 4.6 \times 8.3 \times \cos(38.947^\circ)$ [allow $\cos 39^\circ$] or $AC^2 = 30.6(627\dots)$ $BM = \sqrt{8.3^2 - 5.217\dots^2}$ ($= 6.455\dots$)			M1 a correct start to the cosine rule to find length AC or a fully correct method for BM
	or $AC = \sqrt{30.6(6\dots)}$ or $5.5(3739\dots)$			A1 A correct value for AC which can be the square root of $30.6(6\dots)$
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	18.4		A1 Allow answers in range 18.4 to 18.45
				Total 5 marks

Qn	Working	Answer	Mark	Notes
18 (a)	$15 \div 15 (= 1)$ $18 \div 5 (= 3.6)$ $32 \div 20 (= 1.6)$ $4 \div 10 (= 0.4)$	Correct histogram	3	B3 for a fully correct histogram If not B3 then B2 for 3 correct frequency densities (can be implied by heights) or 3 correct bars drawn If not B2 then B1 for 2 correctly calculated frequency densities (can be implied by heights) or 2 correct bars drawn
				SC: award B2 for all 4 bars of correct width with heights in the correct ratio (eg drawn at 0.5, 1.8, 0.8, 0.2) SC: award B1 for 3 bars of correct width with heights in the correct ratio
(b)	eg $\frac{15}{20} \times 32 (= 24)$ or $\frac{5}{20} \times 32 (= 8)$ or $\frac{15}{20} \times 32 + 18 (= 42)$ or $32 + 18 - \frac{5}{20} \times 32 (= 42)$		2	M1 for a method to find an estimate for the number of students who took between 30 and 45 minutes or between 45 and 50 minutes or between 25 and 45 minutes ft incorrect histogram
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	$\frac{42}{50}$		A1 oe eg $\frac{21}{25}$, 0.84, 84%
				Total 5 marks

Qn	Working	Answer	Mark	Notes
19	$\sqrt{\frac{3600}{625}}$ or $\frac{12}{5}$ oe or 2.4 or 12:5 oe or $\sqrt{\frac{625}{3600}}$ or $\frac{5}{12}$ oe or 0.416.... or 5:12 oe or $\frac{3600^3}{625^3} = \frac{(\text{vol of statue})^2}{750^2}$ oe or $\frac{3600}{625} = \frac{(\text{vol of statue})^{\frac{2}{3}}}{750^{\frac{2}{3}}}$ oe		3	M1 for a correct length scale factor or a correct length ratio or setting up a correct equation involving the volume of the statue
	eg $750 \times \left(\frac{12}{5}\right)^3$ oe or $750 \div \left(\frac{5}{12}\right)^3$ oe or $\sqrt{\frac{3600^3 \times 750^2}{625^3}}$ oe or $\left(\frac{3600 \times 750^{\frac{2}{3}}}{625}\right)^{\frac{3}{2}}$ oe			M1 (dep on M1) for a correct method to work out the volume of the statue
	Correct answer scores full marks (unless from obvious incorrect working)	10 368		A1 cao
				Total 3 marks

Qn	Working	Answer	Mark	Notes
20 (a)	11 – 2		2	M1 2 and 11 clearly identified either in list or stated
	<i>Working required</i>	9		A1 dep on M1
(b) (i)		Kim as she has a higher median	1	B1 oe, ft their median if value given Acceptable examples Kim as she has a higher median Kim as/because her median is 11 and/but/whereas Rutger's is 8 Kim's median is 3 more (than Rutger's) Kim as Rutger's median is 3 less Not acceptable examples Kim's median is 11 and Rutger's is 8 Kim as she has a higher median and a lower IQR
(ii)		Kim as she has a smaller IQR	1	B1 oe, ft their part (a) Acceptable examples Kim as she has a smaller IQR Kim as/because her IQR is 5 and/but/whereas Rutger's is 9 Kim's IQR is 4 less (than Rutger's) Kim as Rutger's IQR is 4 more Not acceptable examples Kim's IQR is 5 and Rutger's is 9 Kim as she has a higher median and a lower IQR
				Total 4 marks

Qn	Working	Answer	Mark	Notes
21	$(\angle AOC =) 132 \times 2 (= 264)$		3	M1 for method to find angle at the centre. Do not award this mark if contradicted on the diagram eg if obtuse AOC is labelled as 264
	eg $\frac{264}{360} \times 2 \times \pi \times 8.5$ ($= 39.1\dots$ or $\frac{187}{15} \pi$) or $2 \times \pi \times 8.5 - \frac{360 - 264}{360} \times 2 \times \pi \times 8.5$ ($= 39.1\dots$ or $\frac{187}{15} \pi$) or $\frac{264}{360} \times 2 \times \pi \times 8.5 + 2 \times 8.5$ or $2 \times \pi \times 8.5 - \frac{360 - 264}{360} \times 2 \times \pi \times 8.5 + 2 \times 8.5$			M1 for a method to find the length of arc AC or perimeter of the sector – allow use of their AOC as long as clearly labelled
	<i>Correct answer scores full marks (unless from obvious incorrect working)</i>	56.2		A1 accept 56.1 – 56.2
				Total 3 marks

WEEK 4 TASK 5

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

- 1 Alice recorded the number of cars going into a village on each of 80 days.
 The incomplete table and the incomplete box plot give information about her results.

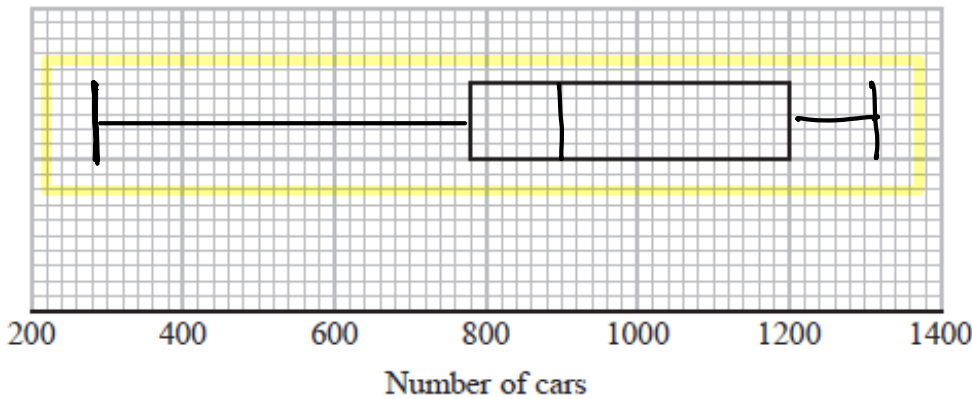
	Number of cars
Least number	300
Lower quartile	780
Median	900
Upper quartile	1200
Range	1000

3 marks for 780, 1200, median plotted and both whiskers drawn

2 marks for two of the above

1 mark for any one of the above

largest
 $= 300 + 1000$
 $= 1300$



- (a) (i) Use the information in the table to complete the box plot.
 (ii) Use the information in the box plot to complete the table.

(3)

On some of these 80 days Alice saw fewer than 1200 cars going into the village.

- (b) Work out an estimate for the number of days Alice saw fewer than 1200 cars going into the village.

$1200 \rightarrow \frac{3}{4} \text{ (75\%)}$

$\frac{3}{4} \times 80 = \frac{80 \times 3}{4}$
 $= 60$
 1 mark

60 Final mark

(2)

(Total for Question 1 is 5 marks)

2 To cook rice

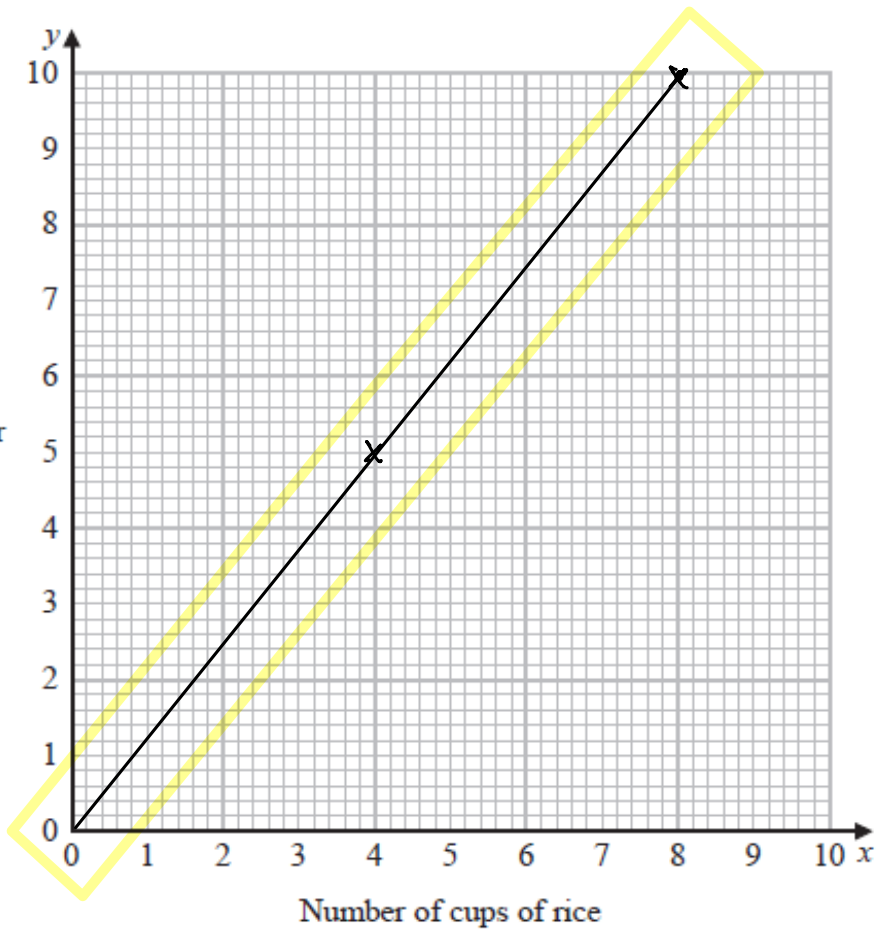
the number of cups of rice (x) : the number of cups of water (y) = 4 : 5

(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.

$x : y$
 $4 : 5$
 $= 8 : 10$

2 marks for correct line drawn

1 mark for plotting two correct points on the line



(2)

(b) (i) 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)

(ii) Explain what this gradient represents.

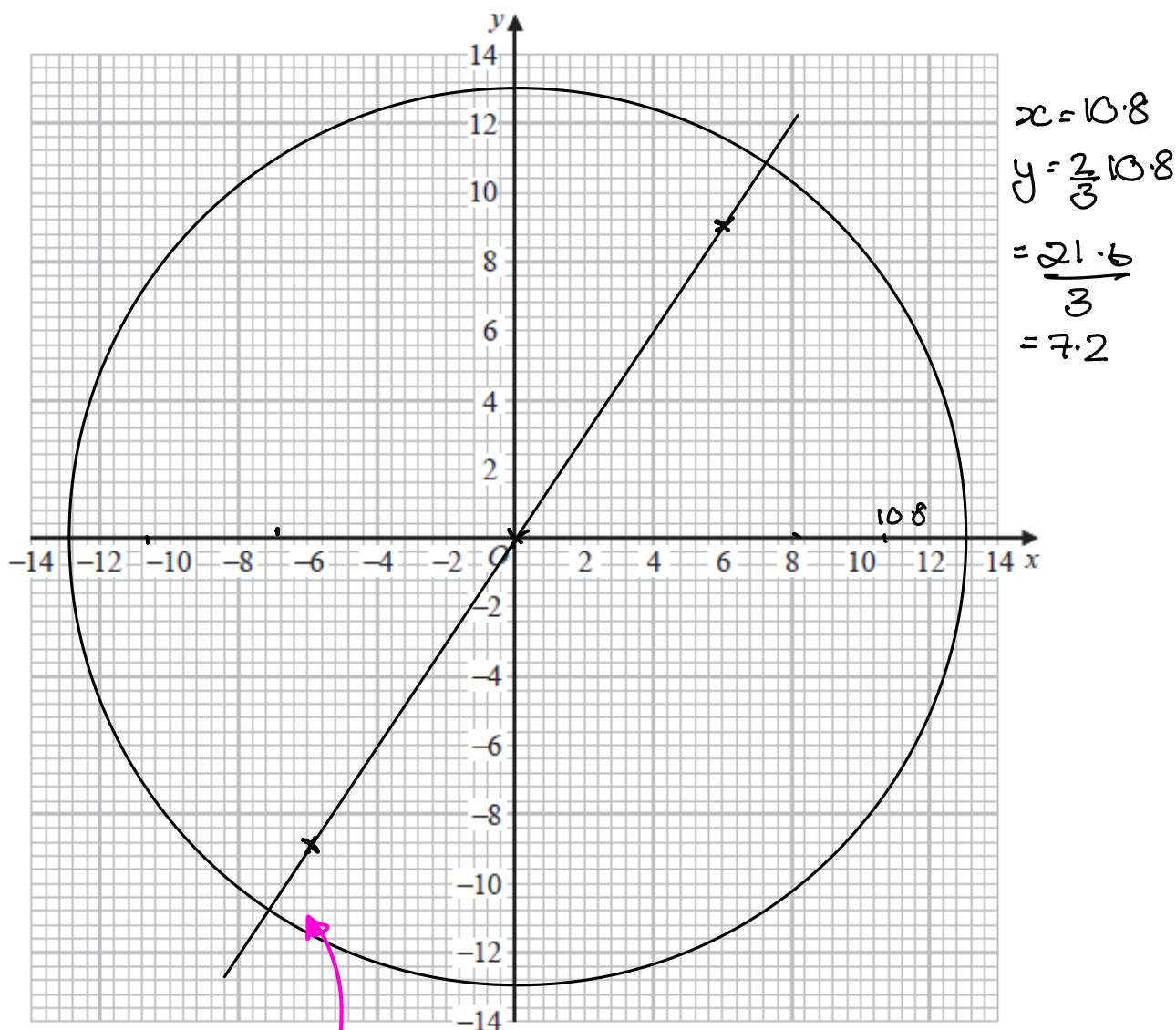
The number of cups of water for each cup of rice

1 mark

(1)

(Total for Question 2 is 4 marks)

3 (a) On the grid, draw the graph of $x^2 + y^2 = 169$



2 marks for correct circle drawn (2)

(b) Use your graph to find estimates for the solutions of the simultaneous equations

Final 2 marks for correct values given as pairs

$$2y = 3x$$

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

1 mark for correct
line drawn

$$x^2 + y^2 = 169$$

$$2y = 3x$$

$$x = 0 \quad y = 0$$

$$x = -6 \quad y = -9$$

$$x = 6 \quad y = 9$$

$$x = 7.2 \quad x = -7.2$$

$$y = 10.8 \quad y = -10.8$$

(3)

(Total for Question 3 is 5 marks)

1 mark may be awarded for both correct x values, both correct y values or one correct pair if two marks is not awarded

4 7 kg of carrots and 5 kg of tomatoes cost a total of 480p

cost of 1 kg of carrots : cost of 1 kg of tomatoes = 5 : 9

Work out the cost of 1 kg of carrots and the cost of 1 kg of tomatoes.

carrots : toms
5 : 9

$$\frac{t}{c} = \frac{9}{5}$$

$$t = \frac{9}{5}c$$

1 mark.

$$7c + 5t = 480$$

$$7c + 5\left(\frac{9}{5}c\right) = 480$$

$$16c = 480$$

1 mark

$$c = \frac{480}{16} = 30$$

$$t = \frac{9}{5} \times 30 = \frac{270}{5} = 54$$

Final mark

carrots 30p

tomatoes 54p

(Total for Question 4 is 4 marks)

5 Write $\frac{3\sqrt{3}}{4-\sqrt{3}} - \frac{2}{\sqrt{3}}$ in the form $\frac{a\sqrt{3}+b}{c}$ where a , b and c are integers.

1 mark

$$\frac{3\sqrt{3}}{4-\sqrt{3}} \times \frac{4+\sqrt{3}}{4+\sqrt{3}} = \frac{12\sqrt{3} + 3\sqrt{3}\sqrt{3}}{16 + 4\sqrt{3} - 4\sqrt{3} - 3} = \frac{12\sqrt{3} + 9}{13}$$

1 mark

$$\frac{2}{\sqrt{3}} \times \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$$

1 mark

$$\text{so: } \frac{12\sqrt{3} + 9}{13} - \frac{2\sqrt{3}}{3} = \frac{3(12\sqrt{3} + 9) - 13 \times 2\sqrt{3}}{39}$$

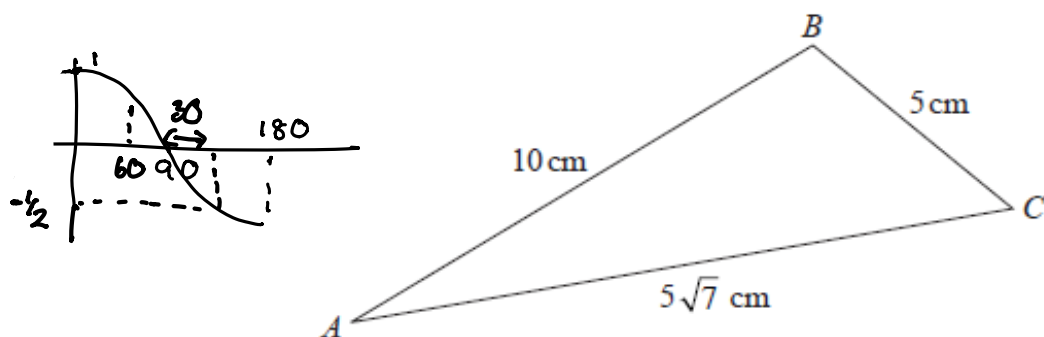
$$= \frac{36\sqrt{3} + 27 - 26\sqrt{3}}{39}$$

$$\frac{10\sqrt{3} + 27}{39}$$

Final mark

(Total for Question 5 is 4 marks)

6 Here is triangle ABC .



Find the size of angle ABC .

You must show all your working.

$$c^2 = a^2 + b^2 - 2ab \cos C$$

$$(5\sqrt{7})^2 = 10^2 + 5^2 - 2 \times 10 \times 5 \times \cos B \quad 1 \text{ mark}$$

$$\cos B = \frac{5^2 + 10^2 - (5\sqrt{7})^2}{2 \times 5 \times 10} \quad 1 \text{ mark}$$

$$= \frac{125 - 175}{100}$$

$$= \frac{-50}{100} = -\frac{1}{2} \quad 1 \text{ mark}$$

$$\text{so } 90 + 30 = 120$$

(see my graph at the top)

120 Final mark

(Total for Question 6 is 4 marks)

- 7 Solid A and solid B are similar.
The ratio of the height of solid A to the height of solid B is 2 : 5
The volume of solid A is 12 cm³
Work out the volume of solid B.

	A	:	B	
height	2	:	5	
length of	$\times \frac{5}{2}$			1 mark
Volume	12	:	?	
	$12 \times \left(\frac{5}{2}\right)^3$			1 mark
	$= 12 \times \frac{125}{8} = \frac{375}{2}$			
				Final mark
				187.5 cm ³

(Total for Question 7 is 3 marks)

- 8 The 2nd term of a geometric sequence is $3 + 2\sqrt{2}$
The 3rd term of the sequence is $13 + 9\sqrt{2}$
Find the value of the common ratio of the sequence.
Give your answer in the form $a + \sqrt{b}$ where a and b are integers.
You must show all your working.

$$\frac{13 + 9\sqrt{2}}{3 + 2\sqrt{2}} \quad 1 \text{ mark}$$

$$= \frac{13 + 9\sqrt{2}}{3 + 2\sqrt{2}} \times \frac{3 - 2\sqrt{2}}{3 - 2\sqrt{2}} \quad 1 \text{ mark}$$

$$= \frac{39 - 26\sqrt{2} + 27\sqrt{2} - 18\sqrt{2}\sqrt{2}}{9 - 6\sqrt{2} + 6\sqrt{2} - 4\sqrt{2}\sqrt{2}} \quad 1 \text{ mark}$$

$$= \frac{39 + \sqrt{2} - 36}{9 - 8}$$

$$= \frac{3 + \sqrt{2}}{1}$$

Final mark

(Total for Question 8 is 4 marks)

9 Find the set of possible values of x for which

$$4x^2 - 25 < 0 \quad \text{and} \quad 12 - 5x - 3x^2 > 0$$

You must show all your working.

$$(2x - 5)(2x + 5) < 0$$

1 mark

$$\frac{5}{2} \quad \frac{-5}{2}$$

$$2.5 \quad \underline{\underline{-2.5}}$$

1 mark

$$-3x^2 - 5x + 12 > 0$$

$$-36$$

$$4, 9$$

$$-3x^2 - 9x + 4x + 12 > 0$$

$$-3x(x + 3) + 4(x + 3) > 0$$

$$(-3x + 4)(x + 3) > 0$$

1 mark

$$\frac{4}{3} \quad \frac{1}{3} \quad -3$$

1 mark

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

$$x > -3$$

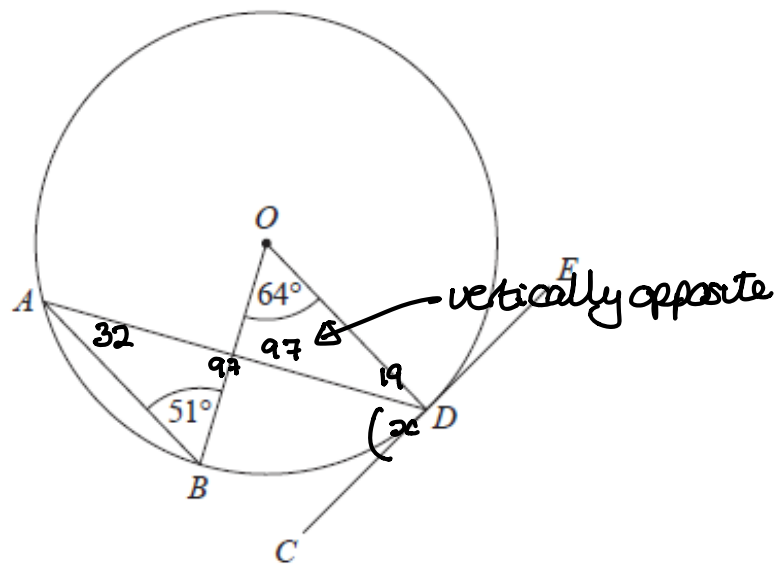
$$\text{so } -2.5 \text{ OR } -\frac{5}{2}$$

Final mark

$$-2.5 < x < \frac{4}{3}$$

(Total for Question 9 is 5 marks)

- 10 A, B and D are points on a circle with centre O .
 CDE is the tangent to the circle at D .



Work out the size of angle ADC .
 Write down any circle theorems you use.

1 mark let $ADC = x$
 $BAD = 32$ angle at the centre is twice the angle at the circumference (BOD)

$$180 - (51 + 32) = 180 - 83 = 97 \text{ angle in a triangle} = 180$$

$$ODA = 180 - (97 + 64) = 161 = 19 \text{ 1 mark}$$

$$x = 90 - 19 = 71 \text{ angle between tangent and radius} = 90^\circ$$

Final mark awarded for correct reasons

71 1 mark

 (Total for Question 10 is 4 marks)