L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

SECONDARY EDUCATION CERTIFICATE LEVEL
2025 MAIN SESSION

SUBJECT:	**Mathematics**
PAPER NUMBER:	I – Level 1-2-3
DATE:	3rd May 2025
DURATION:	2 hours 5 minutes

Answer **ALL** questions.

Write your answers in the space available on the examination paper.

Show clearly all the necessary steps, explanations and construction lines in your working.

Unless otherwise stated, diagrams are drawn to scale.

The use of non-programmable electronic calculators with statistical functions and mathematical instruments is allowed.

Candidates are allowed to use transparencies for drawing transformations.

This paper carries 100 marks.

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1 (a) Fill in the blanks using one of the following symbols:

$<$, $\leq$, $>$, $\geq$, $=$

(i) $\frac{5}{2}$ _____ $2\frac{1}{2}$

(ii) $3\frac{1}{4}$ _____ 3.40

(iii) $\frac{3}{4}$ _____ $\frac{1}{2}$

(3)

(b) Give a number that lies anywhere between 5.67 and 5.68

(1)

(c) If 25% represents a quarter, how many quarters are needed to have 275%.

(2)

(Total: 6 marks)

2 (a) Use ruler and compasses only for part (a).

(i) Draw a circle of radius 3 cm, and mark the centre with the letter O.
Draw a diameter inside the circle and label it AB.

(2)

(ii) Construct an angle of 60° on the line segment AB, at point B.
Name the point where the constructed angle meets the circle as C. (3)

(b) Complete the statements below with one of the following words.

circumference, diameter, radius, circle, double, half

Line OB in the circle is called a …….

Line AB is ……. the length of line OB. (2)

(c) The table below shows four statements about different types of triangles. For each statement indicate whether it is always true, always false or sometimes true and sometimes false by marking the appropriate cell with a ✓ .

Statement	Always True	Always False	Sometimes true/ sometimes false
An isosceles triangle has 2 equal sides and 2 equal angles.			
A right-angled triangle is an equilateral triangle.			
An isosceles triangle is scalene.			
A right-angled triangle is isosceles.			

(4)

(Total: 11 marks)

3 (a) Write these numbers in order of size from small to large.

$$0.313, \quad 3.13, \quad -0.00313, \quad 31.3, \quad -3.13$$

(2)

(b) In January, the average temperature in Canada is $-10°C$.

In Malta, the average temperature in January is 22°C higher than in Canada.

What is the average temperature in Malta in January?

(2)

(Total: 4 marks)

4 A carpenter has two strips of wood of the same thickness.
One strip is $1\frac{3}{4}$ m long, the other is $2\frac{4}{5}$ m long.
He joins the two strips to make a longer strip.

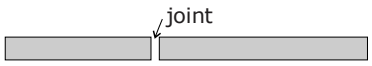


Diagram not drawn to scale

(a) Without using your calculator, work out the length of the joined strip.
Give your answer as a mixed fraction.

(3)

(b) Give the answer found in part (a) as a decimal number.

(1)

(c) The carpenter cuts off a length of $3\frac{1}{5}$ m from the joined strip. What is the length of the remaining strip?

(2)

(Total: 6 marks)

5 In the diagram below, points P, Q, R and T lie on a circle, and triangle PQR is isosceles. Angle QPR = 40°, and chord QT is drawn such that it bisects angle PQR.

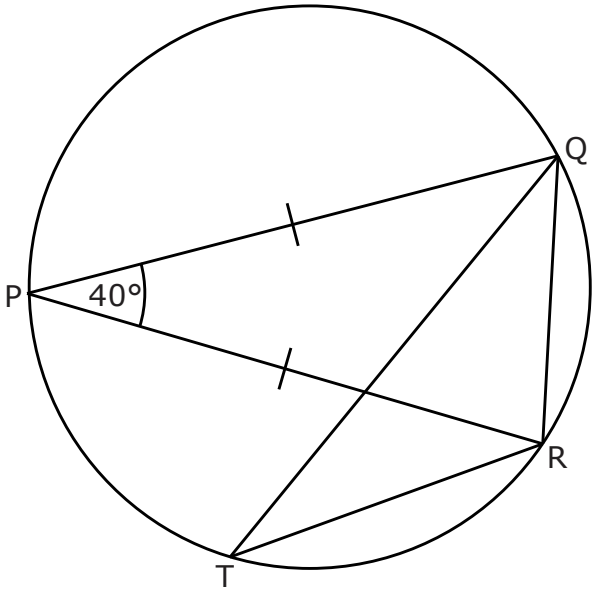


Diagram not drawn to scale

Giving reasons for your answers, calculate the size of:

(a) angle PQR;

(2)

(b) angle QTR;

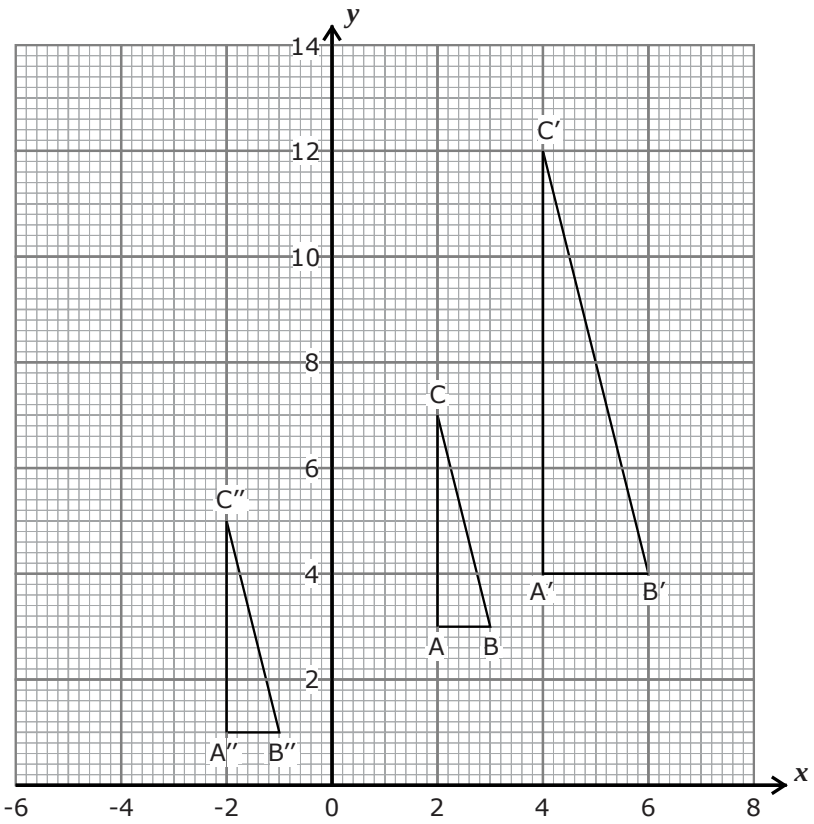
(2)

(c) angle QRT.

(2)

(Total: 6 marks)

6



(a) Describe the single transformation that maps triangle ABC to triangle A'B'C'.

(3)

(b) Describe the single transformation that maps triangle ABC to triangle A''B''C''.

(2)

(c) Complete the following statements by underlining the correct word.

(i) Triangles ABC, A'B'C' and A''B''C'' are (isosceles, right-angled, obtuse angled).

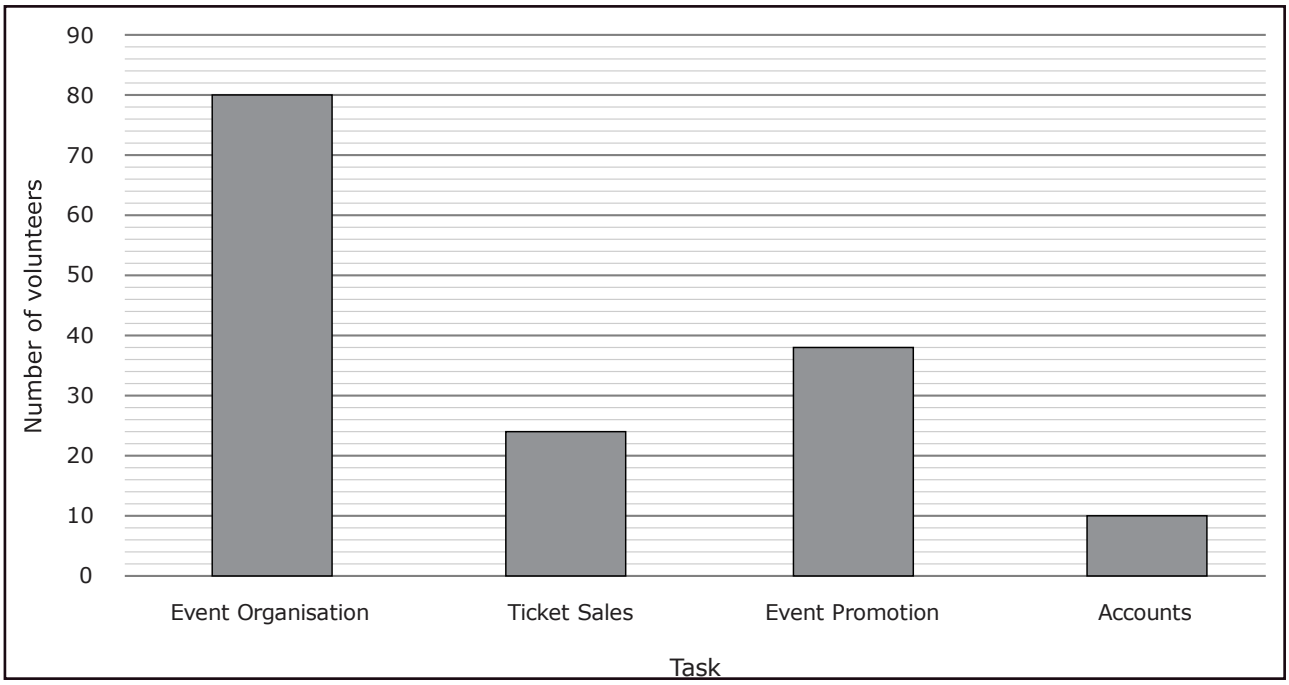
(ii) Triangle ABC is (congruent, similar) to triangle A'B'C'. (2)

(d) Show that the area of triangle A'B'C' is 4 times bigger than the area of triangle ABC.

(3)

(Total: 10 marks)

7 The bar chart below shows the number of volunteers involved in different tasks as part of a charity event.



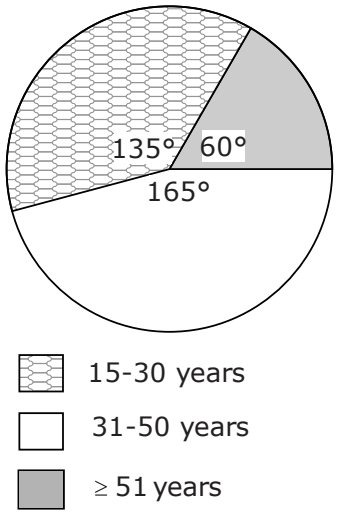
(a) A volunteer is selected randomly to be interviewed by a journalist. What is the probability that the chosen volunteer is involved in Ticket Sales?

(3)

(b) What percentage of volunteers is involved in Event Promotion?

(2)

(c) The pie chart below shows the ages of the volunteers engaged in Event Organisation. Calculate the number of volunteers engaged in Event Organisation aged 15 – 30 years.



(3)

(d) Among the volunteers involved in Accounts, two are twins. The age of the other eight volunteers are: 28, 39, 41, 65, 48, 55, 29 and 53. If the mean age of the Accounts group is 41, what is the age of each twin?

(4)

(Total: 12 marks)

8 Dry cat food comes in 1.5 kg boxes.

(a) Kate feeds her cat 80 g of food every day.
How many days will one box of cat food last?

(2)

(b) Kate wants to buy enough boxes of cat food to feed her cat for 90 days.
What is the least number of boxes needed?

(3)

(Total : 5 marks)

9 (a) Factorise completely $30xy^3 - 12x^2y^2$

(2)

(b) Expand and simplify $5x(2x - 4) + 3x(x - 3)$

(3)

(c) Make a the subject of the formula $b = \sqrt{\frac{a+2}{3}}$

(3)

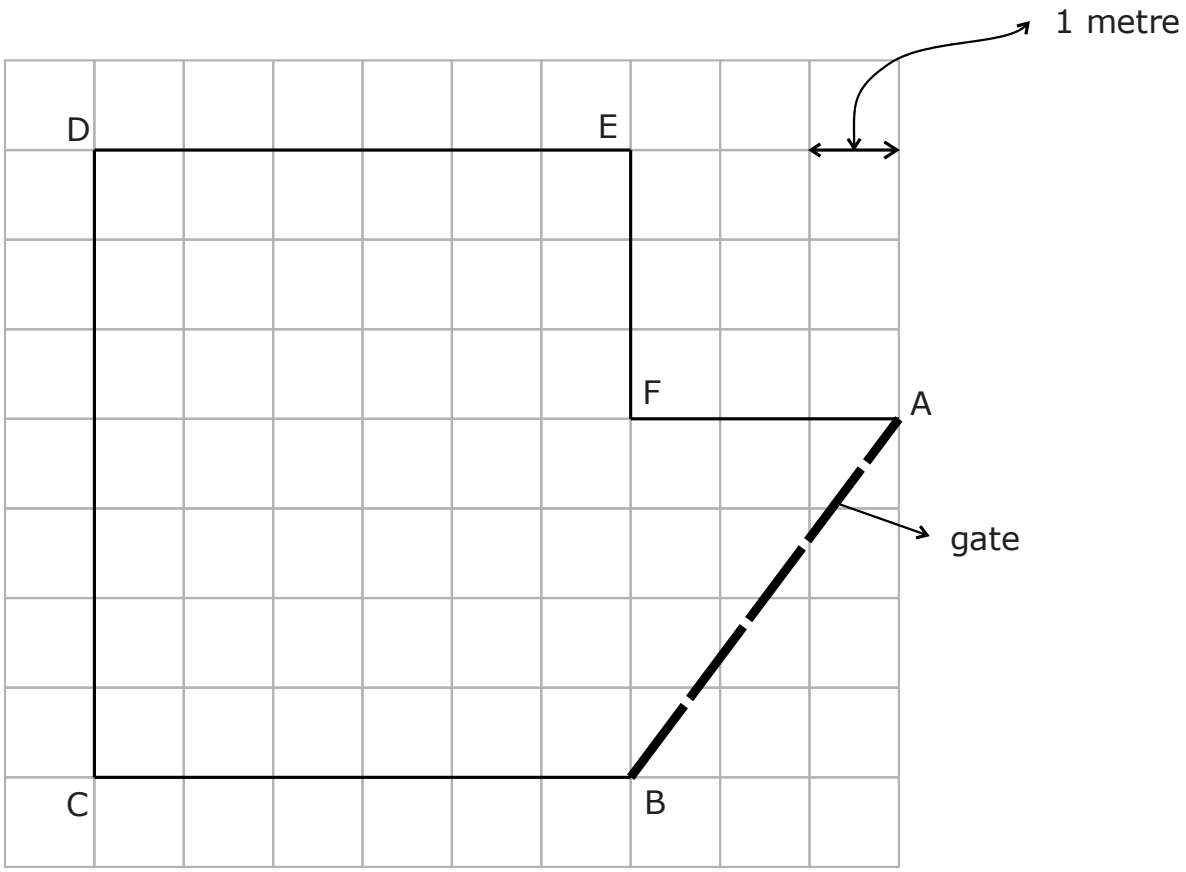
(d) Solve the simultaneous equations: $3y - 5x = -4$

$2y + x = 2$

(4)

(Total: 12 marks)

10 The diagram shows the plan of a field ABCDEF. A gate lies along the side AB.
A stone wall lies along the other sides of the field.



(a) What is the area of the field? Include the units of measurement in your answer.

(3)

(b) What is the length of the stone wall around the field? Include the units of measurement in your answer.

(2)

(Total: 5 marks)

11 A bakery is producing figolli for an Easter Bazaar. On Sunday, they baked 50 figolli. On Monday they continued producing figolli at a constant rate of 15 figolli per hour.

(a) Write an equation for y, the total number of figolli available after t hours on Monday.

(2)

(b) Complete the table below to plot the graph of y against t, for t ranging from 0 to 8 hours, on the axes provided in the next page.

t	0	2	4	6	8
y	50		110		170

(4)

(c) Use your graph to determine:

(i) how many figolli will be available after 5 hours.

(1)

(ii) how long it will take to have 155 figolli available.

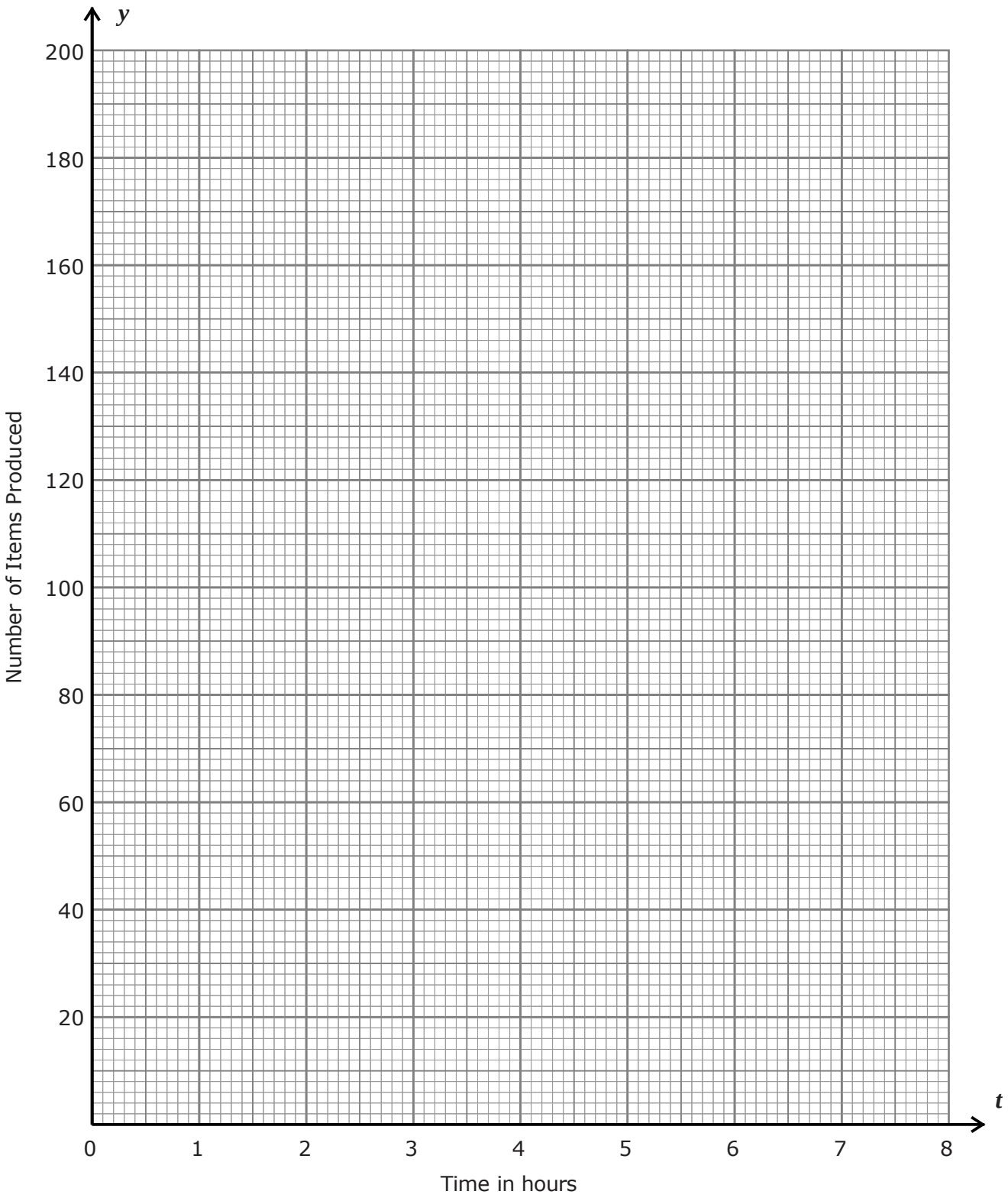
(1)

While making the figolli, the bakery is also preparing jam tarts for the Easter bazaar. At the start of the day on Monday, they already have 30 tarts. Throughout the day, they continue to produce jam tarts at a rate of 20 tarts per hour.

(d) Explain how the graph for the total number of jam tarts available after t hours on Monday is different from the graph in part (b). There is no need to draw this graph.

(2)

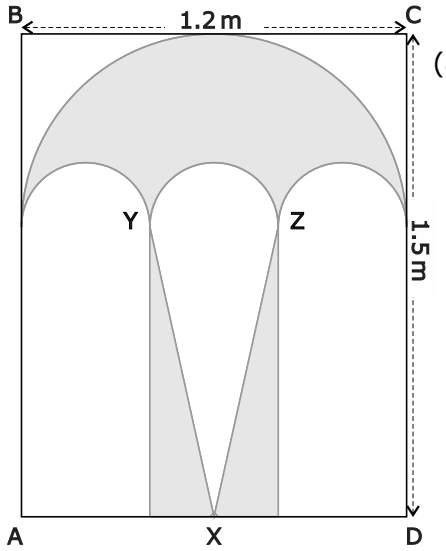
Draw your graph for Question 11b on the axes below.



(Total: 10 marks)

12 The figure shows the uniform cross-section of a rectangular concrete tile, designed to be laid on the floor of the village square. It measures 1.2m by 1.5m. X is the midpoint of AD. The three small identical arcs and the larger arc in the figure are all semicircles.

The shape is divided into sections made from white and grey concrete. The shaded parts in the figure show the cross-sections of the grey concrete parts. The unshaded parts show the cross-sections of the white parts. The depth of concrete is 8 cm.



(a) Find the total volume, in m^3, of concrete used in the tile.

(3)

(b) Find the volume of the two triangular grey parts.

(4)

(c) Find the volume of the white concrete in the tile.

(6)

(Total: 13 marks)

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2025 MAIN SESSION

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DATE:	3rd May 2025
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This paper carries 100 marks.

1 James is helping out at the animal shelter and he wants to keep track of the ages of the dogs which are up for adoption. He records the ages of 9 dogs.

Ages in years: 6, 1, 4, 3, 12, 4, 3, 3, 2

(a) Work out:

(i) the mean

(2)

(ii) the median

(2)

(iii) the mode.

(1)

(b) Which average (mean, mode or median) best represents the ages of the dogs in the shelter? Explain why.

(2)

(Total: 7 marks)

2 Use ✓ to indicate whether each of the following statements is TRUE or FALSE:

Statement	TRUE	FALSE
18 is an odd number		
- 3 > - 10		
23 is a prime number		
51 is a multiple of 3		
8 is a factor of 72		
22 is a square number		

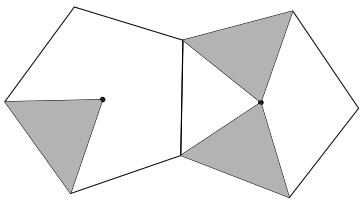
(Total: 6 marks)

3 (a) Circle the fractions that are equivalent to $\frac{9}{21}$

$$\frac{27}{42} \quad \frac{12}{28} \quad \frac{3}{7} \quad \frac{6}{8}$$

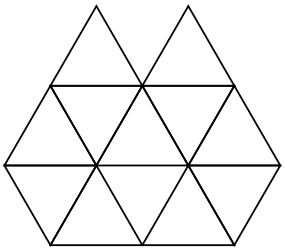
(2)

(b) The diagram below shows two regular pentagons joined together.
The centre of each pentagon is marked with a dot.
What fraction of the diagram is shaded?



(1)

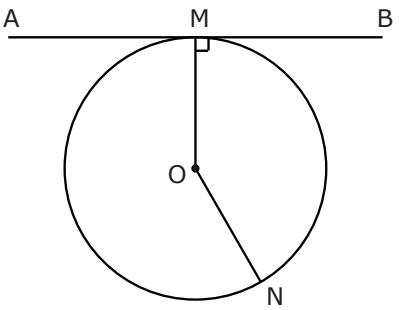
(c) Shade 1/3 of this diagram:



(2)

(Total: 5 marks)

4 (a) The diagram shows a circle centre O.



a diameter
a radius
a right
parallel
perpendicular

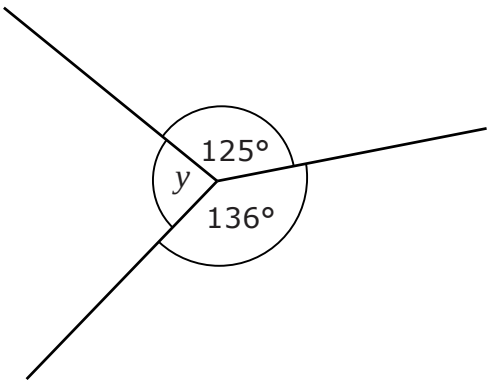
Complete each of the following statements using words from the list shown above.

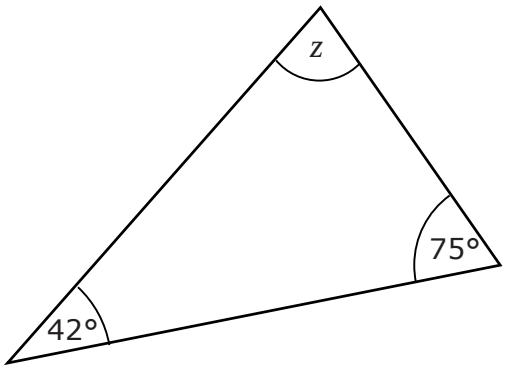
(i) Angle OMB is ..... angle.

(ii) Line ON is .....

(iii) Line OM is ..... to line AB. (3)

(b) Find the size of angles y and z. Explain your answer.





Diagrams not drawn to scale

(4)

(Total: 7 marks)

5 Diane and Christine sell bottles of homemade lemonade. They have 200 bottles of lemonade for sale at a market.

Diane sells $\frac{1}{5}$ of the 200 bottles while Christine sells 15% of the 200 bottles.

(a) Write $\frac{1}{5}$ as a percentage.

(1)

(b) How many of the 200 bottles are left at the end of the market sale?

(3)

(c) If one bottle of lemonade costs 3.25 euro, what is the greatest number of bottles that can be bought for 20 euro.

(2)

(d) Homemade lemonade is made by mixing sugar with lemon juice and water.
The ratio by weight of sugar : lemon juice : water in this lemonade is $1 : 1 : 4$.
How much lemon juice is needed to make 3 Kg of lemonade? Give your answer in g.

(2)

(Total: 8 marks)

6 Ann invested €7,800 at a simple interest rate of 2% per year. Calculate the total interest Ann will earn if she invests the money for 5 years.

(3)

(Total: 3 marks)

7 (a) Kyle is trying to convince his friend that there are other numbers between 2.5 and 2.6.

(i) Write **ONE** number that is exactly halfway between 2.5 and 2.6

(1)

(ii) Write **ONE** other number that also lies between 2.5 and 2.6.

(1)

(b) Write the following in ascending order:

$$\frac{3}{5}, \quad 0.78, \quad \frac{3}{4}, \quad 0.315, \quad \frac{1}{2}$$

(3)

(Total: 5 marks)

8 (a) Put **ONE** pair of brackets into this equation to make it correct.

$$3 + 4 \times 8 - 2 = 27$$

(1)

(b) Show that: $1\frac{1}{2} \div \frac{3}{16} = 8$

Do not use a calculator and show all your working.

(2)

(Total: 3 marks)

9 Francesca spends her Saturday morning doing various activities.
She starts reading a book at 09.30am and reads for 1hr and 40 minutes.
After reading, Francesca takes a 55 minute break before starting to draw.

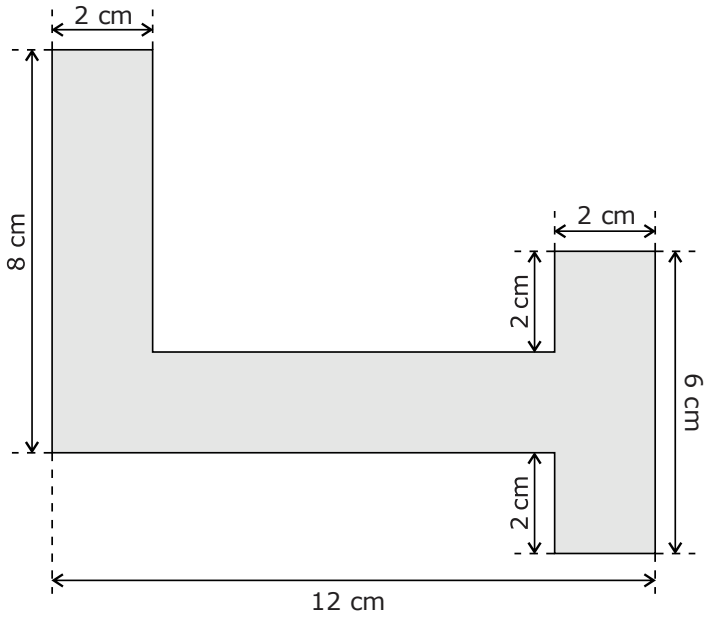
(a) At what time does she start drawing?

(3)

(b) If Francesca draws for 1 hr and 25 minutes. At what time does she finish drawing?

(2)

(c) While drawing, Francesca creates the design below.
The shape is composed of 3 rectangles.
Calculate the total area of Francesca's design.



(4)

(Total: 9 marks)

10 In this question, use ruler and compasses only.

(a) On the given line BC, construct triangle ABC in which AB = 10 cm and AC = 8 cm.

(2)

(b) Construct the bisectors of angle ABC and of angle ACB.
Mark the point D where the two bisectors meet. (5)

(c) (i) Draw a perpendicular from D to the side BC.
Name the point where the perpendicular meets BC as P. (3)

(ii) Draw a circle with centre D and radius DP. (1)

(Total: 11 marks)

11 (a) Mark is playing a board game with his friends. To begin, each player needs to roll a 6 on the dice. After several attempts, Mark still hasn't rolled a 6.

He complains, "It's harder to get a 6 than a 1!"

Is he right? Give a reason for your answer.

(2)

(b) On each turn of the game, a player is required to roll the dice and draw a card from a deck of cards containing 4 cards, marked A, B, C and D.

(i) Complete the possibility space below to show all possible outcomes.

		Dice					
		1	2	3	4	5	6
Cards	A						
	B		(B, 2)				
	C						
	D						

(3)

(ii) What is the probability of a player drawing a card marked C and rolling a 5 on the dice?

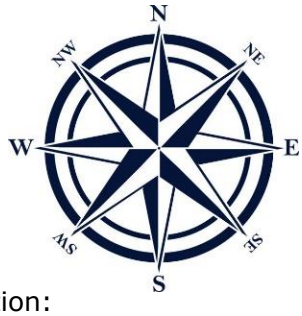
(1)

(iii) A player can have a second turn if he gets an odd number on the dice and a card marked A. What is the probability of a player having a second turn based on this rule?

(2)

(Total: 8 marks)

12 (a) Liam is on a hiking trail. He is standing at a point A facing North. To get to point B he must follow these steps:



First, turn 90° clockwise and walk 100 meters.

Then, turn 135° anticlockwise and walk another 50 meters.

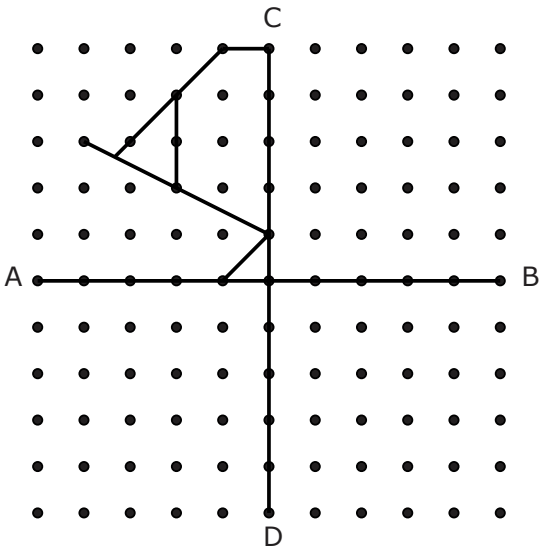
Finally, turn 180° clockwise to face his destination.

What direction is he facing at point B? Underline the correct direction:

N, NE, E, SE, S, SW, W, NW

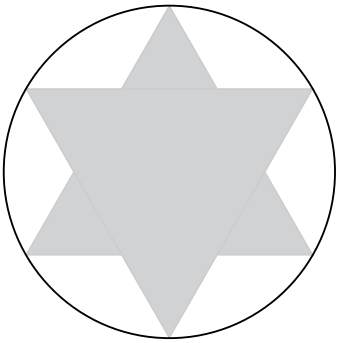
(3)

(b) Complete the pattern to make it symmetrical about lines AB and CD.



(3)

(c) Draw all the lines of symmetry of this shape.



(2)

(Total: 8 marks)

13 (a) Complete the following table of values for the equation of the line $y = 2x - 1$

x	-3	-2	-1	0	1	2	3
$y = 2x - 1$				-1		3	5

(2)

(b) Use the axes on the next page to plot the graph of $y = 2x - 1$ for values of x between -3 and 3. Label this line as Line A.

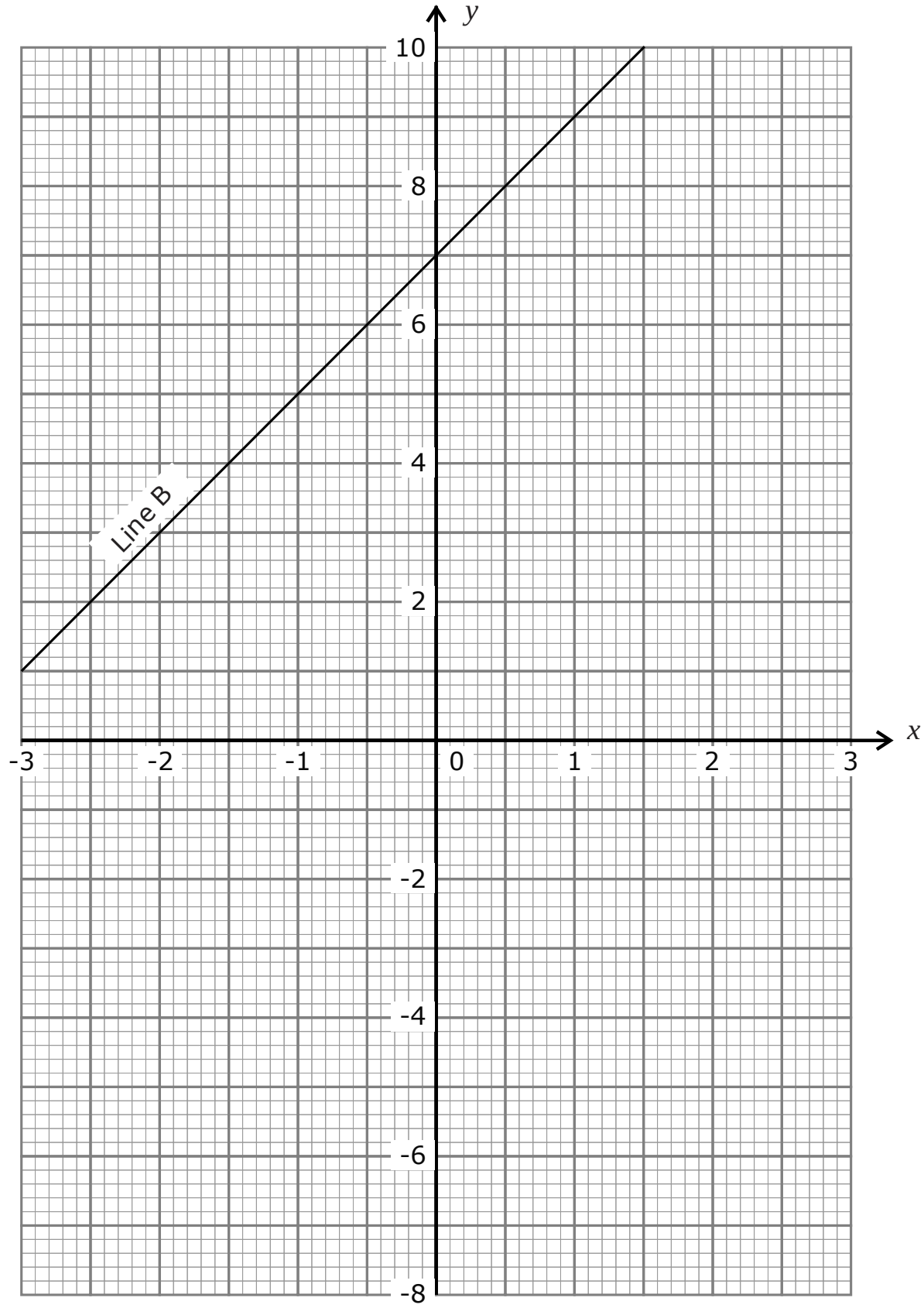
(2)

(c) Line B shown on the graph is parallel to Line A.
Determine the equation of Line B.

(3)

(d) On which line, A or B, does the point (26,59) lie? Show your working.

(3)



(Total: 10 marks)

14 The figure below shows the dimensions, in cm, of square A and rectangle B.

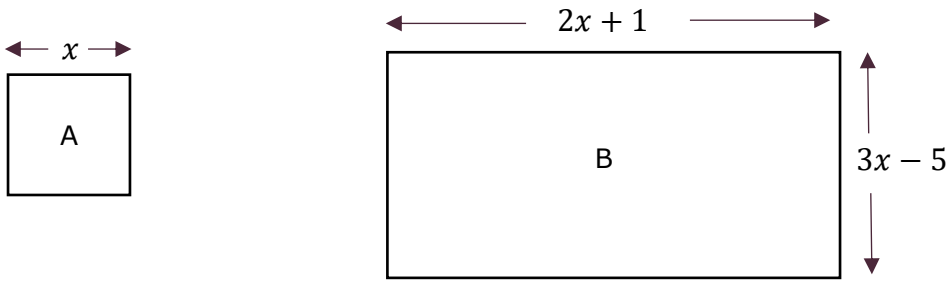


Diagram not drawn to scale

(a) Find the perimeter of square A in terms of x.

(1)

(b) Show that the perimeter of rectangle B is given by $10x - 8$.

(3)

(c) The perimeter of B is twice the perimeter of A.

Form and solve an equation in terms of x.

(3)

(d) Use the value of x found in part (c) to find the area of rectangle B in cm^2.

(3)

(Total: 10 marks)

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Ages in years: 6, 1, 4, 3, 12, 4, 3, 3, 2

(a) Work out:

(i) the mean

(2)

(ii) the median

(2)

(iii) the mode.

(1)

(b) Which average (mean, mode or median) best represents the ages of the dogs in the shelter? Explain why.

(2)

(Total: 7 marks)

2 Diane and Christine sell bottles of homemade lemonade. They have 200 bottles of lemonade for sale at a market.

Diane sells $\frac{1}{5}$ of the 200 bottles while Christine sells 15% of the 200 bottles.

(a) Write $\frac{1}{5}$ as a percentage.

(1)

(b) How many of the 200 bottles are left at the end of the market sale?

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(c) If one bottle of lemonade costs 3.25 euro, what is the greatest number of bottles that can be bought for 20 euro.

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(d) Homemade lemonade is made by mixing sugar with lemon juice and water.
The ratio by weight of sugar : lemon juice : water in this lemonade is $1:1:4$.
How much lemon juice is needed to make 3 Kg of lemonade? Give your answer in g.

(2)

(Total: 8 marks)

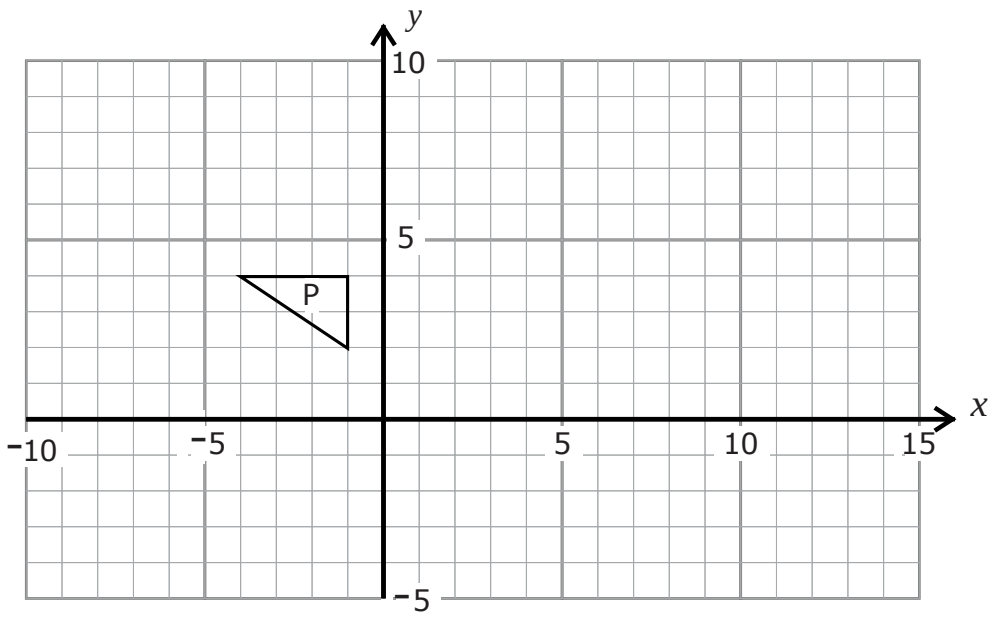
3 Fill in the empty cells in the table below:

Fraction *In its lowest terms*	Decimal	Percentage
$\frac{3}{5}$		
		65%

(Total: 4 marks)

4 (a) A graphic designer is using shape P below to create a logo.

(i) On the axes below draw the line $y = -x$.
Reflect shape P in the line $y = -x$**.** Label the image Q.

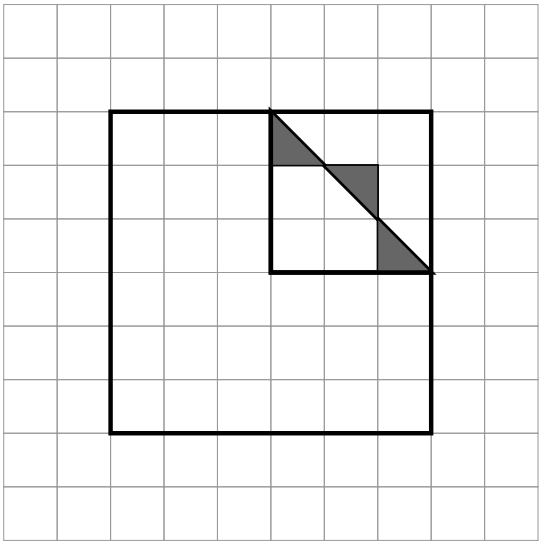


(3)

(ii) On the same axes, enlarge shape P by a scale factor of 3 about the point (-8, 4). Label the image R.

(2)

(b) The designer needs to create another logo. Complete the shape below so that the logo has rotational symmetry of order 4.



(2)

(Total: 7 marks)

5 (a) Work out the value of the following, giving your answer in standard form:

$$\sqrt{\frac{0.045 \times 2.5^3}{459}}$$

(2)

(b) (i) Work out the reciprocal of $\frac{2}{3}$

(1)

(ii) When you multiply a number by its reciprocal you always get the same answer. What is this answer?

(1)

(c) Alex deposits €12,500 in a bank with simple interest. After 5 years, he earns €450 as interest. What was the annual interest rate over this period?

(3)

(Total: 7 marks)

6 In this question, use ruler and compasses only.

(a) On the given line BC, construct triangle ABC in which AB = 10 cm and AC = 8 cm.

(2)

(b) Construct the bisectors of angle ABC and of angle ACB.
Mark the point D where the two bisectors meet. (5)

(c) (i) Draw a perpendicular from D to the side BC.
Name the point where the perpendicular meets BC as P. (3)

(ii) Draw a circle with centre D and radius DP. (1)

(Total: 11 marks)

7 In the figure below, points A, B and C lie on the circumference of a circle centre O. AB is the diameter of the circle, DE is a tangent to the circle at C and angle OAC = 34°.

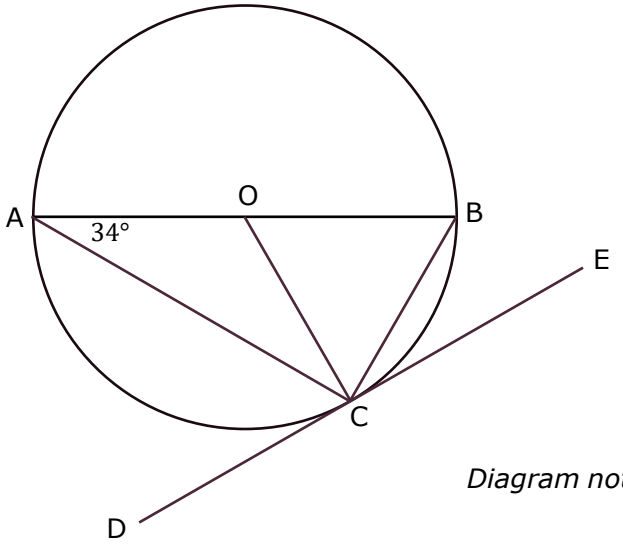


Diagram not drawn to scale

(a) Giving reasons for your working, work out the value of:

(i) angle BOC

(2)

(ii) angle ACD

(3)

(b) If the circumference of the circle is 63.8cm, calculate the length of chord BC.

(4)

(Total: 9 marks)

8 The figure below shows the dimensions, in cm, of square A and rectangle B.

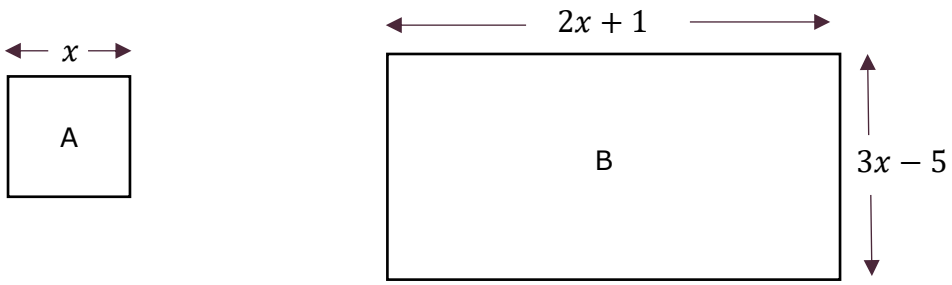


Diagram not drawn to scale

(a) Find the perimeter of square A in terms of x.

(1)

(b) Show that the perimeter of rectangle B is given by $10x - 8$.

(3)

(c) The perimeter of B is twice the perimeter of A.

Form and solve an equation in terms of x.

(3)

(d) Use the value of x found in part (c) to find the area of rectangle B in cm^2.

(3)

(Total: 10 marks)

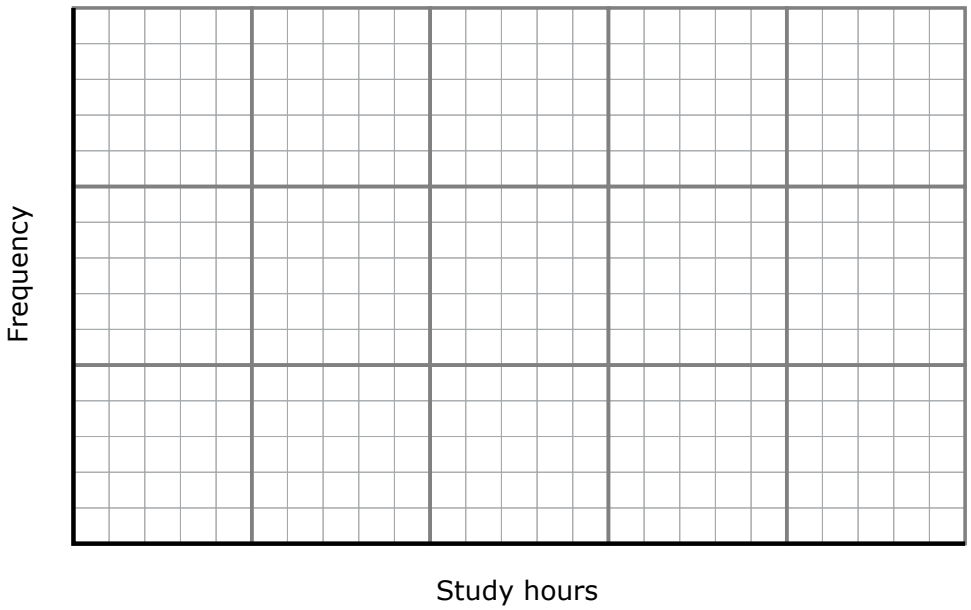
9 A group of 50 students in a sixth form were asked about the number of hours they spend studying each week. The data is presented in the following frequency table:

Study hours (t) in hrs	**Frequency (f)**
$0 \leq t < 5$	10
$5 \leq t < 10$	14
$10 \leq t < 15$	14
$15 \leq t < 20$	
$20 \leq t < 25$	4

(a) How many students lie in the group $15 \leq t < 20$?

(1)

(b) Draw a histogram using the information in the above frequency data.



(4)

(c) Find the probability that a randomly selected student from this group studies 15 hours or more per week.

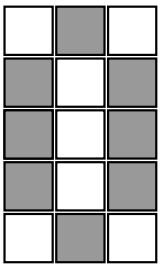
(2)

(d) A new student joins the group and reports studying 10 hours per week.
By including the data of the new student, identify the modal group.

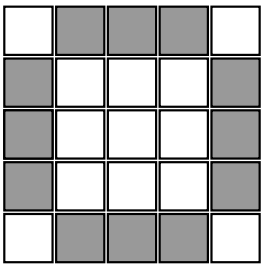
(2)

(Total: 9 marks)

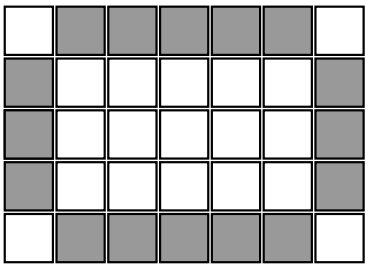
10 The patterns below are made of white and grey tiles.



Pattern 1



Pattern 2



Pattern 3

(a) Complete the table below for the number of tiles in each pattern:

Pattern number	**1**	**2**	**3**	**4**	**5**	n
Number of white tiles	7	13	19			
Number of grey tiles	8	12	16			

(4)

(b) How many grey tiles are required to complete a pattern which has 487 white tiles?

(4)

(c) Is it possible to obtain a pattern which has 101 grey tiles? Explain your answer.

(2)

(Total: 10 marks)

11 A school is giving a financial donation, called a grant, to help a group of students. The grant available to each student is inversely proportional to the number of students in this group. When 30 students are given the grant, they receive 60 euro each.

(a) What would each student get if 120 students receive a grant?

(1)

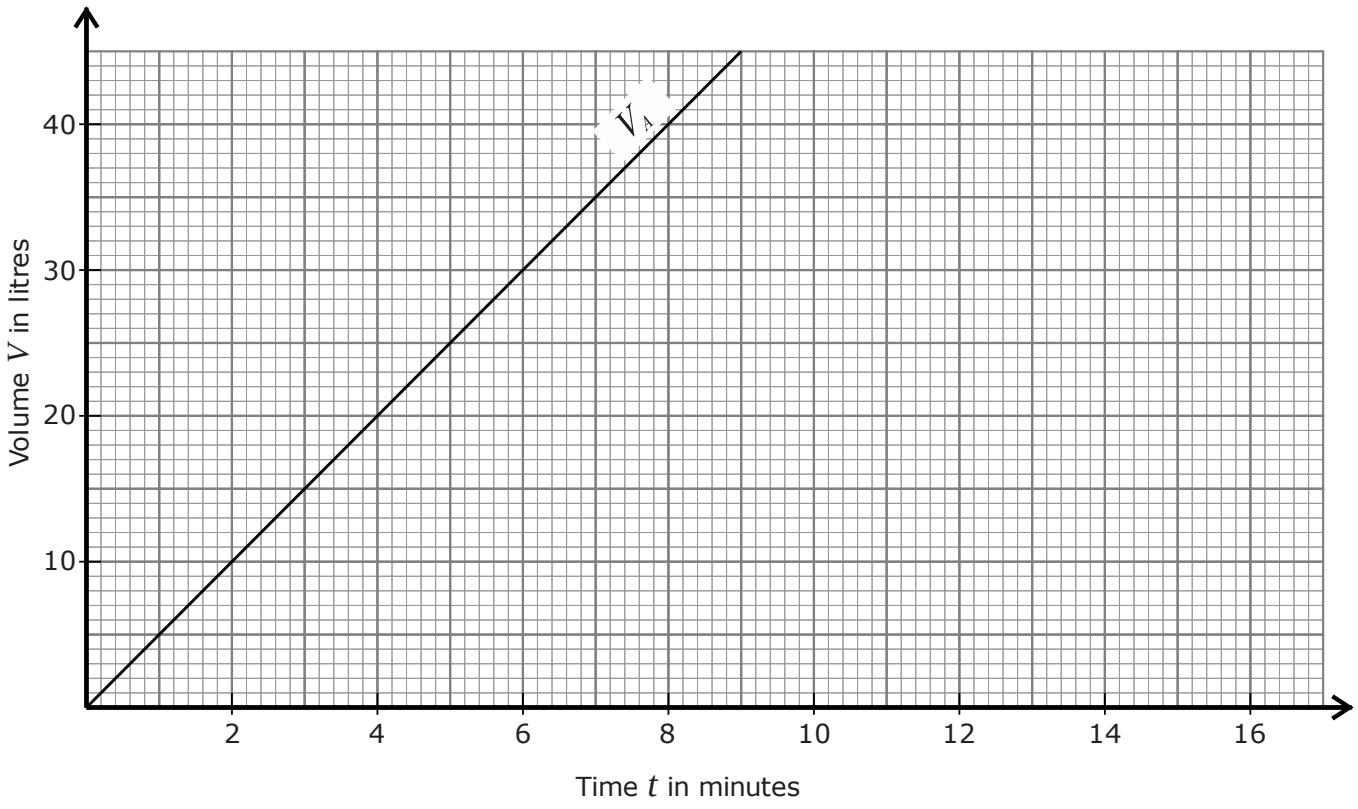
(b) If the grant was 50 euro each, how many students received the grant?

(1)

(Total: 2 marks)

12 Water starts flowing into two tanks at $t = 0$. Tank A is being filled at a constant rate, while another identical tank, B, is being filled at a changing rate owing to a leak. Both tanks start empty at $t = 0$.

Water flows into tank A at a constant rate of 5 litres per minute as shown in the graph below.



(a) Write an equation to represent the volume of water V_A in tank A as a function of time t minutes.

(1)

Water flows into tank B at an initial rate of 8 litres per minute, but the leak causes the rate to decrease over time. The volume of water in tank B after t minutes is given by the equation $V_B = 8t - 0.5t^2$.

(b) Complete the following table of values for the equation of $V_B = 8t - 0.5t^2$

t	0	2	4	6	8	10	12	14	16
V_B		14		30			24		

(3)

(c) Use the same axes to plot the graph of $V_B = 8t - 0.5t^2$ for values of t between 0 and 16.

(3)

(d) After how many minutes do the two tanks have the same volume?

(1)

(e) What is the maximum volume of water in tank B, and when does it occur?

(2)

(Total: 10 marks)

13 PQ and RS are two parallel chords in a circle centre O. The diameter XY is 30 cm long. A is the midpoint of PQ and B is the midpoint of RS.

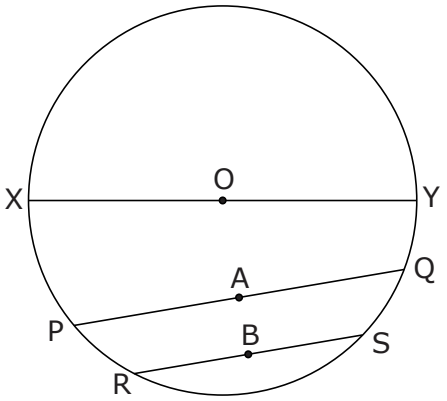


Diagram not drawn to scale

(a) If the perpendicular distance OA is 9 cm, find the length of the chord PQ.

(3)

(b) Chord RS is 17 cm long. Find the perpendicular distance AB between the 2 chords. Give your answer in cm correct to 1 d.p.

(3)

(Total: 6 marks)

Index Number:_____ SEC23/2L3-3*.25m

L-Università ta' Malta

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE EXAMINATIONS BOARD

SECONDARY EDUCATION CERTIFICATE LEVEL
2025 MAIN SESSION

SUBJECT:	**Mathematics**
PAPER NUMBER:	II – Level 3-3*
DATE:	3rd May 2025
DURATION:	2 hours 5 minutes

Answer **ALL** questions.

Write your answers in the space available on the examination paper.

Show clearly all the necessary steps, explanations and construction lines in your working.

Unless otherwise stated, diagrams are drawn to scale.

The use of non-programmable electronic calculators with statistical functions and mathematical instruments is allowed.

Candidates are allowed to use transparencies for drawing transformations.

This paper carries 100 marks.

Useful information:

Area of a Triangle	$\frac{1}{2}\, ab \sin C$
Curved Surface Area of Right Circular Cone	πrl
Surface Area of a Sphere	$4\pi\, r^2$
Volume of a Pyramid /Right Circular Cone	$\frac{1}{3}\ base\ area\ x\ perpendicular\ height$
Volume of Sphere	$\frac{4}{3}\pi r^3$
Solutions of $ax^2 + bx + c = 0$	$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$
Sine formula	$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$
Cosine formula	$a^2 = b^2 + c^2 - 2bc\ cosA$
Compound Interest / Appreciation & Depreciation	$A = P\left(1 \pm \frac{r}{100}\right)^n$

1 (a) Write down the number of seconds in one week in standard form.
Give your answer to 3 significant figures.

(2)

(b) (i) Express 400 and 1080 as a product of prime factors.

(2)

Use your answers to part (b)(i) above to find:

(ii) $\sqrt{400}$

(1)

(iii) whether 1080 is a cube number; Explain.

(2)

(c) Work out:

(i) the LCM of 400 and 1080.

(1)

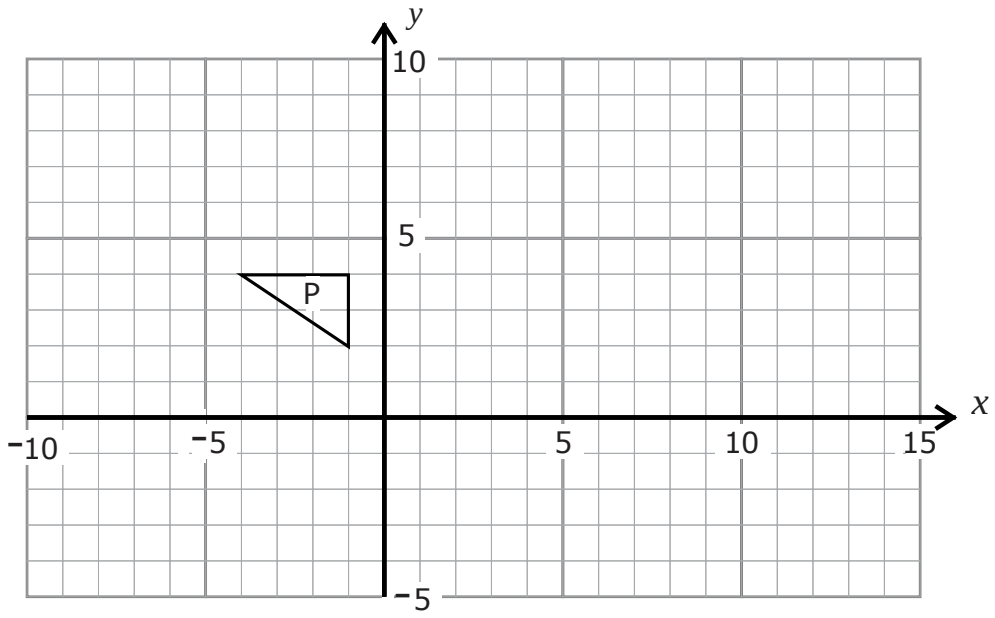
(ii) the HCF of 400 and 1080.

(1)

(Total: 9 marks)

2 (a) A graphic designer is using shape P below to create a logo.

(i) On the axes below draw the line $y = -x$.
Reflect shape P in the line $y = -x$. Label the image Q.

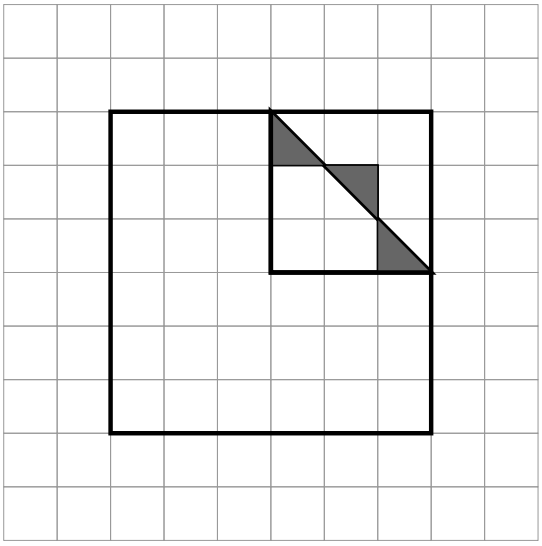


(3)

(ii) On the same axes, enlarge shape P by a scale factor of 3 about the point (-8, 4). Label the image R.

(2)

(b) The designer needs to create another logo. Complete the shape below so that the logo has rotational symmetry of order 4.

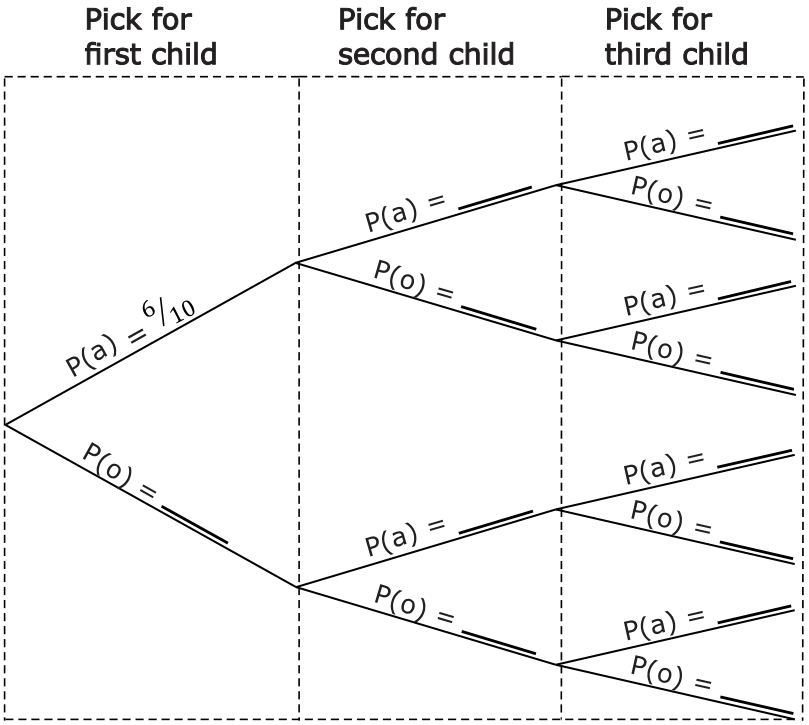


(2)

(Total: 7 marks)

3 Mario is preparing lunch for his three children. He is choosing one fruit for each child from a bowl containing 6 apples and 4 oranges. The fruits are selected at random one after the other.

(a) Fill in the missing probabilities in the diagram below:



Key
a stands for apple
o stands for orange

(4)

(b) Find the probability that the three children get an orange each.

(2)

(c) Find the probability that one of the children gets an apple and the other two get an orange.

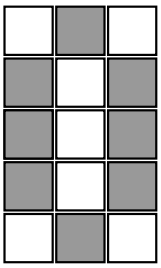
(3)

(d) Find the probability of selecting at least an apple.

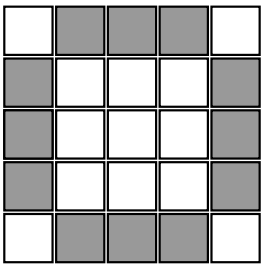
(2)

(Total: 11 marks)

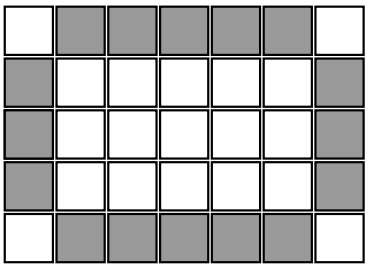
4 The patterns below are made of white and grey tiles.



Pattern 1



Pattern 2



Pattern 3

(a) Complete the table below for the number of tiles in each pattern:

Pattern number	**1**	**2**	**3**	**4**	**5**	n
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(4)

(b) How many grey tiles are required to complete a pattern which has 487 white tiles?

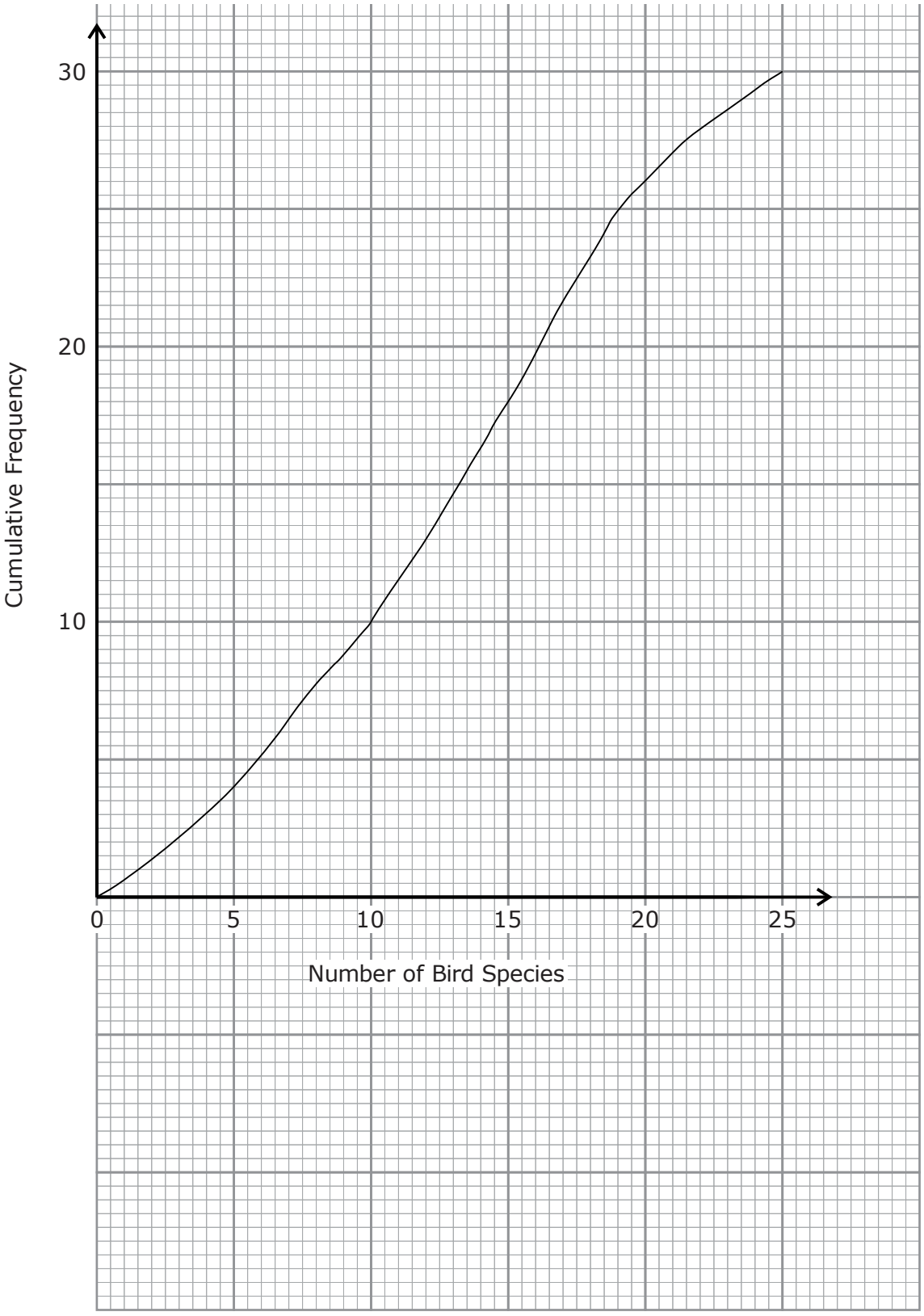
(4)

(c) Is it possible to obtain a pattern which has 101 grey tiles? Explain your answer.

(2)

(Total: 10 marks)

5 A group of environmental scientists collected data on the number of bird species observed in 30 different locations. The data is shown in the Cumulative Frequency table below.



(a) Complete the missing values in the tables below:

Number of Bird Species	Number of Locations
0 – 5	4
6 – 10	
11 – 15	
16 – 20	
21 – 25	4

No of Bird Species	Cumulative Frequency
≤ 5	4
≤ 10	10
≤ 15	
≤ 20	26
≤ 25	

(2)

(b) Use the Cumulative Frequency curve to estimate:

(i) the median number of bird species observed;

(1)

(ii) the interquartile range.

(2)

(c) Underneath the Cumulative Frequency Graph, draw and label a box-and-whisker plot for the given data.

(2)

(d) Using your Cumulative Frequency curve, estimate the percentage of locations that had more than 16 bird species observed.

(2)

(Total: 9 marks)

6 Mariella is considering buying an electric car and came across an advertisement stating the car costs €55,000, including 18% VAT. She wants to determine the actual price of the car before VAT is added.
What is the car's price excluding VAT?

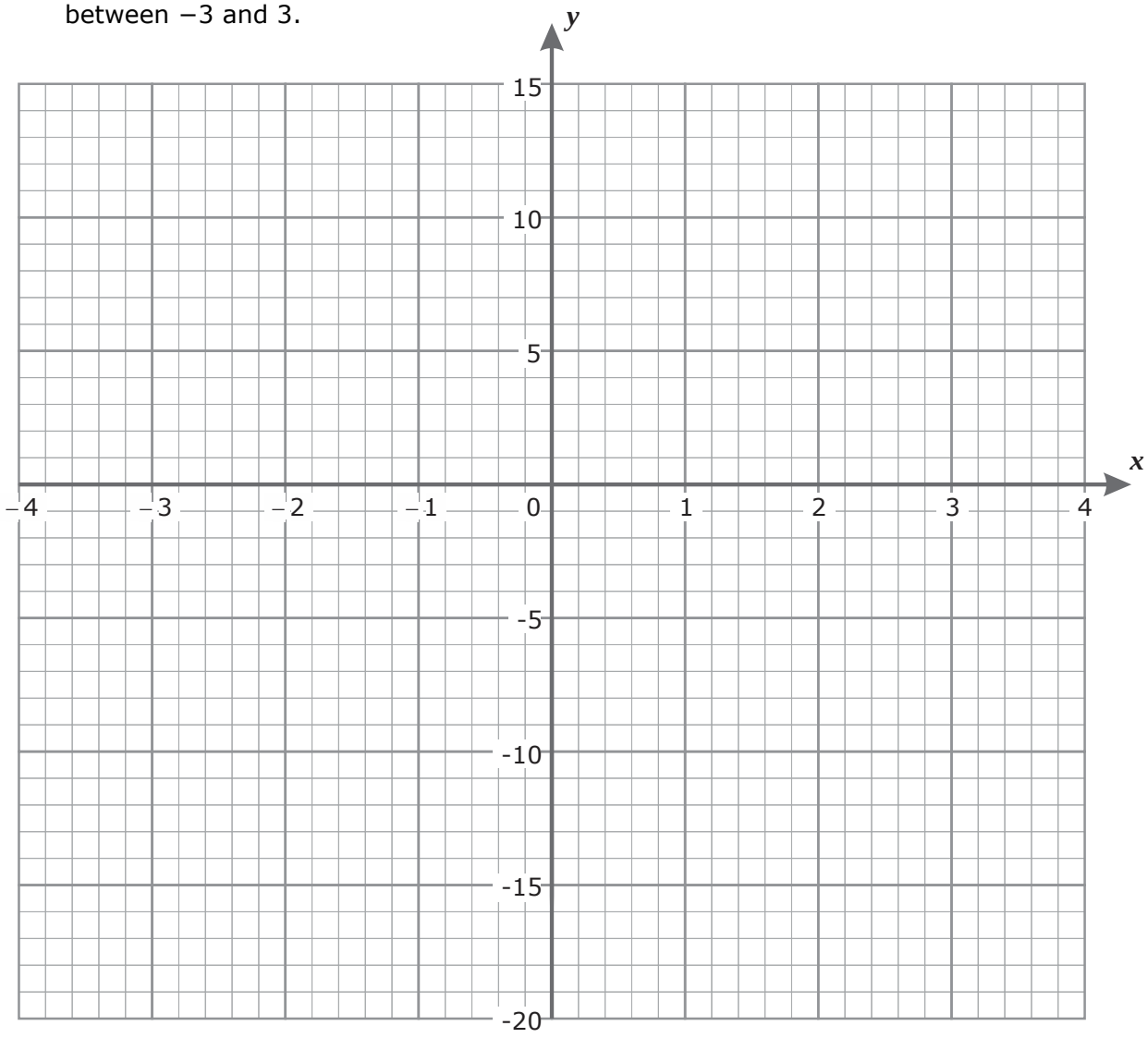
(Total: 3 marks)

7 (a) Complete the table of values for $y = x^3 - 5x - 3$.

x	-3	-2	-1	0	1	2	3
y	-15				-7		9

(2)

(b) Use the axes provided to plot the graph of $y = x^3 - 5x - 3$ for values of x between -3 and 3.



(4)

(c) Use your graph to solve the equation $x^3 - 5x - 3 = 0$.

(3)

(d) On the same axes plot the line $y = -5x + 5$.

(2)

(e) Write the cubic equation which is satisfied at the point of intersection of the two graphs.

From your graph, determine the solution to this equation.

(2)

(f) Solve in another way the cubic equation formed in part (e).

(2)

(Total: 15 marks)

8 John purchased a car for €24,500. The insurance company informed him that the car's value would decrease by 20% after the first year. Following that, the car's value will continue to depreciate by 10% annually for the next 4 years.

(a) What will the car be worth 5 years after John bought it?

(4)

(b) John then decides to sell the car for €15,000. He deposits this amount into a bank account that earns compound interest at a rate of 1.5% per year.
How much will John have in the account after 6 years?

(3)

(Total: 7 marks)

9 In the figure below, points A, B and C lie on the circumference of a circle centre O. AB is the diameter of the circle, DE is a tangent to the circle at C and angle OAC = 34°.

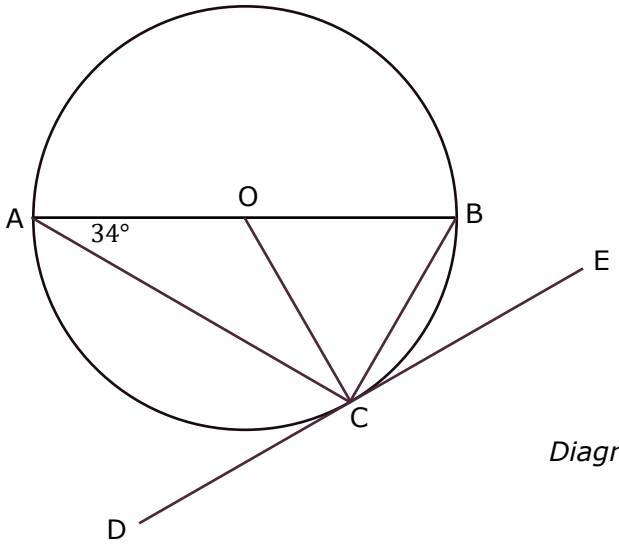


Diagram not drawn to scale

(a) Giving reasons for your working, work out the value of:

(i) angle BOC

(2)

(ii) angle ACD

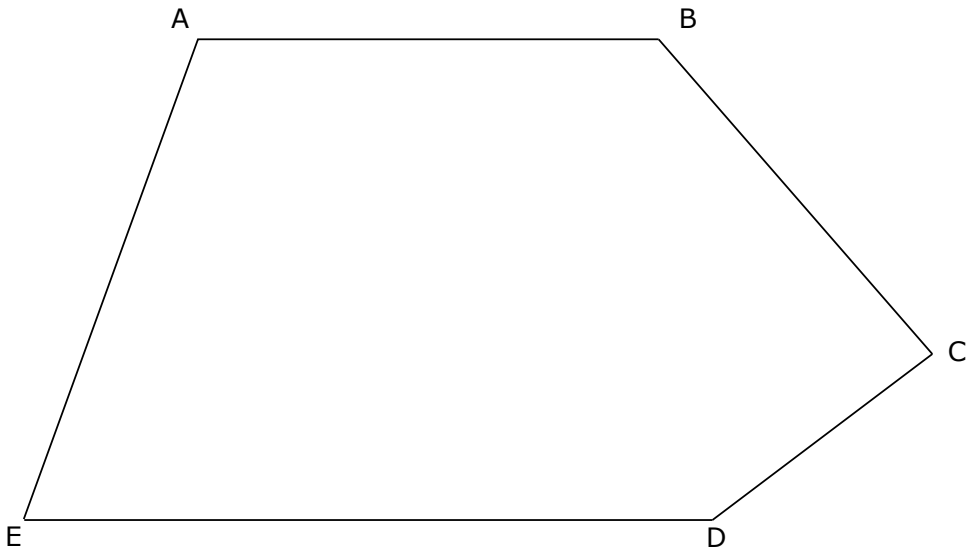
(3)

(b) If the circumference of the circle is 63.8cm, calculate the length of chord BC.

(4)

(Total: 9 marks)

10 The diagram below is the plan of a farmer's field. The two boundary lines AB and ED are parallel.



The farmer wants to put up a scarecrow in his field at a point S within the plan.
The point S needs to satisfy the following conditions:

- S is to be equidistant from the corners E and D;
- S is to be equidistant from the boundary walls AE and ED.

(a) Using a ruler and compasses only, mark on the above diagram the correct location of point S.

(5)

(b) The boundary walls ED and CD are 80 m and 32 m in length respectively while angle EDC = 143°. Use the cosine formula to work out the length of the diagonal EC in metres correct to 1 dp.

(3)

(Total: 8 marks)

11 (a) Luke thinks of a number. He triples it, adds 5 and the result is larger than 29.

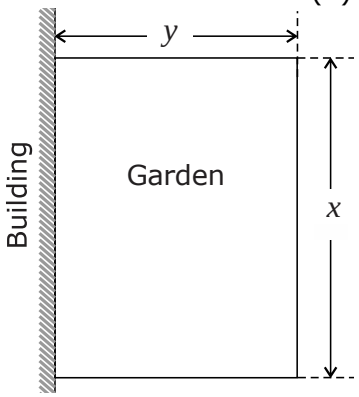
(i) Write an inequality to represent this and solve it.

(3)

(ii) Luke was thinking of an integer. What is the smallest integer he could have been thinking of?

(1)

(b) A rectangular garden is being planned next to a building. As shown in the diagram, 80 m of fencing are used to enclose the garden along the other 3 sides. The length of the garden is x metres and the width is y metres. The area of the garden is 600 m^2.



(i) Form two equations to represent the relationship between x and y.

(2)

(ii) Use the equations obtained in part (b)(i) to find the possible dimensions of this garden.

(6)

(Total: 12 marks)