

**L-Università
ta' Malta**MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD**SECONDARY EDUCATION CERTIFICATE LEVEL
2026 MAIN SESSION**

SUBJECT:	Mathematics
PAPER NUMBER:	I – Level 1-2-3
DATE:	2 nd May 2026
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.

<i>For Office Use Only</i>															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	Total

1. (a) Match the following into pairs and write each pair in the spaces provided.

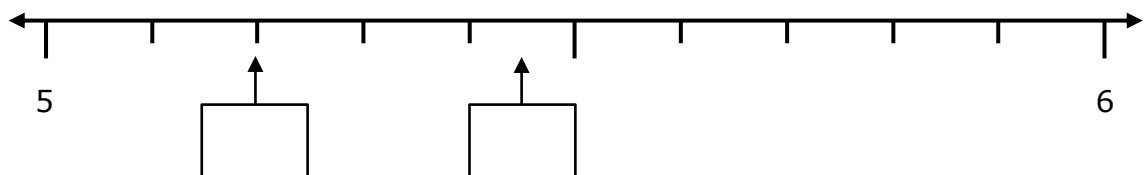
0.75	$\frac{4}{8}$	0.5	0.25	$\frac{3}{4}$	$\frac{1}{4}$
------	---------------	-----	------	---------------	---------------

_____ = _____ _____ = _____ _____ = _____ (3)

- (b) Answer the following on the number line below.

- (i) Fill in the boxes with the correct decimal number. (2)

- (ii) Mark with an arrow the position of $5\frac{7}{10}$. Label this position P. (1)



- (c) Belgium has a population of 11 825 631.

- (i) Write the value of the digit 2 in this number. (1)

- (ii) What is the population of Belgium to the nearest thousand? (1)

- (iii) Write the population of Belgium in standard form, correct to one decimal place. (2)

(Total: 10 marks)

2. Karl is organising a party for 40 children.

- (a) He wants to buy enough juice to fill in 40 cups, each holding 220 ml.
Juice comes in 2 litre cartons.
How many 2 litre cartons does he need to buy?

(3)

- (b) Karl hires a caterer to provide the party food and the services of two waiters.

He chooses a menu that costs €12.50 per person.

- (i) How much will the party food cost?

(2)

The party lasts from 4.30 pm till 8.30 pm.

The cost of the service of one waiter is €10 per hour.

- (ii) Calculate the total amount Karl has to pay the caterer for the party food and the services of two waiters.

(3)

(Total: 8 marks)

3. Gretel buys a jogging suit from an online website at a total cost of £71.50.

- (a) How much do £71.50 amount to in euros when the exchange rate is €1 = £0.88?

(2)

- (b) Gretel intends to sell this jogging suit from her shop in Malta at a profit of 20%.
How much should she price the jogging suit in euro?

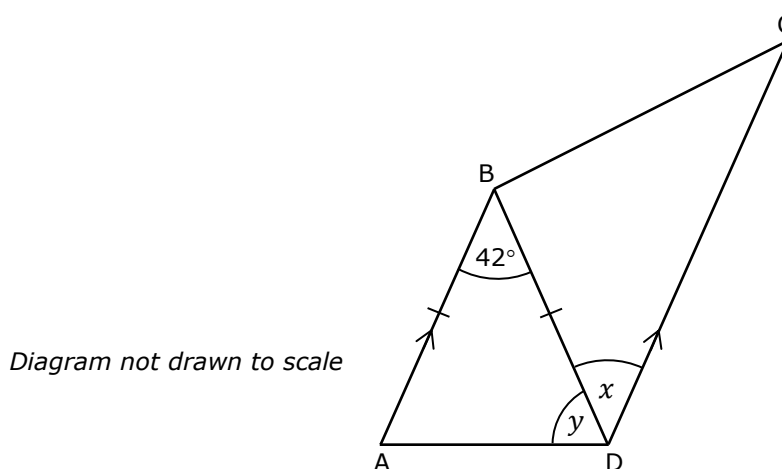
(3)

(Total: 5 marks)

4. Six identical machines produce a number of cupcakes in 5 hours.
If two of these machines are not working, how long does it take the remaining machines to produce the same number of cupcakes?

(Total: 3 marks)

5. The diagram below shows a quadrilateral ABCD with one diagonal, BD, drawn.
AB is equal to BD. Side AB is parallel to side DC. Triangle BCD is scalene.



- (a) Work out the following, giving reasons for your answers.

- (i) What is the size of the angle marked x ?

(2)

- (ii) Work out the size of the angle marked y .

(2)

- (b) (i) Explain why shape ABCD is **not** a parallelogram.

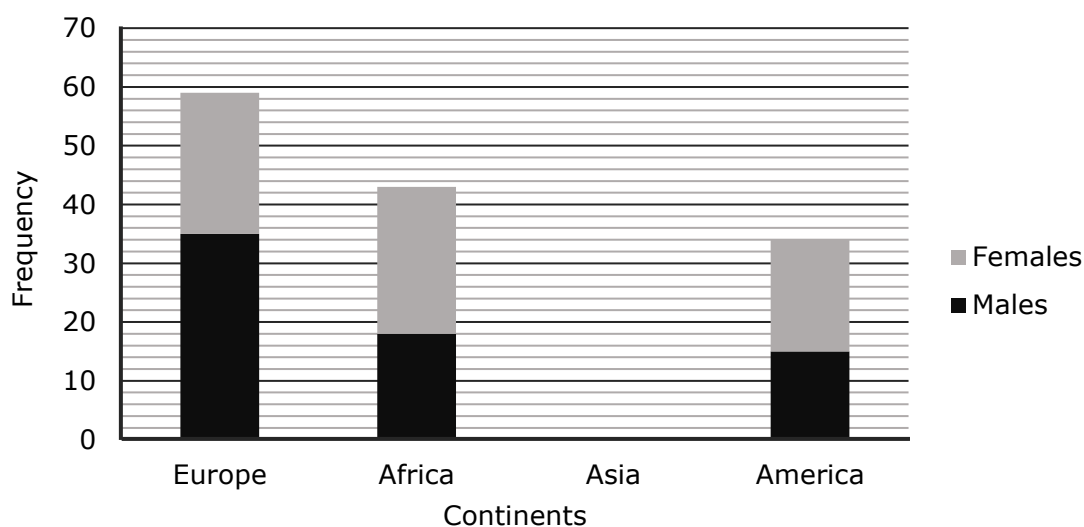
(2)

- (ii) What type of quadrilateral is ABCD?

(1)

(Total: 7 marks)

6. A company employs 180 people from four different continents: Europe, Asia, Africa and America. The distribution of males and females from these continents is shown in the stacked bar chart and frequency table below.



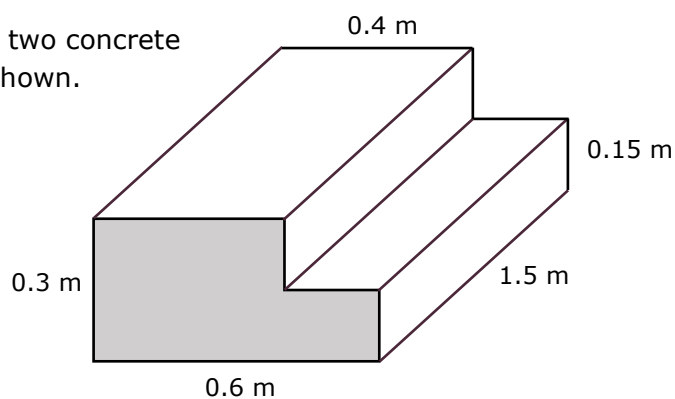
	Europe	Africa	Asia	America
Males	35	18	24	15
Females	24		20	19
Total	59		44	34

- (a) Using the information above:
- complete the stacked bar chart for Asia; (2)
 - complete the frequency table for Africa. (1)
- (b) A worker from the company is chosen at random.
- What is the probability that the worker chosen is from America? (1)
 - What is the probability that the worker chosen is a male? (2)
 - What is the probability that the worker chosen is a female from Asia? (1)

(Total: 7 marks)

7. The drama teacher wants to construct two concrete steps leading to an outdoor stage as shown.

Diagram not drawn to scale



- (a) Calculate the cross-sectional area of the steps, shown shaded above.

(2)

- (b) Work out the volume of concrete needed to construct the steps.

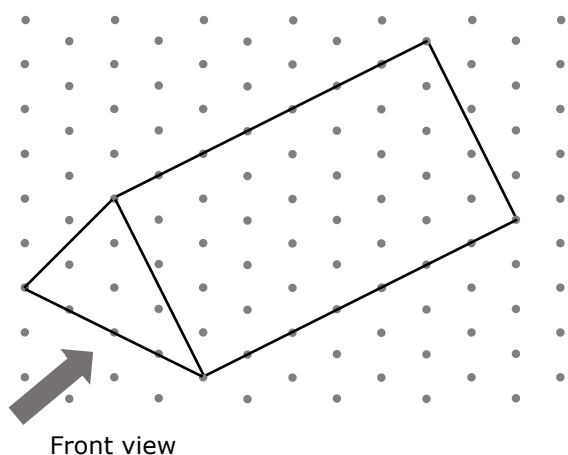
(2)

- (c) The white surfaces shown in the diagram will be covered by a carpet. Carpeting costs €38 per metre. Calculate the cost of carpeting the steps.

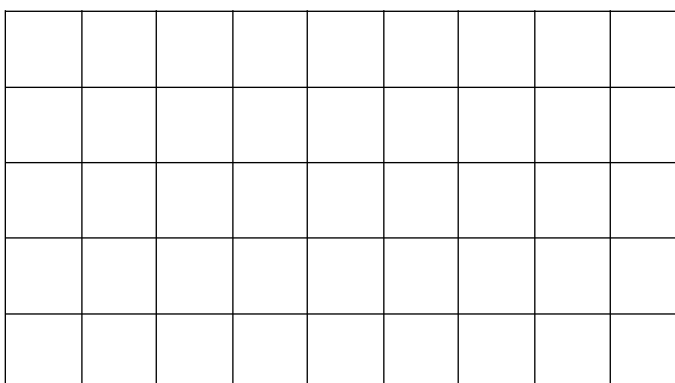
(3)

(Total: 7 marks)

8. (a) On the square grid, draw the front elevation of the triangular prism below.

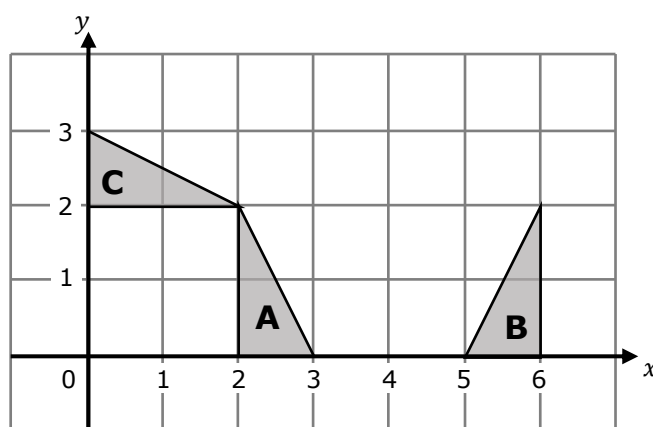


Front view



(1)

(b) Complete the following statements:



(i) A is transformed into B by a reflection in the line _____ . (1)

(ii) A is transformed into C by a reflection in the line _____ . (1)

(Total: 3 marks)

9. Anna builds a model of the Eiffel Tower.

The height of the model is 1.1 m, while the actual Eiffel Tower is 330 m high.

(a) What is the scale ratio of the Eiffel Tower model?

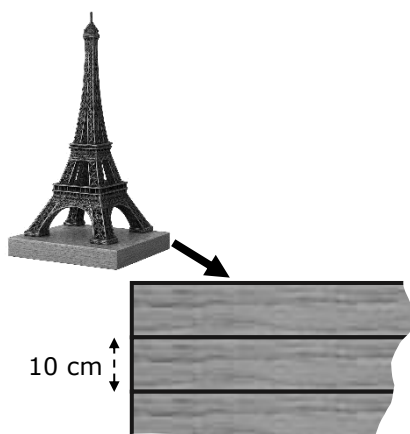
Write your answer in its simplest form.

(2)

(b) The actual Eiffel Tower has a square base of side 125 m.

Anna wants to build a square base for her model using wooden strips that are 10 cm wide and 75 cm long. She will join the strips along their long sides and then cut off any extra length to form a square as shown in the diagram.

What is the smallest number of strips she needs?



(3)

AI-generated image created using ChatGPT (OpenAI)

(Total: 5 marks)

10. The ages, in years, of a group of ten young singers are:

4.6, 12.3, 12.5, 13.3, 13.7, 13.7, 14.5, 14.5, 14.5, 15.2

(a) Write down the modal age.

(1)

(b) What is the median age?

(1)

(c) Work out the range of the ages of the singers.

(1)

(d) The mean of this group of singers is 12.88 years.
Thomas states that removing the outlier will increase the median age and the mean age of this group of singers.

Is he correct? Explain your reasoning.

(3)

(Total: 6 marks)

11. (a) Work out the size of angle a in the irregular pentagon below.

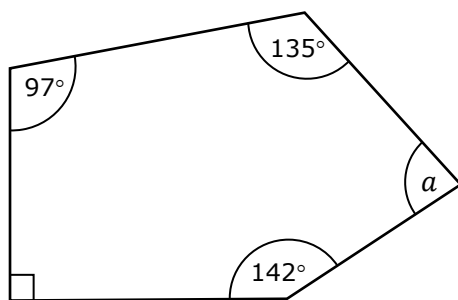


Diagram not drawn to scale

(3)

(b) Is it possible to have a regular polygon with each interior angle equal to 105° ?
Explain your answer.

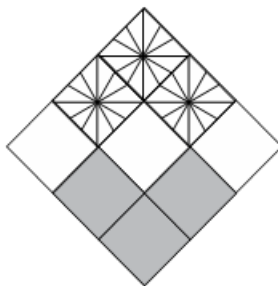
(3)

(Total: 6 marks)

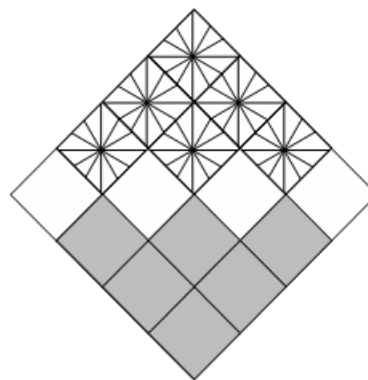
12. The first three shapes in a sequence are given below.



Shape 1



Shape 2



Shape 3

(a) Fill in the table below for this sequence of shapes.

Shape	1	2	3	4		10		n
Total number of squares	4	9						
Number of white squares	2	3						
Number of grey squares	1	3						

(7)

(b) A shape has 400 squares in total.

(i) What is its shape number?

(2)

(ii) How many white squares does this shape have?

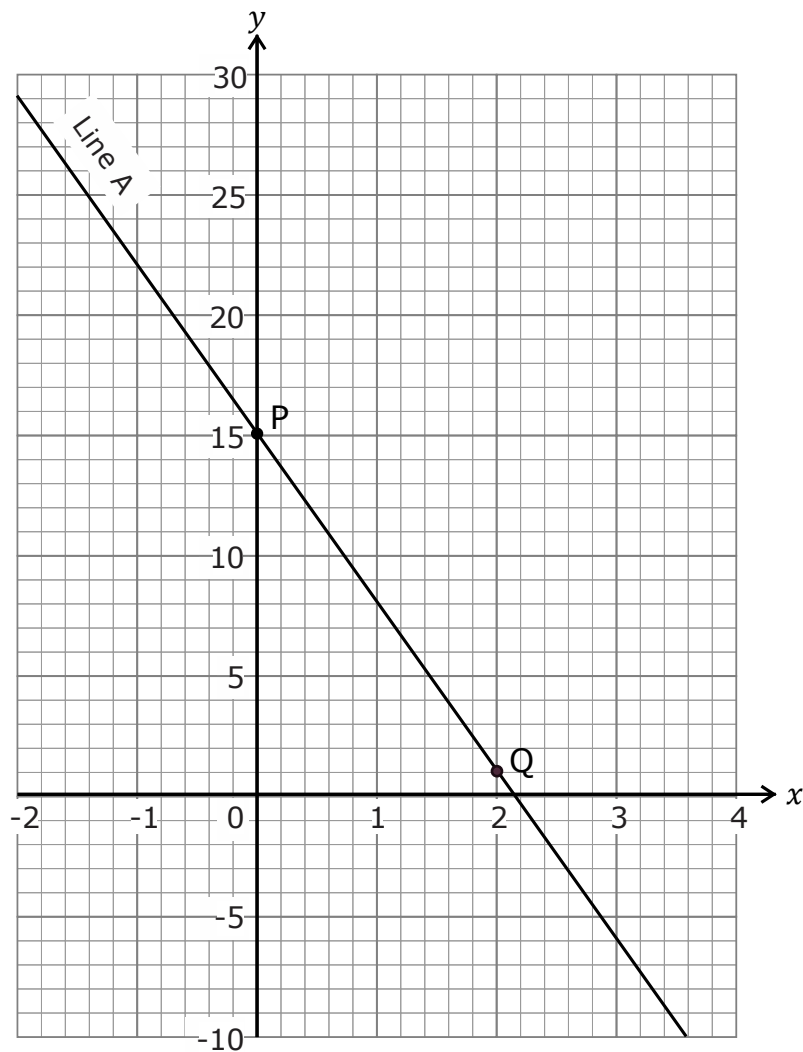
(1)

(iii) How many grey squares does this shape have?

(1)

(Total: 11 marks)

13.



- (a) On the axis above, plot the graph of Line B represented by the equation $y = 8x + 6$.

(3)

- (b) Use the coordinates of points P and Q to write the equation of Line A shown on the grid above.

(3)

- (c) What are the coordinates of the point where Line A intersects Line B?

(1)

- (d) (i) Use the equations of the two graphs to determine the equation in x which is satisfied at this point of intersection.

(1)

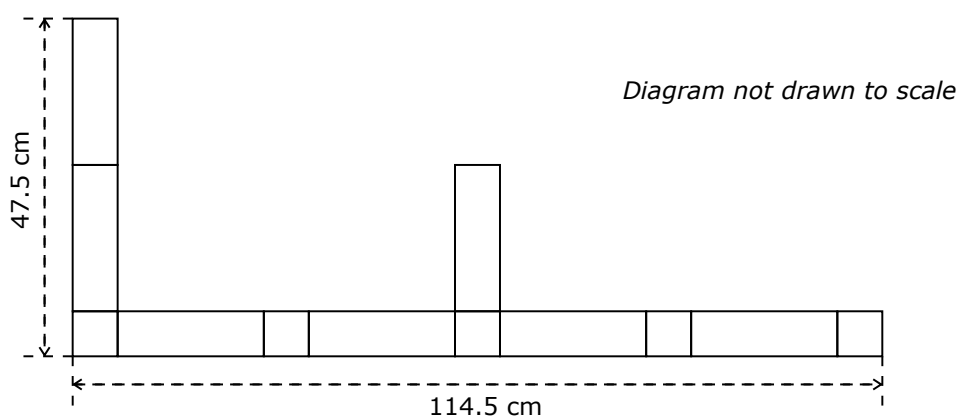
- (ii) What is the value of x which satisfies the equation you gave in part (d)(i)?

(1)

(Total: 9 marks)

14. The shape below is made up of squares and rectangles.

The squares have sides x cm long. The rectangles are y cm long and x cm wide.



- (a) Use the dimensions given in the diagram to write down two equations that are satisfied by x and y .

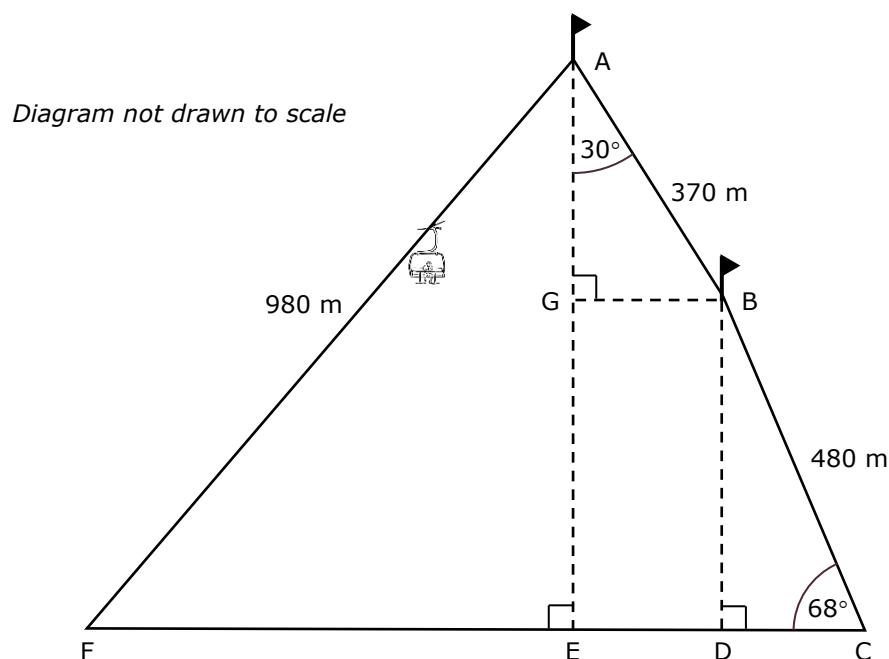
(2)

- (b) Solve the two equations obtained in part (a) to calculate the values of x and y .

(4)

(Total: 6 marks)

15. In a climbing competition, participants must place two flags: the first at point B, located 480 m along an incline of 68° to the horizontal, and the second at point A, a further 370 m along an incline of 30° to the vertical.



- (a) Calculate, giving your answer correct to the nearest metre:

- (i) the vertical height BD;

(2)

- (ii) the vertical height AG.

(2)

- (b) When the participants reach the top at A, they descend to point F, by means of a cable chair. Given that the line of the cable chair, AF, is 980 m long, calculate the horizontal distance FE.

(3)

(Total: 7 marks)



**SECONDARY EDUCATION CERTIFICATE LEVEL
2026 MAIN SESSION**

This paper carries 100 marks.

[illegible]

1. (a)

2, 3, 4, 6, 7, 8, 9, 12, 14, 18

(i) Write two prime numbers from the list above: _____ and _____

(2)

(ii) Use all the numbers in the list above to complete the Carroll diagram.

	Factor of 18	not a factor of 18
Factor of 12	2	
not a factor of 12		7

(4)

(b) Fill in the missing terms of the following sequences:

(i) 1, 4, 9, 16, _____ , _____

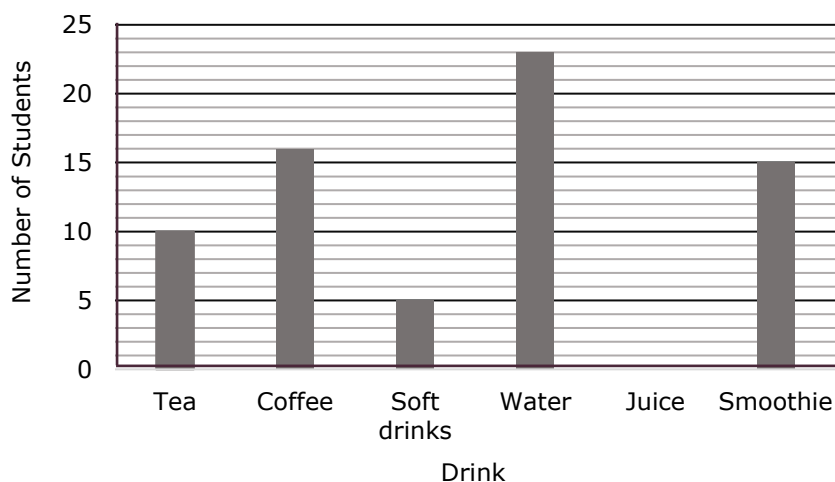
(2)

(ii) 9, 7, 5, _____ , 1, _____

(2)

(Total: 10 marks)

2. The bar chart and frequency table below show the drink preference of a group of high school students.



Preferred drink	Number of Students
Tea	10
Coffee	
Soft drinks	5
Water	
Juice	11
Smoothie	15

- (a) Using the information shown above:

(i) complete the bar chart;

(1)

(ii) complete the frequency table.

(2)

- (b) How many students participated in the survey?

(1)

- (c) How many more students prefer water to soft drinks?

(1)

(Total: 5 marks)

Please turn the page.

3. (a) Write $>$, $<$ or $=$ in the box provided. The signs may be used more than once.

(i) $\frac{27}{36}$ $\frac{3}{4}$ (1)

(ii) $3\frac{2}{3}$ $\frac{5}{3}$ (1)

(iii) $1\frac{3}{8}$ $\frac{24}{16}$ (1)

(iv) 0.35 $\frac{7}{20}$ (1)

(b) There are 940 students in a school. Half of the students practise some kind of sport. One-fifth of the students who practise sport do athletics, while the rest play a team sport.

(i) How many students practise a sport? (1)

(ii) How many students do athletics? (2)

(iii) What percentage of the school population play a team sport? (3)

(Total: 10 marks)

4. (a) Maria has twelve 20c coins, nineteen 50c coins and four €2 coins.
Calculate the total amount of money Maria has. Give your answer in euro.

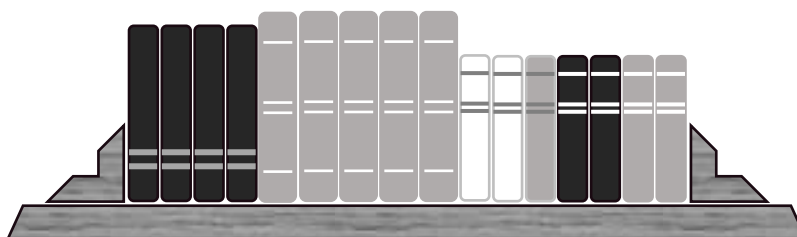
(2)

- (b) Pierre wants to exchange €250 to Sterling Pounds (£) at the rate of €1 = £0.88.
What is the value of his money in Sterling Pounds (£)?

(2)

(Total: 4 marks)

5. There are 16 books on a shelf. The covers of the books are black, grey or white.
A book is picked at random.



- (a) Underline the correct answer:

- (i) The probability of picking a grey book is (impossible, unlikely, evens, certain). (1)
- (ii) The probability of picking a white book is (impossible, unlikely, evens, certain). (1)
- (iii) The probability of picking a red book is (impossible, unlikely, evens, certain). (1)

- (b) What is the probability that a black book is picked? Simplify your answer.

(2)

(Total: 5 marks)

6. (a) The diagram below shows four angles that meet at a point.

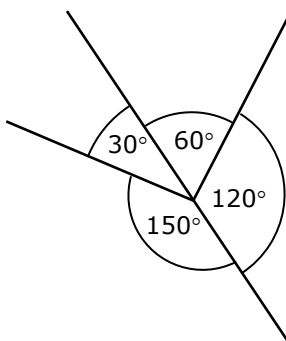


Diagram not drawn to scale

Use the angles above to answer the following:

- (i) Write an acute angle: _____ (1)
- (ii) Write an obtuse angle: _____ (1)
- (iii) Write two angles that together form a right angle: _____ and _____ (2)
- (iv) Write two angles that together form a reflex angle: _____ and _____ (2)

- (b) Work out the size of angle a .

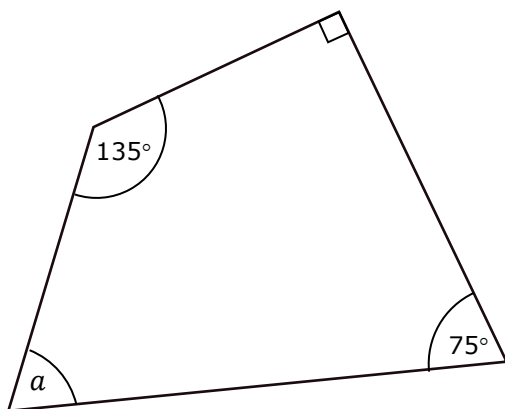
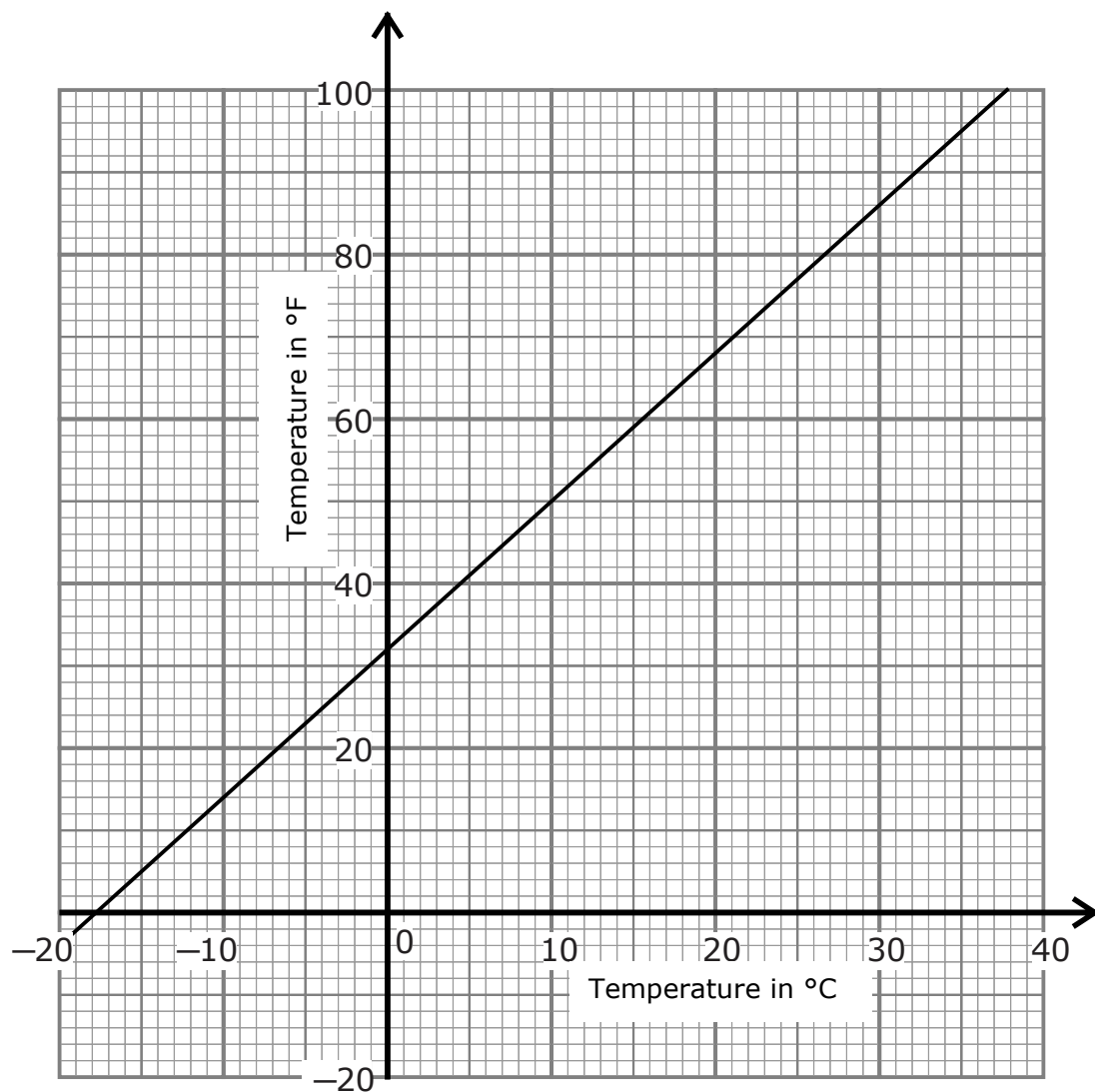


Diagram not drawn to scale

(3)

(Total: 9 marks)

7. The graph shows the conversion of temperature from degrees Celsius ($^{\circ}\text{C}$) to degrees Fahrenheit ($^{\circ}\text{F}$).

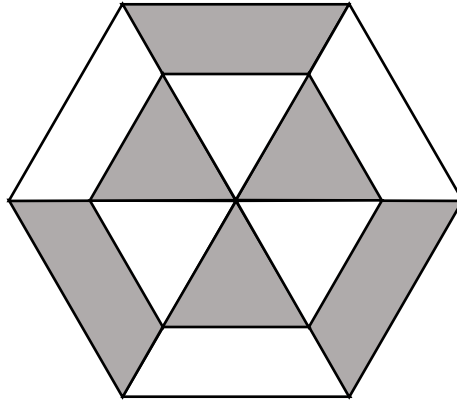


Use the graph to answer the following.

- (a) Convert 0°C to $^{\circ}\text{F}$. (1)
- (b) Convert 30°C to $^{\circ}\text{F}$. (1)
- (c) Convert 0°F to $^{\circ}\text{C}$. (1)
- (d) Convert 14°F to $^{\circ}\text{C}$. (1)

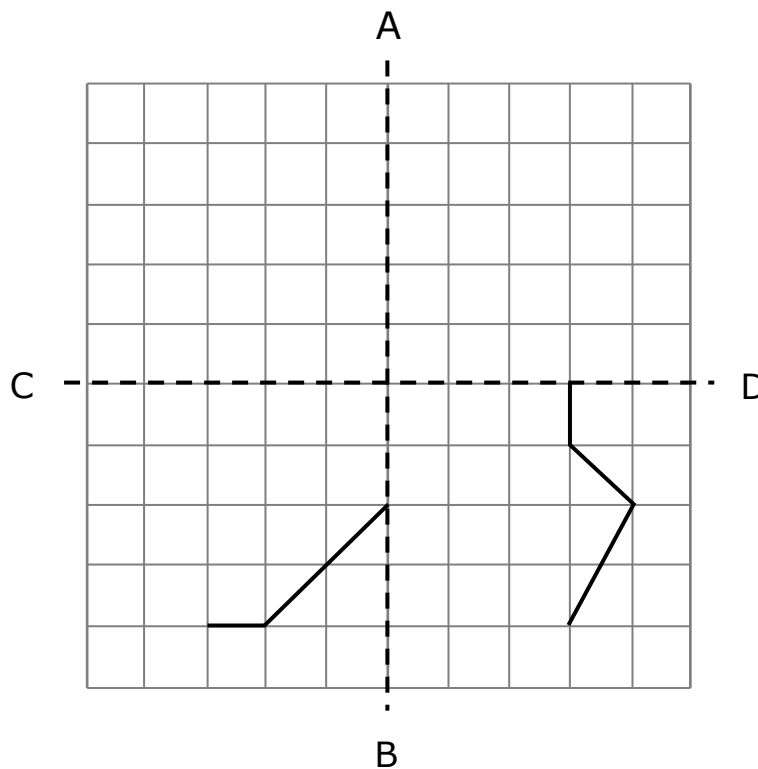
(Total: 4 marks)

8. (a) Fill in:
The order of rotational symmetry of the diagram below is _____.



(1)

- (b) Complete the patterns to make a shape symmetrical about lines AB and CD.



(3)

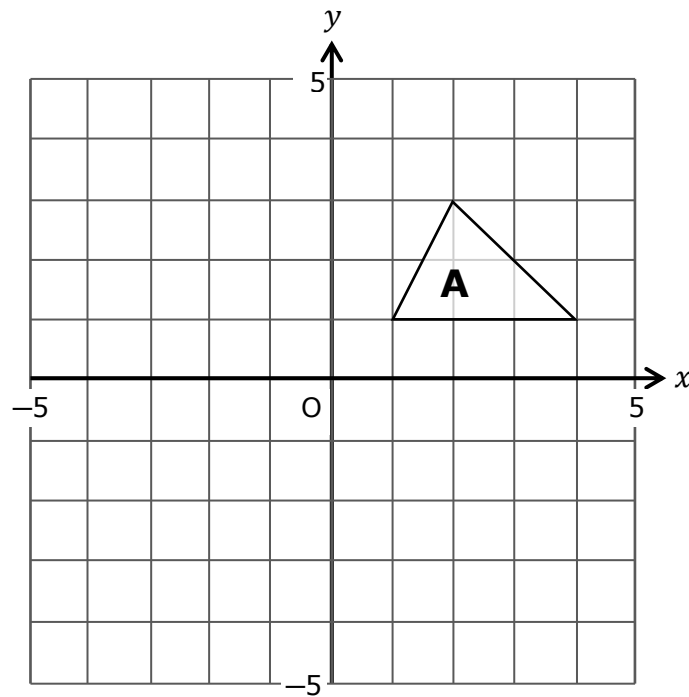
(c) Use the grid below to answer the following questions.

(i) Reflect triangle A in the x -axis. Label the image B.

(2)

(ii) Translate triangle A by a vector of $\begin{pmatrix} -4 \\ 1 \end{pmatrix}$. Label the image C.

(2)



(Total: 8 marks)

Please turn the page.

9. (a) A petshop has two offers on cans of cat food, all identical in size.

- Offer A: Pack of 6 cans selling at €9.00 per pack.
- Offer B: Pack of 8 cans selling at €13.00 per pack.

(i) Which offer is of better value? Show all your working.

(3)

(ii) Clare needs to buy 96 cans of cat food.

How much does it cost her if she takes the offer of better value?

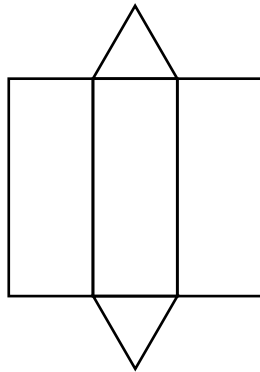
(2)

(b) Tony prepares a cat food mixture made up of vegetables and meat in the ratio 4 : 5 respectively. How many grams of vegetables does he need if he uses 140 g of meat in his mixture?

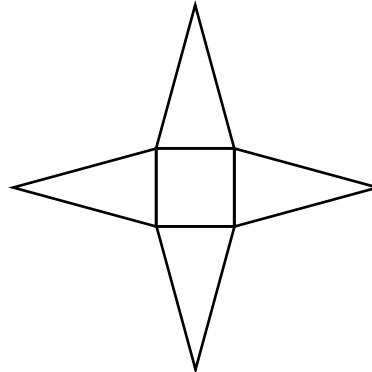
(3)

(Total: 8 marks)

10. (a) The two diagrams below show the nets of two solid shapes.



Net of Shape A



Net of Shape B

square	triangular prism	cone	square-based pyramid
--------	------------------	------	----------------------

- (i) Use words from the box to complete the following:

Shape A is a _____.

Shape B is a _____.

(2)

- (ii) Fill in:

Shape A has _____ vertices and Shape B has _____ vertices.

(2)

- (b) The diagram below shows the net of a cuboid. Calculate the volume of the cuboid.

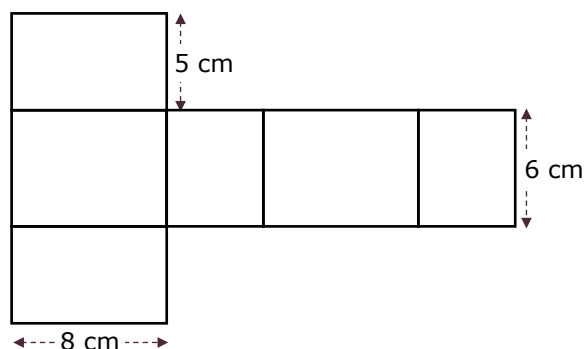


Diagram not drawn to scale

(2)

(Total: 6 marks)

11. (a) Expand and simplify: $3(x + 4) - 2(x - 5)$

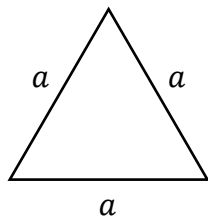
(2)

- (b) Solve the equation: $2(3x - 5) = 11$

(3)

- (c) Write the perimeter of each shape in terms of a . Give your answers in their simplest form.

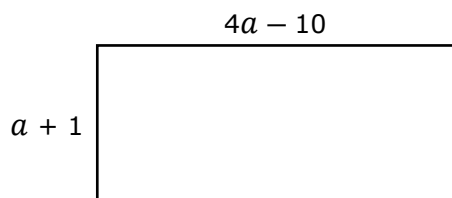
(i)



The perimeter of this triangle is _____

(1)

(ii)



The perimeter of this rectangle is _____

(2)

(Total: 8 marks)

12. Clara has x euro. Mario has €90 less than Clara. Alex has €250 more than Clara.

(a) Complete the statements below. The first has been done for you.

- Clara has x euro.
- Mario has _____.
- Alex has _____.

(1)

(b) In total the three friends have €580.

Use the above information to form an equation in terms of x .

(1)

(c) Solve the equation and work out how much money each one has.

(3)

(Total: 5 marks)

13. The wheel of Karl's bicycle has a diameter of 60 cm.

(a) Write down the length of the radius of the wheel.

(1)

(b) Calculate the circumference of the wheel.

(2)

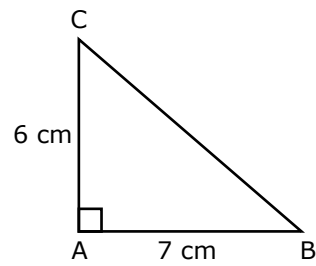
(c) Karl cycles across a road that is 30 m wide. How many times must the wheel of the bicycle go round to reach the other side of the road.

Give your answer to the nearest whole number.

(3)

(Total: 6 marks)

14. (a) Use ruler and compasses only to construct triangle ABC, shown in the sketch below. Point A has been done for you.



+

A

(3)

- (b) Measure the length of BC.

(1)

(Total: 4 marks)

-
15. (a) A sofa cost €2100 in 2025.
The price of the sofa increased by 35% in 2026.
How much does this sofa cost in 2026?

(3)

- (b) A pair of curtains cost €280.
During a sale, the curtains cost €224.
Calculate the percentage decrease in the cost of the curtains.

(3)

- (c) Nina invested €3400 at a simple interest rate of 3% per year for 4 years.
Calculate the total interest Nina earns from her investment.

(2)

(Total: 8 marks)

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**L-Università
ta' Malta**

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

**SECONDARY EDUCATION CERTIFICATE LEVEL
2026 MAIN SESSION**

SUBJECT: **Mathematics**
 PAPER NUMBER: II – Level 2-3
 DATE: 2nd May 2026
 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.

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1	2	3	4	5	6	7	8	9	10	11	12	13	14	Total

1. (a) (i) Express 864 as a product of prime factors, giving your answer in index form.

(2)

- (ii) Suggest a number which divides 864 to obtain a perfect square.

(2)

- (b) Three iron rods are 24 cm, 36 cm and 40 cm long. They need to be cut into small pieces of equal length, without any pieces left over.

What is the greatest possible length of each small piece?

(3)

(Total: 7 marks)

2. The outcomes from tossing a fair coin and rolling a fair 6-sided die are recorded in the possibility space below:

		Die					
		1	2	3	4	5	6
Coin	Heads (H)		(2, H)				
	Tails (T)					(5, T)	

- (a) Complete the possibility space to show all the outcomes.

(2)

- (b) How many different outcomes are there in total?

(1)

- (c) Find the probability that:

- (i) the number on the die is even;

(1)

- (ii) the coin shows a head and the die is an odd number;

(1)

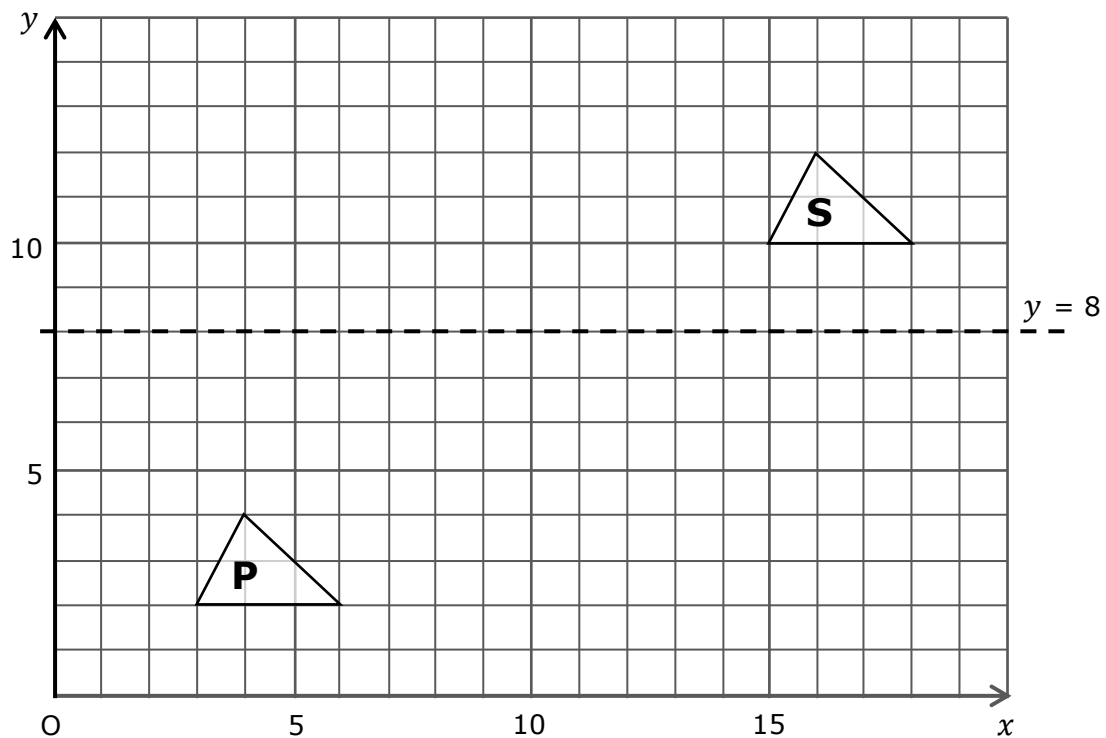
- (iii) the coin shows a tail and the number on the die is an odd prime number.

(1)

(Total: 6 marks)

Please turn the page.

3.



(a) The transformation that maps triangle P to triangle S is

a _____ by _____.

(2)

(b) On the grid above draw:

(i) the reflection of triangle P in the line $y = 8$. Label your triangle Q.

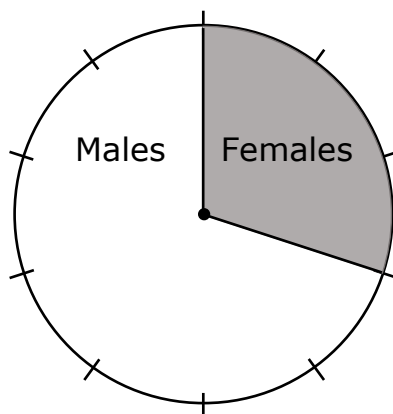
(1)

(ii) the enlargement of triangle P, centre O and scale factor 3. Label your triangle R.

(1)

(Total: 4 marks)

4. The pie chart shows how 80 musicians in an orchestra are divided.



- (a) How many females are there in the orchestra?

(2)

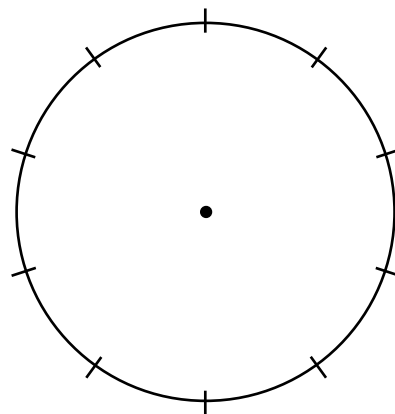
- (b) What percentage of the musicians are females?

(2)

- (c) The number of musicians playing the different instruments in the orchestra are as follows:

- 12 musicians play percussions
- 16 musicians play wind instruments
- 16 musicians play brass instruments
- 36 musicians play string instruments

Represent this information on the pie chart below:



(4)

- (d) Find the probability that a randomly chosen musician from the orchestra does **not** play the percussions.

(2)

(Total: 10 marks)

5. (a) Cat food comes in two brands and is sold only in packs as stated below:

- Brand A: Pack of 6 cans selling at €9.00 per pack.
- Brand B: Pack of 10 cans selling at €13.00 per pack.

Clare has a budget of €95 to buy 62 cans of cat food for the month of May.
Which brand must Clare buy to have enough cat food for this month without spending more than she budgeted for?

(3)

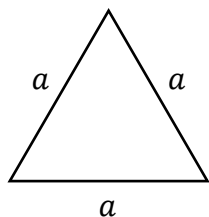
(b) Tony prepares 200 g of cat food mixture made up of vegetables and meat in the ratio 3 : 7 respectively. Keeping the same amount of meat, how many grams of vegetables should be added to the mixture to change the ratio to 4 : 5?

(3)

(Total: 6 marks)

6. (a) Write the perimeter of each shape in terms of a .
Give your answers in their simplest form.

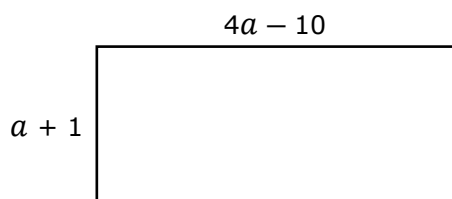
(i)



The perimeter of this triangle is _____

(1)

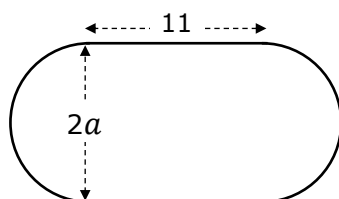
(ii)



The perimeter of this rectangle is _____

(2)

- (iii) This shape is a compound shape made up of a rectangular part and two semicircles of radius a joined at its ends.



The perimeter of this shape is _____

(2)

- (b) A room has a rectangular shape whose length is 135 cm longer than its width x cm.
The perimeter of the room is 14 m 50 cm.

- (i) What is the length of the room in terms of x ?

(1)

- (ii) What is the perimeter of the room in terms of x ? Simplify your answer.

(2)

- (iii) Calculate the value of x .

(3)

(Total: 11 marks)

7. (a) Solve the following equation:

$$\frac{3}{2}(x + 5) + \frac{x + 5}{4} = 21$$

(3)

- (b) Solve algebraically these simultaneous equations:

$$3x + 2y = 18$$

$$10x - 4y = 36$$

(4)

(Total: 7 marks)

8. The cyclic quadrilateral PQRS is such that PQ is parallel to SR.

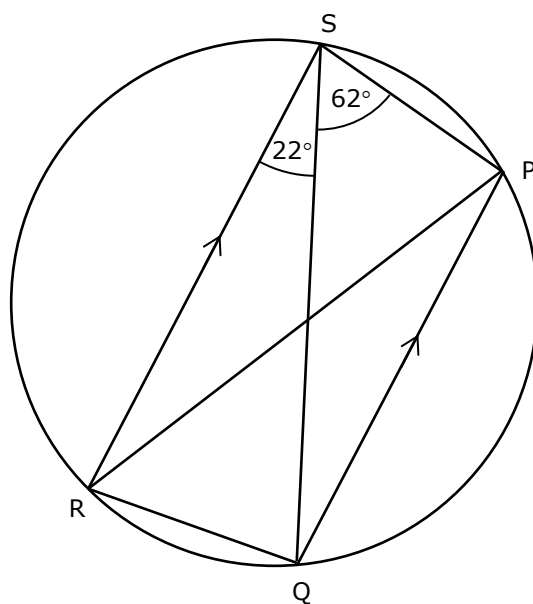


Diagram not drawn to scale

- (a) Work out the value of:

(i) angle PRQ;

(1)

(ii) angle PQS;

(1)

(iii) angle SQR.

(2)

- (b) Andrea states that PR is a diameter. Explain why Andrea is not correct.

(1)

(Total: 5 marks)

Please turn the page.

9. Katya is looking for a technician to do a repair job at her house.
She wants to choose between two companies. Their prices are as follows:

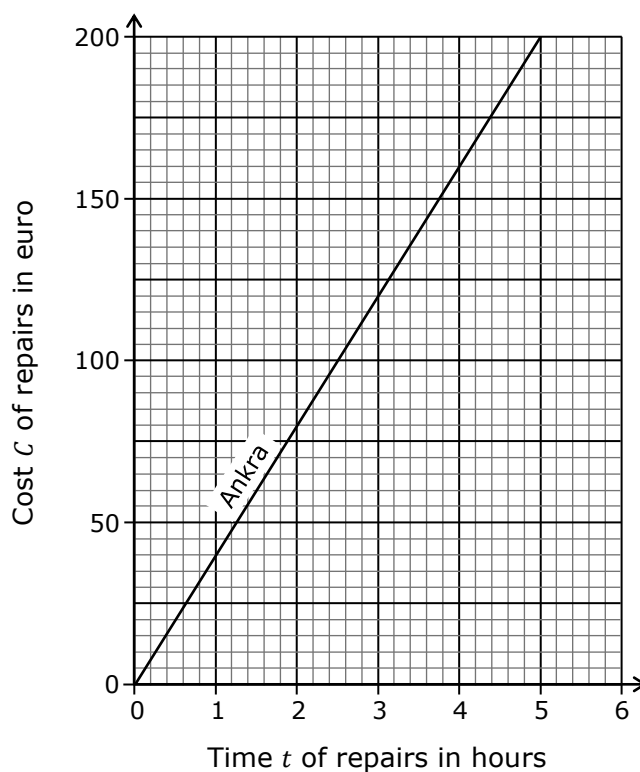
<i>Ankra Company</i> Technical fees: €40 per hour	<i>Bakkar Company</i> Technical fees: €35 call fee €30 per hour
--	---

For each company, C represents the cost in euro of a repair job that takes t hours.
For Ankra Company, C is represented by the formula $C = 40t$.

- (a) Write a formula, for the cost C , for Bakkar Company.

(2)

- (b) The graph shows the cost C for Ankra Company, namely $C = 40t$.
On the same axes plot the graph of C for Bakkar Company.



(4)

-
- (c) What does the point of intersection of the two graphs represent?

(1)

- (d) From the graph, can you tell which of the two companies charges the least for a job taking 6 hours? Explain.

(2)

(Total: 9 marks)

10. (a) (i) Find the value of a when $b = 4$ and $d = -6$, given that $ab = a + d^2$.

(2)

- (ii) Make a the subject of the formula: $ab = a + d^2$

(3)

- (b) Simplify:

(i) $(5a^2)^3$

(1)

(ii) $12x^7 \div 2x^{-3}$

(2)

(Total: 8 marks)

-
11. (a) In 2020, the market value of Stefan's house was €210 000. By 2025, its value increased by 128%. Calculate the market value of Stefan's house in 2025.

(2)

- (b) Stefan decides to renovate his house and estimates the costs to amount to €22 750. The renovation actually cost him €30 350 due to miscalculation. What is the percentage error in the costs?

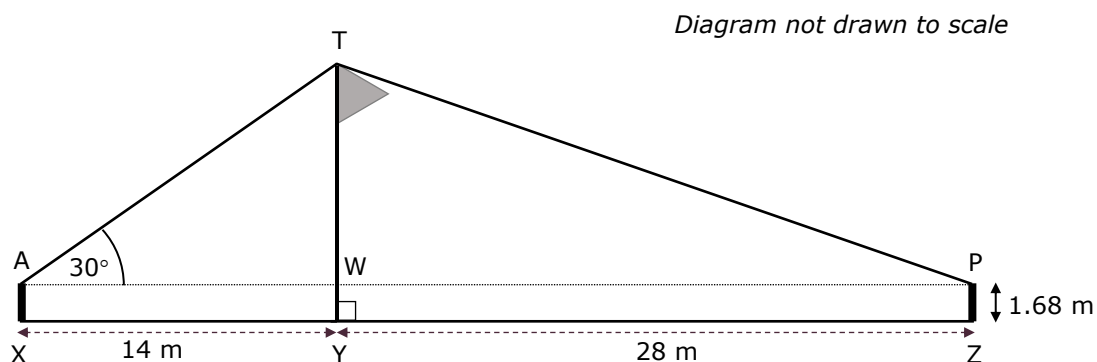
(2)

- (c) Part of the house renovation includes new doors and windows, which cost €23 010 including VAT at 18%. Calculate the cost of the new doors and windows, excluding VAT.

(2)

(Total: 6 marks)

12. Alex (AX) and Paul (PZ) are standing on opposite sides of a flagpole (TY) as shown in the diagram. Alex is standing 14 m away from the base of a flagpole and the angle of elevation of T from A is 30° . Paul stands at a distance of 28 m from the base of the flagpole.



- (a) The two friends are both 1.68 m tall. Calculate TY, the height of the flag pole.

(3)

- (b) Paul states that the angle of elevation of the top of the pole, T, from P is 15° because he is twice as far as his friend. Is Paul correct? Show your working.

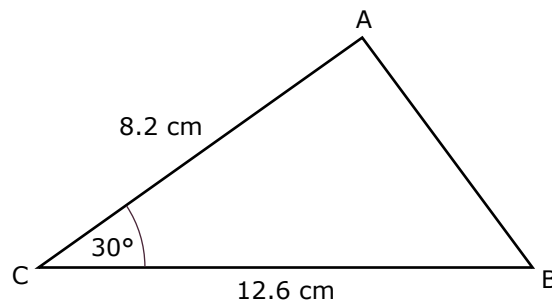
(3)

- (c) Paul now wants the angle of elevation of T from P to be exactly 60° . What distance must Paul be from the base of the flagpole for this to occur?

(3)

(Total: 9 marks)

13. The sketch drawing below shows the position of three radio stations A, B and C on a map.



- (a) Use ruler and compasses only to construct an accurate drawing of this sketch. Point C has been done for you. Show all your construction marks.

+

C

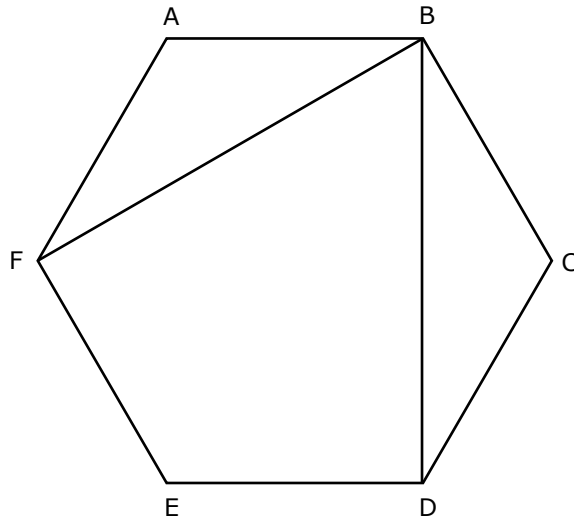
(4)

- (b) A communication tower is to be built such that it is located at an equal distance from radio station A and radio station B. On your diagram, construct the locus of points equidistant from the two radio stations.

(2)

(Total: 6 marks)

14. Shape ABCDEF is a regular hexagon.



- (a) What is the size of angle BCD?

(1)

- (b) Prove that triangles ABF and CDB are congruent.

(3)

- (c) Use part (b) to explain why quadrilateral BDEF forms a kite.

(2)

(Total: 6 marks)

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**L-Università
ta' Malta**

MATRICULATION AND SECONDARY EDUCATION CERTIFICATE
EXAMINATIONS BOARD

**SECONDARY EDUCATION CERTIFICATE LEVEL
2026 MAIN SESSION**

SUBJECT:	Mathematics
PAPER NUMBER:	II – Level 3-3*
DATE:	2 nd May 2026
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	$\pi r l$
Surface Area of a Sphere	$4\pi r^2$
Volume of a Pyramid /Right Circular Cone	$\frac{1}{3} \text{ base area} \times \text{perpendicular height}$
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	$a^2 = b^2 + c^2 - 2bc \cos A$
Compound Interest / Appreciation & Depreciation	$A = P \left(1 \pm \frac{r}{100}\right)^n$

For Office Use Only

1	2	3	4	5	6	7	8	9	10	11	12	13	Total

1. (a) Suggest a number which divides 864 to obtain a perfect square.
Use prime factorisation to lead you to the answer.

(3)

- (b) Three pieces of iron rods are 24 cm, 36 cm and 40 cm long. They need to be cut into smaller pieces of equal length, without any pieces left over.

What is the greatest possible length of each small piece?

(3)

- (c) Tony prepares 200 g of cat food mixture made up of vegetables and meat in the ratio 3 : 7 respectively. Keeping the same amount of meat, how many grams of vegetables should be added to the mixture to change the ratio to 4 : 5?

(3)

(Total: 9 marks)

2. (a) Write the following algebraic expressions in their simplest form:

(i) $4x^2 + 2(x^2 - 5) - (3x^2 - 5)$

(2)

(ii) $\sqrt{\frac{a^7 b^{\frac{5}{2}}}{a^3 b^{\frac{1}{2}}}}$

(2)

(b) (i) Make a subject of the formula:

$$ab = a + d^2$$

(2)

(ii) Make x subject of the formula:

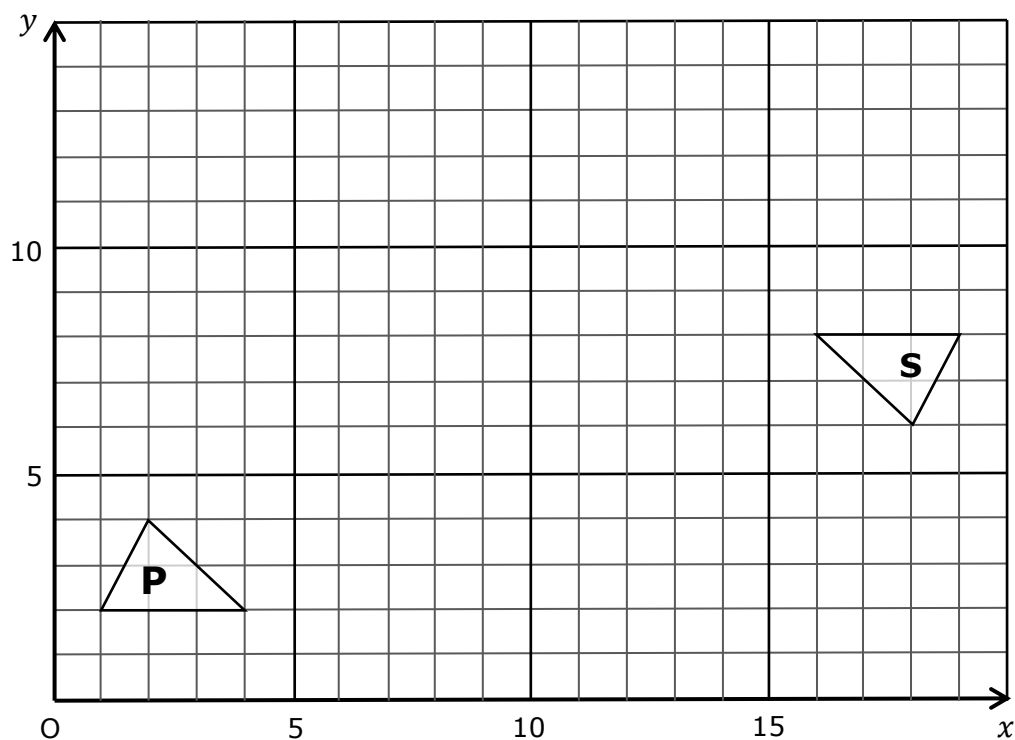
$$y = \sqrt{x^2 - 49}$$

(3)

(Total: 9 marks)

Please turn the page.

3.



- (a) On the grid above, draw the enlargement of triangle P, centre O and scale factor 3. Label your triangle Q.

(2)

- (b) Triangle P is transformed to triangle S by a rotation of 180° about a point X. Write the coordinates of the centre of rotation X.

(2)

- (c) Melanie states that triangle P is congruent to triangle S.
Bernice states triangle P is similar to triangle S.

- (i) Tick (✓) the correct statement:

Only Melanie is correct	
Only Bernice is correct	
Both Melanie and Bernice are correct	
Both Melanie and Bernice are incorrect	

(1)

- (ii) Explain your answer.

(1)

(Total: 6 marks)

4. (a) An electronics shop increases its prices by 20% every year for four consecutive years.

(i) The original price of a television is €220. What is its price after four years?

(2)

(ii) What is the percentage increase over the four years?

(3)

(b) A manager claims that increasing the price of a product by 30% and then decreasing it by 25% will leave the price unchanged.

(i) Use calculations to show that the manager's claim is not correct.

(2)

(ii) Determine the percentage decrease that would exactly cancel out the 30% increase. Give your answer correct to two decimal places.

(3)

(Total: 10 marks)

Please turn the page.

5. The cyclic quadrilateral PQRS is such that PQ is parallel to SR. TU is a tangent to the circle at R. Angle $TRQ = 22^\circ$

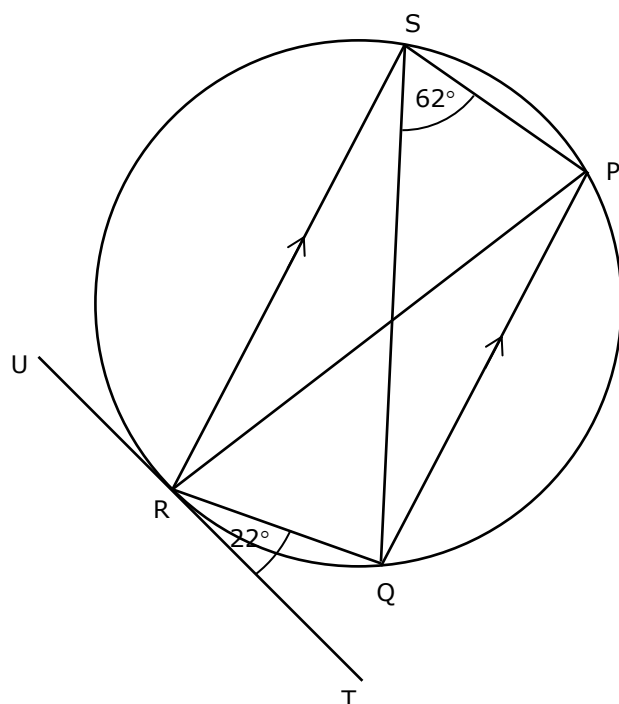


Diagram not drawn to scale

- (a) What is the size of angle RSQ? Give a reason for your answer.

(2)

- (b) Work out the size of angle SQR.

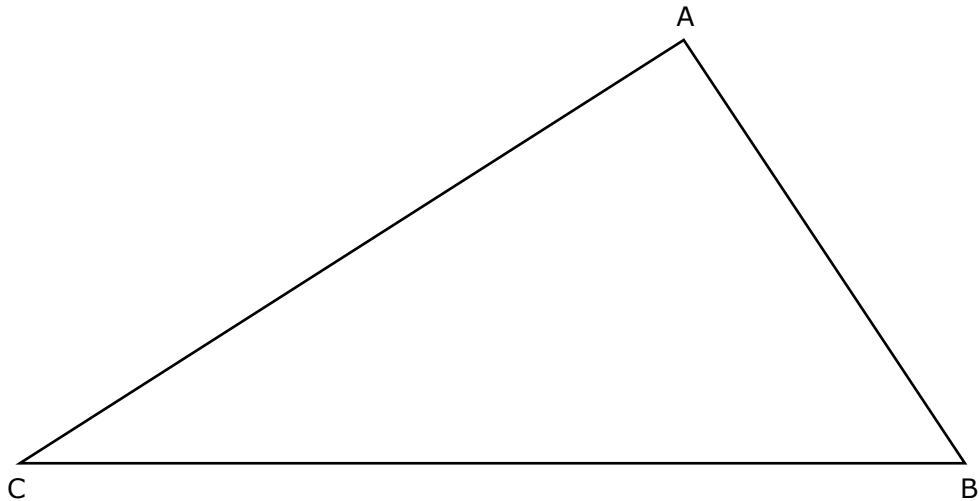
(2)

- (c) The position of point P is moved so that PR becomes a diameter. The positions of all other points remain unchanged. By how much will the size of angle PSQ increase? Give a reason for your answer.

(2)

(Total: 6 marks)

6. The drawing below shows the location on a map of city C and two radio stations A and B. Straight roads connect the three locations to form triangle ABC.



A communication tower is to be built.

Its position on the map is such that it must be located:

- at a distance of more than 6 cm from city C, and
- at a distance of less than 2 cm from road CB.

- (a) On the diagram above, use ruler and compasses only to construct the two loci that satisfy the above conditions.

(3)

- (b) Shade the region within triangle ABC, where the communication tower can be built.

(1)

(Total: 4 marks)

Please turn the page.

7. In the situations below, the variables may be related. Where applicable, describe the relation in the form $y \propto x^n$ where n is equal to ± 1 , ± 2 or ± 3 .

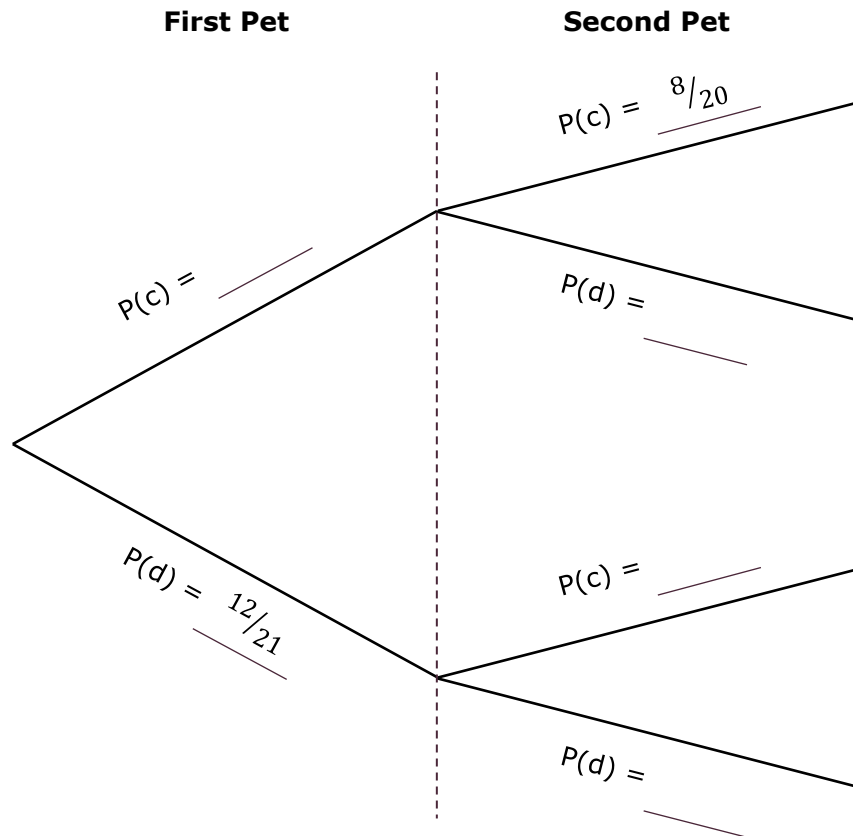
The first two examples have been done for you.

	Statement	Relation
(a)	The cost C of sugar and its weight w	$C \propto w$
(b)	The weight W of a girl and her height h	Not applicable
(c)	The area of a square A and the length x of one side	
(d)	The volume V of a cylinder with circular cross-section of radius 1 cm and the height h	
(e)	The perimeter P of a square and the length x of one side	
(f)	The time t and speed s to cover a fixed distance	
(g)	The height H of a boy and his age t	

(Total: 5 marks)

8. There are 21 animals in an animal shelter: 9 cats (c) and 12 dogs (d).
A family comes in to choose 2 pets to take home.

(a) Complete the tree diagram to represent all the outcomes the family can choose.



(2)

(b) Find the probability that:

- (i) both pets chosen are dogs;

(2)

- (ii) one pet is a cat and the other is a dog.

(2)

(c) The family decides to pick a third pet, what is the probability that:

- (i) all three chosen pets are dogs;

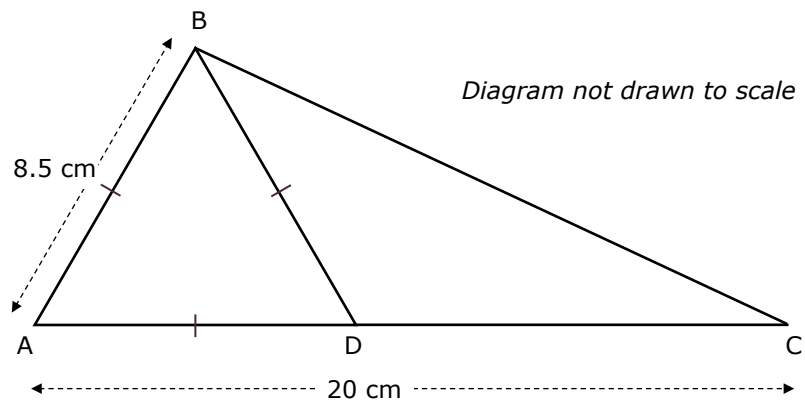
(2)

- (ii) at least one of the pets is a cat.

(1)

(Total: 9 marks)

9. In triangle ABC, $AC = 20$ cm. Triangle ABD is equilateral with sides 8.5 cm long.



- (a) Use the Cosine rule to work out the length of side BC.

(3)

- (b) Calculate the size of angle CBD.

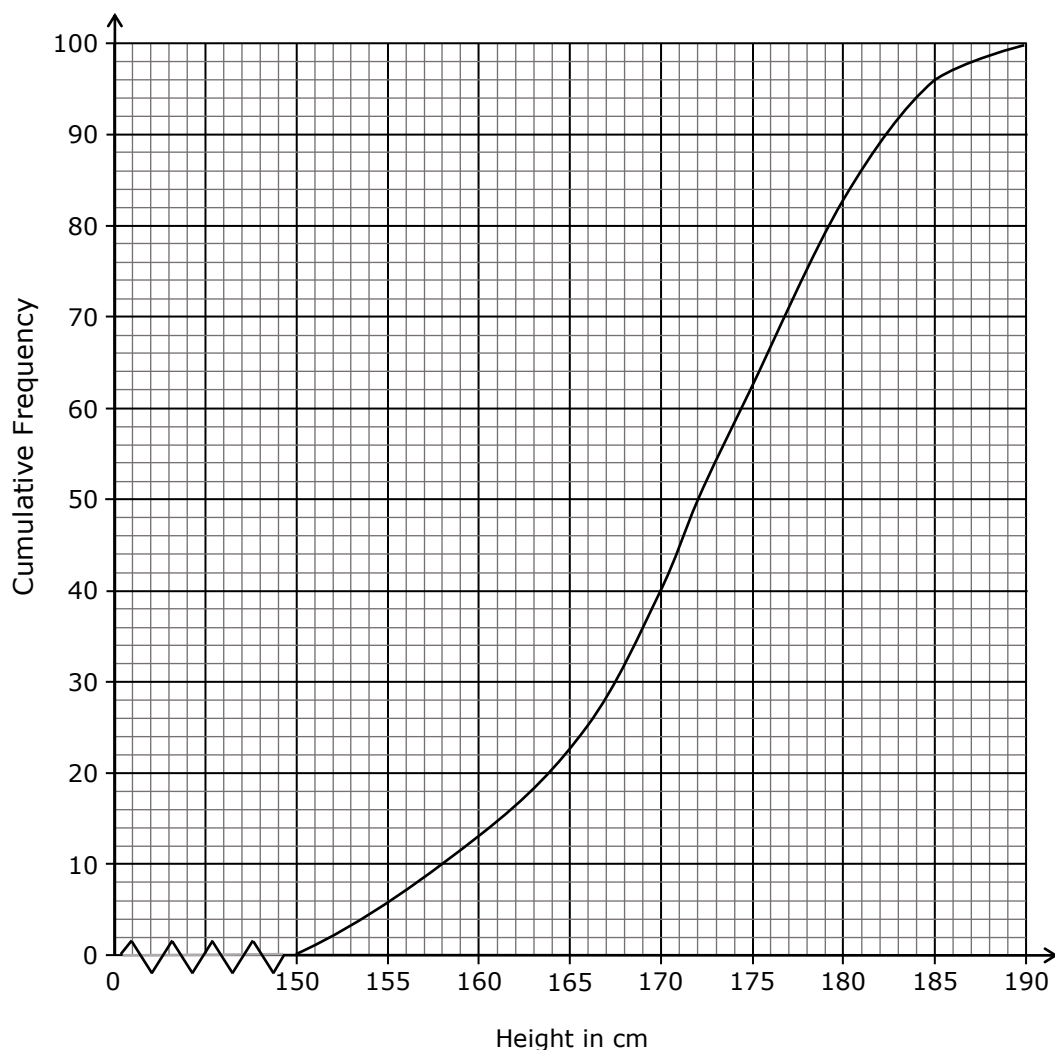
(3)

- (c) Work out the area of triangle ABC, giving your answer correct to one decimal place.

(2)

(Total: 8 marks)

10. The heights of 100 athletes were measured, and the results are shown on the cumulative graph below.



Use the cumulative frequency graph to answer the following.

- (a) Estimate the median height. (1)
- (b) Estimate the interquartile range. (2)
- (c) Estimate the number of athletes who are more than 182 cm tall. (1)
- (d) Kevin states that three-fifths of the athletes are taller than h .
Estimate the value of h . (2)

(Total: 6 marks)

11. (a) Complete the following table of values, where $y = \frac{1}{10} (2x^3 - 3x^2)$

x	-4	-3	-2	-1	0	1	2	3	4
$y = \frac{1}{10} (2x^3 - 3x^2)$	-17.6		-2.8			-0.1	0.4		8

(2)

- (b) Draw the graph of $y = \frac{1}{10} (2x^3 - 3x^2)$ on the axes given on the next page.

(4)

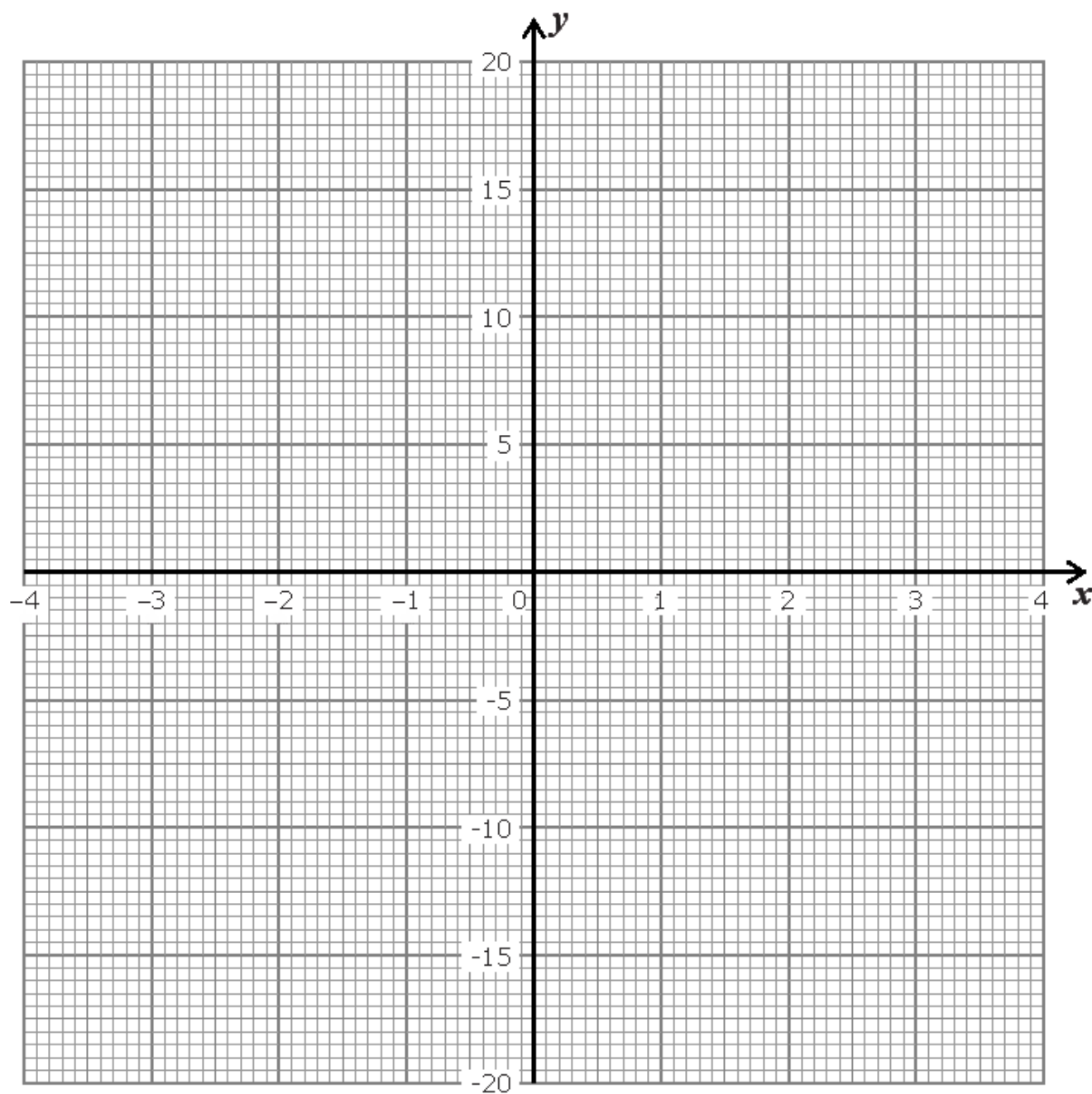
- (c) By drawing a suitable linear graph, determine the three solutions of the equation:

$$\frac{1}{10} (2x^3 - 3x^2) = 2x - 1$$

(4)

- (d) Use trial and improvement to determine the solution of $\frac{1}{10} (2x^3 - 3x^2) = 5$ correct to two decimal places.

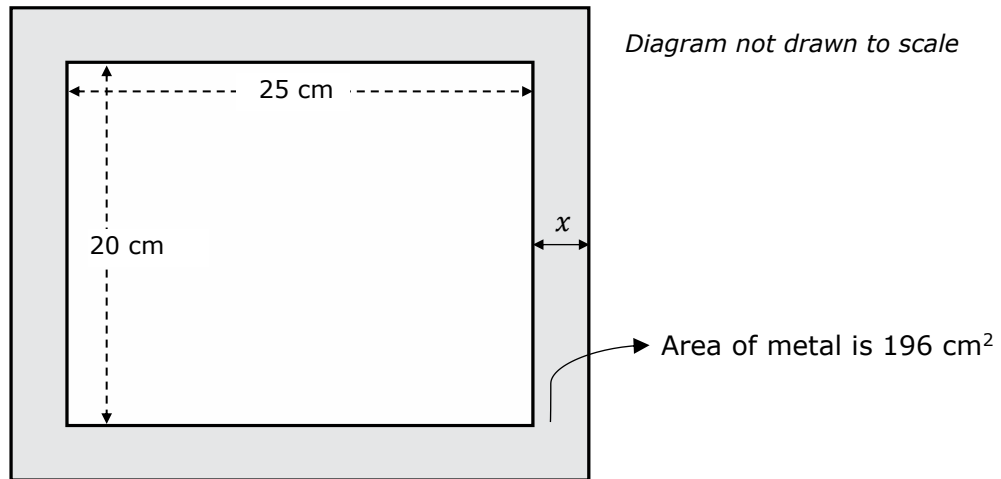
(4)



(Total: 14 marks)

Please turn the page.

12. A company is launching a new product in their frames collection. The frame will be cut out of a metal sheet, and the final area of the metal part has to be 196 cm^2 . The inside of the frame should be 25 cm by 20 cm .



- (a) Show that the width x of the frame satisfies the equation $4x^2 + 90x = 196$.

(3)

- (b) Calculate the width x of the frame.

(3)

(Total: 6 marks)

13. (a) A hanging flower basket is conical in shape.
It is 15 cm high and the radius of its top is 8 cm.
The basket, which is lined with plastic, is completely filled with rainwater.
Work out the volume of rainwater in the hanging flower basket.

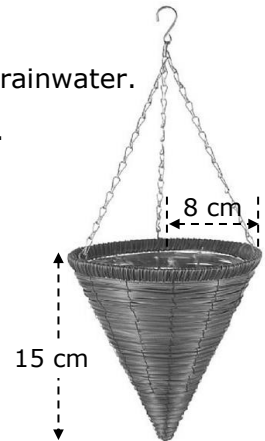


Image taken from webbsdirect.co.uk

- (b) The water from the flower basket is poured into a frustum-shaped pot with base radius of 5 cm, top radius of 7 cm, and a vertical height of 10 cm.
Will all the water fit in the pot?

Show your working to justify your answer.



Image taken from hermie.com

(6)

(Total: 8 marks)

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