2025.S32

2025J003G1EL

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Cycle Final Examination 2025

Mathematics

Ordinary Level

Friday 6 June Afternoon 1:30 - 3:30

270 marks

Examination Number

Date of Birth For example, 3rd February 2005 is entered as 03 02 05

Centre Stamp

Instructions

There are 14 questions on this examination paper. Answer **all** questions.

Questions do not necessarily carry equal marks. To help you manage your time during this examination, a maximum time for each question is suggested. If you remain within these times you should have about 10 minutes left to review your work.

Write your Examination Number in the box on the front cover.

Write your answers in blue or black pen. You may use pencil in graphs and diagrams only.

This examination booklet will be scanned and your work will be presented to an examiner on screen. Anything that you write outside of the answer areas may not be seen by the examiner.

Write all answers into this booklet. There is space for extra work at the back of the booklet.
If you need to use it, label any extra work clearly with the question number and part.

The superintendent will give you a copy of the *Formulae and Tables* booklet. You must return it at the end of the examination. You are not allowed to bring your own copy into the examination.

In general, diagrams are not to scale.

You may lose marks if your solutions do not include supporting work.

You may lose marks if you do not include the appropriate units of measurement, where relevant.

You may lose marks if you do not give your answers in simplest form, where relevant.

Write the make and model of your calculator(s) here:

Question 1 **(Suggested maximum time: 5 minutes)**

(a) Calculate the value of each of the following:

(i) $456 - 321$

(ii) $7{\cdot}4 \times 6{\cdot}2$

(iii) $\sqrt{9} \times (7 - 3)$

(b) The ages of Jael, Alice, and Paul are shown in the table below.

(i) Complete the table to show the ages of Jael, Alice, and Paul in 4 years' time.

	Age now	**Age in 4 years' time**
Jael	16	
Alice	12	
Paul	11	

(ii) Work out the **mean age** of Jael, Alice, and Paul in 4 years' time.

Question 2 **(Suggested maximum time: 5 minutes)**

(a) Noah buys **3 bars** of chocolate at the local shop.
Each bar costs the same.

He pays €20 and gets €13·40 in change.
Work out the cost of **1** bar of chocolate.

(b) Noah has €13·40.
He divides the money between himself and his friend Amy in the **ratio** 3 : 2, respectively.

Work out how much money each person gets.

Noah =

Amy =

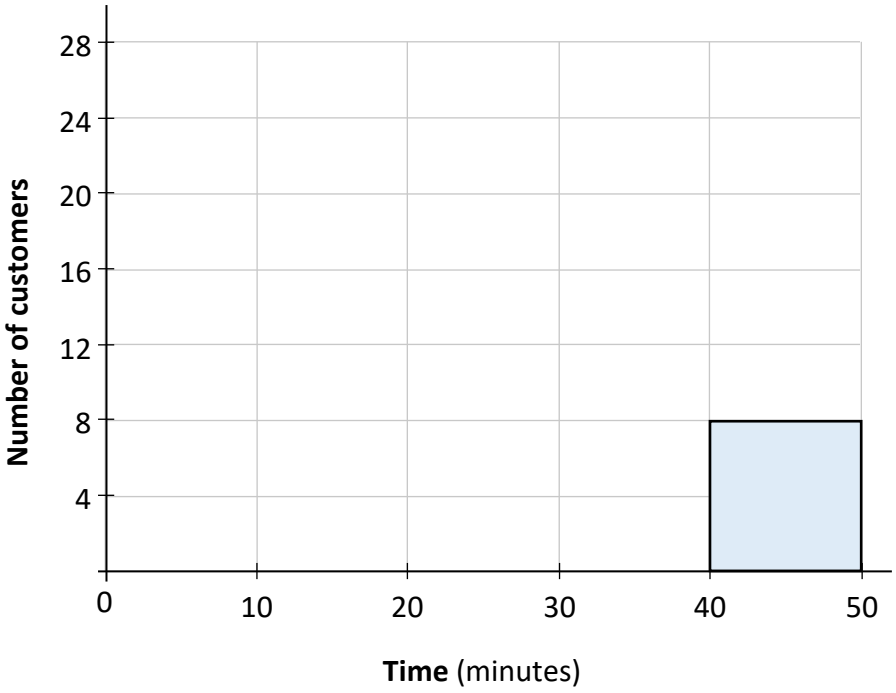
Question 3 **(Suggested maximum time: 5 minutes)**

The table below shows the length of time customers spent in a café on a particular day.

Time (minutes)	$0-10$	$10-20$	$20-30$	$30-40$	$40-50$
Number of customers	12	18	16	24	8

(Note: '$10-20$' means 10 minutes or more, but less than 20 minutes, and so on.)

(a) Complete the histogram below to show the information in the table.



(b) Find the **total** number of customers who visited the café on that day.

(c) What is the **greatest** possible number of customers that could have spent **less than 15 minutes** in the café on that day?

Question 4 **(Suggested maximum time: 5 minutes)**

A rectangular flag has a length of 100 cm and a width of 60 cm, as shown in the diagram below.

(a) Work out the **area** of the rectangular flag, in cm^2.

(b) The flag has a circle inside the rectangle.
The radius of the circle is 21 cm.

Work out the **area** of the circle.
Give your answer correct to the nearest cm^2.

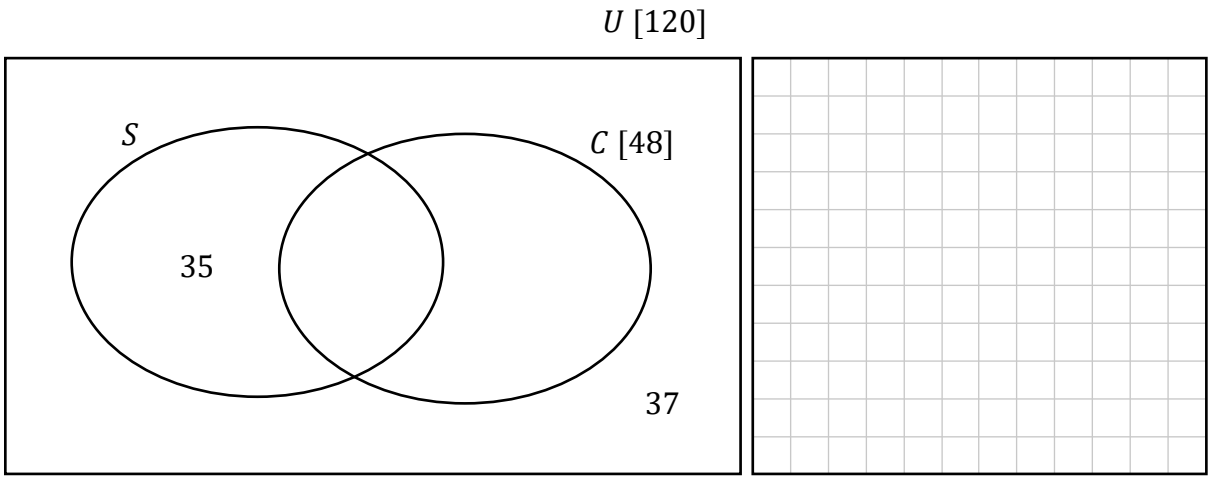
$A = \pi r^2$

Question 5 **(Suggested maximum time: 5 minutes)**

In a survey of 120 students in Harmony Haven School:

30 play **both** sport (S) **and** computer games (C)
48 play computer games.

(a) Use the above information to complete the Venn diagram below.



(b) How many students play **neither** sport **nor** computer games?

(c) $\#(S \backslash C) = 35$.
Explain what this statement means, in terms of what students in the school play (sport and computer games).

(d) One student is picked at random from the 120 students who were surveyed.
What is the probability that this student plays sport **or** computer games but **not** both?

Question 6 **(Suggested maximum time: 10 minutes)**

(a) A sports shop sells 3 different brands of running shoes. Each brand comes in the 4 different colours shown the table below.

Brand	Colour
A	Red
B	Blue
C	Black
	Yellow

How many **different** choices of running shoe does the shop sell?
For example, one choice would be brand **B** and yellow.

(b) Tom writes down a list of five numbers, from smallest to biggest.
Two of these numbers are shown below.

$$2, \quad \square \ , \quad \square \ , \quad 10, \quad \square$$

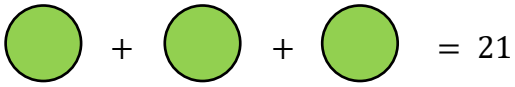
The **mode** of these five numbers is 2.
The **median** of these numbers is 7.
The **range** is 12.

Use this information to find the three missing numbers from Tom's list, and write them into the spaces above.

Question 7 **(Suggested maximum time: 5 minutes)**

In this question, each shape has a fixed value.

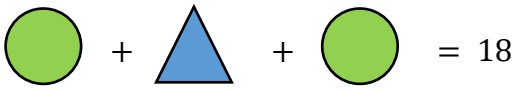
(a) **(i)** Work out the value of a circle, using the following equation:



= 21

= _____

(ii) Work out the value of a triangle, using the following equation, and your answer to part **(a)(i)**:



= 18

= _____

(b) Two equations are shown below.
Work out the value of a hexagon and the value of a square.

= 24

= 13

= _____

= _____

Question 8 **(Suggested maximum time: 10 minutes)**

(a) Eight numbers are given in the table below.

1	3	8	12
15	24	30	60

From the numbers in the table, write down:

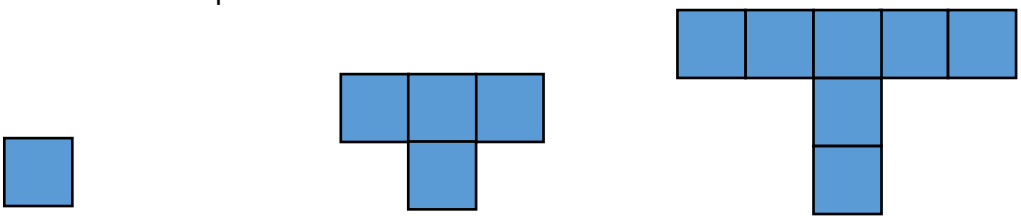
(i) an even number

(ii) the lowest common multiple (LCM) of 12 and 15.

(b) The number 36 has nine positive **factors**. Four of these factors are given below.
Fill in the remaining five factors of 36 in the boxes provided.

$1,\quad 2,\quad 3,\quad \square\ ,\ \square\ ,\ \square\ ,\quad 12,\quad \square\ ,\ \square$

(c) The first three patterns in a sequence are shown below.
Each pattern is made of squares.



Pattern 1 Pattern 2 Pattern 3

(i) Draw Pattern 4 in the sequence.

(ii) Fill in the table to show the number of squares in each of the first 4 patterns.

Pattern	Number of squares
1	
2	
3	7
4	

(iii) What kind of sequence is made by the number of squares in each pattern?
Give a reason for your answer.

Answer: Linear ☐ Non-linear ☐
(Tick (✓) **one** box only)

Reason:

Question 9 **(Suggested maximum time: 10 minutes)**

Alice gets €100 for her birthday, and puts it in a bank account.
She puts a further €25 in the bank account **every month** for 6 months.

(a) Work out how much **in total** she will have in the bank account at the end of the 6 months.

(b) Alice puts €130 in a post office savings account.
The annual interest rate is 3%.

(i) Work out how much **interest** Alice gets in one year.

(ii) Work out the **total** amount of money in the account after one year.

(c) Alice puts €120 in a Credit Union account. This account earns interest.
At the end of one year, she has €124·56 in the account.

Find the **percentage** annual interest rate for this account.

Question 10 **(Suggested maximum time: 10 minutes)**

(a) Find the value of $3p + 7q$, when $p = 2$ and $q = 11$.

(b) Multiply out **and** simplify:

$$2(5a - 3) - 4a + 7$$

(c) Solve the following equation in y:

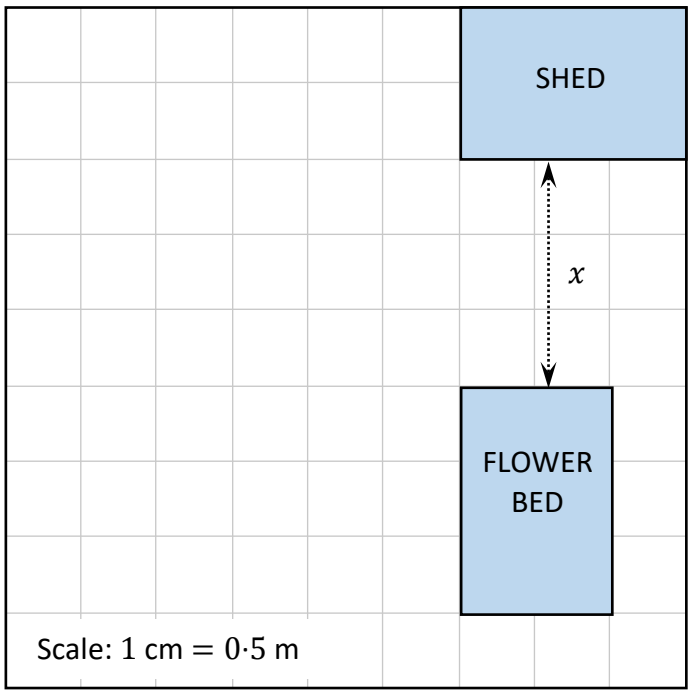
$$8y + 4 = 2y - 8$$

(d) Factorise the quadratic expression $x^2 - 10x + 21$.

$x^2 - 10x + 21 = (x - 3)($ $)$

Question 11 **(Suggested maximum time: 10 minutes)**

Tanya draws a scaled diagram of her garden, as shown below.
The diagram includes a shed and a flower bed.



(a) 1 cm on the diagram represents an actual distance of 0·5 m.

(i) Write down the distance marked x on the diagram. Give your answer in cm.
Hence, find the **actual** distance from the shed to the flower bed, in metres.

Distance on the diagram (cm): _____ Actual distance (m): _____

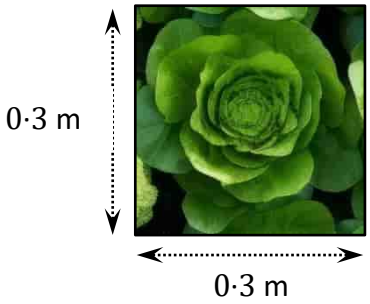
(ii) Work out the **actual perimeter** of the flower bed.

(iii) Tanya wants to put a vegetable patch in the garden.
The vegetable patch will be rectangular, with a length of 3 m and a width of $1{\cdot}5$ m.

Draw the vegetable patch in a position on the diagram **on the previous page** so that it does not overlap with the shed or the flower bed.

(b) Tanya decides to plant cabbage in the vegetable patch.
She reads that each cabbage needs a square space of $0{\cdot}3$ m by $0{\cdot}3$ m.

According to this, what is the maximum number of cabbages that Tanya should plant in this vegetable patch?
Remember that the vegetable patch will have a length of 3 m and a width of $1{\cdot}5$ m.



Question 12 **(Suggested maximum time: 10 minutes)**

Jael buys a pizza.

(a) Jael orders his pizza at $19{:}50$.
It is delivered 45 minutes later.

What time does his pizza arrive?

(b) The pizza is in a closed rectangular box with dimensions:

Length $= 28$ cm

Width $= 25$ cm

Height $= 4$ cm

(i) Work out the **volume** of the pizza box.

(ii) Work out the **surface area** of the pizza box.
Give your answer in cm^2.

(c) A pizza costs €14 in Limerick.
The same pizza costs £12 in London.
The exchange rate is €1 = £0·93.

Work out which pizza is **cheaper**.
Use calculations to support your answer.

The pizza is cheaper in:	Limerick	London
Tick (✓) **one** box only.	☐	☐

Calculations:

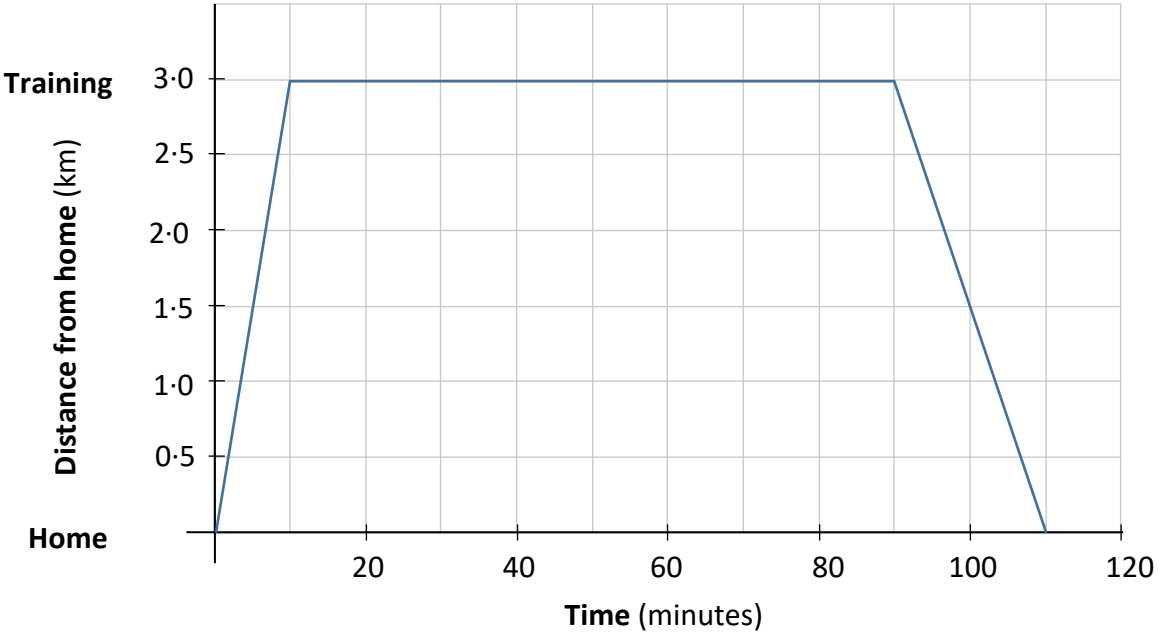
Question 13 **(Suggested maximum time: 10 minutes)**

Tadhg usually cycles 3 km to football training.

(a) It takes Tadhg 10 minutes to cycle to training.
Work out his average speed, in km/hour.

(b) Below is a distance-time graph showing how far Tadhg's bike is from his home, along the route travelled, for one of the days that he goes training.

Use the information in the graph to answer parts **(b)(i)**, **(b)(ii)**, and **(b)(iii)**.



(i) How long was Tadhg away from home, **in total**? Give your answer in minutes.

(ii) How long was Tadhg at training? Give your answer in hours and minutes.

(iii) Was Tadhg quicker cycling **to** training or on the way **home from** training?
Using the graph, give a reason for your answer.

Tadhg is quicker cycling:	**to** training	**home from** training
Tick (✓) **one** box only.	☐	☐

Reason:

(c) The first year and second year students train together.
Each year is divided into two teams, the red team and the blue team.
The table below shows the number of students in each team.

	First year	**Second year**
Red	18	10
Blue	17	15

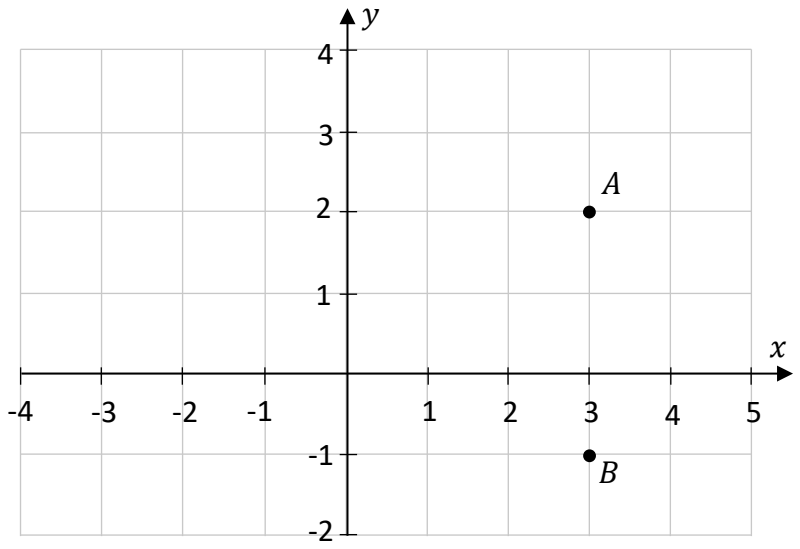
There are 60 students in total.
One student is picked at random.

(i) What is the probability that the student is a **first year** on the **red** team?

(ii) What is the probability that the student is on the **blue** team?

Question 14 **(Suggested maximum time: 10 minutes)**

(a) The points A and B are shown on the co-ordinate diagram below.



(i) Write down the co-ordinates of the point A and the point B.

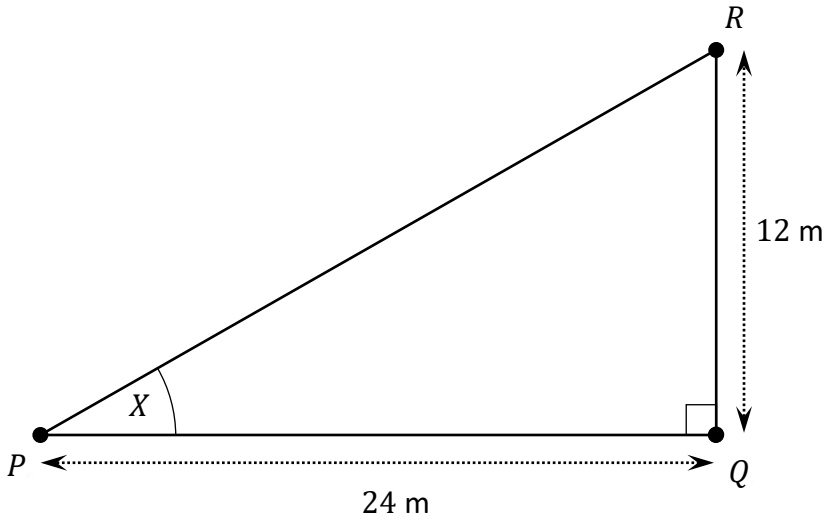
$A =$ (,) $B =$ (,)

(ii) Write down the **length** $|AB|$.

(iii) The point C is $(-4\,,2)$.
Plot and label the point C on the co-ordinate diagram above.

(iv) Work out the **slope** of BC.
Give your answer as a fraction.

(b) The diagram below shows the triangle PQR.
$|PQ| = 24$ m, $|QR| = 12$ m, and $|\angle PQR| = 90°$.
The angle at P is marked X.

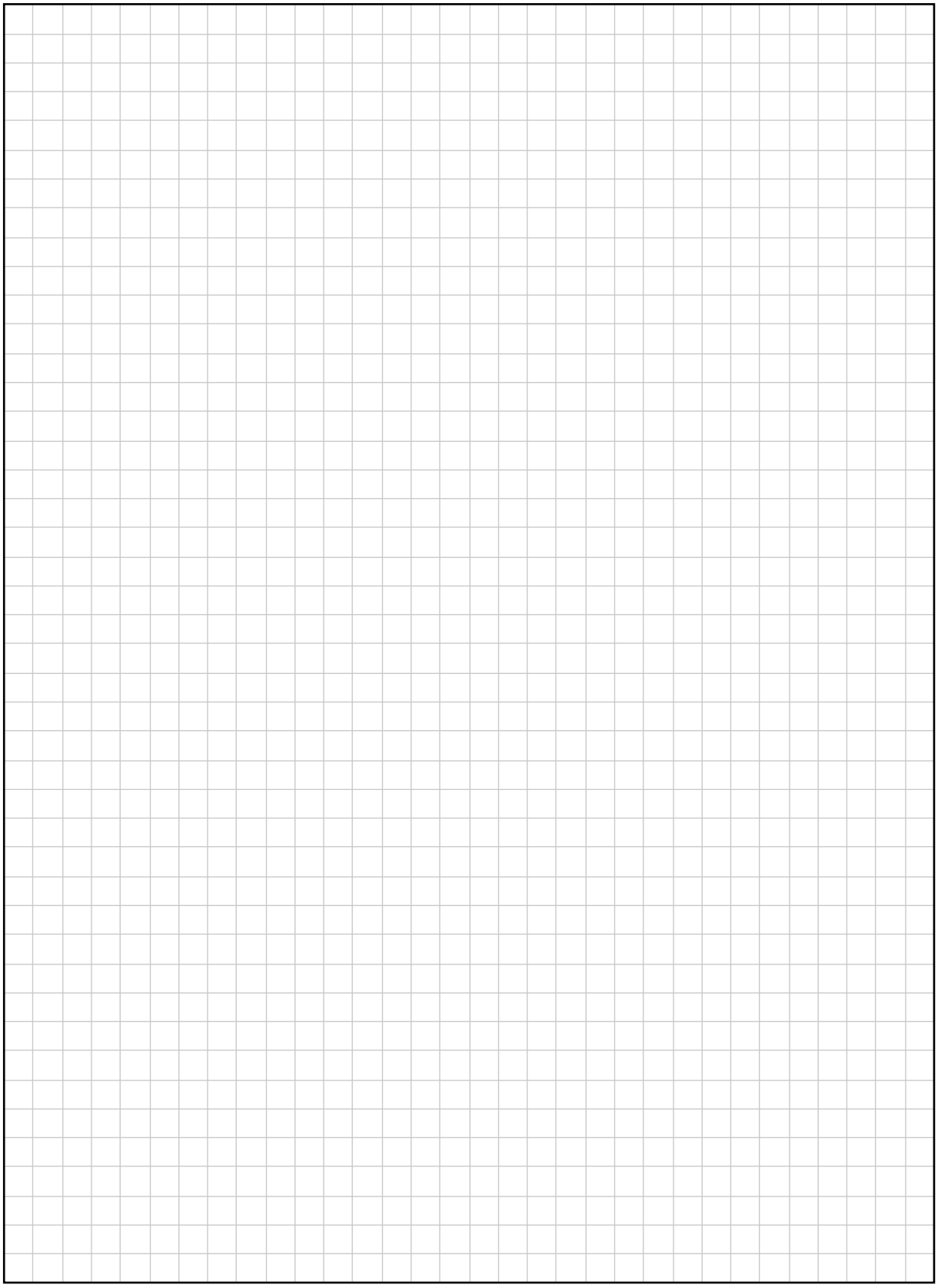


(i) Which of the following is correct? Tick (✓) **one** box only.

$\sin X = \frac{12}{24}$ ☐ $\cos X = \frac{12}{24}$ ☐ $\tan X = \frac{12}{24}$ ☐

(ii) Hence, use your calculator to find the size of the angle X, correct to the nearest degree.

Page for extra work.
Label any extra work clearly with the question number and part.



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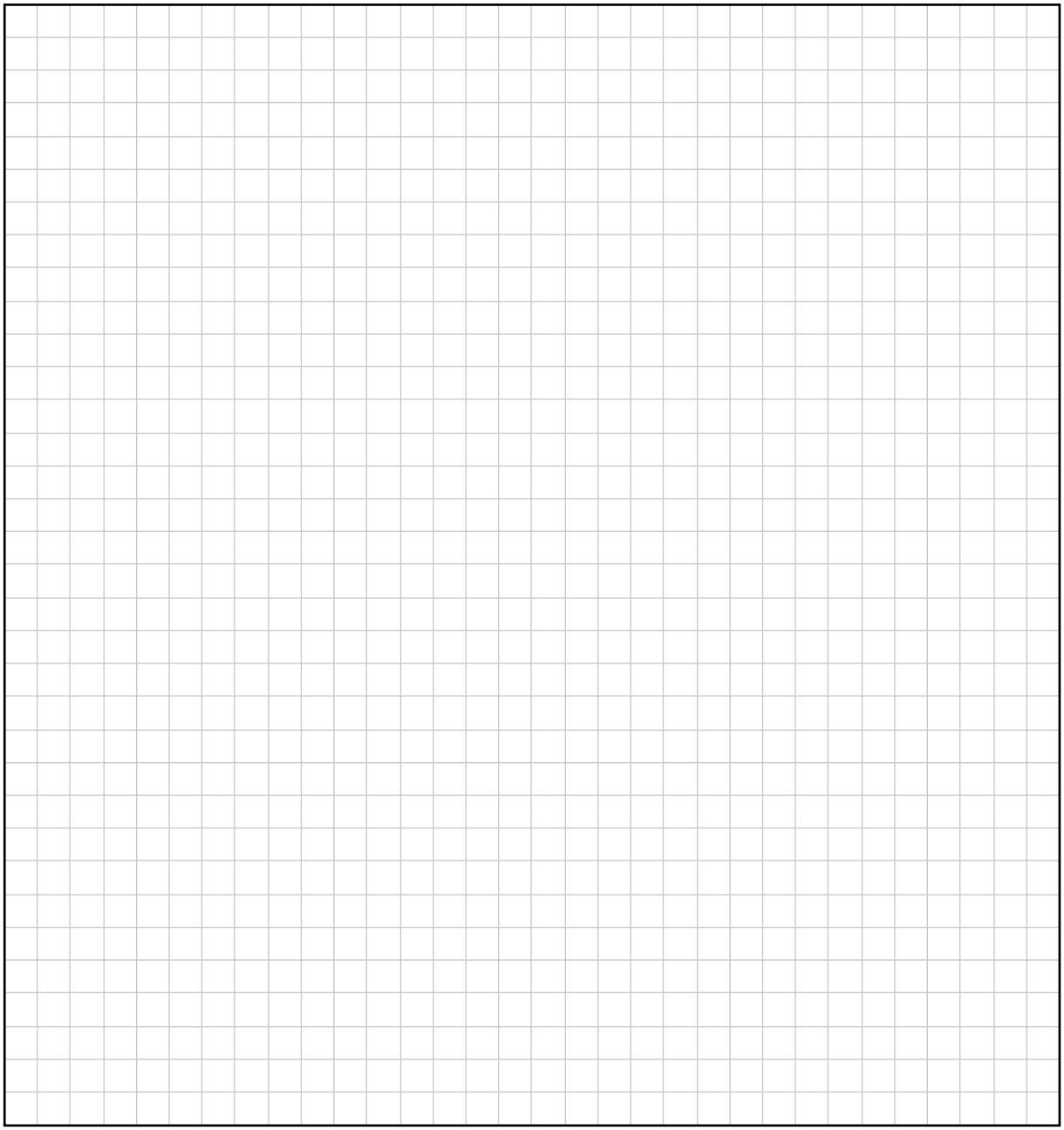

Acknowledgements

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Images on page 16: www.needpix.com. Altered
Image on page 18: www.pexels.com/. Altered

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Junior Cycle Final Examination – Ordinary Level

Mathematics

Friday 6 June

Afternoon 1:30 - 3:30

2024.S32

2024J003G1EL

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Cycle Final Examination 2024

Mathematics

Ordinary Level

Friday 7 June Afternoon 1:30 - 3:30

270 marks

Examination Number

Date of Birth

For example, 3rd February 2005 is entered as 03 02 05

Centre Stamp

Instructions

There are 12 questions on this examination paper. Answer **all** questions.

Questions do not necessarily carry equal marks. To help you manage your time during this examination, a maximum time for each question is suggested. If you remain within these times you should have about 10 minutes left to review your work.

Write your answers in the spaces provided in this booklet. You may lose marks if you do not do so. You may ask the superintendent for more paper. Label any extra work clearly with the question number and part.

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You may lose marks if you do not include the appropriate units of measurement, where relevant.

You may lose marks if you do not give your answers in simplest form, where relevant.

Write the make and model of your calculator(s) here:

Question 1 **(Suggested maximum time: 5 minutes)**

(a) Find the value of each of the following:

(i) $634 + 297$

(ii) $4{\cdot}8 \times 6$

(iii) $32 \div (7 - 5)^2$

(b) **(i)** Complete the table to show **all** the factors of 8, 12, and 16.
The factors of 8 have already been done.

Number	Factors
8	1, 2, 4, 8
12	
16	

(ii) What is the highest common factor of 8, 12, and 16?

Tick (✓) **one** box only.

1	4	16	48
☐	☐	☐	☐

Question 2 **(Suggested maximum time: 10 minutes)**

(a) Lily buys the following ingredients:





Fresh milk	Courgettes	Oranges	Spaghetti	Cranberry juice
€2·49	€1·19	€0·99	€1·15	€2·55

(i) Work out the **total cost** of these ingredients.

(ii) Later that week Lily plans a menu for a full week and goes shopping for ingredients. Her bill comes to €72·63. She pays using **one** €50 note and **two** €20 notes. Work out how much **change** she receives.

(b) Lily works as a chef in a restaurant.
The table below shows the hours Lily worked one weekend.
Her basic pay is **€18 per hour.**

Day	Friday	Saturday	Sunday
Numbers of hours worked	7	8	6

(i) How much money in **total** did Lily earn for working on Friday and Saturday?

(ii) Lily is paid 50% extra for working on Sunday.
How much did she earn for working on Sunday?

(c) Lily's gross income was €1900 last month.
She pays tax at a rate of 20%.

(i) Work out Lily's **gross tax** for the month.

(ii) Lily's monthly tax credit is €$312{\cdot}50$.
Work out Lily's **net income** for the month.

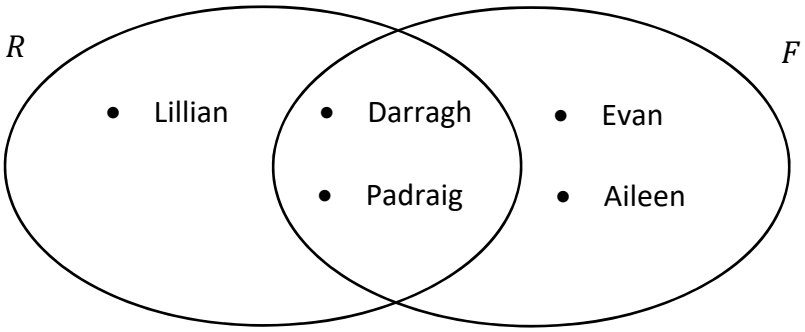
Question 3 **(Suggested maximum time: 10 minutes)**

(a) $A = \{4, 5, 9, 10, 11\}$.

(i) Write down a subset of A that contains **four elements.**

(ii) Write down a subset of A that contains **only prime numbers**.

(b) A restaurant has a choice of rice (R) or fries (F) or both with each main course on the menu.
The Venn diagram shows what 5 people chose.



(i) From the Venn diagram, what did Aileen choose?

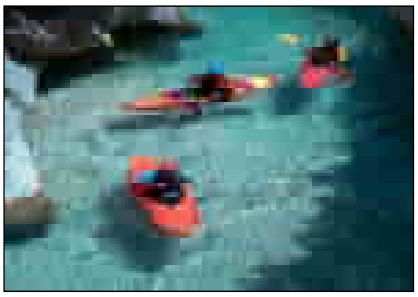
(ii) Tick the correct box to show the region of the Venn diagram in which Darragh lies.
Tick (✓) **one** box only.

$R \setminus F$	$R \cap F$	$F \setminus R$
☐	☐	☐

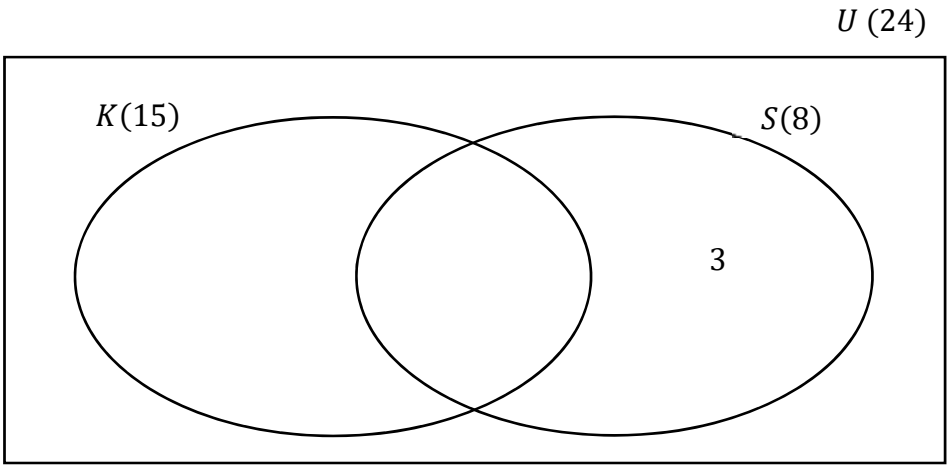
(iii) List the elements of the set $F \setminus R$.

(c) A summer camp has two water sports on offer, kayaking and surfing.
In total, 24 students were on the summer camp (U).
Of these:

15 of the students had kayaked before (K).
8 of the students had surfed before (S).
5 of the students had kayaked **and** surfed before.



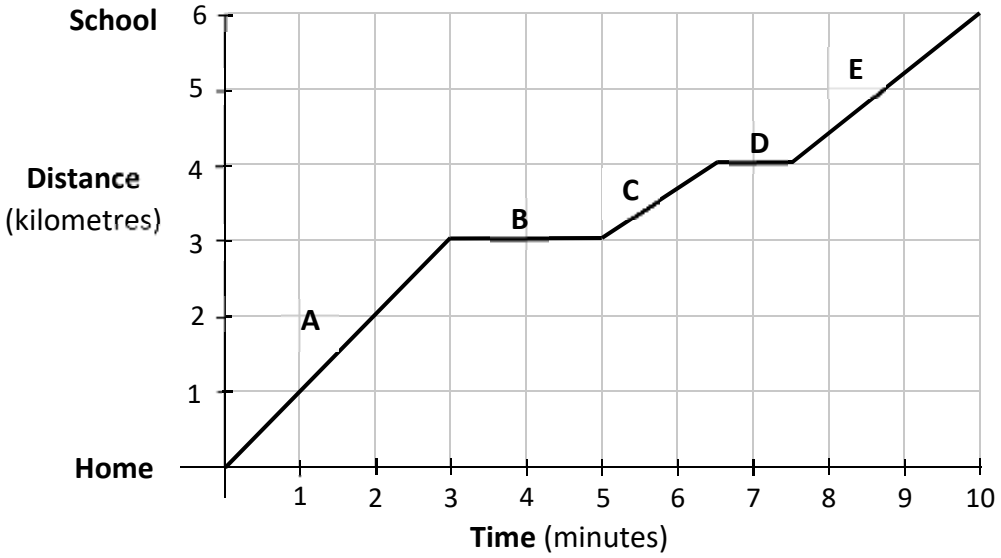
(i) Fill in the Venn diagram to show the above information.
One region is already filled in for you.



(ii) One student is picked at random from the group of students.
Write down the probability that this student has not kayaked **or** surfed before.

Question 4 **(Suggested maximum time: 10 minutes)**

Alex travels on a bus to get to school each morning.
The following graph shows the distance travelled along the route on one particular morning.
The graph is in five stages, labelled **A**, **B**, **C**, **D**, and **E**.



(a) During stage **B**, the bus was stopped.

(i) For how many minutes was the bus stopped during stage **B**?

Answer: ☐

(ii) During which stage, other than stage **B**, was the bus stopped?

Answer: ☐

(b) The bus is moving at its fastest at stage **A**.
How do you know this by looking at the graph?

(c) Fiadh takes a different bus to school.
This bus takes 15 minutes to get to school.

(i) Write 15 minutes as a fraction of one hour.

Answer: _____

(ii) Fiadh's journey is 5 kilometres.
Work out the average speed of the bus, in km/hour.

(d) The cost of a litre of fuel was €1·50 at the end of 2020.
The cost of a litre of the same fuel was €2 at the end of 2022.

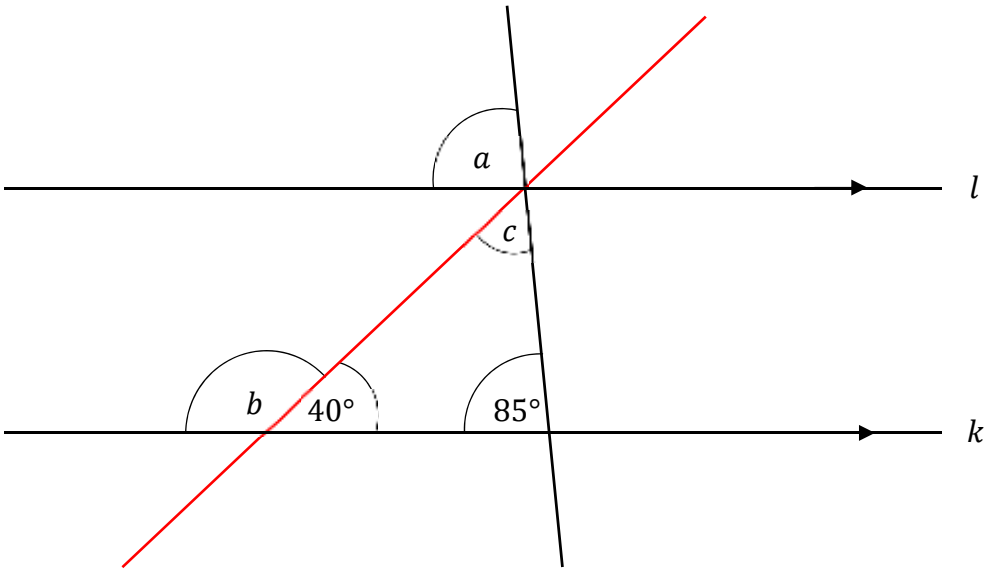
(i) How much has the cost of a litre of fuel increased by in this time period?

(ii) Work out the percentage increase in the cost of a litre of fuel from the end of 2020 to the end of 2022. Give your answer correct to the nearest percent.

Question 5 **(Suggested maximum time: 5 minutes)**

The lines l and k are parallel, as shown in the diagram below (not to scale).
Two other lines are shown.

The sizes of two of the angles are given.
The sizes of three of the other angles are a, b and c.



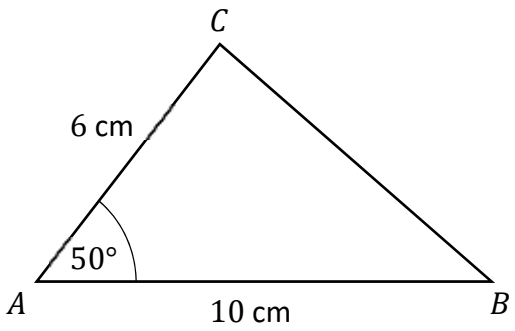
Find the size of the angle a, the angle b, and the angle c, without measuring.

a = ☐ b = ☐ c = ☐

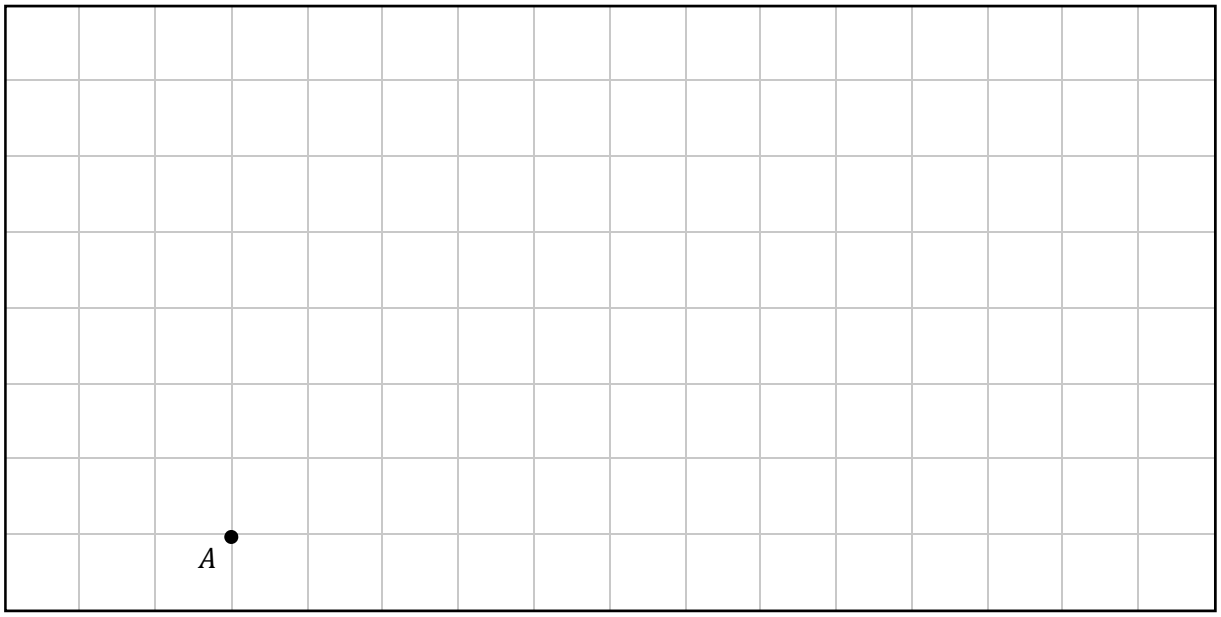
Question 6 **(Suggested maximum time: 10 minutes)**

Construct a triangle ABC where $|AB| = 10$ cm, $|\angle CAB| = 50°$ and $|AC| = 6$ cm.
A sketch of the triangle is shown below (not to scale).

Each small square in the grid has sides of length 1 cm.
The point A is marked for you.



Show your construction lines clearly.



Question 7 **(Suggested maximum time: 5 minutes)**

Margaret is trying to solve the simultaneous equations:

$$x + y = 5$$

$$x - 2y = -4$$

She says the answer is $x = 3$ and $y = 2$.

Is Margaret correct?
Tick (✓) **one** box only.
Justify your answer by suitable calculations.

Yes	No
☐	☐

Calculations:

Question 8 **(Suggested maximum time: 15 minutes)**

The ages (in months) of 12 third year students are shown in the table below.

179	185	186	187
187	189	190	191
192	196	197	200

(a) Complete the stem and leaf diagram below to show this data.

17						
18						
19						
20						

Key: | 19 | 1 | = | 191 |

(b) **(i)** Work out the **mean age** of these students.

(ii) Find the **median age** of these students.

(iii) Find the **range** of the ages of these students.

This question continues on the next page.

(iv) In 6 months, which one of these measures will **not** have changed for this group of students?
Tick (✓) **one** box only.

Mean age	Median age	Range of the ages
☐	☐	☐

Give a reason for your answer.

Reason:

(c) The 12 students were asked their favourite subject from the list: **Maths**, **Science** and **History**.
The results are displayed in the table.

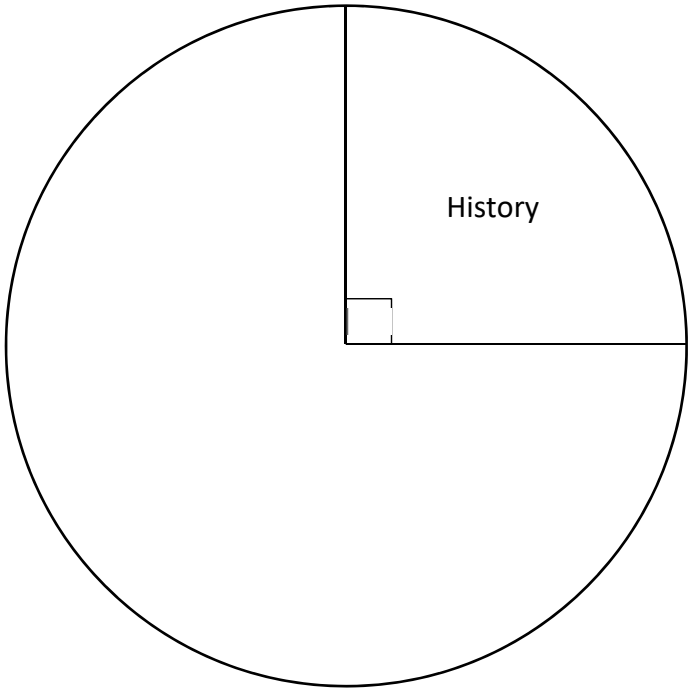
Favourite Subject	Number of students	Fraction	Angle in Pie Chart
Maths	4	$\frac{4}{12}$	
Science	5		
History			90°

(i) Work out the number of students who chose **History**.
Write your answer in the appropriate space **in the table above**.

(ii) Work out the two missing fractions of the students who chose Science and History.
Write your answer in the appropriate space **in the table above**.

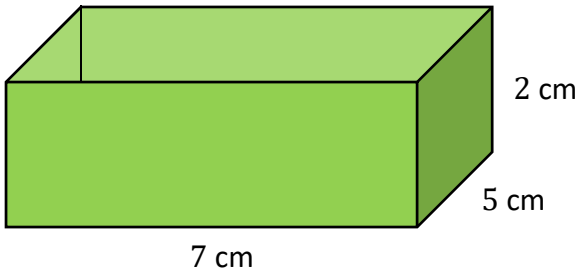
(iii) Work out the sizes of the two missing angles in the pie chart.
Write each answer in the appropriate space **in the table** on the previous page.

(iv) Use the information in the table to complete the pie chart.
Label each sector clearly with the name of the subject (**Maths** and **Science**).

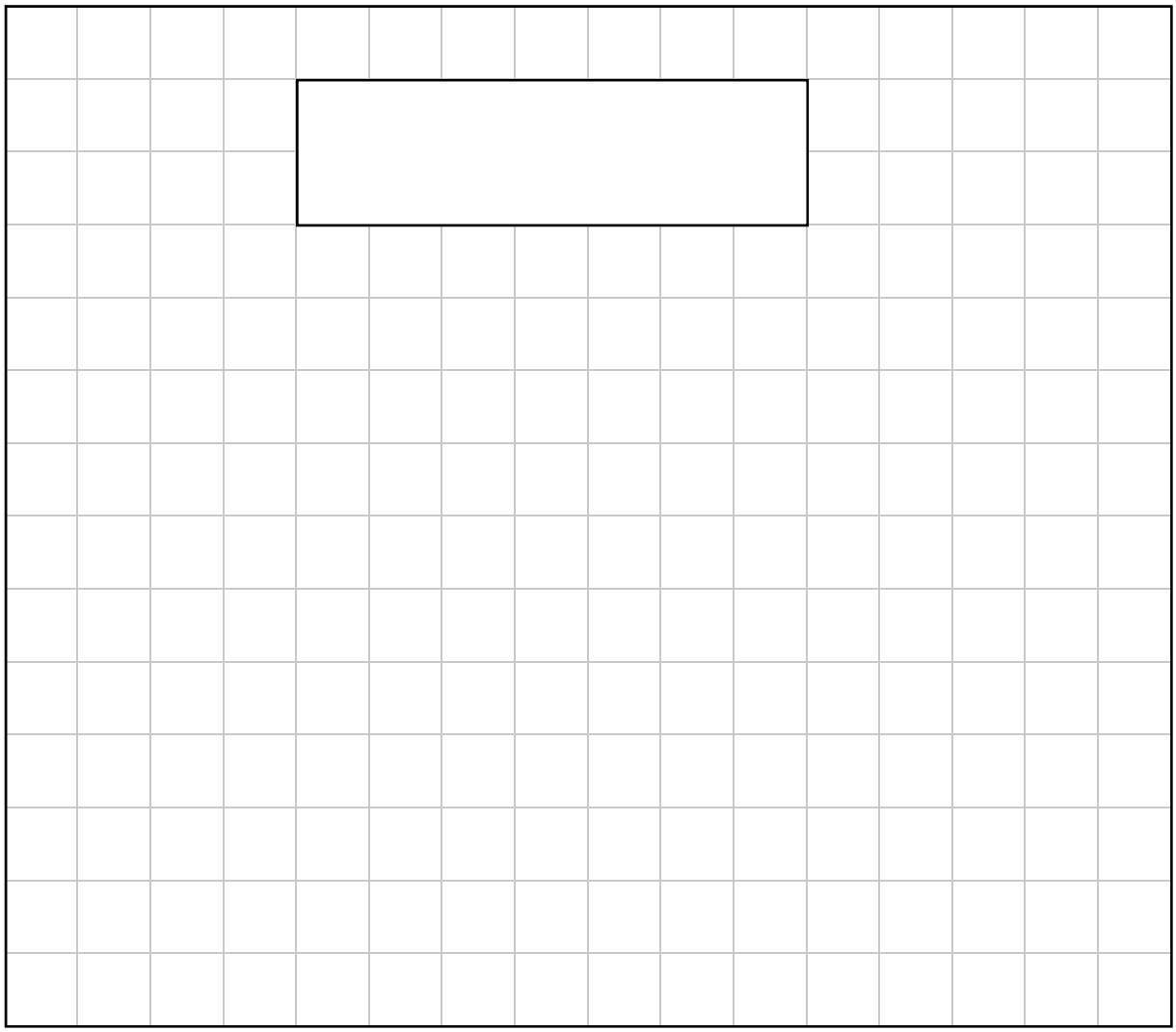


Question 9 **(Suggested maximum time: 10 minutes)**

A baking tin is in the shape of an **open rectangular box**.
Alex makes a scaled model of the tin.
It is 7 cm long, 5 cm wide, and 2 cm high, as shown in the diagram below.



(a) Use the lengths in the diagram above to draw a net of the **open rectangular box**.
One side has already been done for you.
Each small square in the grid has a side of length 1 cm.



(b) Find the **surface area** of Alex's **open rectangular box**.

(c) Alex made his model using a scale of $\mathbf{1 : 3}$.
Complete the table to show the lengths of the sides of the actual tin.
One has already been done for you.

Scaled length (cm)	7	5	2
Actual length (cm)	21		

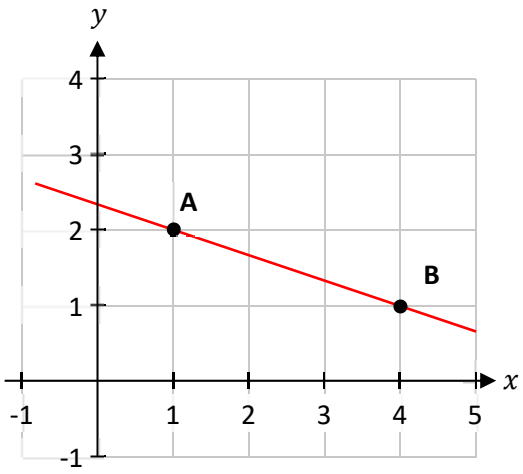
(d) The instructions for cooking an item are:

25 minutes for every **500 g**, plus an **extra 20 minutes**.

Work out how many minutes an item of mass **1·4 kg** should be cooked for.

Question 10 **(Suggested maximum time: 10 minutes)**

(a) The points **A** and **B** are shown on the graph.

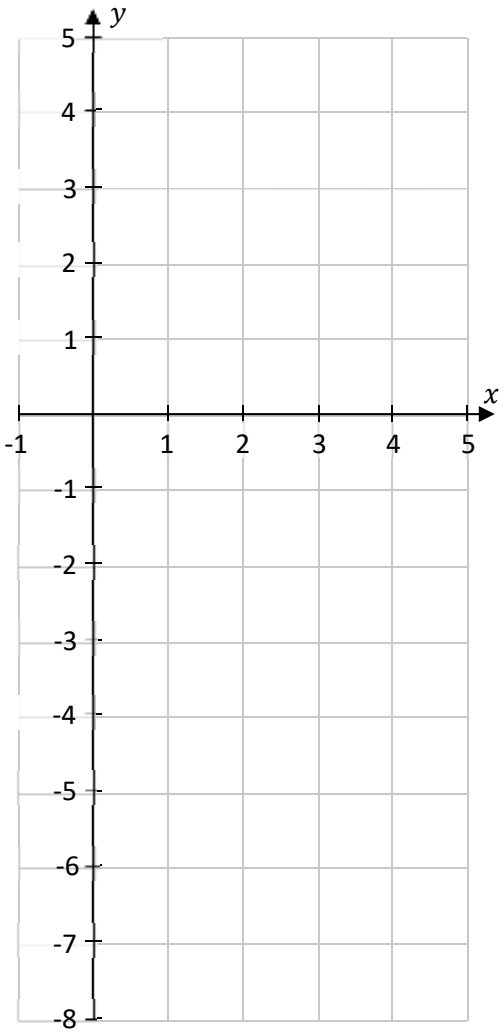


(i) Write down the coordinates of **A** and **B**.

A (,) **B** (,)

(ii) Hence, or otherwise, work out the distance between the points **A** and **B**.
Give your answer correct to 1 decimal place.

(b) On the co-ordinate diagram below, draw the graph of the line $y = 2x - 5$, for $-1 \leq x \leq 5$, $x \in \mathbb{R}$.



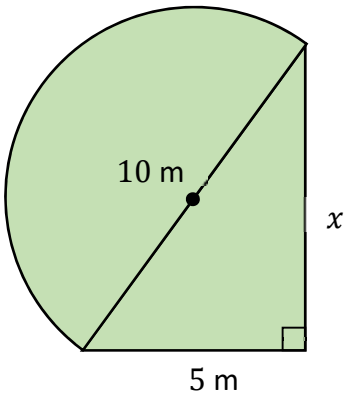
(c) The equation of line $\boldsymbol{l}$ is $\boldsymbol{y = 3x - 2}$.

(i) Write down the equation of **another** line that is parallel to l.

(ii) Write down the equation of **another** line that crosses the y-axis at the same point as l.

Question 11 **(Suggested maximum time: 10 minutes)**

A plan for a flower bed is shown in the diagram below (not to scale).
It is in the shape of a right-angled triangle with a semicircle on the hypotenuse.



(a) **(i)** The diameter of the semicircle is 10 m.
Write down the length of the radius (r) of the semicircle.

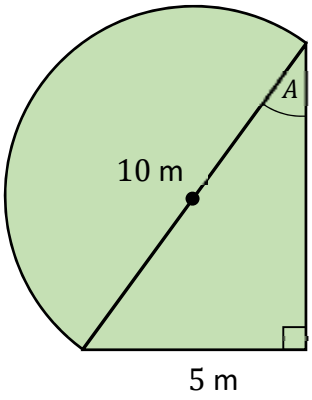
$r =$ ☐

(ii) Use the formula $L = \pi \times r$ to find the length of the semi-circular arc.
Give your answer correct to the nearest metre.

$\pi \times r =$

(b) Use the **Theorem of Pythagoras** to work out the value of x.
Give your answer correct to 1 decimal place.

(c) The angle A is marked on the diagram below.



(i) Write $\sin A$ as a fraction.

$$\sin A = \frac{\square}{\square}$$

(ii) Hence, find the size of the angle A.

Question 12 **(Suggested maximum time: 10 minutes)**

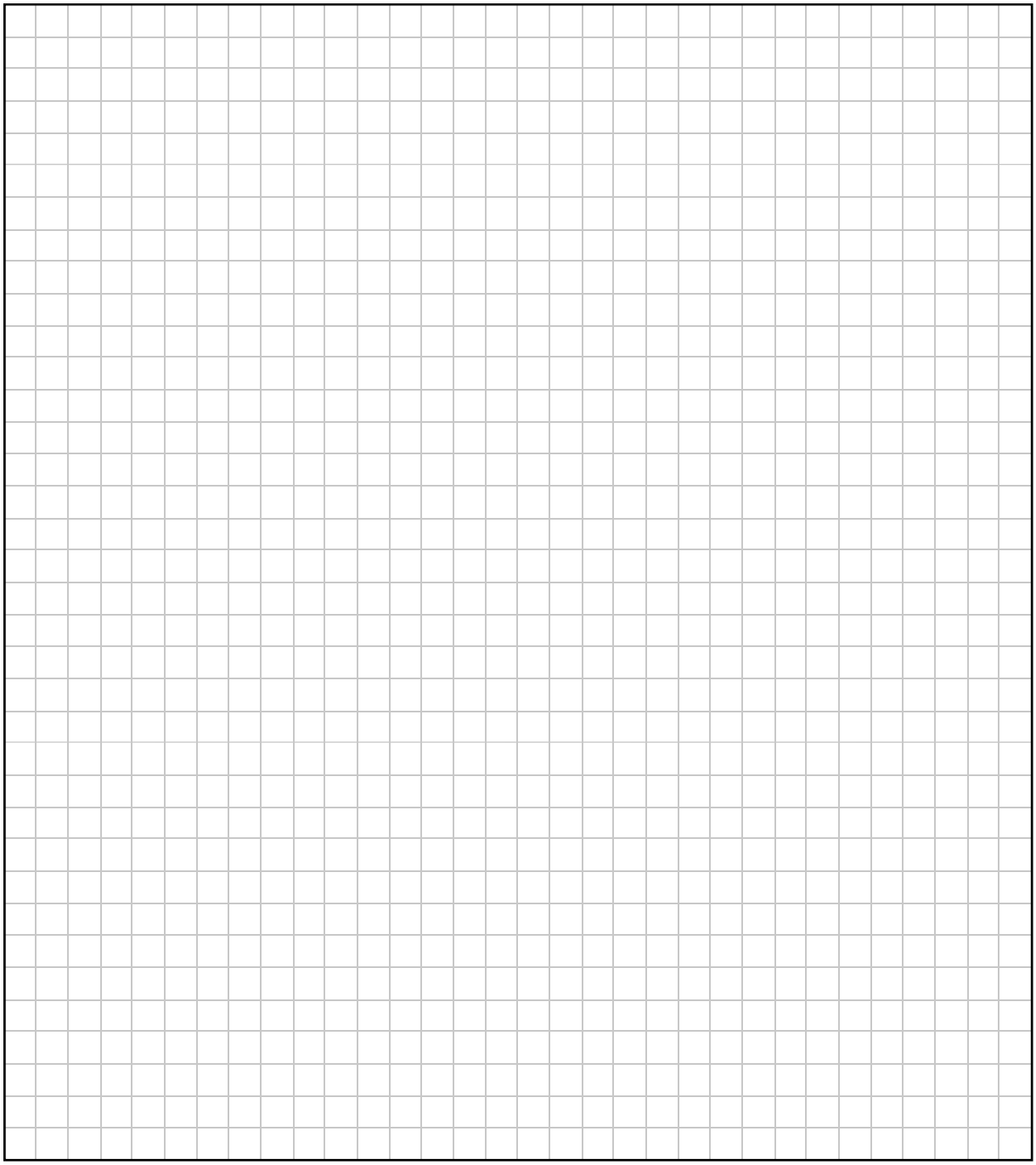
(a) Find the value of $5(a + 3b)$, when $a = 4$ and $b = -3$.

(b) Factorise $x^2 + 5x - 24$. One of the factors is $(x + 8)$.

$(x + 8)($ $)$

(c) Multiply out and simplify fully $(2x + 3)(x - 4)$.

Page for extra work.
Label any extra work clearly with the question number and part.



Acknowledgements

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Junior Cycle Final Examination – Ordinary Level

Mathematics

Friday 7 June

Afternoon 1:30 - 3:30

2023.S32

2023J003G1EL

Coimisiún na Scrúduithe Stáit
State Examinations Commission

Junior Cycle Final Examination 2023

Mathematics

Ordinary Level

Friday 9 June Afternoon 1:30 - 3:30

270 marks

Examination Number

Day and Month of Birth

For example, 3rd February is entered as 0302

Centre Stamp

Instructions

There are 14 questions on this examination paper. Answer **all** questions.

Questions do not necessarily carry equal marks. To help you manage your time during this examination, a maximum time for each question is suggested. If you remain within these times you should have about 10 minutes left to review your work.

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You may lose marks if your solutions do not include supporting work.

You may lose marks if you do not include the appropriate units of measurement, where relevant.

You may lose marks if you do not give your answers in simplest form, where relevant.

Write the make and model of your calculator(s) here:

Question 1 **(Suggested maximum time: 5 minutes)**

(a) Find the value of each of the following.

(i) $372 + 119$

(ii) $3{\cdot}4 \times 7$

(iii) $4^2 \times (8 - 5)$

(b) Martin bought the following items in his local shop.
Fill in the table below to find the total cost of his shopping.

Items	**Cost** (in €)
3 litres of milk at €1·27 a litre	
4 scones at €1·10 each	
500 grams of ham at €12 per kg	
Total Cost	

Question 2 **(Suggested maximum time: 5 minutes)**

Ruth has 2 bags of marbles and 4 loose marbles, as shown.
Liam has 1 bag of marbles and 10 loose marbles, as shown.

There are the same number of marbles in each bag.

Ruth's Marbles	Liam's Marbles
	

Ruth and Liam each have the **same total** number of marbles.

Work out how many marbles are in each bag.

Number of Marbles:

Question 3 **(Suggested maximum time: 5 minutes)**

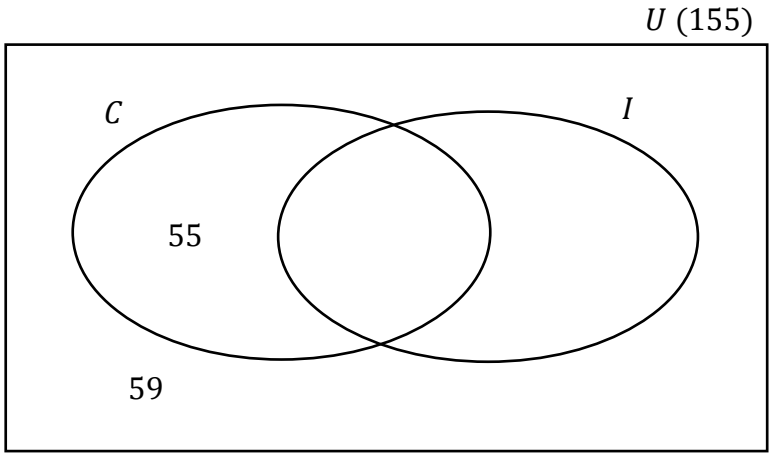
In a survey of a group of 155 students on take-away food:

75 said they like Chinese food (C)

41 said they like Indian food (I)

20 said they like both.

(a) Complete the Venn diagram below to show this information.



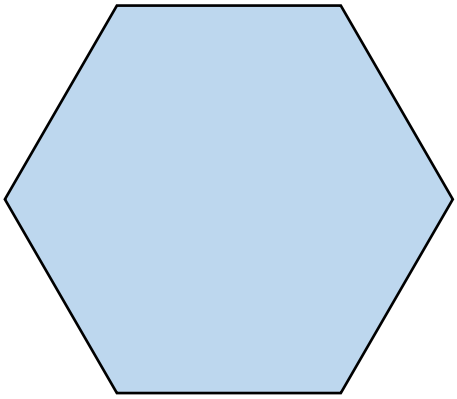
(b) How many students in the group like Chinese food **only**?

(c) Explain what the following statement means, in the context of this survey, where C' is the complement of the set C:

$$\#(C') = 80$$

Question 4 **(Suggested maximum time: 10 minutes)**

The hexagon below is a scaled diagram of a classroom in a school.
All sides are equal in length.



(a) By measuring, find the **length** of the **side** of the hexagon.
Give your answer correct to the nearest cm.

Length $=$ ☐ cm

(b) Find the length of the **perimeter** of the hexagon. Give your answer in cm.

The diagram is to a scale of 1 cm $=$ 2 m.

(c) Find the **actual perimeter** of the classroom. Give your answer in metres.

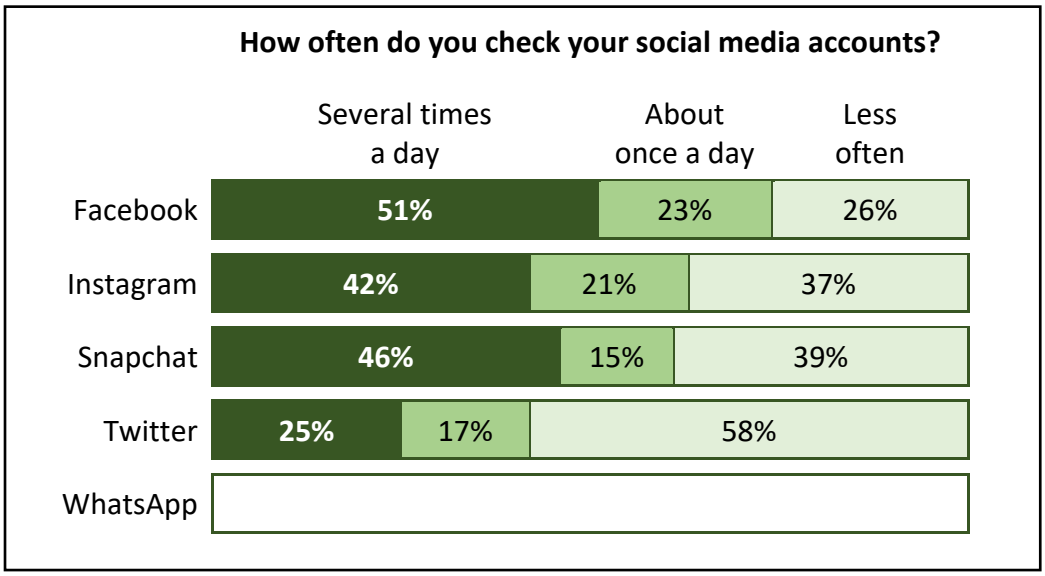
(d) There are 560 students in the school. 75% of the students go to a camogie match. Work out the number of students who go to the match.

In 2019, there were 80 students in first year in the school.
In 2020, there were 90 students in first year.

(e) Write this **increase** as a **percentage** of the number of students in first year in 2019.

Question 5 **(Suggested maximum time: 10 minutes)**

The diagram below shows the results of a survey of how often a group of adults checked their social media accounts, each day. The results for WhatsApp are not shown.



(a) Use the diagram to answer the following two questions.
In each case, tick (✓) the correct box only.

(i) The percentage who checked their *Instagram* account about once a day was:

15%	21%	37%	51%
☐	☐	☐	☐

(ii) The account that exactly $\frac{1}{4}$ of users checked several times a day was:

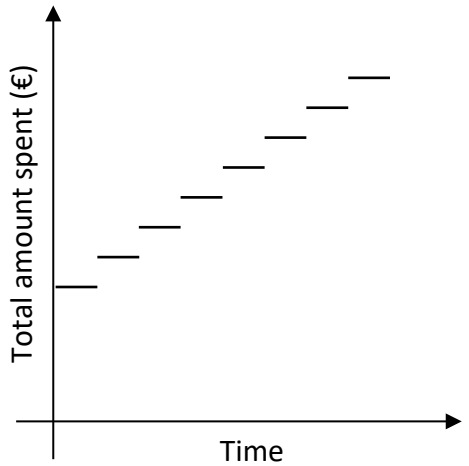
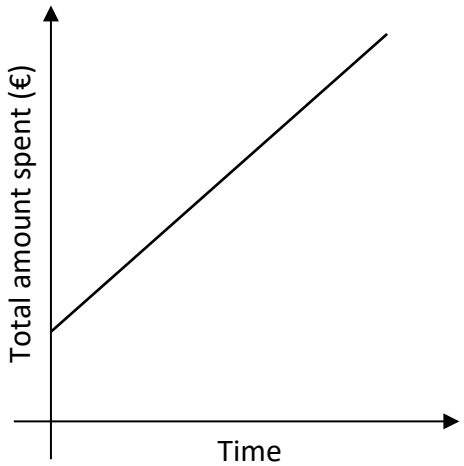
Facebook	Instagram	Snapchat	Twitter
☐	☐	☐	☐

(b) The results for WhatsApp are in the table below.
Use the values in the table to complete the diagram above.
It may be useful to use a ruler. You don't need to shade the diagram.

Results for WhatsApp	
Several times a day:	60%
About once a day:	20%
Less often:	20%

(c) Eoin has a mobile phone.
He paid €80 when he bought the phone, at the start of June.
He paid €25 at the start of each month after that.

Which of the graphs below, **A** or **B**, is better at showing the way Eoin paid for his phone over the first 8 months? Give a reason for your answer.

Graph A	**Graph B**
	

Answer: **Graph A** **Graph B**

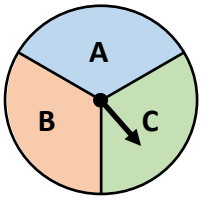
(Tick (✓) **one** box only) ☐ ☐

Reason:

Question 6 **(Suggested maximum time: 10 minutes)**

Maria is playing a game. She rolls the die and spins the spinner shown.

Die



Spinner

(a) Complete the table below to show all of the possible outcomes. Three are already done for you. For example, **6 C** means that Maria got a **6** on the die and a **C** on the spinner.

		Spinner		
		A	**B**	**C**
Die	**1**		**1 B**	
	2			
	3	**3 A**		
	4			
	5			
	6			**6 C**

(b) How many different possible outcomes are there, in **total**?

(c) List all of the outcomes that have an **even number and B**.

(d) Each outcome in the table is equally likely.
What is the **probability** that Maria will get an **even number and B**?

Answer = ____

Question 7 **(Suggested maximum time: 5 minutes)**

Laurie is asked to write down a function, and an example to show how her function works.
Laurie writes the following:

> My function, f, takes a word as an input, and the output is the number of letters in the word.
>
> For example, $f(\text{banana}) = 6$.

Using Laurie's function:

(a) find the value of $f(\text{ned})$

$$f(\text{ned}) = \square$$

(b) write in an input that gives an output of 5.

$$f\left(\square\right) = 5$$

(c) work out the value of:

$$f(Tomás) - 3 \times f(Ava) + 2 \times [f(Jakub)]^2$$

Question 8 **(Suggested maximum time: 10 minutes)**

The students in a class used clinometers and metre sticks to find the height of their school.
Each student measured the angle of elevation from a given point to the roof of the school.
These angles are shown in the table below.

63°	63°	63°	62°
61°	60°	58°	57°
57°	56°	56°	55°

(a) Work out the **median** of the angles measured by the students.

(b) Keith finds the **mean** of the angles.
Mairéad finds the **mode** of the angles.
Should their answers be the same, or different? Give a reason for your answer.

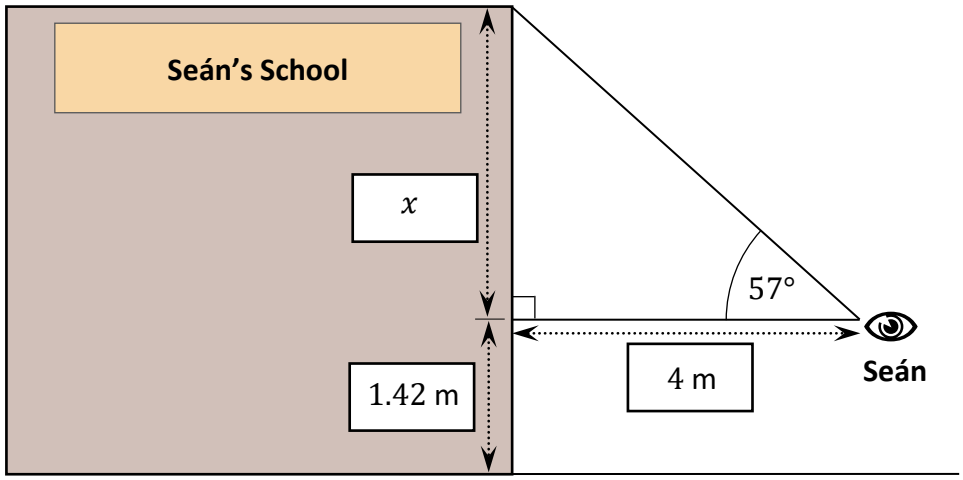
Answer: the same different

(Tick (✓) **one** box only) ☐ ☐

Reason:

Seán's value for the angle of elevation was $57°$. Seán's clinometer was at a height of $1{\cdot}42$ m. He was standing 4 m from the school wall at this time.

Seán drew the diagram below to show this information.



(c) Use the right-angled triangle in the diagram to write $\tan 57°$ as a fraction, in terms of x.

$$\tan 57° = \frac{}{}$$

(d) Use your calculator to find the value of $\tan 57°$.
Give your answer correct to 2 decimal places.

$$\tan 57° = \boxed{}$$

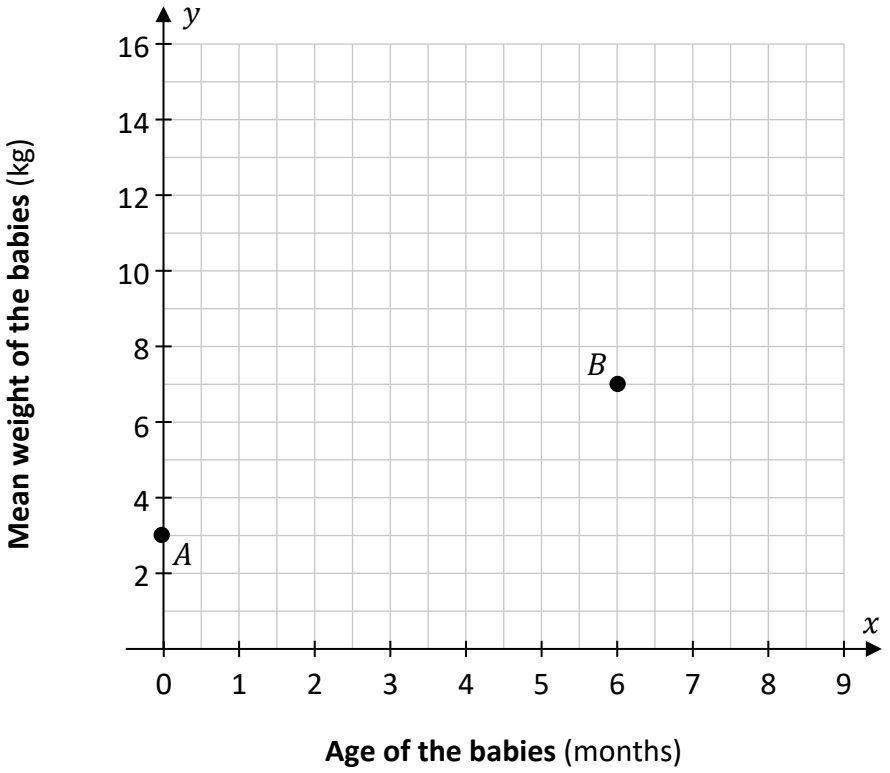
(e) Using his measurements, Seán works out that x is roughly $6{\cdot}16$ m.
Use this value to find Seán's estimate of the total height of the school, in metres.

Question 9 **(Suggested maximum time: 15 minutes)**

The weight of each baby in a group was measured every 3 months, for the first 12 months of life. Some of the results are shown in **Table 1** below.

Table 1				
Age of the babies (months)	0	3	6	9
Mean weight of the babies (kg)	3		7	

The points $A(0, 3)$ and $B(6, 7)$ are shown on the co-ordinate diagram below.



(a) **Draw** the line AB on the co-ordinate diagram.

(b) Complete the following sentence:

"The point B represents the mean weight of the babies after ☐ months."

Assume that the mean weight of the babies in the group increased in a **linear pattern** over the first 18 months of life.

(c) Use the line AB to **estimate** the mean weight of the babies after 3 months and after 9 months. Write these values into **Table 1**. Show your work on the diagram.

(d) The **slope** of the line AB is $\frac{2}{3}$. Explain what this slope means in the context of this question.

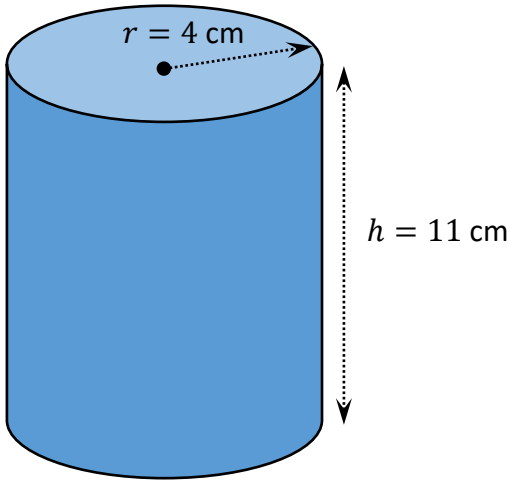
(e) The line AB has equation:

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

Use this to estimate the mean weight of the babies after 18 months.
Show your working out.

Question 10 **(Suggested maximum time: 5 minutes)**

Martina buys a carton of yoghurt. The carton is roughly in the shape of a cylinder.
It has the dimensions shown in the diagram below.



(a) Work out the **volume** of the carton in cm^3.
Give your answer in terms of π.

$V = \pi r^2 h$

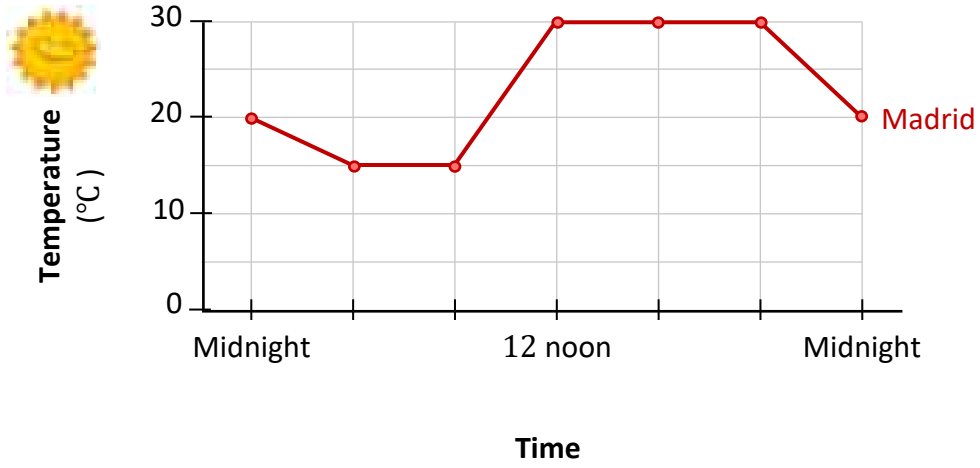
(b) The carton contains fruit and yoghurt and weighs 450 g.
The ratio of fruit to yoghurt is $4 : 21$.

Work out how many grams of **fruit** are in the carton.

Question 11 **(Suggested maximum time: 5 minutes)**

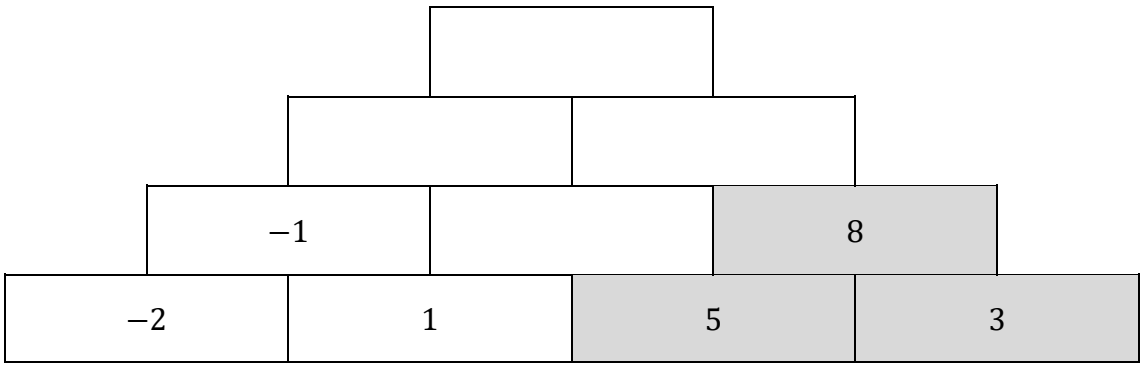
The graph below shows the approximate temperature in Madrid throughout one day (in °C).
The temperature in Ennis was exactly **half** that in Madrid throughout this day.

On the diagram below, **draw** a graph of the temperature in Ennis throughout this day.
Use the same axes and scales.



Question 12 **(Suggested maximum time: 10 minutes)**

Pawel makes the "adding wall" below.



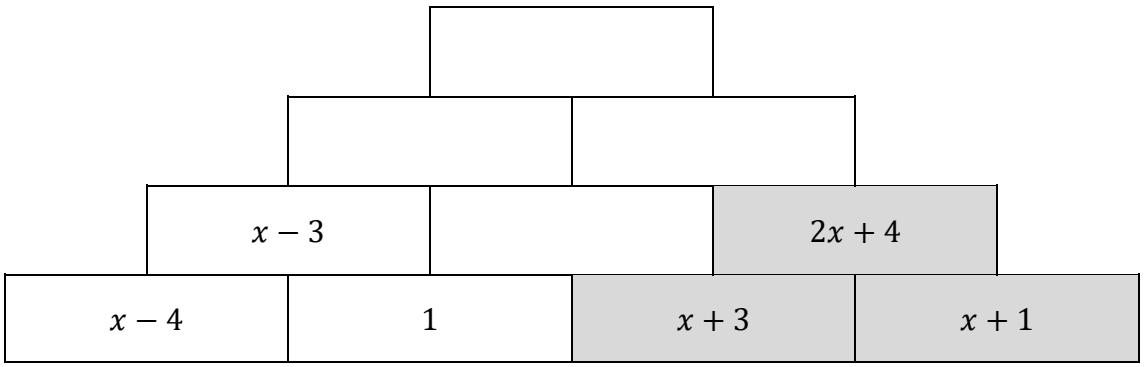
Each box in the bottom row is filled in.
To fill in any other box, you add the two numbers in the boxes that are directly below it.

For example, in the shaded boxes: 5 + 3 = 8

(a) Fill in all the boxes in Pawel's adding wall above.

Pawel also makes the "algebra adding wall" below, with the same rules.

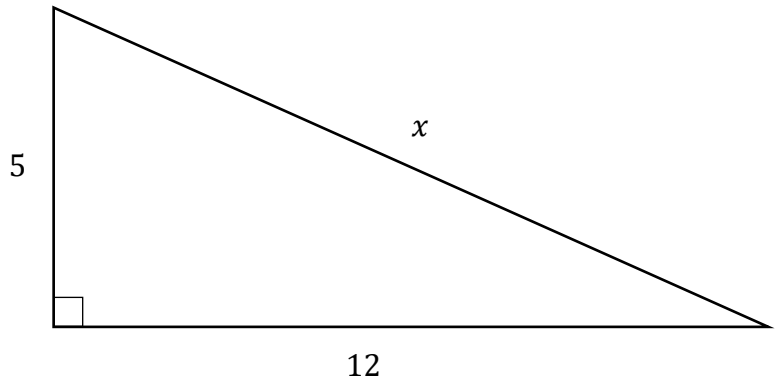
(b) Fill in all the boxes in Pawel's algebra adding wall below, in terms of x.



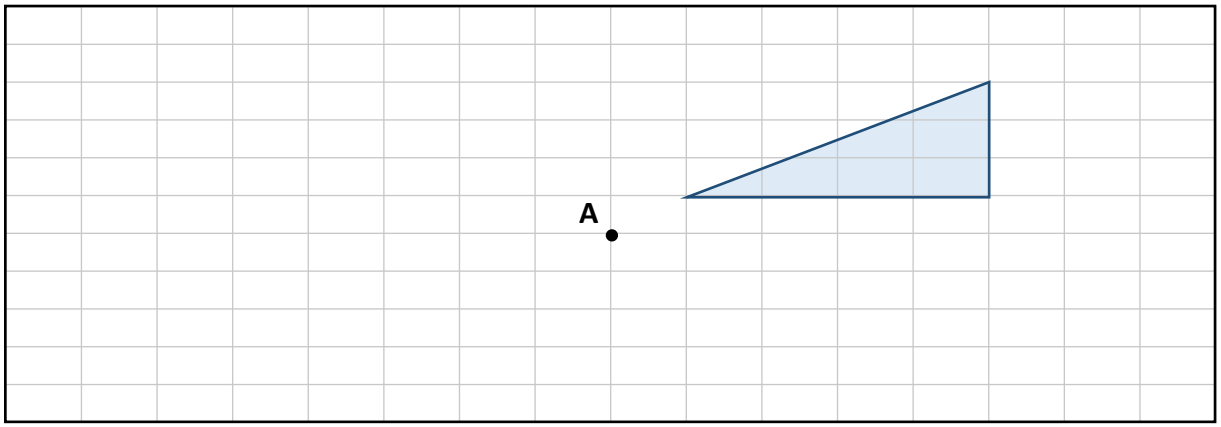
(c) There is one value of x that will make both adding walls exactly the same.
Find this value of x.

Question 13 **(Suggested maximum time: 10 minutes)**

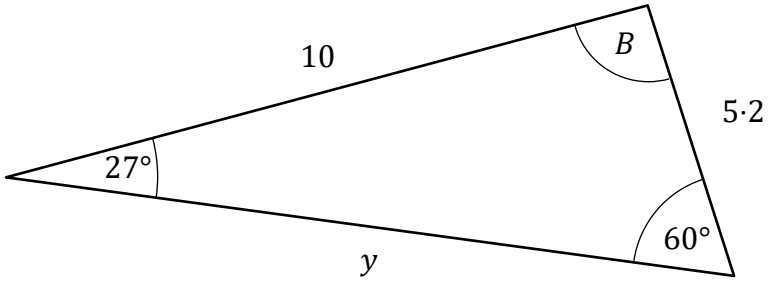
(a) Use the theorem of **Pythagoras** to find the value of x in the right-angled triangle below. Show all of your working out.



(b) Draw the image of the following triangle under **central symmetry** in the point **A**.



(c) **(i)** Work out the size of the angle B in the triangle below.



(ii) Explain why the theorem of Pythagoras **cannot** be used to find the length of the side y in the triangle above.

Question 14 **(Suggested maximum time: 5 minutes)**

(a) The following are algebraic expressions.

$$2x \qquad 3x-2 \qquad 3x+2 \qquad 3(x+2)$$

Complete the table below by writing the correct algebraic expression from the list above next to the corresponding statement. You do not need to use all of the algebraic expressions.

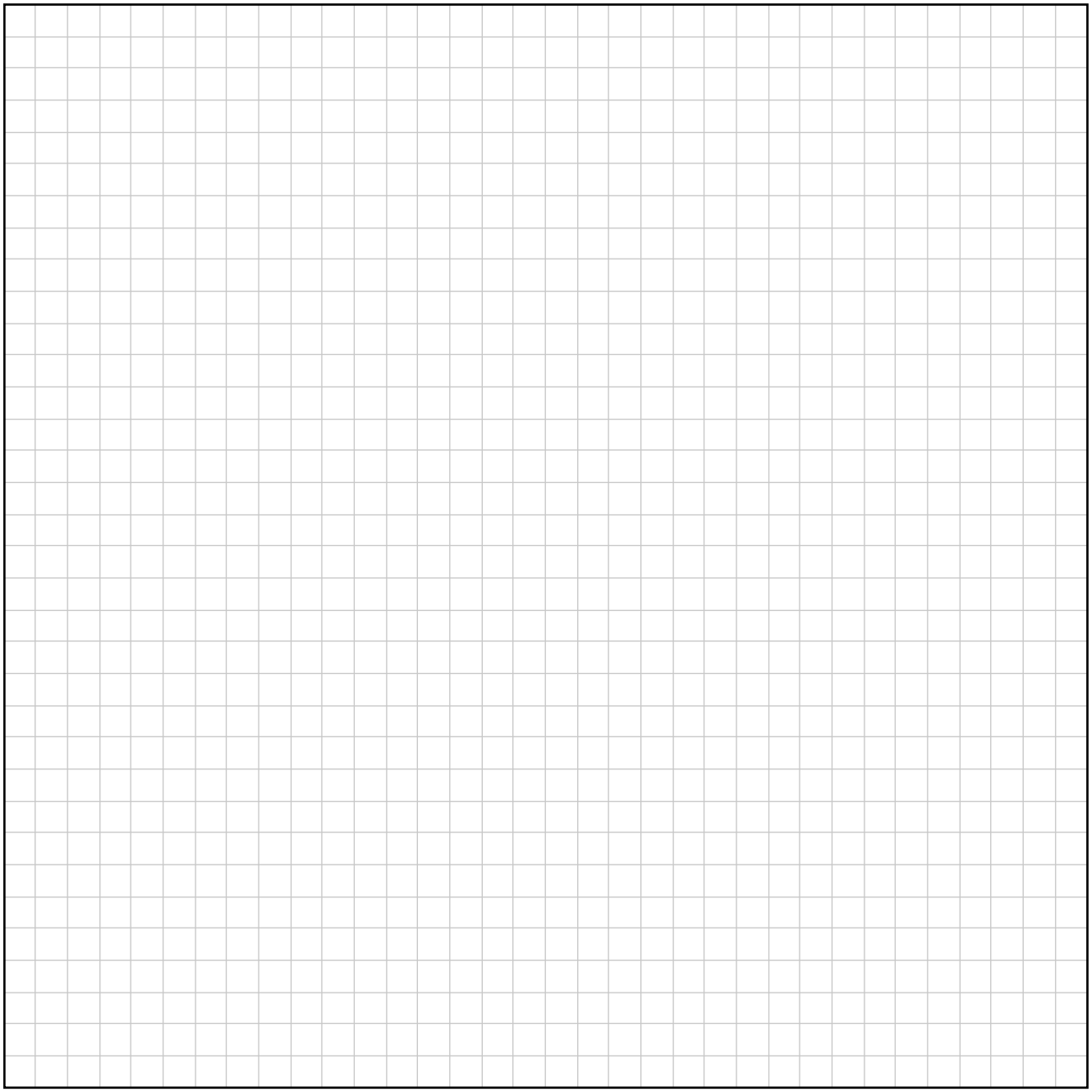
Statement	Algebraic Expression
Multiply x by 3, then subtract 2 from the result.	
Double x.	
Add 2 to x, then multiply the result by 3.	

(b) Multiply out and simplify $(3x-2)(2x-3)$.

(c) Factorise $x^2+2x-15$.

$x^2+2x-15=(x+5)$ ( )

Page for extra work.
Label any extra work clearly with the question number and part.



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Junior Cycle Final Examination – Ordinary Level

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Coimisiún na Scrúduithe Stáit
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270 marks

Examination Number

Day and Month of Birth

For example, 3rd February is entered as 0302

For Superintendent
Centre Stamp

For Examiner	
Running total	
Grade	

For Examiner					
Q.	Ex.	Adv. Ex.	Q.	Ex.	Adv. Ex.
1			11		
2			12		
3			13		
4					
5					
6					
7					
8					
9					
10			Total		

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You may lose marks if you do not give your answers in simplest form, where relevant.

Write the make and model of your calculator(s) here:

Question 1 **(Suggested maximum time: 5 minutes)**

(a) Find the value of each of the following.

(i) $243 + 178$

(ii) $7{\cdot}2 \times 6$

(iii) $24 \div (9 - 7)$

(iv) 3^4

(b) Write down the **whole number** that is nearest to $15{\cdot}8$.

(c) What number is half way between 16 and 30?

Question 2 **(Suggested maximum time: 10 minutes)**

A restaurant has the following menu, with 4 main courses and 3 desserts:

Main Course	Price €
Fish	16·95
Steak	18·95
Pasta	14·95
Pizza	15·95

Dessert	Price €
Ice-cream	3·50
Cheesecake	4·95
Brownie	4·50

(a) **(i)** John orders a steak and cheesecake. Work out the price of John's meal.

(ii) John pays for the meal with a €50 note. How much change should he get?

(b) Michelle picks one main course and one dessert.
In how many different possible ways could she do this?
For example, one possible way is to pick fish and ice-cream.

(c) Gina orders food costing €72.
Gina gives a tip of 15% of this cost, rounded to the nearest euro.

Work out how much Gina gives as a tip.

(d) There are 5 waiters and 3 kitchen staff working in the restaurant.
At the end of each night, the tips are all added together, and are then split evenly between these 8 people.

One night, the 3 kitchen staff get a combined total of €96 in tips.
Work out the **total** value of all the tips that evening.

Question 3 **(Suggested maximum time: 10 minutes)**

Joshua estimates that an airbed is roughly in the shape of a rectangular solid.
The dimensions of the airbed are 180 cm by 80 cm by 20 cm.

(a) Use Joshua's values to show that the **volume** of the airbed is $288\,000$ cm^3.

(b) Joshua uses an electric pump to blow up the airbed.
The pump blows air into the airbed at a rate of 800 cm^3 per **second**.
Work out how many **minutes** it will take to fill the airbed with air, using this pump.

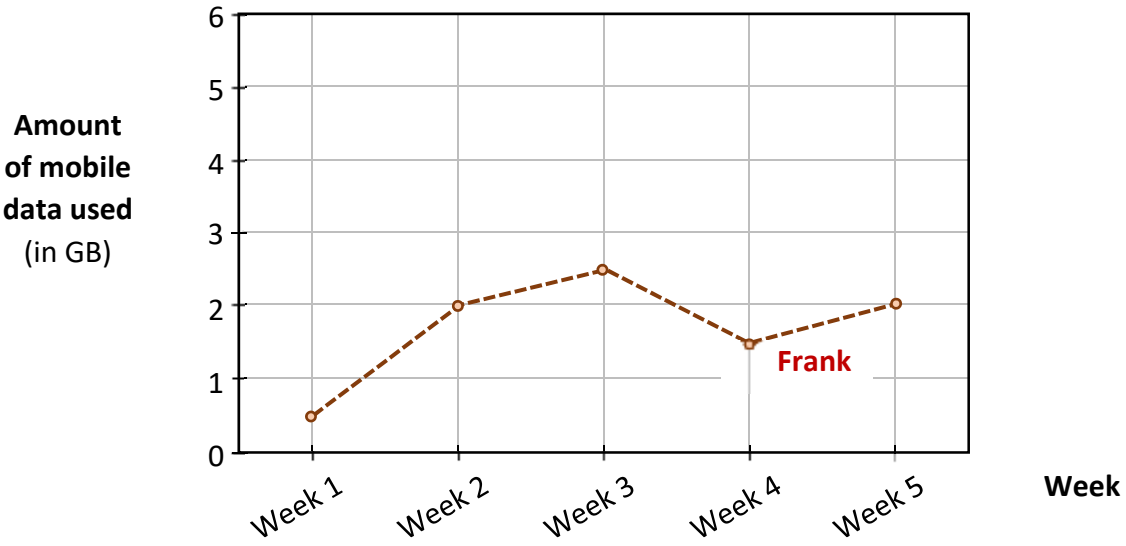
(c) Joshua finishes pumping up the airbed at $9{:}35$ p.m.
He goes to bed 45 minutes later.

At what time does Joshua go to bed?

(d) Joshua buys the electric pump on the internet for £$15{\cdot}95$.
The currency conversion rate is €$1 =$ £$0{\cdot}90$.
Convert £$15{\cdot}95$ to euro. Give your answer correct to the nearest cent.

Question 4 **(Suggested maximum time: 5 minutes)**

Frank and Ciarán each recorded how much mobile data they used each week for five weeks.
The graph below shows the amount of mobile data that Frank used in each of these weeks.



(a) Based on the graph:

(i) in which week did Frank use the **most** mobile data?

Answer:

(ii) how many GB of mobile data did Frank use in **Week 5**?

Answer:

(iii) in which week did Frank use **less** mobile data than the week before?

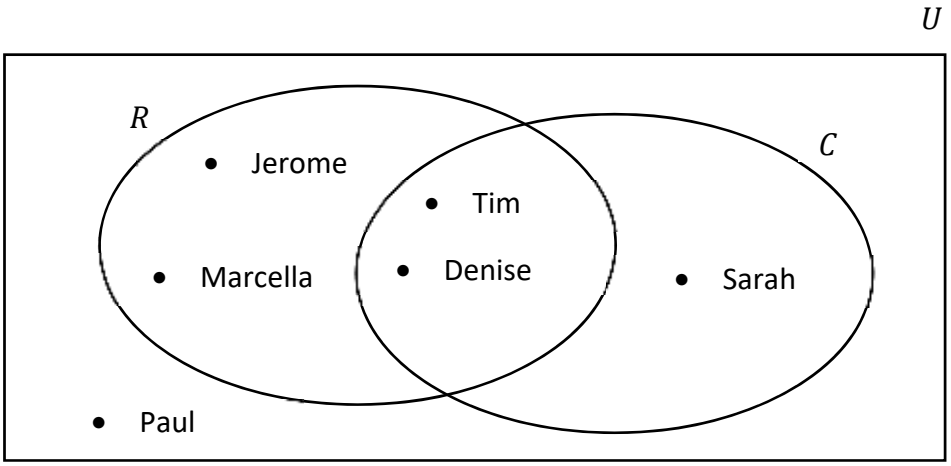
Answer:

(b) In each of these weeks, Ciarán used **2 GB of data more** than Frank used.

Use this information to draw a graph on the diagram above showing how much mobile data Ciarán used in each of these weeks.

Question 5 **(Suggested maximum time: 5 minutes)**

6 students in a class (U) were asked if they ran (R) or cycled (C) during the midterm break.
The Venn diagram shows their responses.



(a) Name one student who **ran** during the midterm break.

Answer: _____

(b) Explain what the following statement means, in terms of the students in the class:

$$\#\, C = 3$$

(c) Name one student who is in the region $R \cap C$ in the Venn diagram.

Answer: _____

(d) One student is picked at random from the six students in the Venn diagram.
Write down the probability that this student **ran** during the midterm break.

Answer: $\frac{\quad}{\quad}$

Question 6 **(Suggested maximum time: 15 minutes)**

All the students in fourth year in a school took part in a long-jump competition.
The results are shown in the following frequency table.

Distance jumped (cm)	$200 - 250$	$250 - 300$	$300 - 350$	$350 - 400$	$400 - 450$	$450 - 500$
Number of students	10	15	25	32	10	3

(a) In **total**, how many students took part in the competition?

Answer: ☐

(b) What is the **modal** group of the frequency table? Tick (✓) **one** box only.

$300 - 350$	$350 - 400$	$400 - 450$	$450 - 500$
☐	☐	☐	☐

(c) To qualify for the final, a student must jump $\mathbf{415}$ **cm or more**.

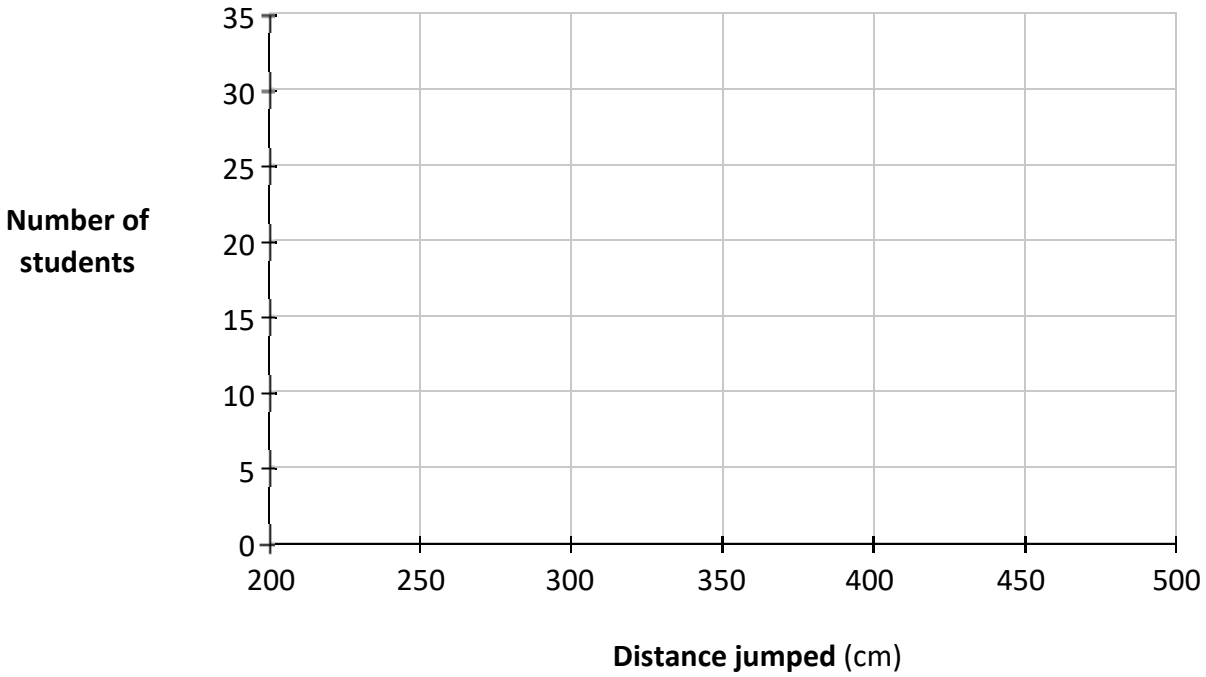
(i) What is the **least** number of students who could have qualified for the final?

Answer: ☐

(ii) What is the **greatest** number of students who could have qualified for the final?

Answer: ☐

(d) Draw a **histogram** to represent the data from the frequency table.
Use the axes and scales below.

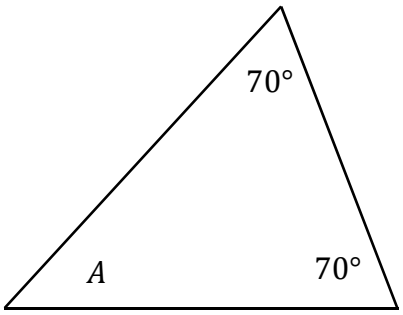


(e) The **median** distance jumped was 331 cm.

Explain what this means, in terms of how far the students jumped in the long-jump competition.

Question 7 **(Suggested maximum time: 10 minutes)**

(a) The triangle below has two angles of size $70°$, as shown (diagram not to scale).



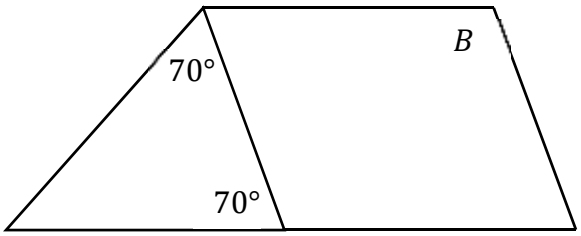
(i) What type of triangle is this? Tick (✓) **one** box only.

Right-angled	Isosceles	Equilateral
☐	☐	☐

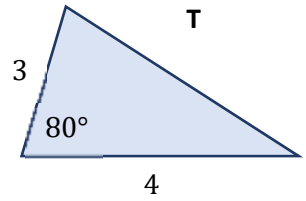
(ii) Work out the size of the angle A, the third angle in this triangle.

(iii) This triangle is joined to a parallelogram, as shown below.
The angle B in the parallelogram is marked.

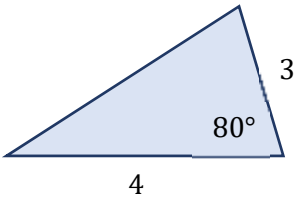
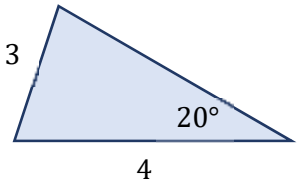
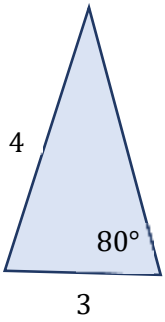
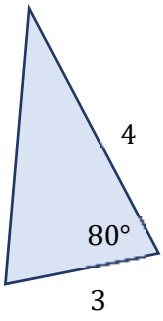
Work out the size of the angle B.



(b) The diagram below shows the triangle **T**.
The lengths of two sides and the size of one angle are shown.

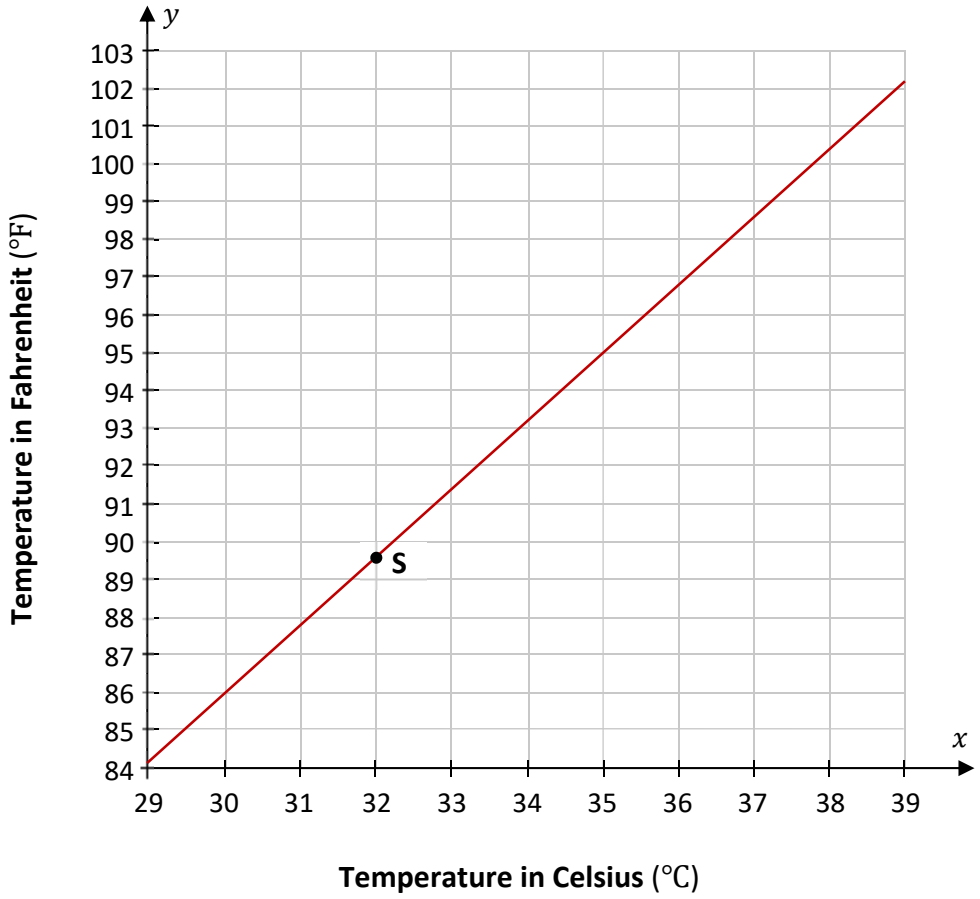


4 more triangles are shown below.
For each triangle, tick (✓) the correct box to show if it is **definitely congruent** to **T** or not.

Triangle	Is this triangle definitely congruent to T?	
	Yes ☐	No ☐
	Yes ☐	No ☐
	Yes ☐	No ☐
	Yes ☐	No ☐

Question 8 **(Suggested maximum time: 15 minutes)**

The graph on the co-ordinate diagram below shows the relationship between degrees Celsius (°C) and degrees Fahrenheit (°F). The axes do **not** start at $(0, 0)$ in the diagram.



(a) For parts **(a)(i)** and **(a)(ii)**, **show your work on the diagram above**.

(i) Normal temperature for an adult is $37°C$.
Write $37°C$ in degrees Fahrenheit.

Answer: _____

(ii) A temperature above $100{\cdot}4°F$ is a high temperature. Write $100{\cdot}4°F$ in degrees Celsius.

Answer: _____

(b) The point **S** is marked on the graph. Estimate the co-ordinates of the point **S**.

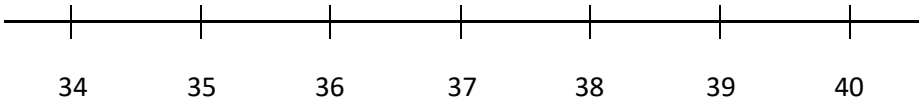
S: (,)

(c) The points $(35, 95)$ and $(30, 86)$ are also on the graph of the line.
Use these two points to work out the **slope** of the graph.

(d) The table below gives two inequalities in T (a temperature in ℃), and a description of two inequalities in T. Complete the table by filling in the missing description and inequality.

	Description	Inequality
1	Temperature is less than 36℃	$T < 36$
2		$36 < T < 38$
3	Temperature is greater than 38℃	

(e) **Graph** the inequality $T < 36$ on the number line below, where $T \in \mathbb{R}$ (T is a real number).



Question 9 **(Suggested maximum time: 5 minutes)**

Margaret makes and sells furniture.

(a) It costs Margaret €75 to make a chair. She sells it for €110.
Work out the **profit** she makes on the chair.

(b) It costs Margaret €120 to make a bench. She sells it for a profit of €45.
Work out how much Margaret **sells** the bench for.

(c) It costs Margaret €$3n$ to make a stool, where $n \in \mathbb{N}$.
She sells the stool for €$5n$.
Work out the **profit** she makes on the stool, in terms of n.

(d) It costs Margaret €320 to make a table. She sells it for a profit of €80.
Write Margaret's profit for the table as a **percentage** of its cost to her.

Question 10 **(Suggested maximum time: 5 minutes)**

(a) Write the following as a single fraction in its simplest form:

$$\frac{2}{3} + \frac{5}{7}$$

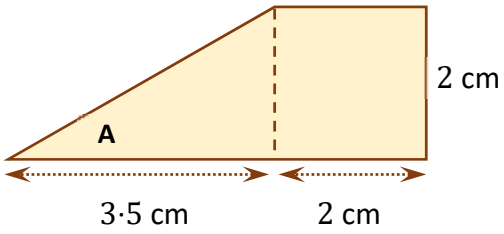
(b) Solve the following equation in k:

$$4k - 7 = 41$$

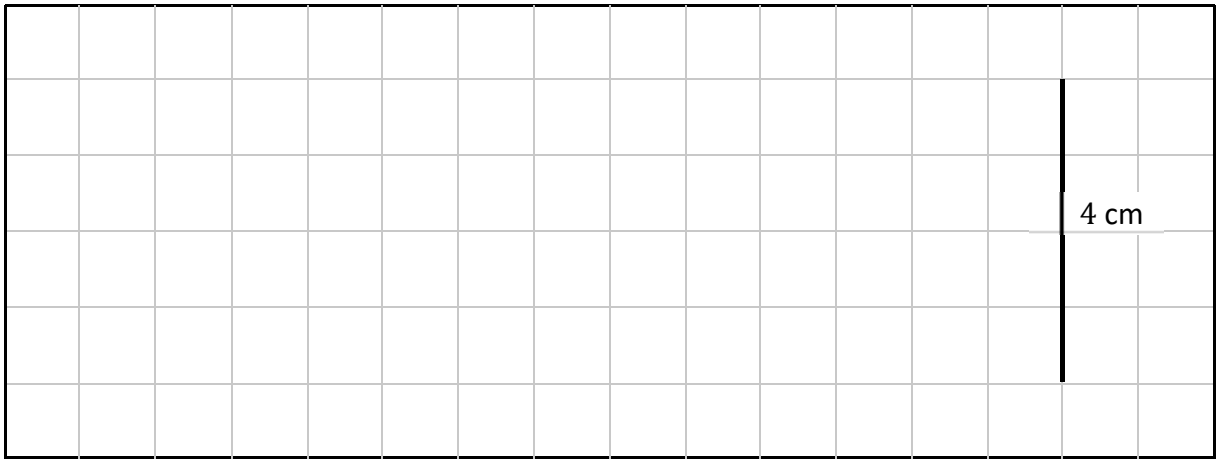
Question 11 **(Suggested maximum time: 10 minutes)**

Two friends are building a skate-board ramp.
They each have a different design for the ramp.

(a) Tracey draws the following diagram as part of her design for the ramp.
It is made up of a triangle and a square.
It is to a scale of $1:100$.
The angle **A** is marked.



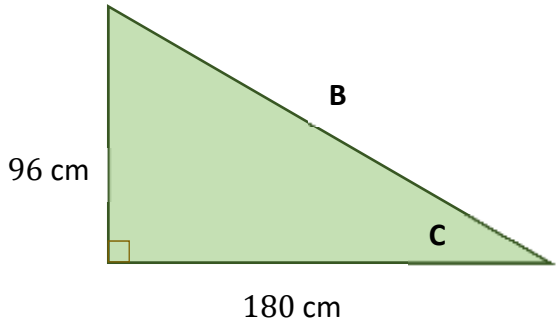
(i) Construct a scale diagram of this part of the design for the ramp in the grid below, to a scale of $1:50$. Each side in your diagram should be twice the length of the corresponding side in Tracey's diagram. One side is already done for you.



(ii) Measure the size of the angle **A** in Tracey's diagram above.

Answer: ____

Sinéad has a different design for the ramp.
Part of Sinéad's design is the right-angled triangle in the diagram below (not to scale).
One of the sides is marked **B**. One of the angles is marked **C**.



(b) Use the **Theorem of Pythagoras** to work out the length of the side **B** in Sinéad's design.
Give your answer in cm.

(c) Sinéad knows that, for the angle **C**,

$$\tan \mathbf{C} = \frac{96}{180}$$

Use your calculator to find the size of the angle **C**, correct to the nearest degree.

Question 12 **(Suggested maximum time: 10 minutes)**

In January 2021, people were allowed to travel 5 km from their home to exercise.

(a) Write **km** or **km²** into each box below to complete the following sentence correctly.
Use each one only once.

Area is measured in ☐ and **distance** is measured in ☐ .

(b) Use the following formula to work out the circumference of a circle with a radius of 5 km.
Give your answer correct to 1 decimal place.

$2 \times \pi \times r =$

(c) Use a different formula to work out the **area** of a circle with a radius of 5 km.
Give your answer correct to 1 decimal place.

(d) The tables below show the circumference and area of a circle in terms of π, as the radius increases by 2 units. One of these is a **linear** sequence; the other is **not**.

Sequence 1 Circumference
$8\,\pi$
$12\,\pi$
$16\,\pi$
$20\,\pi$
$24\,\pi$

Sequence 2 Area
$16\,\pi$
$36\,\pi$
64π
$100\,\pi$
$144\,\pi$

Tick (✓) the correct box to show which of these sequences is **linear**.
Give a reason for your answer.

The linear sequence is: **Sequence 1** ☐ **Sequence 2** ☐
(tick **one** box only)

Reason:

Question 13 **(Suggested maximum time: 5 minutes)**

(a) Simplify $2a - 5n + 2n + 6a$.

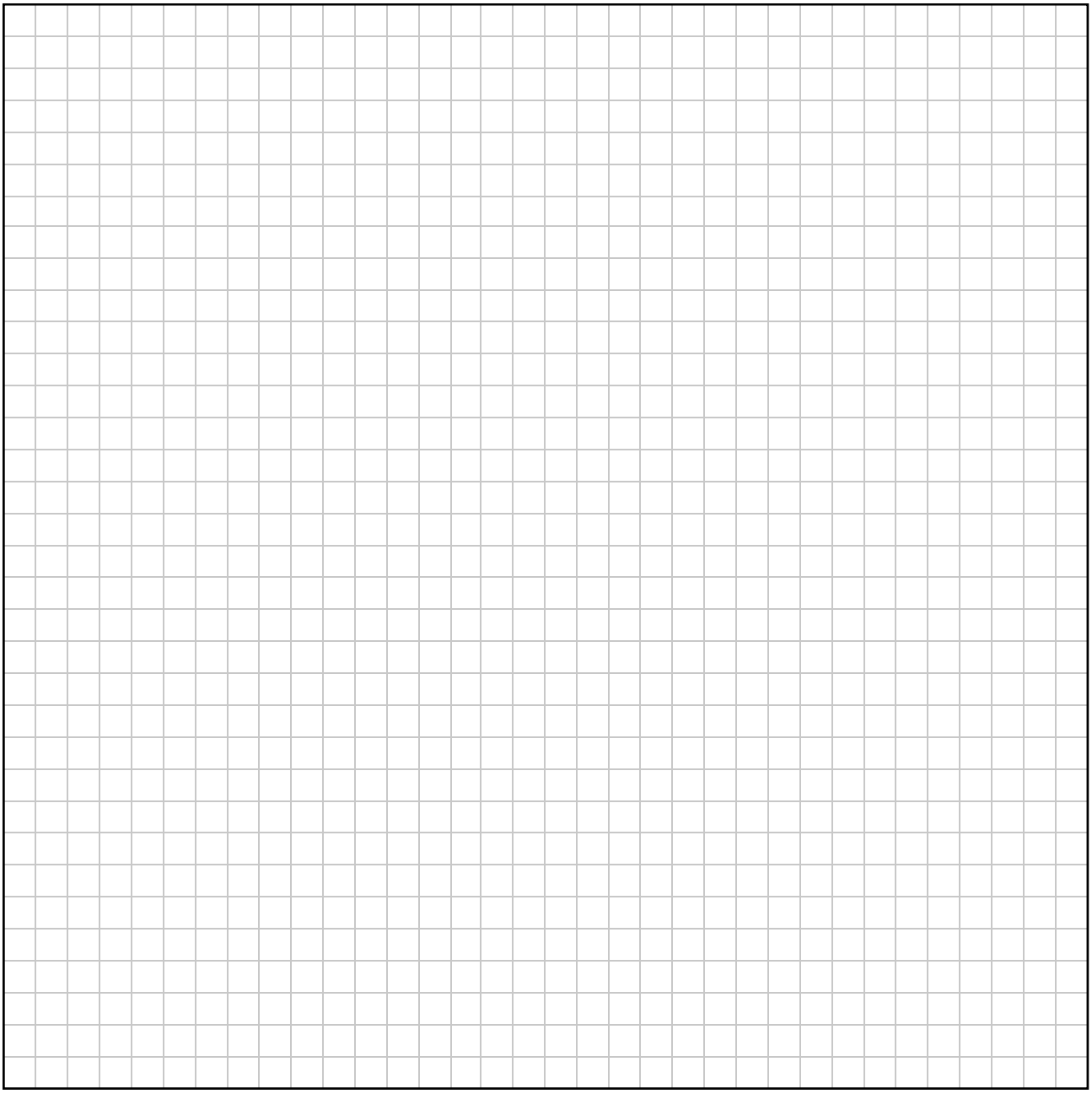
(b) $y = \frac{3n + 70}{5}$.

Work out the value of y when $n = 10$.

(c) Factorise the quadratic expression $x^2 - 7x + 12$.

$x^2 - 7x + 12 = (x \quad)(\quad)$

Page for extra work.
Label any extra work clearly with the question number and part.



Acknowledgements

Image on page 4: www.hookedonhenryst.com. Altered.
Image on page 6: www.omearacamping.com. Altered.
Image on page 18: www.popsugar.co.uk. Altered.
Image on page 20: www.2kmfromhome.com. Altered.

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Junior Cycle Final Examination – Ordinary Level

Mathematics

Friday 10 June
Afternoon 1:30 - 3:30