Coimisiún na Scrúduithe Stáit
State Examinations Commission

Leaving Certificate Examination 2024

Mathematics

Foundation Level

Friday 7 June   Afternoon 2:00 - 4:30

300 marks

Examination Number ☐☐☐☐☐☐

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

Centre Stamp

Do not write on this page

Instructions

There are **two** sections in this examination paper.

Section A   210 marks   8 questions

Section B   90 marks   3 questions

Answer questions as follows:
- any **seven** questions from Section A
- any **two** questions from Section B

Write your Examination Number into 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 will lose marks if your solutions do not include relevant supporting work.

You may lose marks if the appropriate units of measurement are not included, where relevant.

You may lose marks if your answers are not given in simplest form, where relevant.

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

Answer **any seven** questions from this section.

Question 1 **(30 marks)**

(a) Darek wants to hang wallpaper in some rooms in his house.
He has estimated that he will need 10 rolls of wallpaper.

A single roll of wallpaper costs €14·50.

(i) Find the cost of 10 rolls of wallpaper.

(ii) Darek can also buy wallpaper in packs of 5 rolls.
One pack of five rolls costs €65.

Find how much Darek will save if he buys the 10 rolls of wallpaper in packs of 5 instead of single rolls of wallpaper.

(b) **(i)** On Monday Gráinne drove 40 km at 80 km/hour.

Find how long it took Grainne to drive this distance.

(ii) On Tuesday Gráinne drove 190 km.
It took her 2 hours to drive this distance.

Calculate her average speed in km/hour.

Question 2 **(30 marks)**

(a) Orla is playing a game. In this game she:

- Picks a counter at random from four counters: Blue (**B**), Yellow (**Y**), Red (**R**) or Purple (**P**).

- Flips an unbiased coin and gets heads (**H**) or tails (**T**).

(i) Complete the table below to list all the possible outcomes.
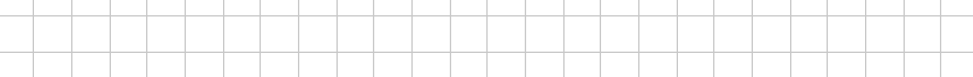Two are already done for you.
For example, **BH** means that Orla picks a blue counter and gets heads on the coin.

<table>
<tr><td rowspan="2"></td><td rowspan="2"></td><td colspan="2">**Coin**</td></tr>
<tr><td>Heads (**H**)</td><td>Tails (**T**)</td></tr>
<tr><td rowspan="4">**Counter**</td><td>Blue (**B**)</td><td>**BH**</td><td></td></tr>
<tr><td>Yellow (**Y**)</td><td></td><td></td></tr>
<tr><td>Red (**R**)</td><td></td><td>**RT**</td></tr>
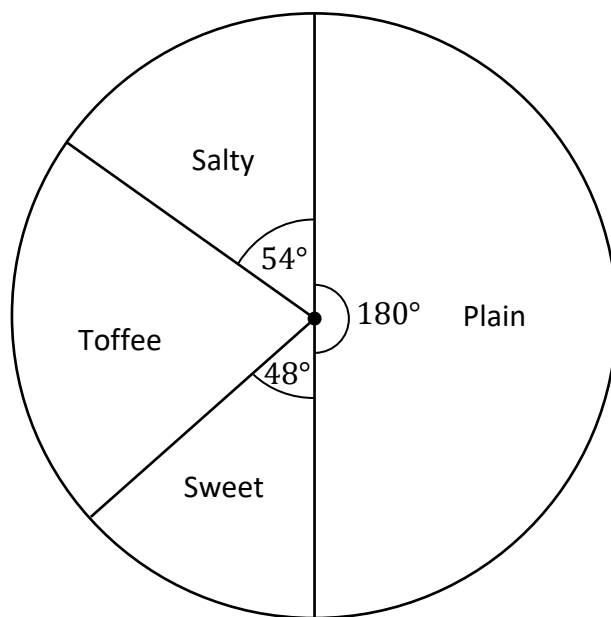<tr><td>Purple (**P**)</td><td></td><td></td></tr>
</table>

Each outcome in the table is **equally likely**.

(ii) What is the probability that the outcome of the game is **RT**?
(That is, that a red counter is picked and tails is the result of flipping the coin.)
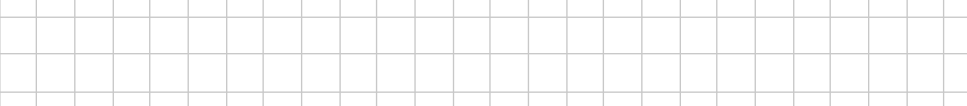
(b) A cinema offers four different flavours of popcorn: Toffee, Salty, Plain, and Sweet.
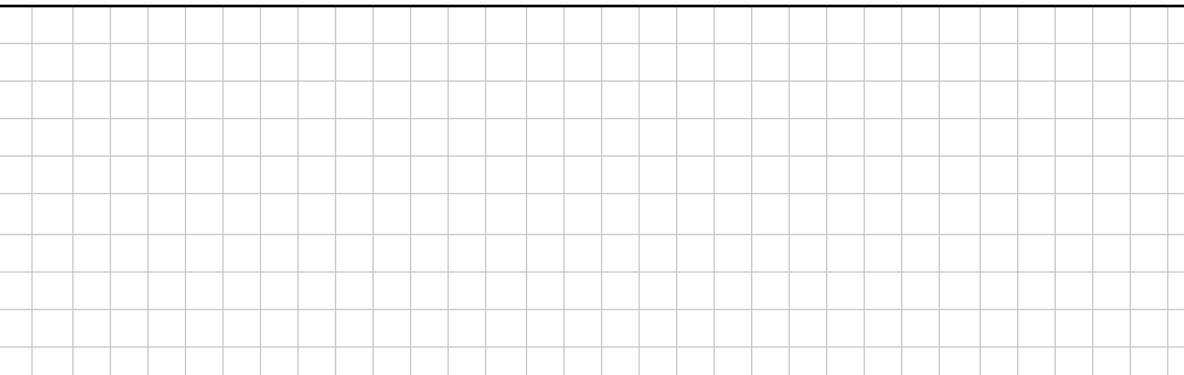The pie chart below shows the different flavours of popcorn that people bought.

The size of three of the angles are shown in the diagram above.

(i) Work out the size of the angle for **Toffee**.
Show your working out.

(ii) 30 people bought Plain popcorn.

Work out how many people bought **Sweet popcorn**.

Question 3 (30 marks)

Ethan bought a car for €40 000 at the start of 2018.
On the diagram below, the line shows how the value of the car has decreased over 6 years, from the start of 2018 ($t = 0$) to the start of 2024 ($t = 6$).
The value of the car is measured in thousands of euro.

(a) Use the graph to estimate the value of the car at the start of 2020 ($t = 2$).

(b) Ethan also bought a site (a plot of land) at the start of 2018 for €24 000.
The site has increased in value by €1000 each year since 2018.

(i) Complete the table below to show the value of the site, in thousands of euro.

Time from start of 2018, t (years)	0	1	2	3	4	5	6
Value of site (thousands of euro)	24	25					30

(ii) Use the values from the table above to **draw** a graph of the value of the site on the diagram on the previous page, from $t = 0$ to $t = 6$, for $t \in \mathbb{R}$.

(iii) After how many years (value of t) do the car and the site have the **same** value?
Show your work on the diagram on the previous page.

(iv) The numbers in the table in **part (b)(i)** follow a pattern, where V is the value of the site, in thousands, and t is the number of years after it was bought.

Which one of the following formulae shows the pattern in the table?
Give a reason for your answer.

Answer: $V = 24 + t$ $V = 24 - t$ $V = 30 + t$
(Tick (✓) **one** box only)   ☐   ☐   ☐

Reason:

Question 4   **(30 marks)**

Molly is holding auditions for the school musical.

In **total**, 6 boys and 5 girls auditioned.

(a) All students have an equal chance of getting the lead role.

    (i) What is the probability that a boy will get the lead role?

    (ii) 2 of the boys were from junior cycle and 3 of the girls were from junior cycle. All other students were from senior cycle.
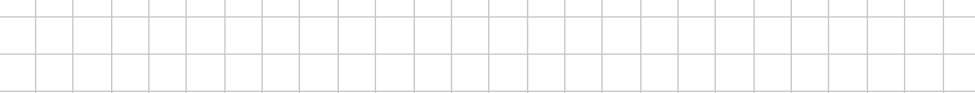
          How many senior cycle students auditioned?

(b) The ages (in years) of the boys who auditioned are given below.

$$15, \quad 16, \quad 17, \quad 14, \quad 17, \quad 17$$

(i) Find the **mode** of the data.

(ii) Find the **mean** of the data.

(c) Molly wrote out the ages of the girls who auditioned and circled the number in the middle as shown below.

$$17, \quad 16, \quad 15, \quad 13, \quad 16$$

Molly says the **median** is 15.
Is Molly correct? Give a reason for your answer.

Answer: Yes   No
(Tick (✓) **one** box only)   ☐   ☐

Reason:

Question 5 **(30 marks)**

(a) Amira and Kevin did a survey.
They wrote down the ages in years of all the people under 50 living on their street.
The results are shown in the table below:

Age (years)	$0 - 10$	$10 - 20$	$20 - 30$	$30 - 40$	$40 - 50$
Number of people	12	16	14	20	18

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

(i) Complete the histogram below to show the information in the table.
One bar has been done for you.
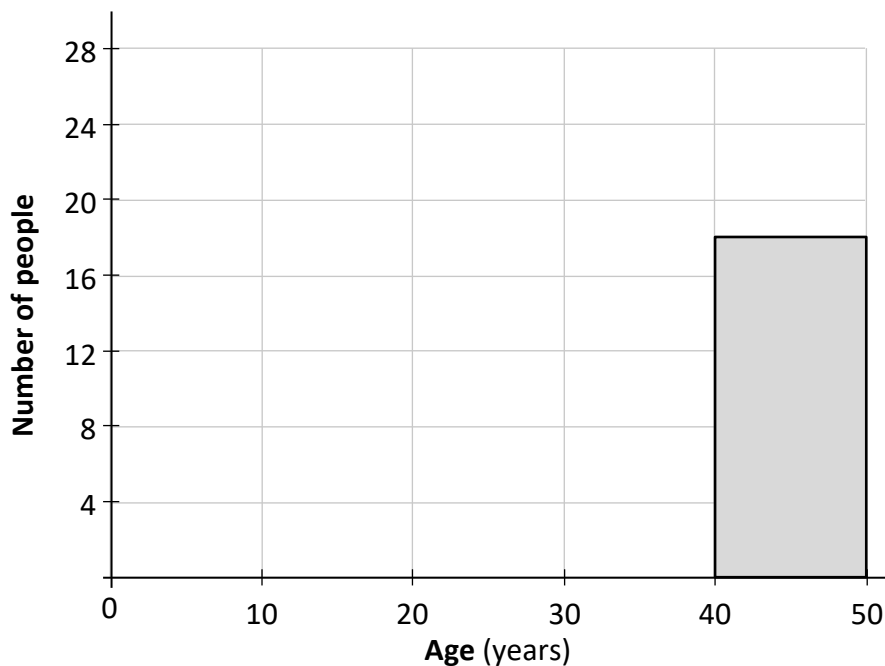
(ii) Find the **total** number of people under 50 living on the street.

(iii) What is the **greatest** number of people that could be under 18 years old?

(iv) Work out the percentage of people from the survey that are 30 years old or older.

(b) Amira and Kevin started collecting their data at 7: 30 p.m.
They spent 1 hour 45 minutes collecting the data.

At what time did they finish?

Question 6 **(30 marks)**

Ciara is redesigning her bedroom.

(a) Her bedroom floor is a rectangle with a length of 4 m and a width of $2 \cdot 8$ m.

Find the **area** of Ciara's bedroom floor, in m^2.
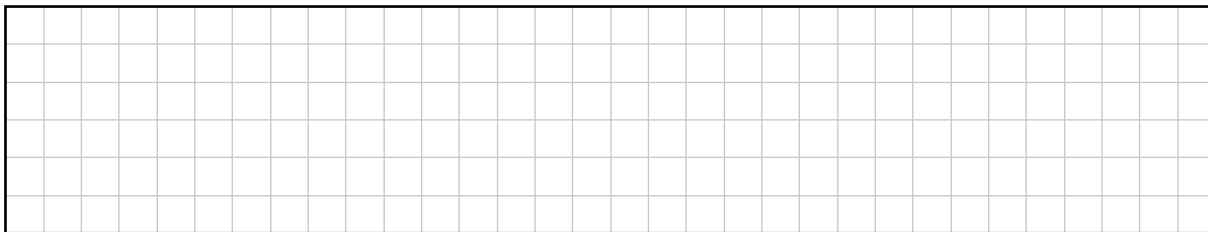
(b) Ciara draws the scaled co-ordinate diagram of her bedroom shown below.
Some of her furniture is shown in the diagram. The door opening is also shown.
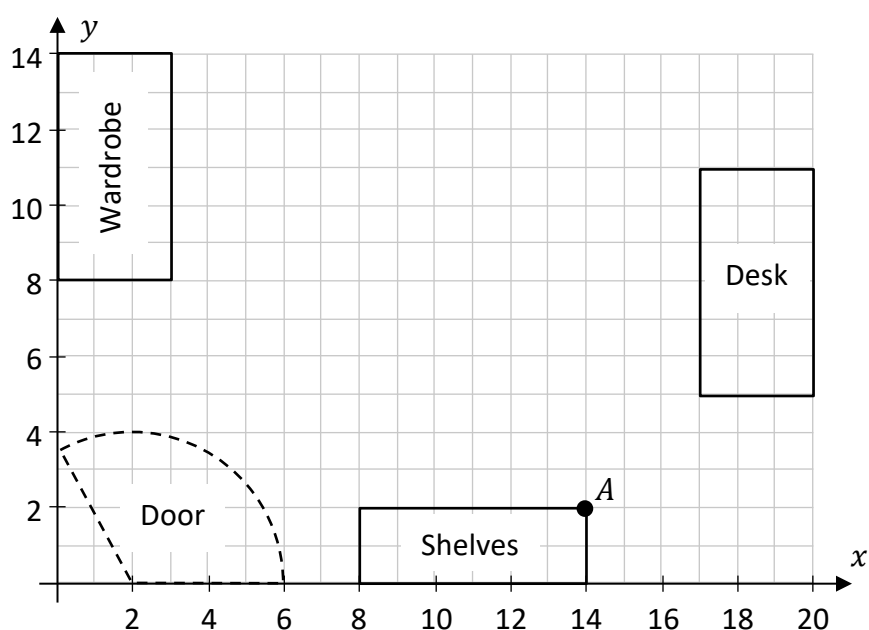
(i) Write down the co-ordinates of the point A from the diagram.

$$A = (\quad , \quad)$$

(ii) Ciara's bed is a rectangle which is 5 units wide and 10 units long.

Draw the bed in a position on the diagram on the previous page so that it does not overlap with any of the given furniture or with the door opening in the room.

(iii) Ciara uses the following scale for her co-ordinate diagram:

1 unit in Ciara's co-ordinate diagram is equal to 20 cm in reality.

On the diagram, Ciara's desk is 6 units long.

How long is Ciara's desk in reality?

6 units   =   [   ] cm
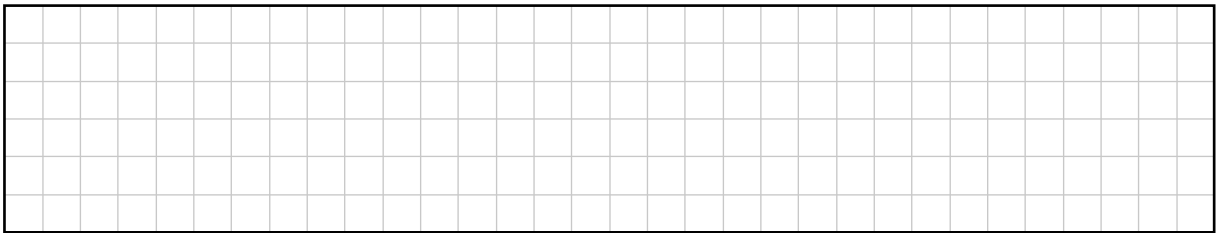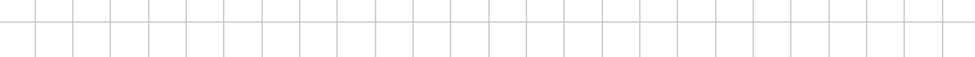
Question 7 **(30 marks)**

(a) Rory is designing a sports kit. The colours available are shown in the table below.

Jersey	Shorts	Socks
Red	White	Black
Blue	Black	White
Green	Red	
Yellow		

Find how many different choices of kit are possible if he must choose a colour for the jersey, a colour for the shorts and a colour for the socks.

(b) A sliotar is a ball used for the game of hurling. It is in the shape of a sphere.

Work out the volume of a spherical sliotar with a radius of $3{\cdot}5$ cm.
Give your answer correct to the nearest cm^3.

(c) The co-ordinate diagram below shows a picture of a hurley, labelled **A**.
It also shows three transformations of **A**, labelled **X**, **Y** and **Z**.
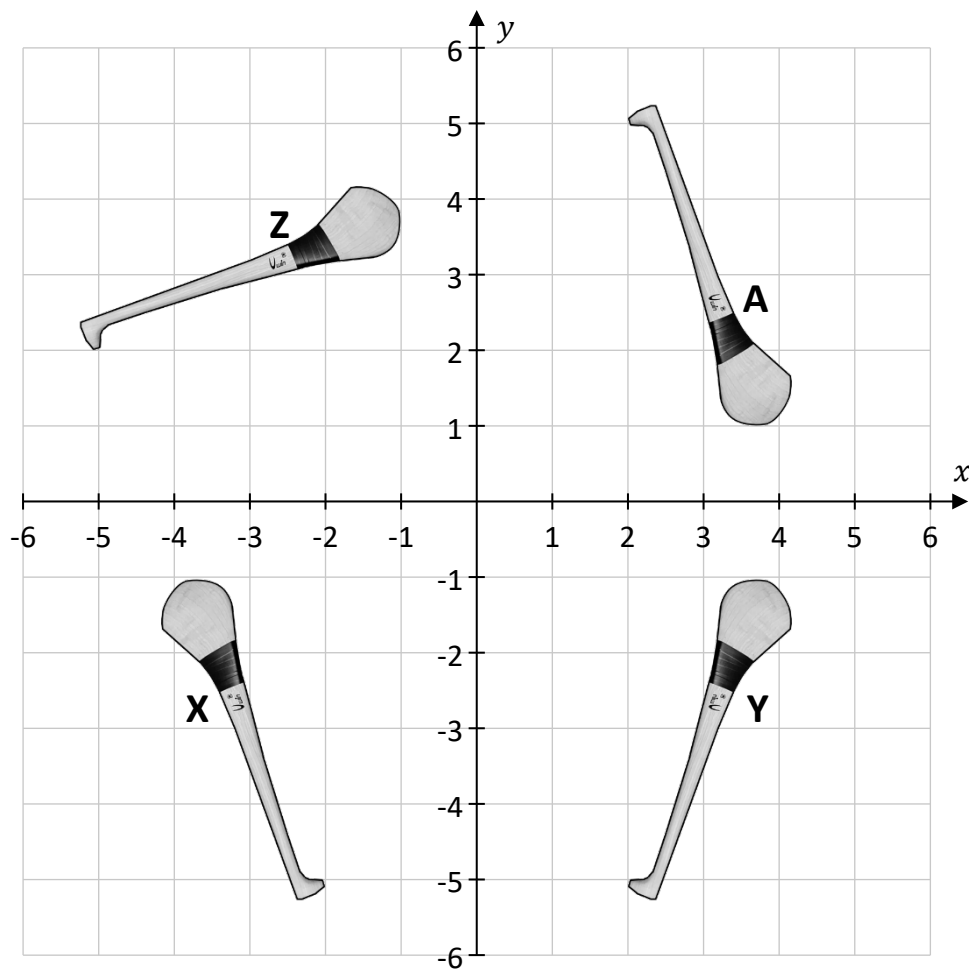
Image: www.elverys.ie. Altered.

Complete the table below by writing the correct letter (**X**, **Y** or **Z**) to show the image of **A** under each transformation.

Transformations of A	X, Y or Z
Axial symmetry in the x-axis	
90° rotation anticlockwise about $(0,0)$	
Central symmetry through the point $(0,0)$	

Question 8 **(30 marks)**

(a) A company has a logo formed by two triangles.
One triangle (ABC) is an enlargement of the other triangle (DEF) as shown in the diagram below.
The side of each small square in the grid is 1 cm.
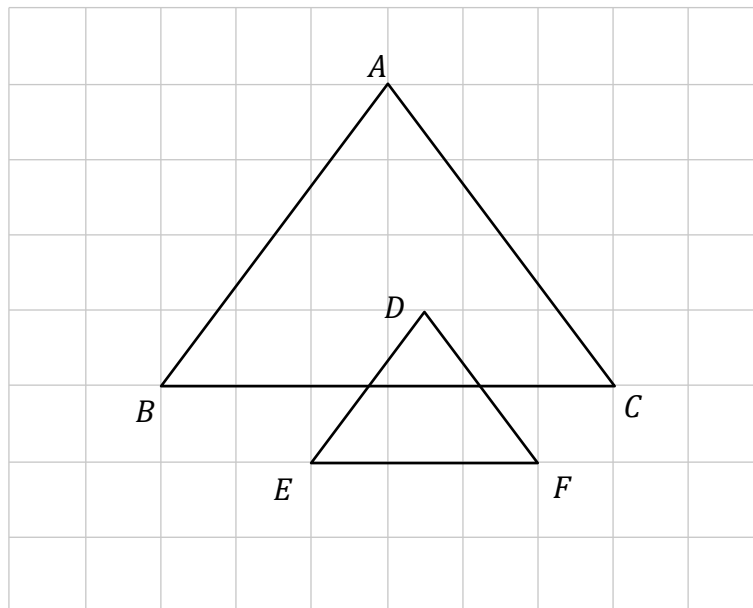
(i) Write down the lengths, in cm, of $[BC]$ and $[EF]$.

$$|BC| = \boxed{} \text{ cm}$$

$$|EF| = \boxed{} \text{ cm}$$

(ii) Use your answers to **part (a)(i)** to work out the value of k, the scale factor of the enlargement.

(iii) **Construct** the centre of enlargement on the diagram above, and label it O.

(b) A different company has a logo in the shape of a triangle, with a base of 6 cm and a height of 4 cm, as shown in the diagram below.
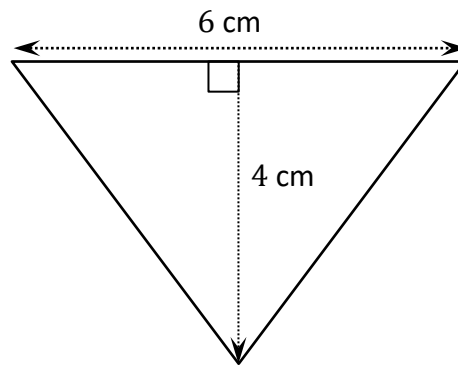
Find the area of the triangle.
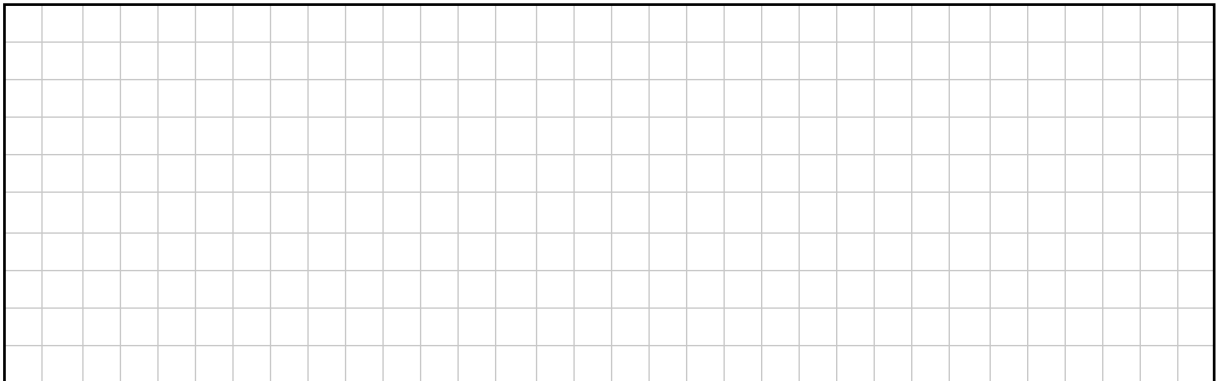
Section B   90 marks

Answer **any two** questions from this section.

Question 9   **(45 marks)**

(a) Sheila is making a rectangular jigsaw, with length 72 cm and width 54 cm, as shown in the
diagram below.

54 cm

72 cm
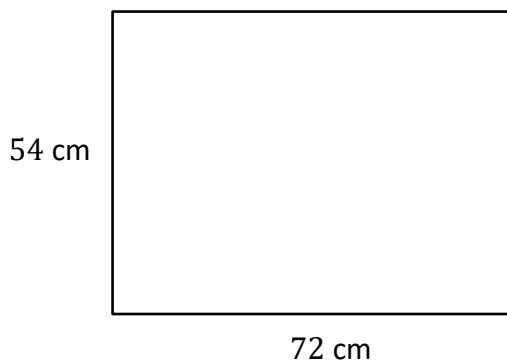
(i) Find, in cm, the perimeter of the jigsaw.
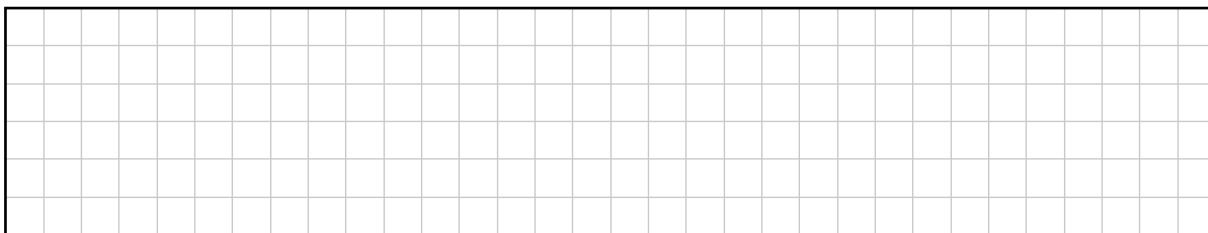
(ii) Use Pythagoras' Theorem to show that the length of the diagonal of the jigsaw is
90 cm.

54 cm

72 cm
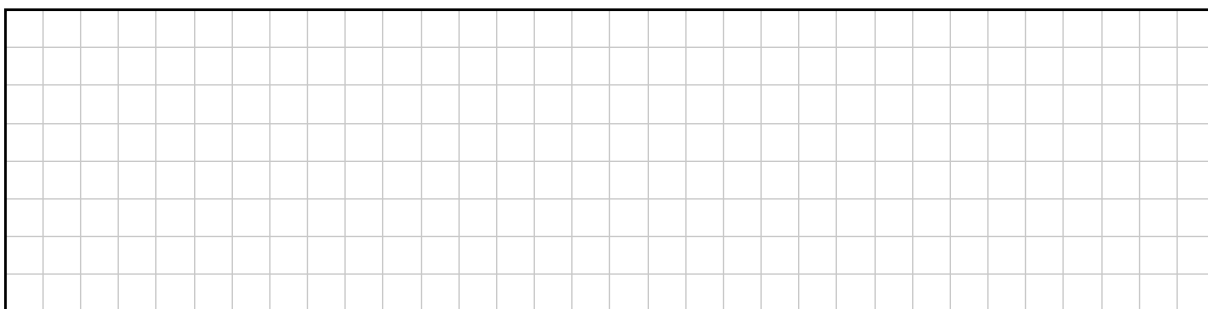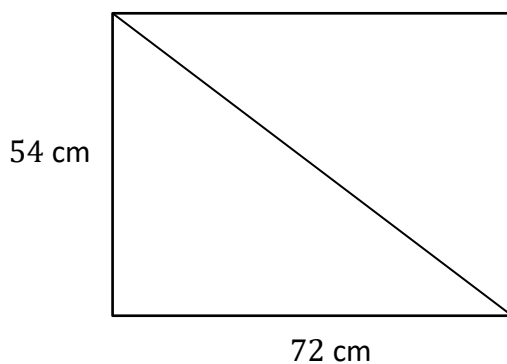
(b) The jigsaw is being made on a circular table where all four corners of the jigsaw are on the edge of the table, as shown in the diagram below.
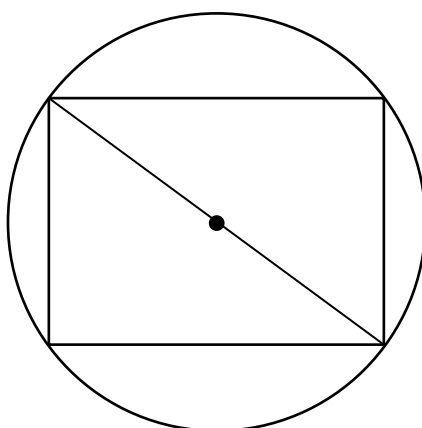
(i) Write down the radius of the circular table. Remember the diameter is 90 cm.

Radius = [ ] cm

(ii) Hence, work out the **area** of the circular table.
Give your answer correct to the nearest cm^2.
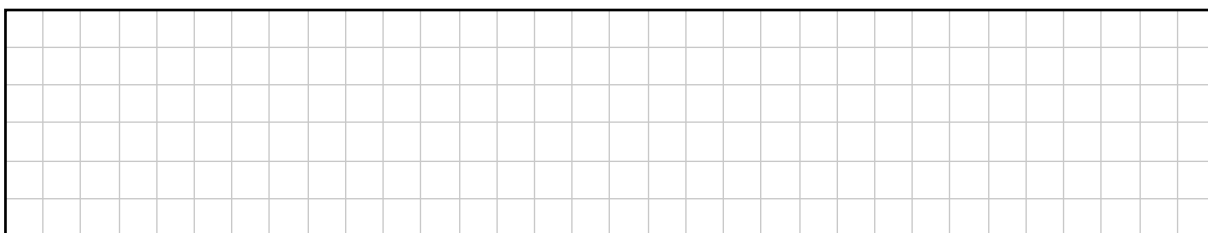
(c) Natalie was in America and she bought a jigsaw for $20.
The exchange rate was €1 = $1·07.

Find how much the jigsaw cost in euro.
Give your answer correct to 2 decimal places.
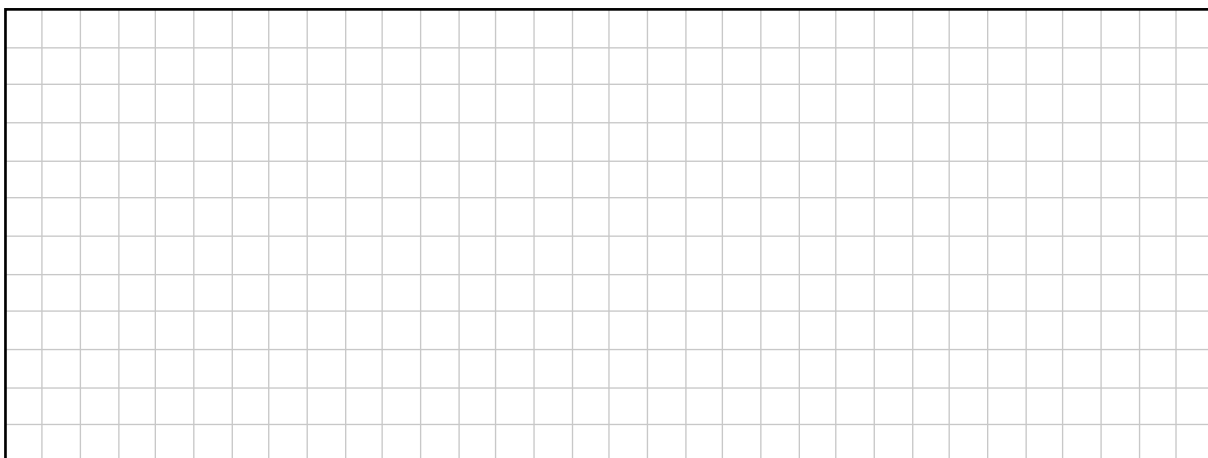
This question continues on the next page.

(d) Paul is making a jigsaw.

- In the first hour he makes $\frac{1}{8}$ of the jigsaw.
- In the second hour he makes $15 \cdot 3\%$ of the jigsaw.
- In the third hour he makes $0 \cdot 162$ of the jigsaw.

Find what **percentage** of the jigsaw he has made after three hours.

(e) Rían is making a different jigsaw. It has 500 pieces.
He knows that, on average, he can put together 24 pieces in 10 minutes.

Work out how long it will take him to complete the jigsaw.
Give your answer in **hours**, correct to 1 decimal place.
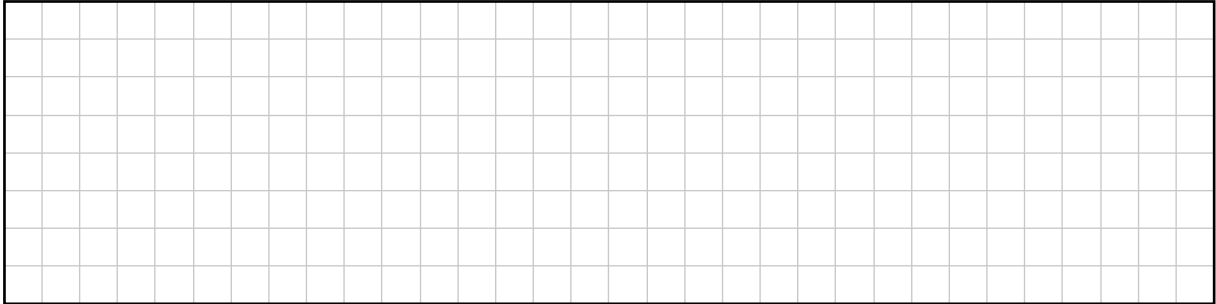
Question 10 (45 marks)

Marko works in a restaurant.
He gets paid at a rate of €14 per hour from Monday to Saturday.
In general, Marko works an 8-hour shift.
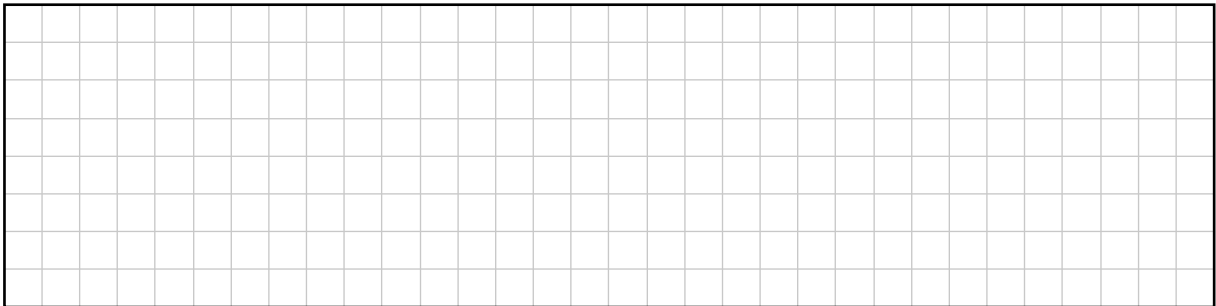
(a) **(i)** Work out how much Marko gets paid in total for an 8-hour shift.
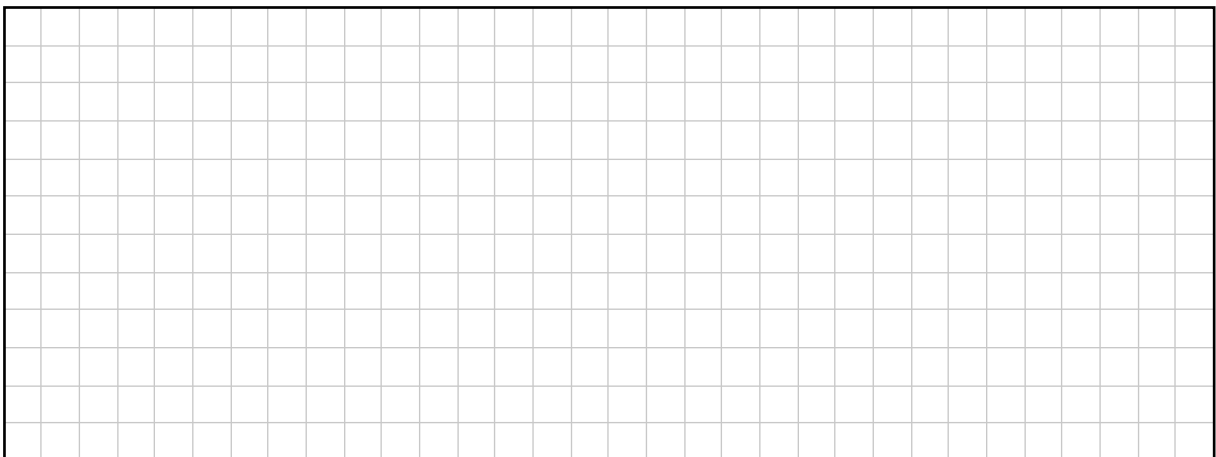
(ii) Marko gets paid 50% extra on a Sunday.
Find how much he gets paid **per hour** when he works on a Sunday.

(iii) One week, Marko works:

- **four** 8-hour shifts from Monday to Thursday, and

- **one** 6-hour shift on a Sunday.

Work out how much he earns for this week.
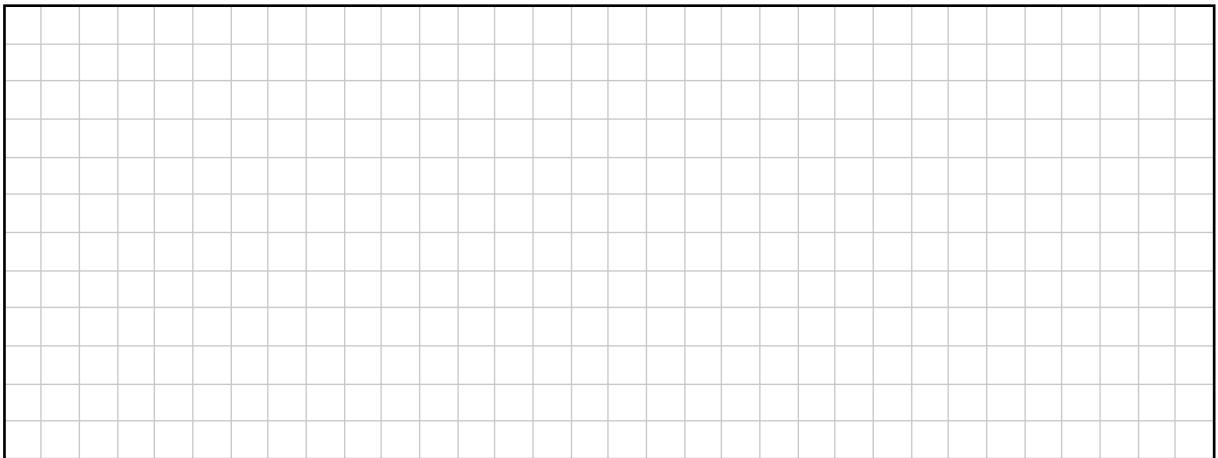
This question continues on the next page.

(b) On a different week, Marko earns a gross income of €609.
He pays income tax at the standard rate of 20%.

(i) Find Marko's gross tax for this week.

(ii) He has a tax credit of €68·27 per week.
Find his net pay for the week.

(c) Margaret is trying to estimate how much money she should give as a tip in the restaurant.
She ordered a starter, a main course and a dessert. The cost of each course is given below:

Starter	=	€10·70
Main course	=	€18·95
Dessert	=	€6·20

She rounds the cost of each course to the nearest euro and adds them together.
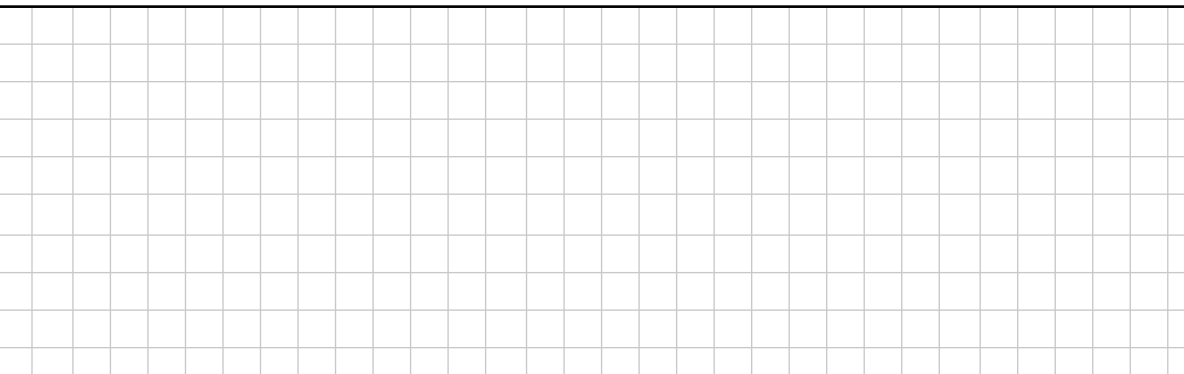
(i) By rounding each to the nearest euro, work out the **total** Margaret gets.

Starter		Main course		Dessert		Total
	+		+		=	

(ii) Margaret decides to give a tip of 15% of the total from **part (c)(i)**.

Find how much Margaret gives **as a tip**.

Question 11   **(45 marks)**

(a) Donagh has three new combination locks.
Each lock has a four-digit code.
He sets a different four-digit code to open each of the locks.

    (i) The first code is the factors of 6 from the lowest to the highest.
Write the code into the boxes provided.

    (ii) The second code is the first two positive multiples of 27.
Write the code into the boxes provided.

    (iii) The final code is the value of 19^3.
Write the code into the boxes provided.
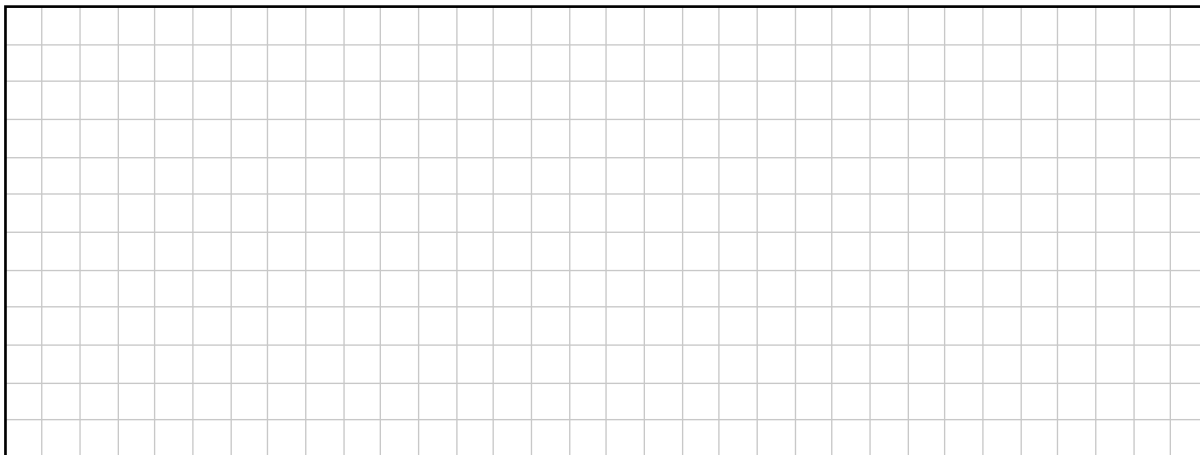
(b) Nadia puts an ice pack in a freezer.

The temperature of the freezer is $-19°C$.
The temperature of the ice pack now is $17°C$.
The temperature in the ice pack will decrease by $9°C$ per hour.

Work out how many hours it will take for the temperature of the ice pack to reach $-19°C$.

This question continues on the next page.

(c) Aaron is playing in a game where a new scoring system is being trialled.
In the new scoring system you can either score a goal for **G** points or a behind for **B** points.

Aaron scored 3 goals and 2 behinds in the game. He wrote his score as:

$$3\,\mathbf{G} + 2\,\mathbf{B}$$

(i) Tom scored 2 goals and 5 behinds in the game.
Write Tom's score in terms of **G** and **B**.

(ii) A goal (**G**) is worth 7 points and a behind (**B**) is worth 2 points.
Work out who scored more points in the game, Aaron or Tom.
Use calculations to support your answer.

Scored more points: Aaron   Tom
(Tick (✔) **one** box only)   ☐   ☐

Calculations:

(d) Miah is kicking a ball where she is aiming at the point **G**.

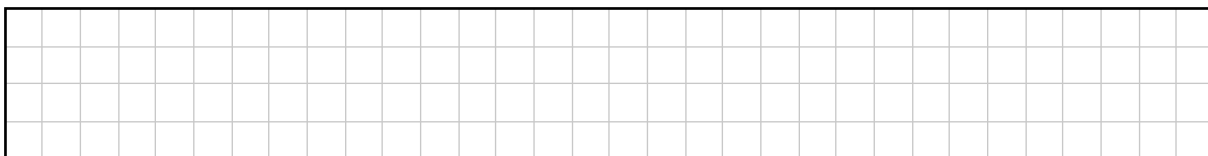Some lengths are shown in the diagram.
The angle X is also shown.

(i) Miah wants to find the size of the angle X.
Fill in the table to show which length is opposite to the
angle X and which length is adjacent to the angle X.

G   4 m

16 m

X

Miah

	Lengths (16 m or 4 m)
Opposite to X	
Adjacent to X	
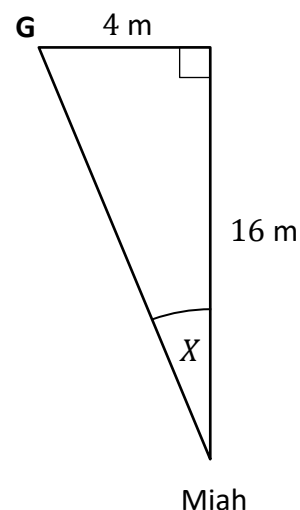
(ii) Use the lengths from **part (d)(i)** to find the value of $\tan X$.

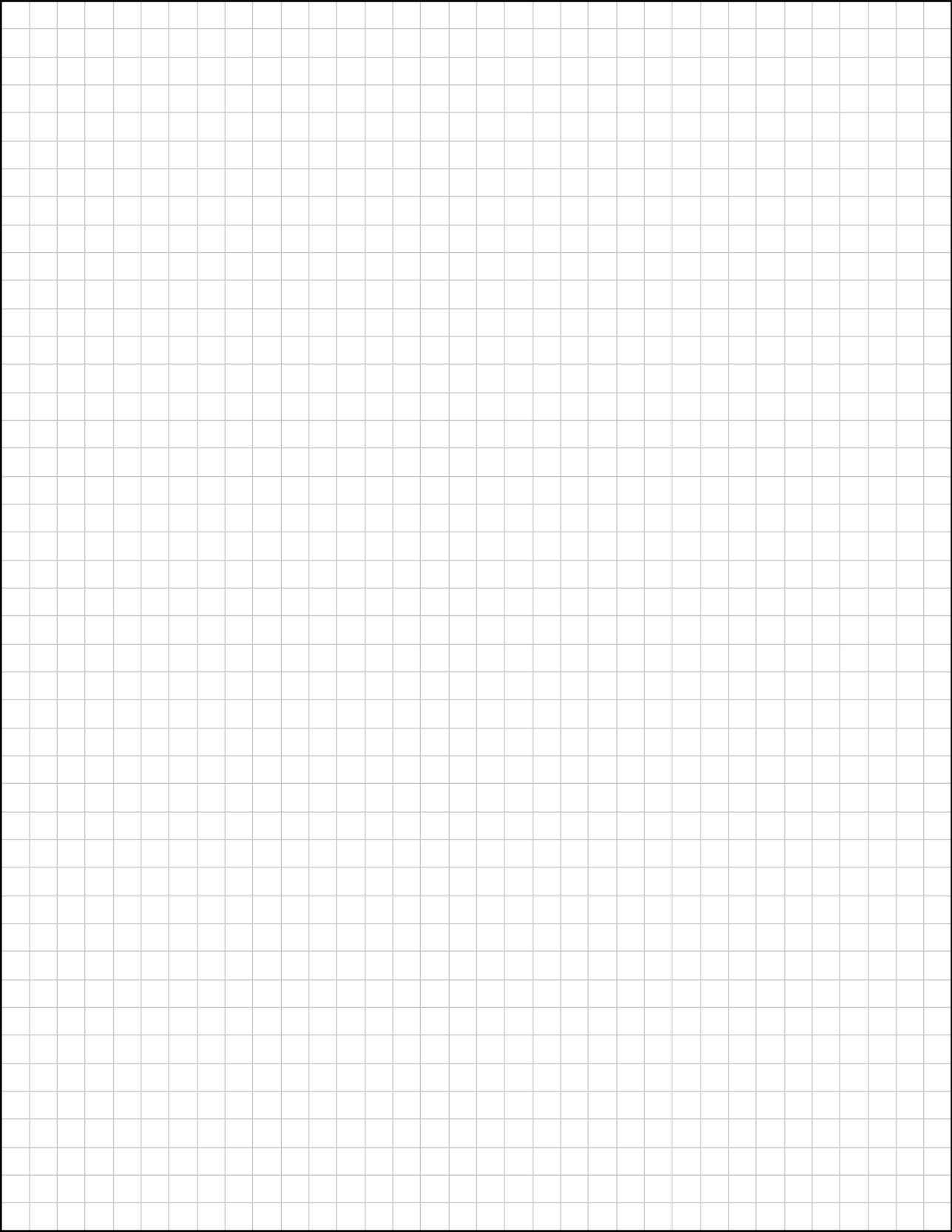$$\tan X = \frac{\boxed{}}{\boxed{}}$$

(iii) Hence, find the size of the angle X.
Give your answer correct to the nearest degree.
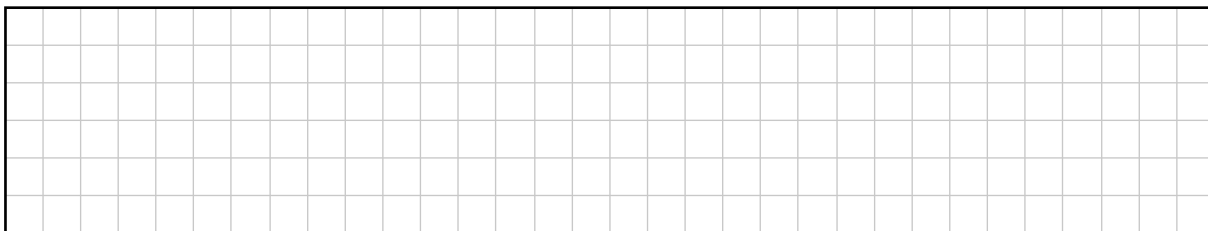
Page for extra work.
Label any extra work clearly with the question number and part.

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Leaving Certificate – Foundation Level

Mathematics

Friday 7 June

Afternoon 2:00 - 4:30