



Coimisiún na Scrúduithe Stáit  
State Examinations Commission

# Junior Cycle Final Examination Sample Paper

## Mathematics

Ordinary Level

2 hours

270 marks

**Examination Number**

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**Day and Month of Birth**

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For example, 3rd February  
is entered as 0302

**Centre Stamp**

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## 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 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 your answers into this booklet. There is space for extra work at the back of the booklet. 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.

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 3**

(Suggested maximum time: 10 minutes)

Camille uses sticks to make a sequence of patterns.  
The first 3 patterns in her sequence are shown below.



**Pattern 1**



**Pattern 2**



**Pattern 3**

(a) Draw Pattern 4 in the sequence.

(b) Fill in the table below to show the number of **triangles** in each of the first five patterns.  
One is already done for you.

Pattern	Number of triangles
1	
2	3
3	
4	
5	

- (c) What kind of sequence is made by the number of **triangles** in each pattern?  
Tick (✓) **one** box only. Give a reason for your answer.

linear

non-linear

Reason:

- (d) One pattern has exactly 21 triangles.  
Tick the correct box to show which pattern this is. Show your working out.

The pattern with 21 triangles is:

(tick (✓) **one** box only)

Pattern 11

Pattern 21

Pattern 41

Working out:

- (e) There are also parallelograms in these patterns.  
The number of parallelograms in Pattern  $n$  is:

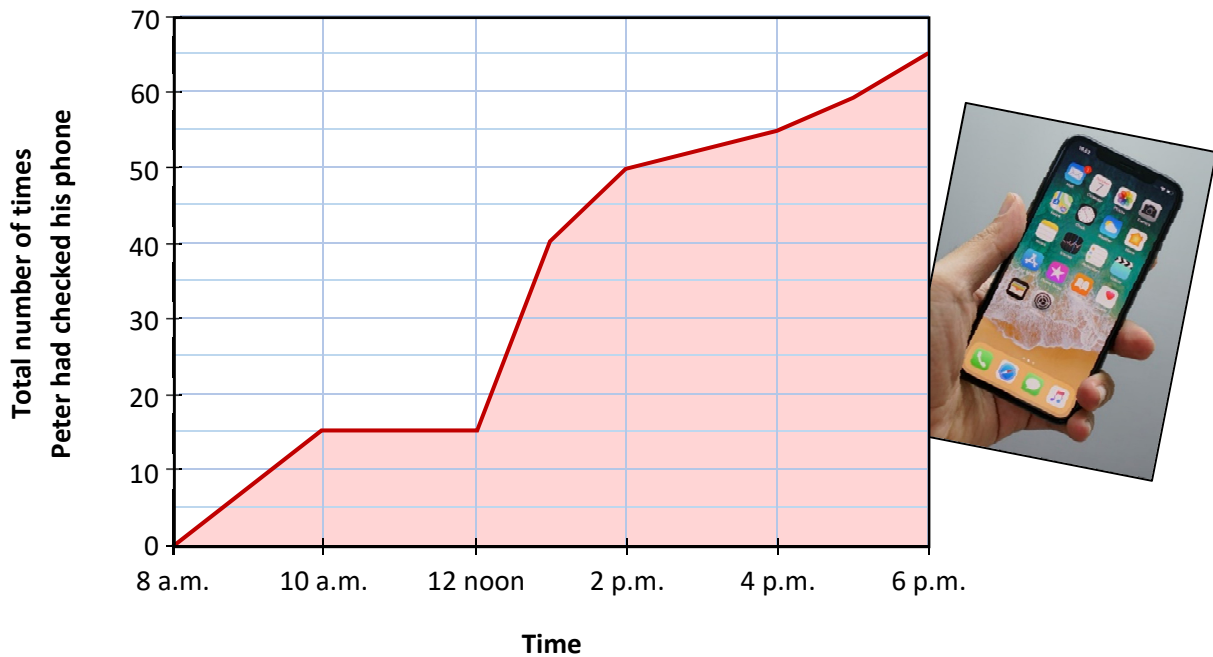
$$n^2 - n$$

Use this to work out the number of parallelograms in Pattern 30 (when  $n = 30$ ).

**Question 4**

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

The graph below shows the total number of times Peter checked his phone from 8 a.m. to 6 p.m. on a given day. For example, by 6 p.m. Peter had checked his phone a total of 65 times.



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

(i) By 2 p.m., the total number of times Peter had checked his phone was:

- |                          |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|--------------------------|
| 15                       | 40                       | 50                       | 55                       |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

(ii) Peter did **not** check his phone at all from:

- |                          |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|--------------------------|
| 10 – 12 noon             | 12 – 2 p.m.              | 2 – 4 p.m.               | 4 – 6 p.m.               |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |

(iii) Peter checked his phone **most often** from:

- |                          |                          |                          |                          |
|--------------------------|--------------------------|--------------------------|--------------------------|
| 10 – 12 noon             | 12 – 2 p.m.              | 2 – 4 p.m.               | 4 – 6 p.m.               |
| <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |







- (e) One student is picked at random from the  $3x + 25$  students who study German.

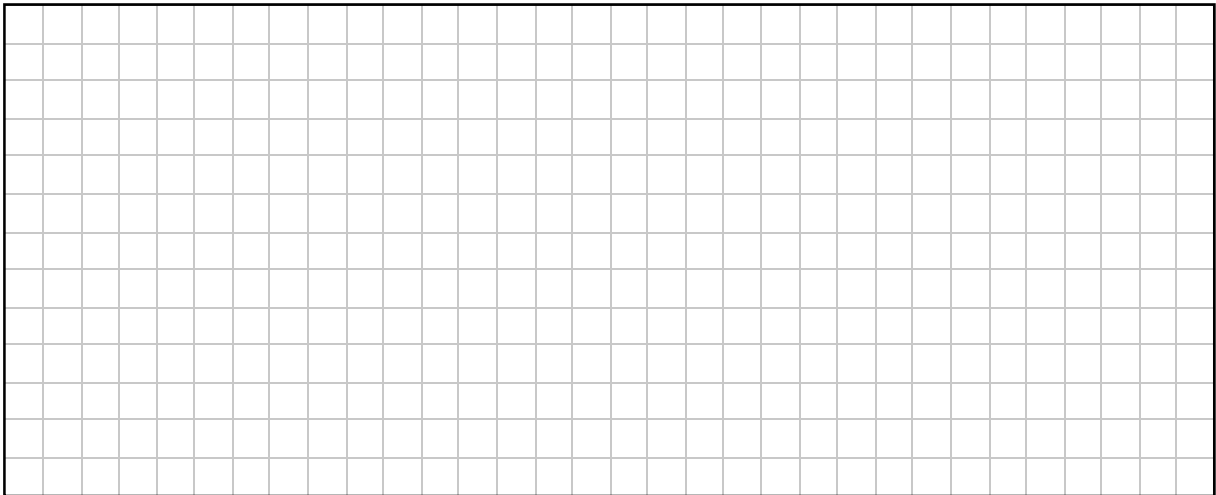
Write down the **probability** that this student also studies French.  
Give your answer as a fraction, in terms of  $x$ .

Probability = 


- (f) Kate finds out that there are 141 students in total in her year.  
She writes the following equation in  $x$ :

$$68 + 3x + 25 + x = 141$$

Work out the value of  $x$ .

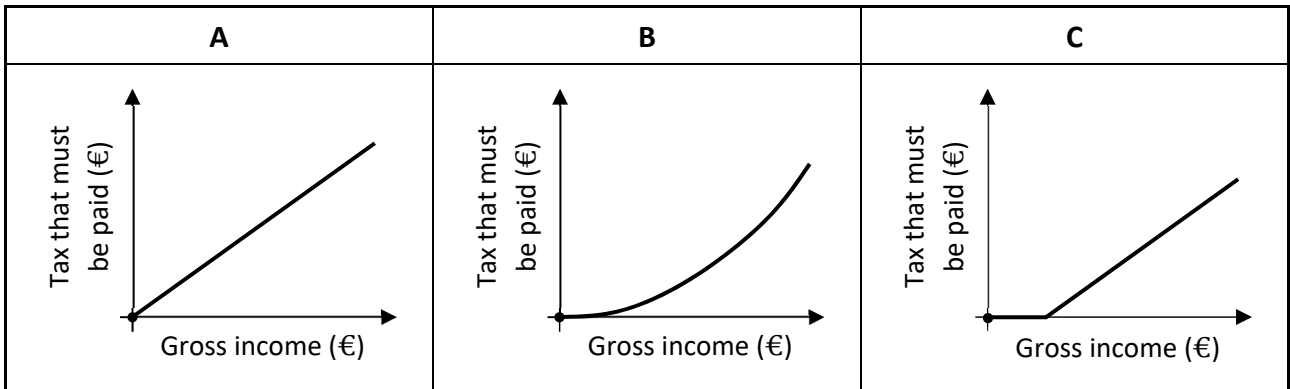




**Question 7**

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

The table below shows the three graphs **A**, **B**, and **C**. Each graph shows the tax that someone must pay depending on their gross income. Each graph begins at (0, 0).

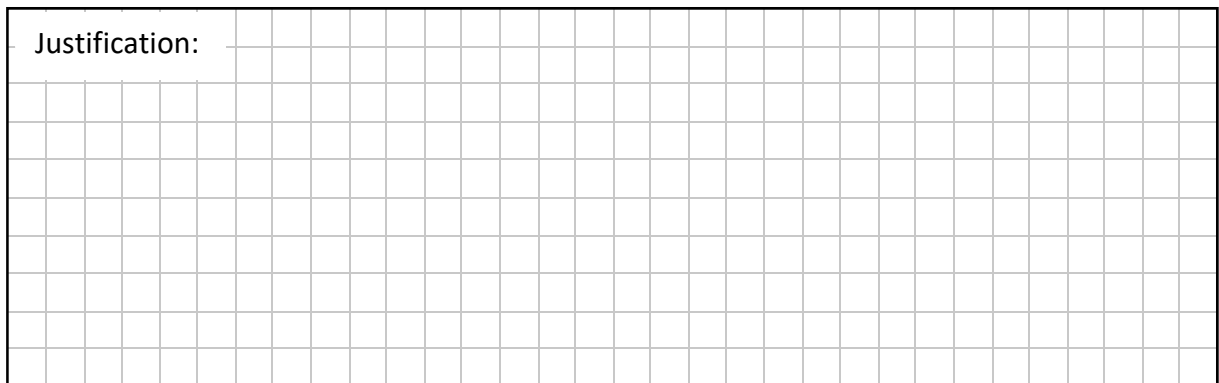


Jean's tax rate is 20% of her gross income. She has a tax credit of €3000.

Which graph shows the tax that Jean must pay depending on her gross income, taking her tax credit into account? Tick (✓) **one** box only. Justify your answer.

<b>A</b> <input type="checkbox"/>	<b>B</b> <input type="checkbox"/>	<b>C</b> <input type="checkbox"/>
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Justification:

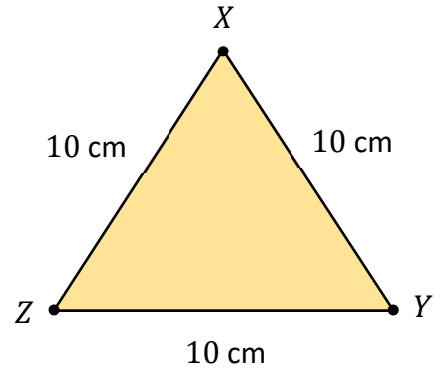
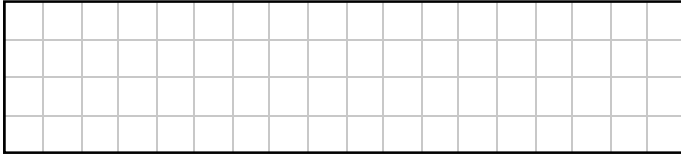

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**Question 8**

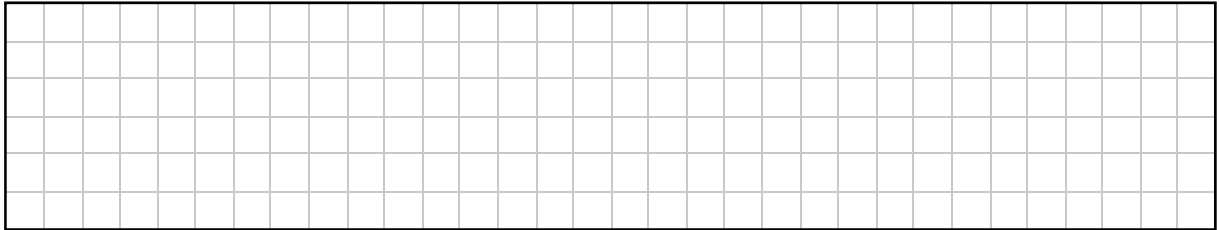
(Suggested maximum time: 15 minutes)

An **equilateral** triangle  $XZY$  has sides of length 10 cm.

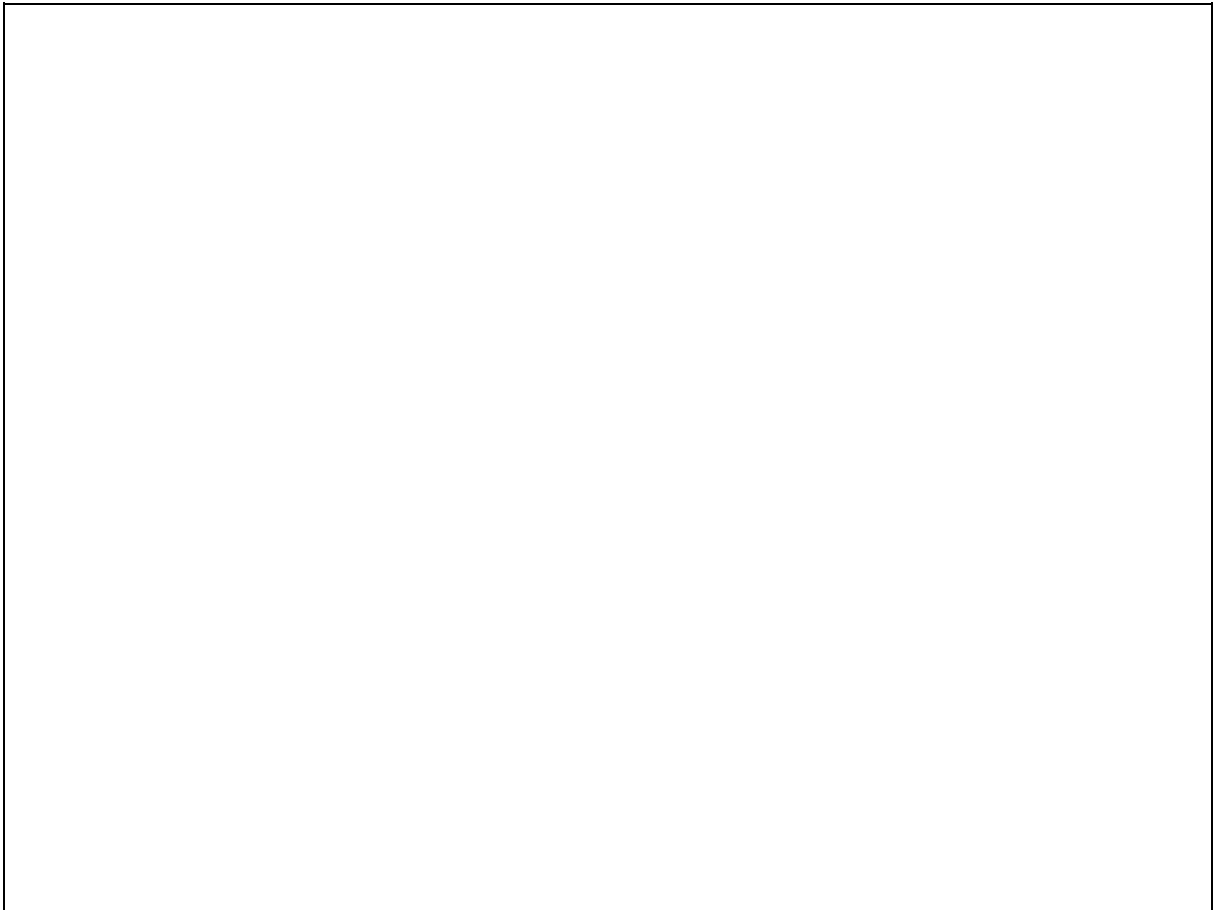
- (a) Write down the size of each **angle** in the triangle.



- (b) Work out the length of the **perimeter** of the triangle  $XZY$ . Give your answer in cm.

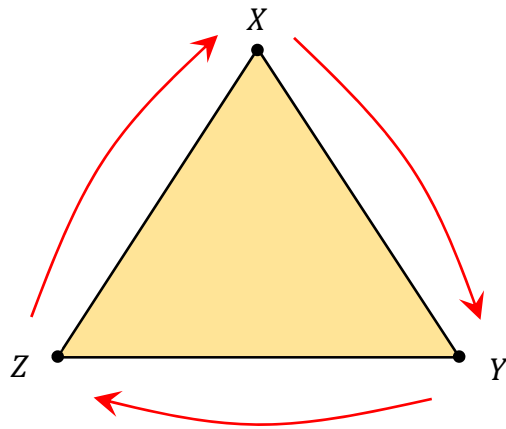


- (c) **Construct** the triangle  $XZY$  in the space below. Show all of your construction lines clearly.



(d) Maria plays a game using the triangle  $XZY$ . She starts with a counter at the point  $X$ . She flips a coin and moves the counter around the triangle in the direction  $XYZ$ , as shown in the diagram below, using the following rule:

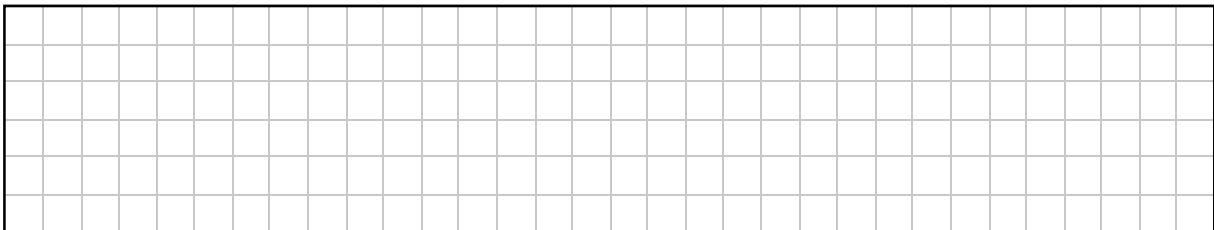
- if she gets **heads (H)**, she moves the counter along 1 side of the triangle (e.g.  $X$  to  $Y$ )
- if she gets **tails (T)**, she moves the counter along 2 sides of the triangle (e.g.  $X$  to  $Z$ )



Maria's first 4 flips of the coin are **H H H T**.

Fill in the table below to show which point the counter is at after each flip of the coin. Some are already done for you.

	Outcome of flip (H or T)	Number of sides the counter moves	After this flip, the counter is at:
Start			$X$
1st flip	H	1	$Y$
2nd flip	H		$Z$
3rd flip	H	1	
4th flip	T		



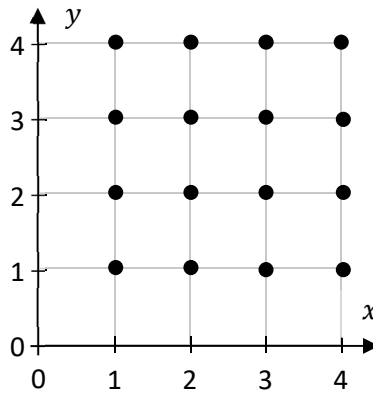




**Question 10**

(Suggested maximum time: 5 minutes)

In the co-ordinate diagram below, 16 points are marked with a dot (●).

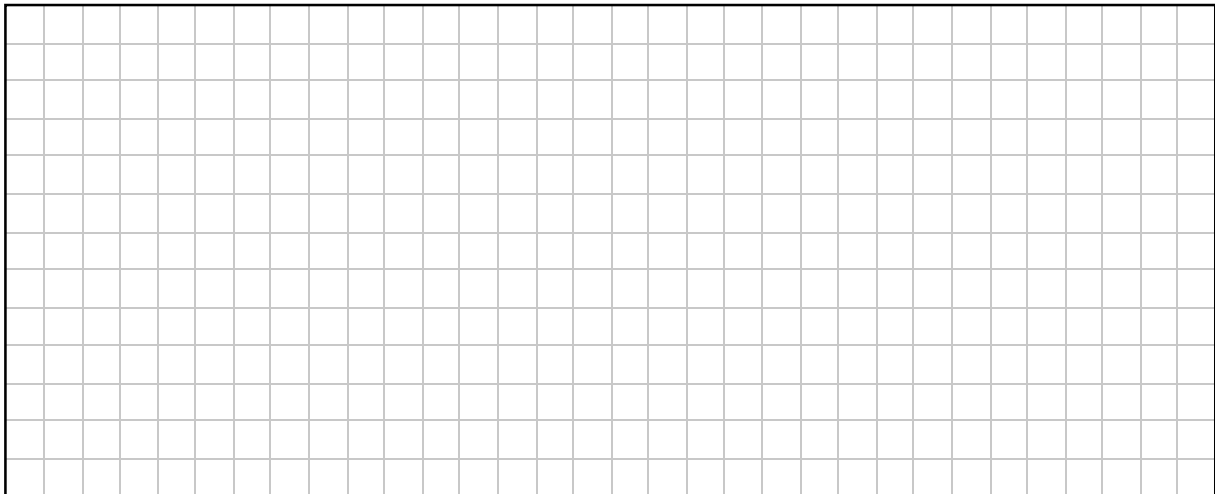


Louise picks 1 point at random from the 16 points marked with a dot in the diagram. She then finds the equation of the line that goes through this point and through (0, 0).

Find the **probability** that Louise's line has a slope that is **greater than 1**.

Probability = 

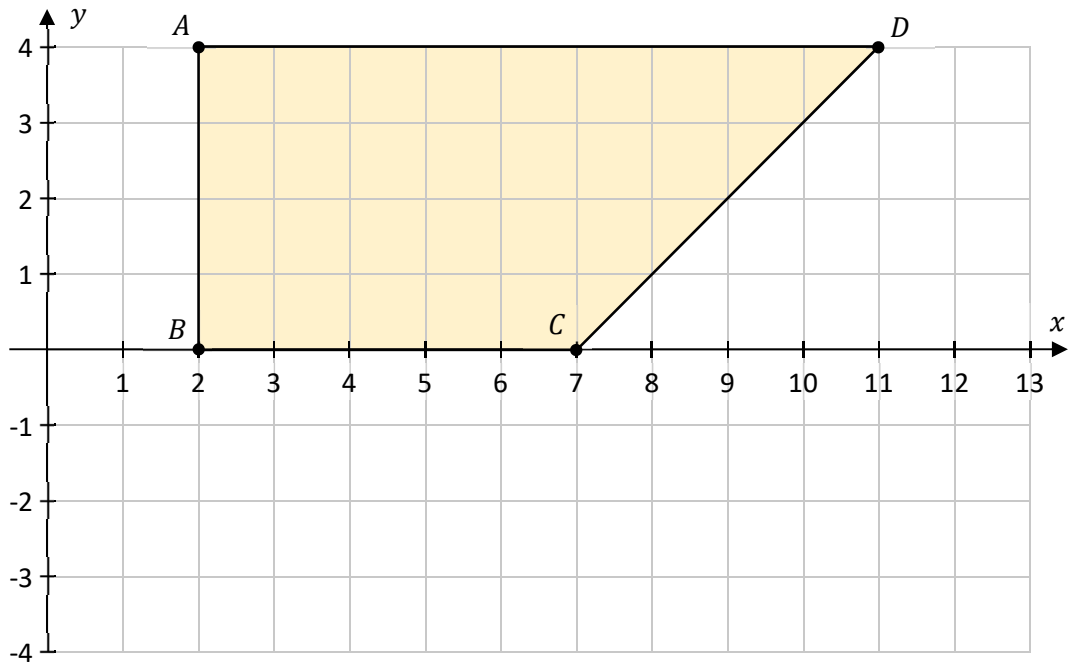
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**Question 11**

(Suggested maximum time: 10 minutes)

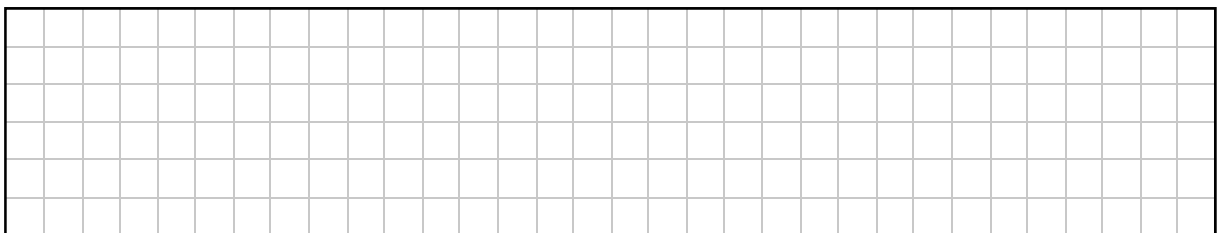
The quadrilateral  $ABCD$  is shown in the co-ordinate diagram below.



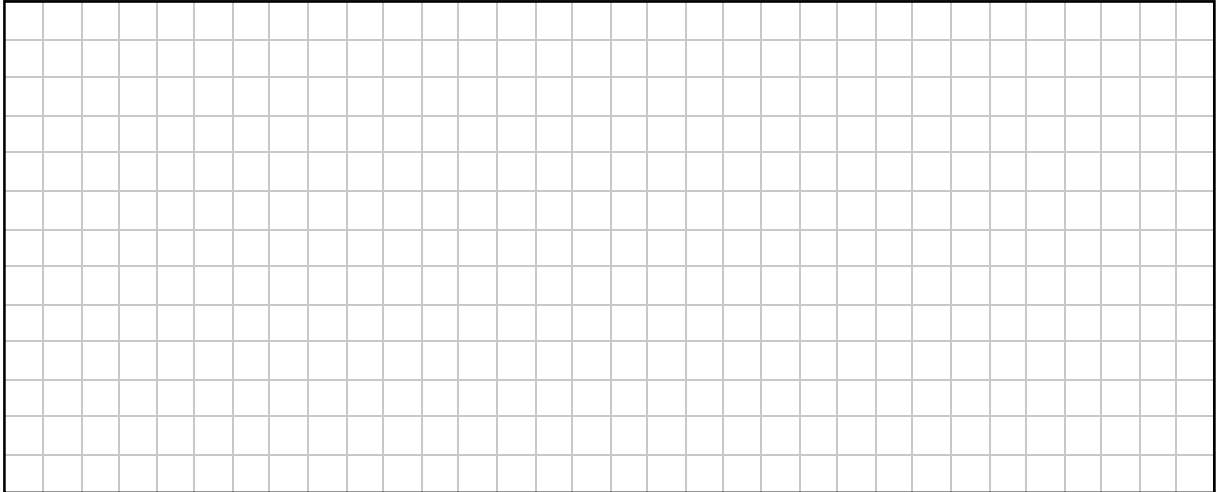
- (a) Complete the table below to show the co-ordinates of the four corners of  $ABCD$ .

Point	$A$	$B$	$C$	$D$
Co-ordinates	$(2, 4)$	$(2, 0)$	$( \quad , \quad )$	$( \quad , \quad )$

- (b) On the diagram above, draw the image of  $ABCD$  under **axial symmetry** in the  $x$ -axis.



- (c) Work out the **area** of the shape  $ABCD$ .  
To do this, you might need to find the area of a rectangle and a triangle.

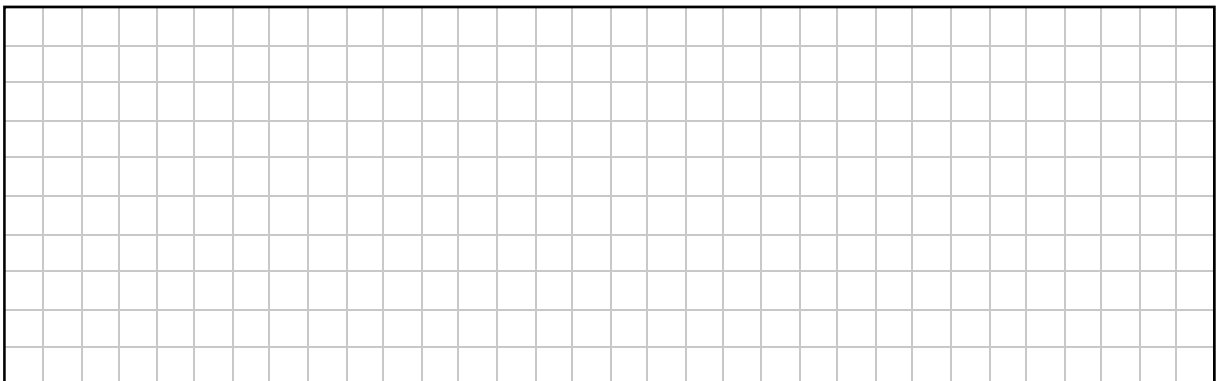


- (d) The perimeter of  $ABCD$  is made up of these four line segments:

[ $AB$ ]            [ $BC$ ]            [ $CD$ ]            [ $AD$ ]

Write each line segment from the list above into the correct place in the table below, to match each line segment to its equation. Use each line segment only once.  
[ $BC$ ] is already done for you.

Equation	Line segment
$x = 2$	
$y = 0$	[ $BC$ ]
$y = 4$	
$y = x - 7$	



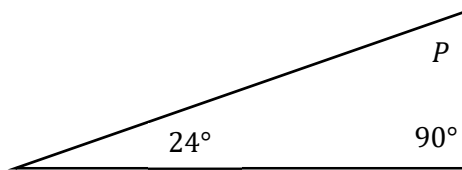
**Question 12**

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

The photograph below shows a house.



Part of the roof of this house is shown in the diagram below. One angle is marked  $P$ .



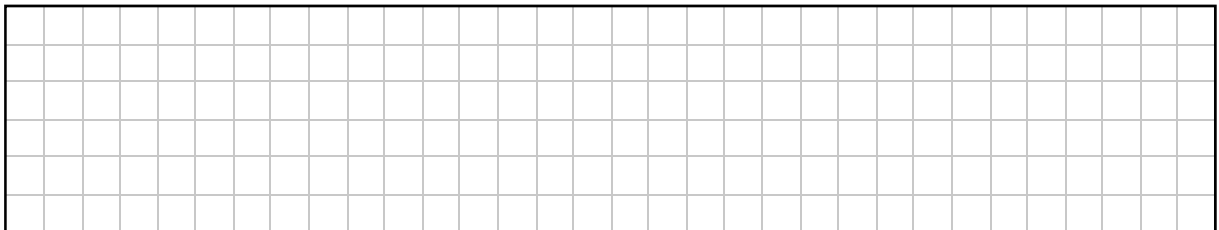
- (a)** What kind of angle is  $24^\circ$ ?  
Tick (✓) **one** box only.

obtuse

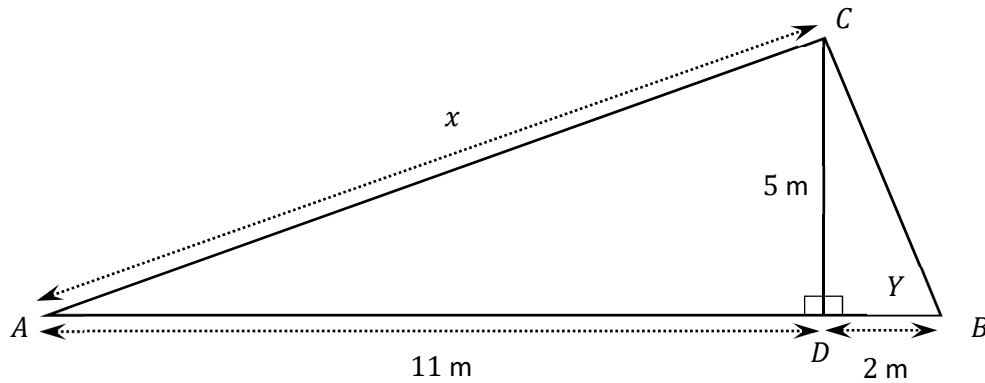
acute

reflex

- (b)** Work out the size of the angle  $P$ .



The diagram below shows more of the roof of this house.  
 $AB$  is perpendicular to  $DC$ . The lengths of some of the sides are shown on the diagram.  
Note:  $\angle ACB$  is **not** a right angle.



- (c) Use the theorem of **Pythagoras** to work out the length  $x$ .  
Give your answer in metres, correct to one decimal place.

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- (d)  $Y$  is one of the angles in the triangle  $DBC$ .

- (i) Write down the length of the side opposite  $Y$  and the side adjacent to  $Y$  in  $DBC$ .

Opposite  $Y =$

Adjacent to  $Y =$

- (ii) Use your answer from part (c)(i) to write  $\tan Y$  as a fraction.

$\tan Y =$ 


- (iii) Hence, use a calculator to find the size of the angle  $Y$ , correct to the nearest degree.

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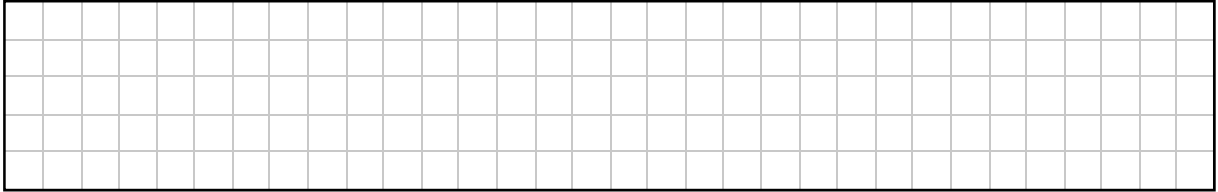
**Question 13**

(Suggested maximum time: 5 minutes)

Maryam writes down the following 6 numbers, where  $A \in \mathbb{N}$  and  $A \geq 20$  :

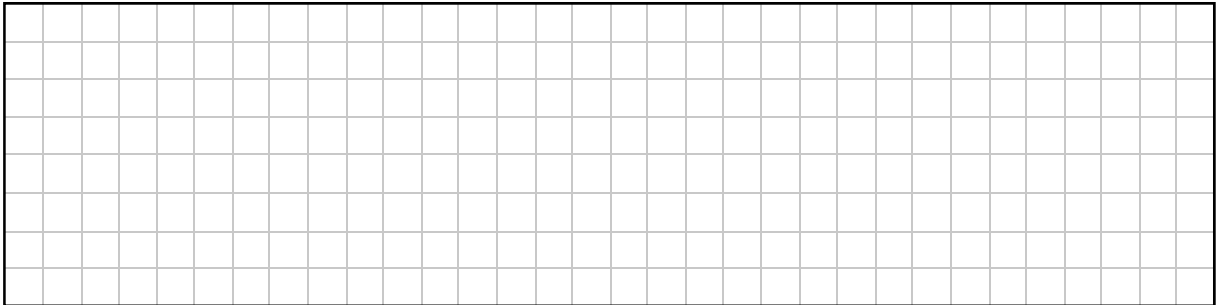
$$11, 11, 12, 18, 19, A$$

- (a) Work out the **median** of Maryam’s 6 numbers.



- (b) Maryam works out the **mean** of the 6 numbers.  
She then **increases** the value of  $A$  by 60.

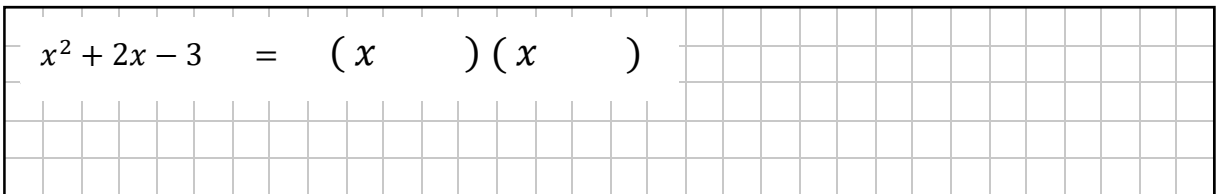
What will this increase do to the mean of the 6 numbers?



**Question 14**

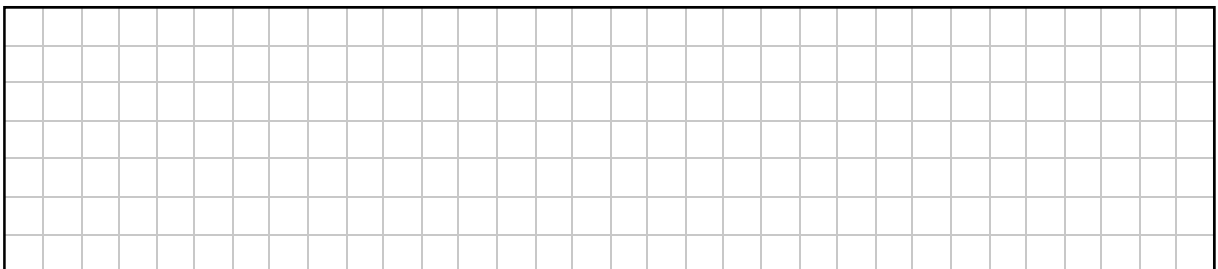
(Suggested maximum time: 5 minutes)

- (a) Factorise the quadratic expression  $x^2 + 2x - 3$  .



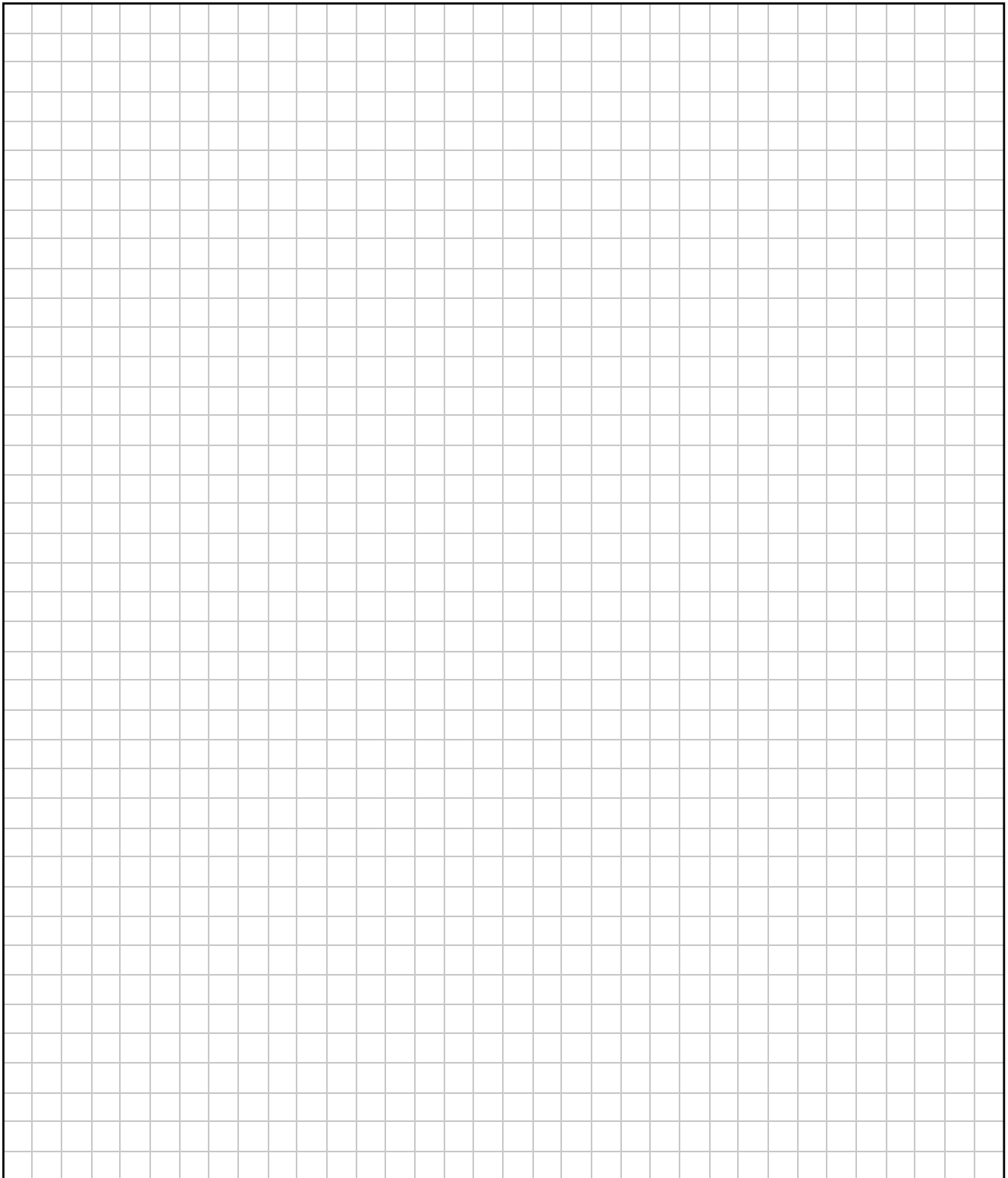
$x^2 + 2x - 3 = (x \quad)(x \quad)$

- (b) Factorise fully  $3ps - pr + 3qs - qr$  .



Page for extra work.

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



**Acknowledgements**

Image on page 8: Bagus Hernawan, [www.unsplash.com](http://www.unsplash.com)

Image on page 12: [www.activekids.com](http://www.activekids.com)

Image on page 20: [www.interiordesign.net](http://www.interiordesign.net)

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Junior Cycle Final Examination Sample Paper – Ordinary Level

**Mathematics**

2 hours