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MATHEMATICS

0580/31

Paper 3 (Core)

May/June 2023

2 hours

You must answer on the question paper.

You will need: Geometrical instruments

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You should use a calculator where appropriate.
- You may use tracing paper.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π , use either your calculator value or 3.142.

INFORMATION

- The total mark for this paper is 104.
- The number of marks for each question or part question is shown in brackets [].

This document has **20** pages. Any blank pages are indicated.

- 1 (a) Write the number forty thousand and thirty-three in figures.

..... [1]

- (b) Find the value of $\sqrt[3]{729}$.

..... [1]

- (c) Find the reciprocal of $\frac{7}{9}$.

Give your answer as a decimal, correct to 3 decimal places.

..... [2]

- (d) Find the value of $6^5 \div 3^4$.

..... [2]

- (e) Work out $(-9) \times (-7) \div (-3)$.

..... [1]

- (f) Work out.

(i) $11 + 9 \times 5 - 4$

..... [1]

(ii) $(11 + 9) \times 5 - 4$

..... [1]

- (g) -0.67 $\sqrt{123}$ $\sqrt{49}$ $\frac{5}{9}$ 3.142

From this list, write down an irrational number.

..... [1]

- (h) (i) Find the lowest common multiple (LCM) of 24 and 104.

..... [2]

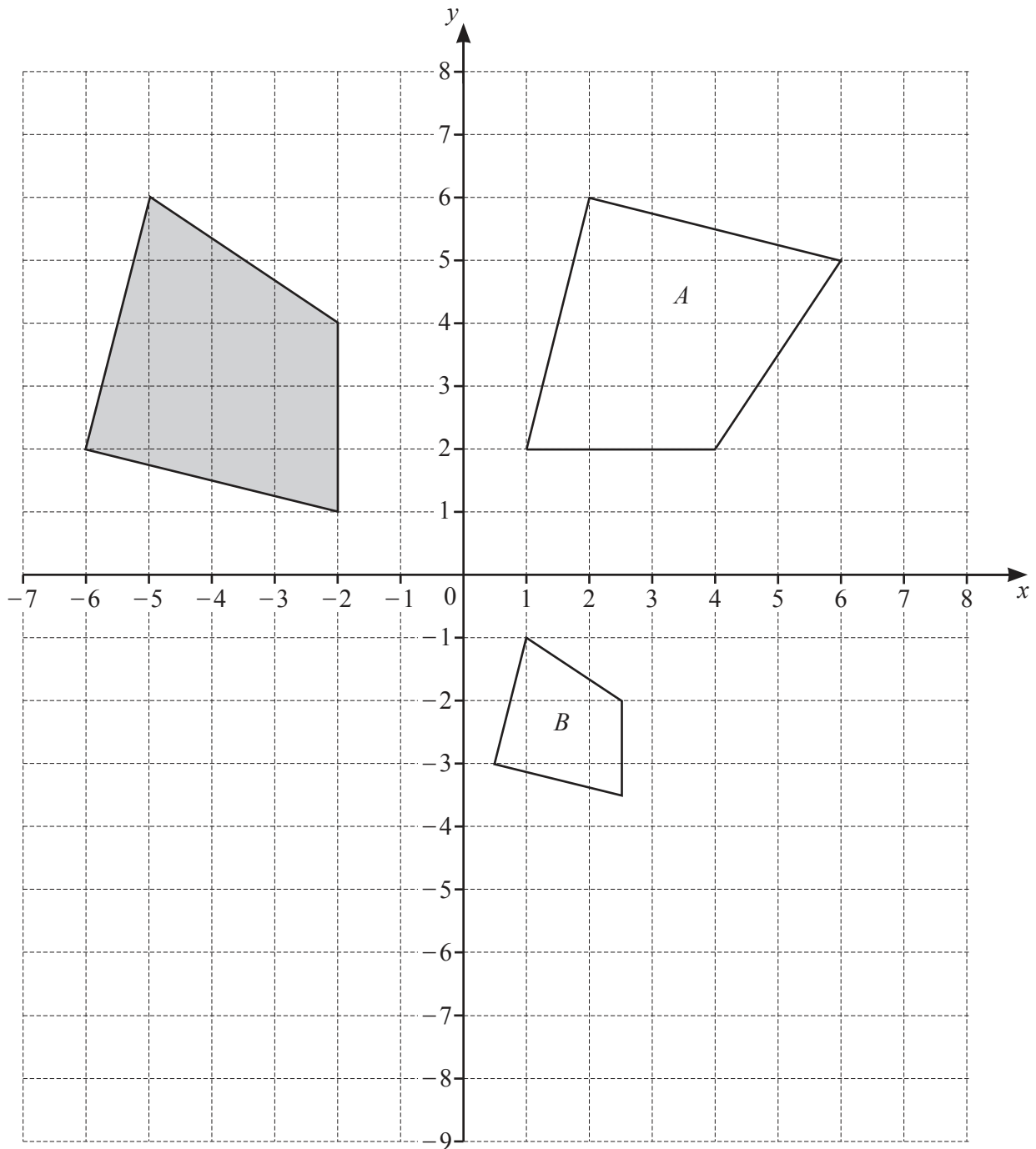
- (ii) Find the highest common factor (HCF) of 24 and 104.

..... [2]

- 2 (a) Complete this statement.

The mathematical name of any polygon with 4 sides is a [1]

- (b) Three of these shapes are shown on the grid.



Describe fully the **single** transformation that maps

- (i) the shaded shape onto shape A

.....
 [3]

- (ii) the shaded shape onto shape B .

.....
 [3]

- (c) On the grid, draw the image of

- (i) the shaded shape after a translation by the vector $\begin{pmatrix} 9 \\ -6 \end{pmatrix}$ [2]

- (ii) the shaded shape after a reflection in the line $y = -1$. [2]

3 These are the test scores of 16 students.

15 26 9 45 36 20 41 39
40 23 32 18 41 34 37 31

(a) Complete the stem-and-leaf diagram.

0	
1	
2	
3	
4	

Key: 1|5 represents 15

[2]

(b) Find the mode.

..... [1]

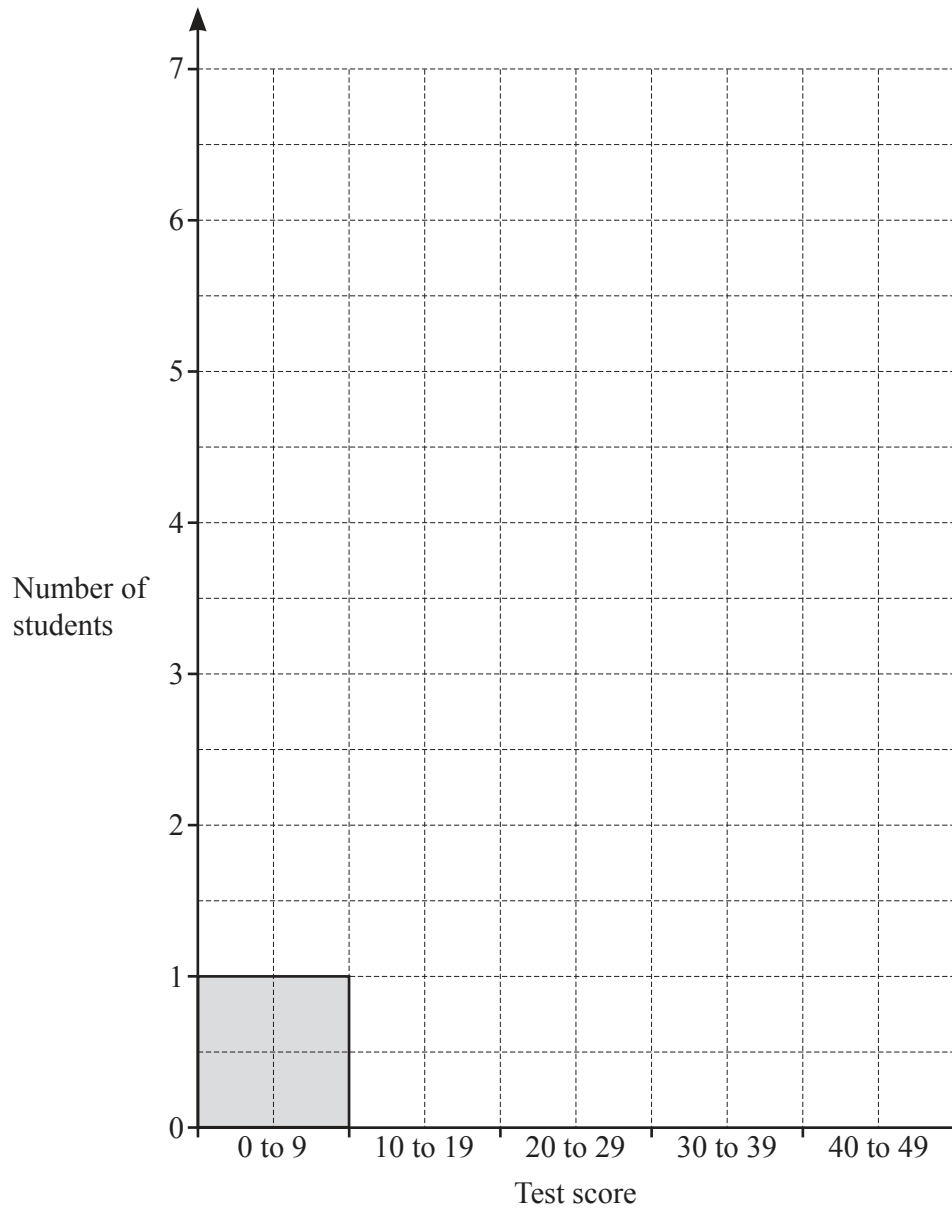
(c) Find the median.

..... [1]

(d) Find the range.

..... [1]

(e) Complete the bar chart for the test scores of the 16 students.

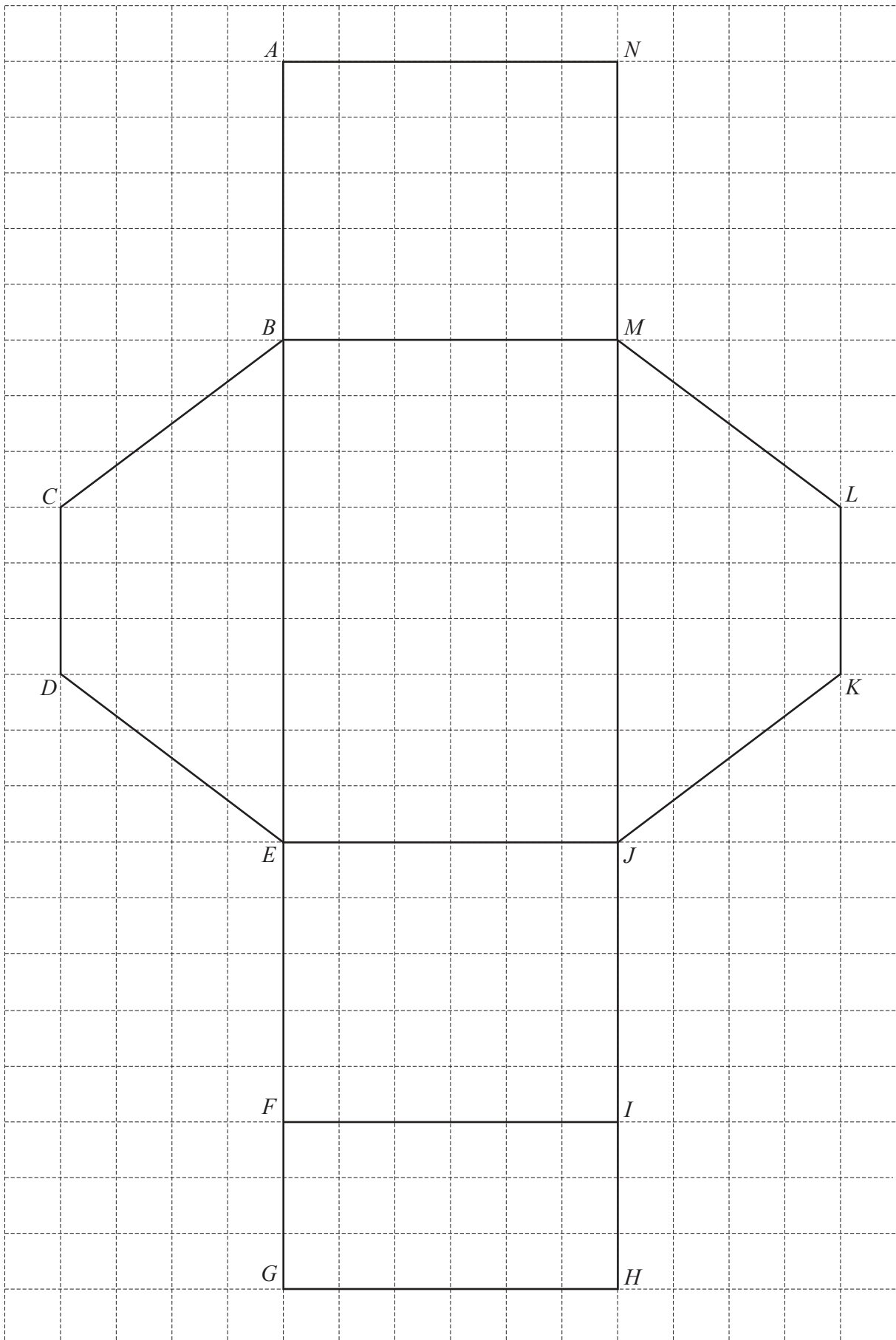


[2]

(f) Work out the percentage of students with a test score of 40 or more.

..... % [1]

- 4 (a) The diagram shows the net of a solid on a 1 cm^2 grid.



- (i) When the net is folded to make the solid, point C will join with point A .

Write down which other point will join with point A .

..... [1]

- (ii) Calculate the total surface area of the solid.

..... cm^2 [3]

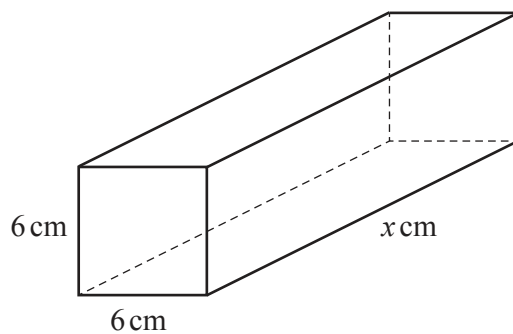
- (iii) Complete this statement.

The solid is a with the cross-section in the shape of a [2]

- (iv) Draw a sketch of the solid.

[1]

(b)



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The diagram shows a cuboid.
The volume of the cuboid is 540 cm^3 .

Calculate the value of x .

$x =$ [2]

- 5** Antonio buys a restaurant for \$240 000.

This is $\frac{5}{8}$ of the amount he has available to spend.

- (a)** Show that he has \$144 000 left after buying the restaurant.

[2]

- (b)** Some of the \$144 000 is spent on expenses.
Expenses are wages, equipment and supplies in the ratio

$$\text{wages : equipment : supplies} = 9 : 5 : 8.$$

The amount spent on wages is \$45 000.

- (i)** Find the amount spent on

- (a)** equipment

\$ [2]

- (b)** supplies.

\$ [1]

- (ii)** Work out the amount Antonio has left now.

\$ [2]

- (c) Antonio borrows \$25 400 for 6 years at a rate of 5% per year simple interest.

Calculate the total amount he repays at the end of the 6 years.

\$ [3]

- (d) In one week, the number of customers in the restaurant was 560.
In the next week, the number of customers in the restaurant was 656.

Calculate the percentage increase.

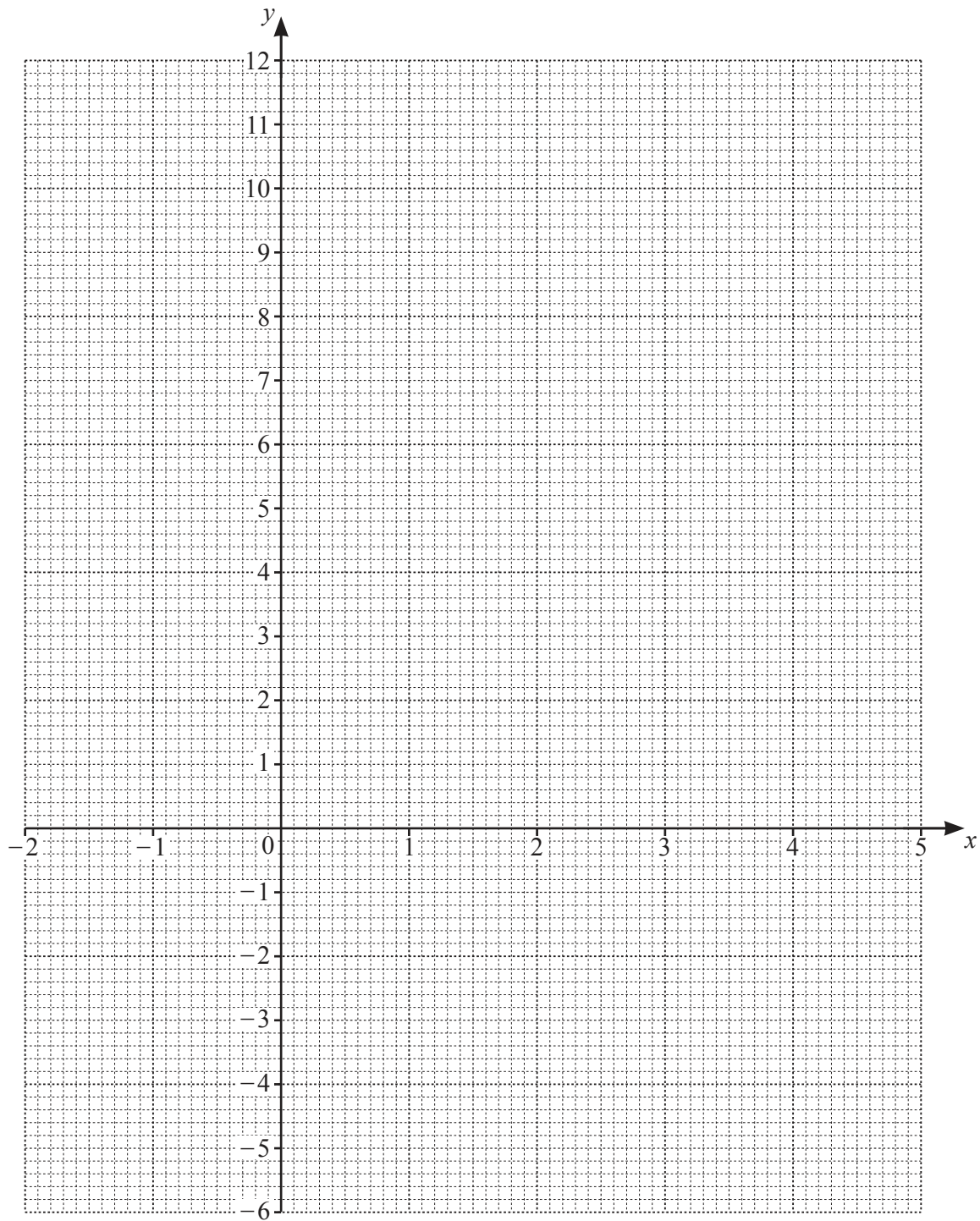
..... % [2]

- 6 (a) Complete the table of values for $y = 5 + 3x - x^2$.

x	-2	-1	0	1	2	3	4	5
y		1			7			-5

[3]

- (b) On the grid, draw the graph of $y = 5 + 3x - x^2$ for $-2 \leq x \leq 5$.



[4]

- (c) Write down the equation of the line of symmetry of the graph.

..... [1]

- (d) (i) Complete the table of values for $y = 2x + 1$.

x	-1	0	2
y			

[2]

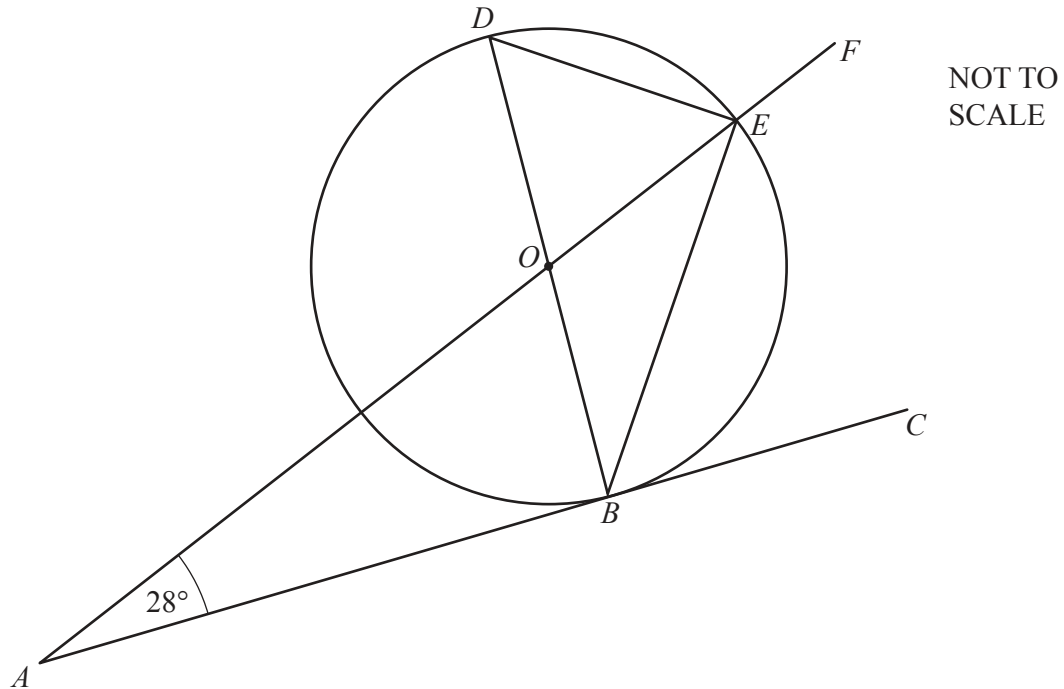
- (ii) On the grid, draw the graph of $y = 2x + 1$ for $-2 \leq x \leq 5$.

[1]

- (e) Write down the coordinates of the two points where the two graphs intersect.

(..... ,) and (..... ,) [3]

7 (a)



The diagram shows a circle, centre O , with points B , D and E on the circumference.

$AOEF$ is a straight line.

The straight line AC touches the circle at B .

(i) Write down the mathematical name for

(a) line BOD

..... [1]

(b) line ABC .

..... [1]

(ii) Write down the two geometrical reasons why angle AOB is 62° .

.....

and [2]

(iii) Give the geometrical reason why angle DOE is also 62° .

..... [1]

(iv) (a) Find angle DEB .

Angle $DEB = \dots\dots\dots$ [1]

(b) Find angle ODE .

Angle $ODE = \dots\dots\dots$ [2]

(c) Find angle BEF .

Angle $BEF = \dots\dots\dots$ [2]

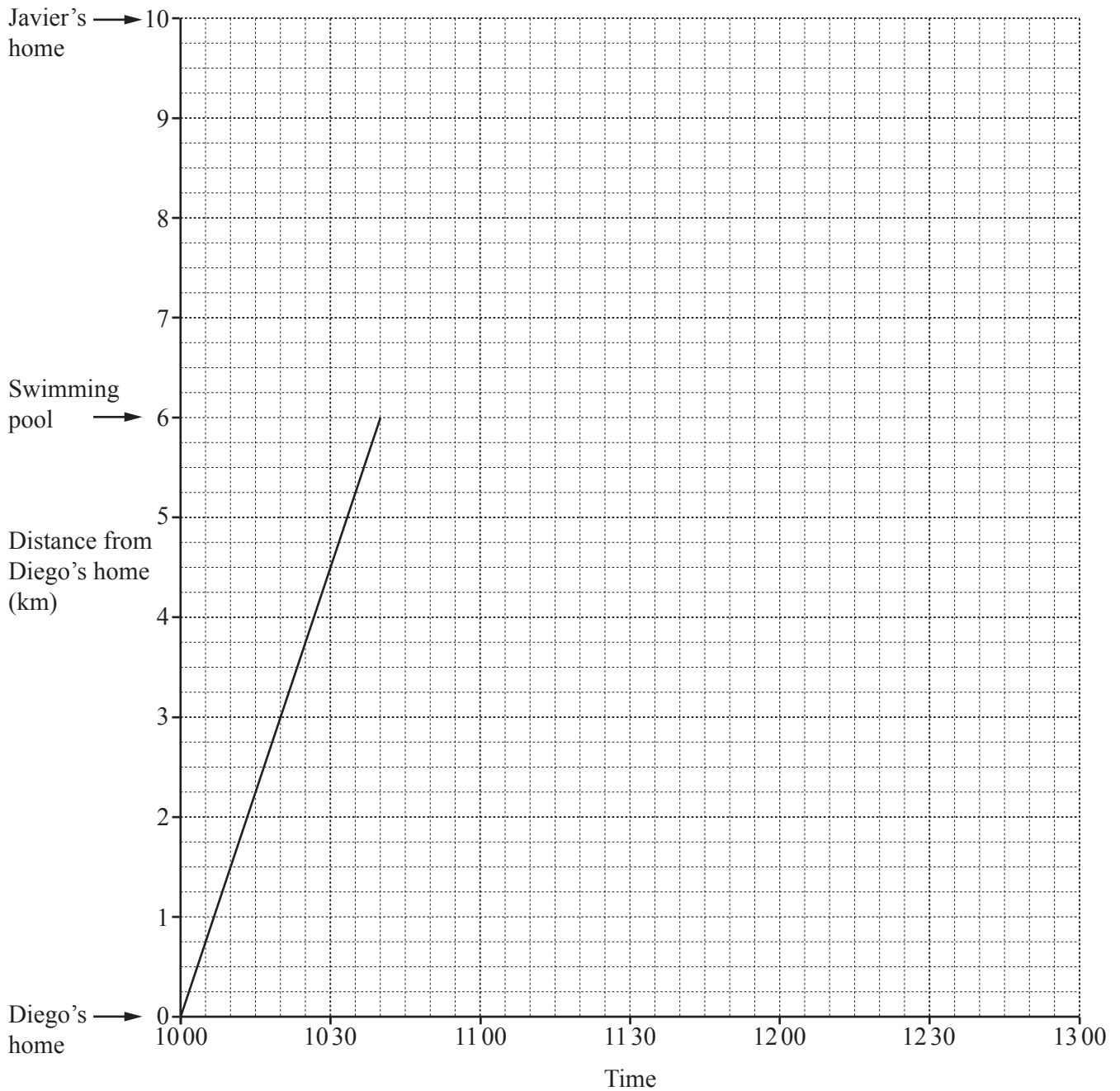
(b) Write down two geometrical properties that show that a polygon is regular.

$\dots\dots\dots$ and $\dots\dots\dots$ [2]

(c) Work out the interior angle of a regular 10-sided polygon.

$\dots\dots\dots$ [2]

- 8 Two friends, Diego and Javier, meet at a swimming pool.
The travel graph shows Diego's journey by bicycle from his home to the swimming pool.



- (a) Calculate Diego's speed for his journey from his home to the swimming pool.
Give your answer in kilometres per hour.

..... km/h [2]

(b) Diego stays at the swimming pool until 12 20.

(i) On the grid, draw the line representing the time he stays at the swimming pool. [1]

(ii) Work out how long, in hours and minutes, he is at the swimming pool.

..... h min [1]

(c) Javier leaves his home 15 minutes later than Diego.
He walks to the swimming pool at a constant speed of 6 km/h.

On the grid, show Javier's journey from his home to the swimming pool.

[3]

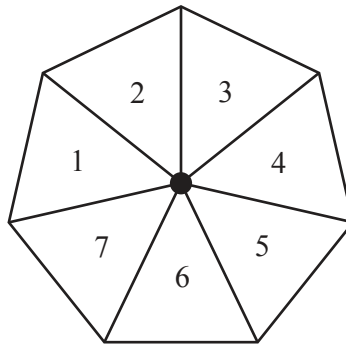
(d) They both leave the swimming pool at 12 20 and return to their own homes, each at a constant speed.

Diego arrives home at 12 45.

Javier arrives home 5 minutes later than Diego.

Complete the travel graph. [2]

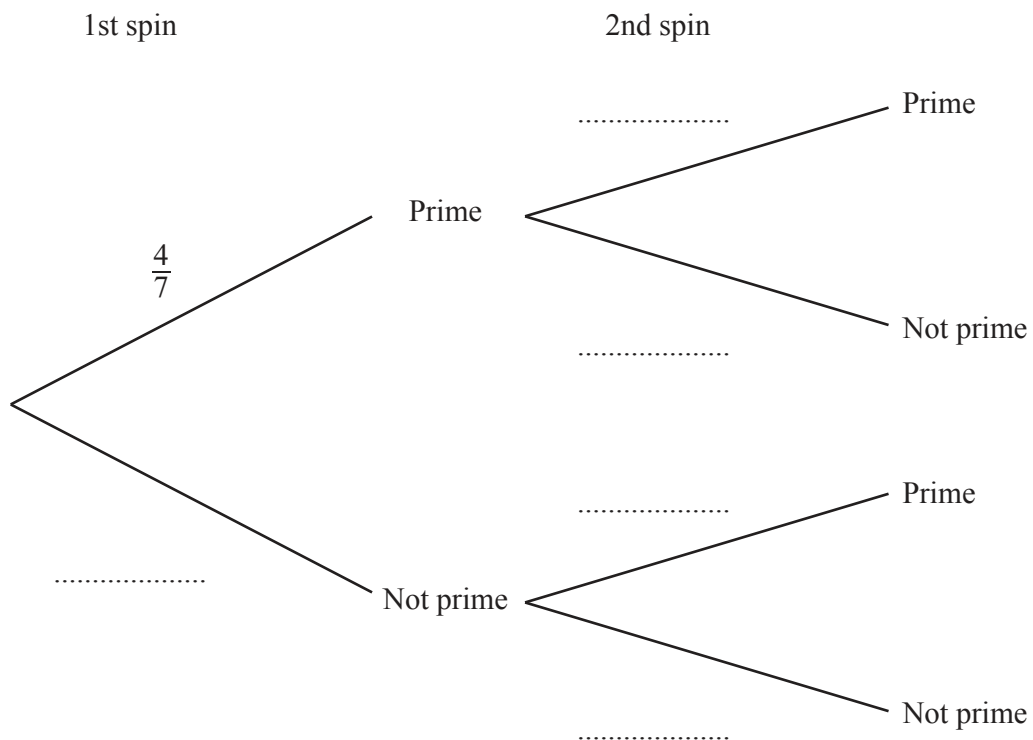
- 9 (a) Maria spins a fair 7-sided spinner numbered 1 to 7.



Explain why the probability that the spinner lands on a prime number is $\frac{4}{7}$.

[2]

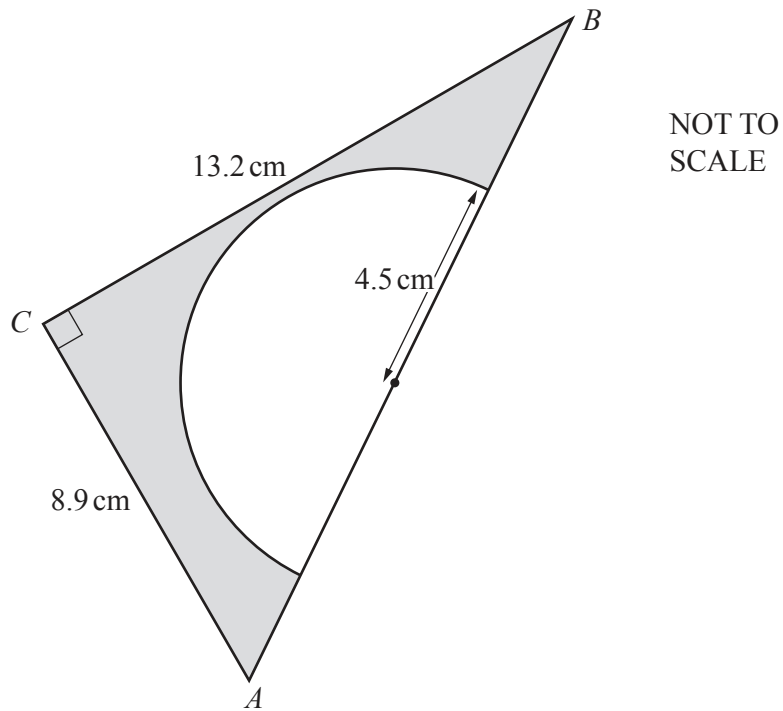
- (b) Maria spins the spinner a 2nd time.



- (i) Complete the tree diagram. [2]

- (ii) Work out the probability that the spinner lands on a prime number both times.

..... [2]



The diagram shows a right-angled triangle, ABC , and a semicircle.
 The radius of the semicircle is 4.5 cm.
 $AC = 8.9$ cm and $BC = 13.2$ cm.

- (a) Calculate the shaded area.
 Give the units of your answer.

..... [5]

- (b) Calculate AB .

$AB =$ cm [2]

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