Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
November 2024

Mathematics

StemUp Model Solution

Unit M7 Paper 1
(Non-Calculator)
Higher Tier

[GMC71]



GMC71

THURSDAY 21 NOVEMBER, 9.15am–10.30am

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page, on blank pages or tracing paper.
Complete in black ink only. **Do not write with a gel pen.**
Questions which require drawing or sketching should be completed using an HB pencil.
All working **must** be clearly shown in the spaces provided. Marks may be awarded for partially correct solutions.
You **must not** use a calculator for this paper.
Answer **all seventeen** questions.

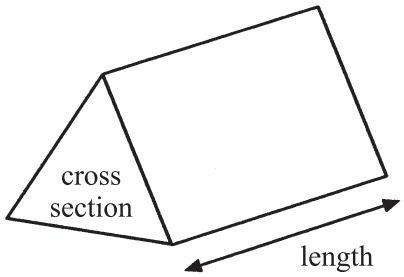
INFORMATION FOR CANDIDATES

The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You should have a ruler, compasses and a protractor.
The Formula Sheet is on page 2.

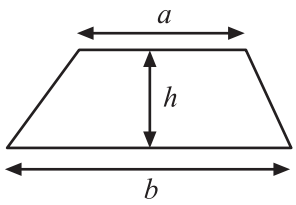
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Formula Sheet

Volume of prism = area of cross section × length

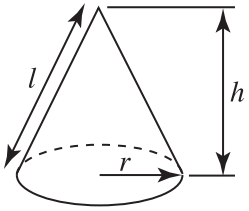


Area of trapezium = $\frac{1}{2}(a+b)h$



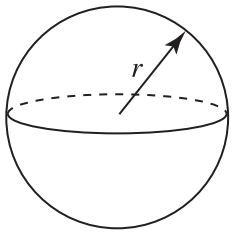
Volume of cone = $\frac{1}{3}\pi r^2 h$

Curved surface area of cone = $\pi r l$

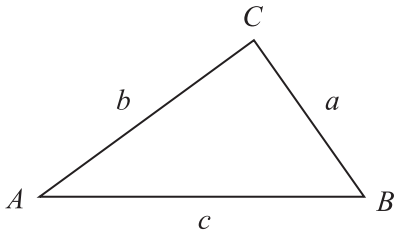


Volume of sphere = $\frac{4}{3}\pi r^3$

Surface area of sphere = $4\pi r^2$



In any triangle *ABC*



Quadratic Equation

The solutions of $ax^2 + bx + c = 0$ where $a \neq 0$, are given by

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Sine Rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine Rule: $a^2 = b^2 + c^2 - 2bc\cos A$

Area of triangle = $\frac{1}{2}ab\sin C$

1 Max is playing a game with cards.

There are four blue cards numbered 1, 2, 3 and 4

There are three yellow cards numbered 2, 3 and 4

The cards are placed with the numbers facing downwards.

He takes one blue card at random and one yellow card at random.

He **multiplies** the two numbers together to get his score.

(a) Complete the table to show the possible scores.

		Blue			
	×	**1**	**2**	**3**	**4**
Yellow	**2**	2	4	6	8
	3	3	6	9	12
	4	4	8	12	16

[2]

(b) What is the probability that he gets a score which is

(i) an even number, 10 even out of 12 Answer $\frac{10}{12}$ [1]

(ii) a number greater than 4, 6, 6, 8, 8, 9, 12, 12, 16 Answer $\frac{8}{12}$ [1]

(iii) a prime number? 2 and 3 only Answer $\frac{2}{12}$ [1]

[Turn over

2 Write down the next two terms in the sequence below

39 37 33 27 19 ___9___ ___−3___ [2]

Differences: −2, −4, −6, −8, then −10, −12

19 − 10 = 9, 9 − 12 = −3

3 Laura deposits £7 200 in a bank for one year.

The interest rate is 2% per year.

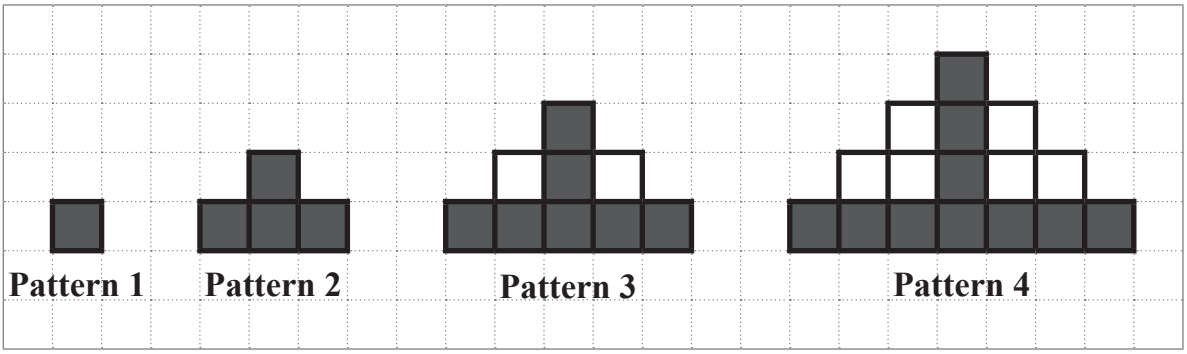
How much **interest** does Laura receive at the end of the year?

1% = 7200 ÷ 100 = 72

2% = 72 × 2 = £144

Answer £ ___144___ [2]

4 The first four patterns in a sequence are shown below.



(a) Write down the **total** number of squares for each of the patterns shown.

Pattern 1 = 1 Pattern 2 = 4 Pattern 3 = 9 Pattern 4 = 16

[1]

(b) Use your answer in part **(a)** to help calculate the **total** number of squares in Pattern 7

Square numbers, so Pattern 7 = 7^2 = 49

Answer 49 squares [1]

The number of **black** squares also follows a sequence.

(c) Use this sequence to help calculate the number of **white** squares in Pattern 7

Black: 1, 4, 7, 10, ... (add 3 each time)

13, 16, 19 so Pattern 7 has 19 black

White = 49 − 19 = 30

Answer 30 white squares [3]

[Turn over

5 A school canteen supervisor asked a sample of students what drink they bought in the canteen.

The table shows the results.

Drink	Frequency
Tea	6
Coffee	10
Orange juice	4
Hot chocolate	3
Water	7

On a later day, 300 students buy a drink in the canteen.

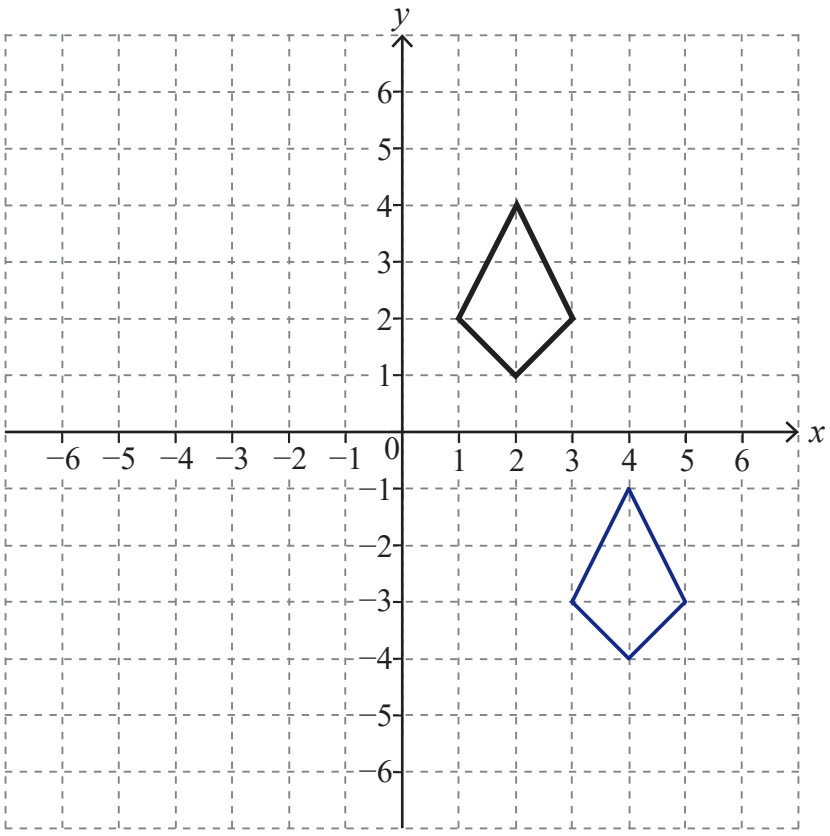
How many students do you expect to buy tea?

Total in sample = 6 + 10 + 4 + 3 + 7 = 30

$\frac{6}{30} \times 300 = \frac{1}{5} \times 300 = 60$

Answer 60 students [2]

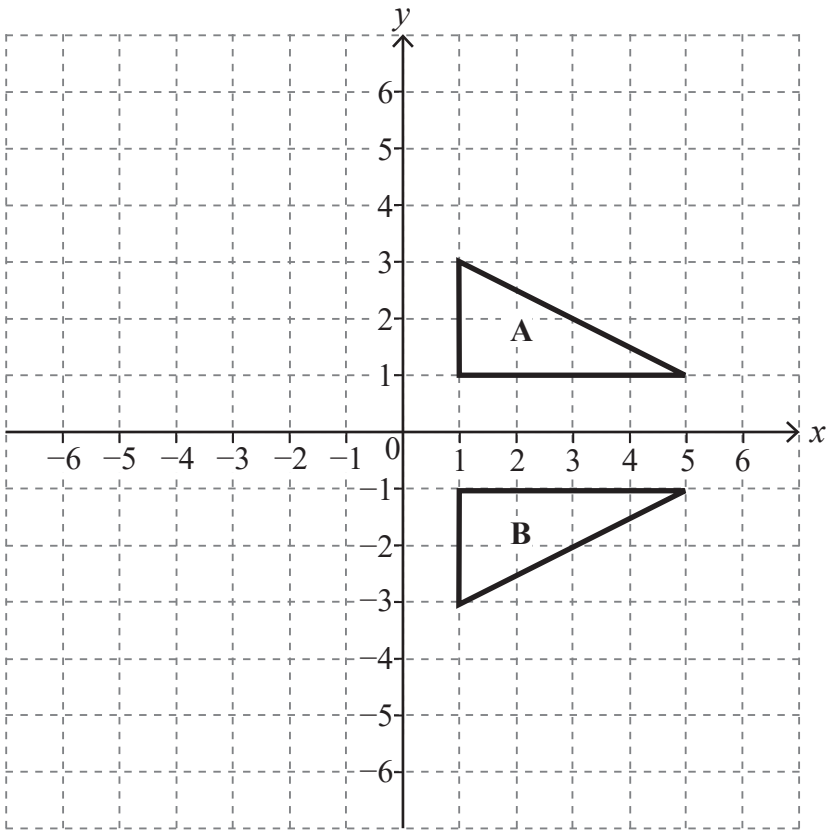
6 Translate the shape 2 to the right and 5 down.



[2]

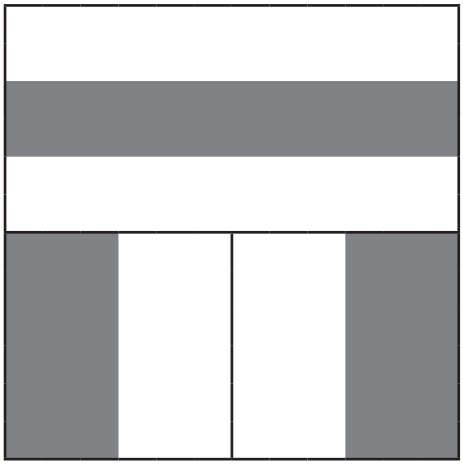
[Turn over

7 Describe fully the single transformation that maps **A** to **B**.



Answer Reflection in the x-axis (y = 0) [2]

8



A square is divided into two halves.

The top half is divided into 3 equal parts.

The bottom half is divided into 4 equal parts.

What fraction of the whole square is shaded?

Top: 1 of 3 parts shaded. Bottom: 2 of 4 parts shaded.

Top: $\frac{1}{3} \times \frac{1}{2} = \frac{1}{6}$

Bottom: $\frac{2}{4} \times \frac{1}{2} = \frac{1}{4}$

Total: $\frac{1}{6} + \frac{1}{4} = \frac{2}{12} + \frac{3}{12} = \frac{5}{12}$

Answer $\frac{5}{12}$ [3]

[Turn over

9

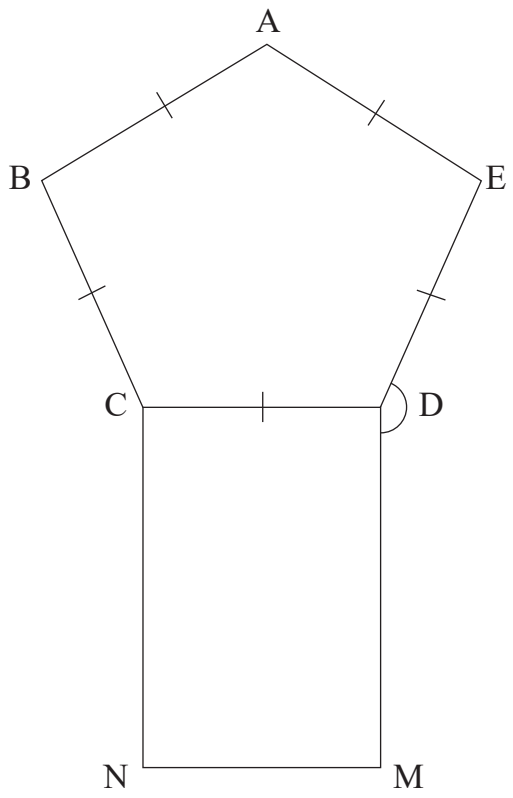


diagram not
drawn accurately

ABCDE is a regular pentagon.

CDMN is a rectangle.

Work out the size of the obtuse angle EDM.

Sum of interior angles = (5 − 2) × 180 = 540°

Each interior angle = 540 ÷ 5 = 108°

Angles at a point add to 360°, angle CDM = 90°

Angle EDM = 360 − (90 + 108) = 162°

Answer 162 ° [4]

10 Kevin tosses a coin.

He knows it is biased.

It lands 60 times on Heads.

Kevin uses his experiment to work out that the relative frequency of his coin landing on Heads is $\frac{2}{3}$

How many times did Kevin toss the coin?

$\frac{60}{n} = \frac{2}{3}$

$\frac{2}{3}$ of tosses = 60, so $\frac{1}{3}$ of tosses = 30

Tosses = 30 × 3 = 90

Answer 90 [2]

[Turn over

11 Katie used flour to make muffins.

She used an equal amount of flour for each muffin.

To begin, she made three muffins and had $\frac{3}{4}$ of her flour left.

(a) What fraction of her flour did Katie **use** for **each** muffin?

Used $\frac{1}{4}$ for 3 muffins

$\frac{1}{4} \div 3 = \frac{1}{12}$

Answer $\frac{1}{12}$ [1]

Katie then made **another** seven muffins, giving a total of 10 muffins, and had 50 g of flour left.

(b) How many grams of flour did Katie use for **each** muffin?

10 muffins use $\frac{10}{12}$, so $\frac{2}{12} = \frac{1}{6}$ is left = 50 g

1 muffin = $\frac{1}{12}$ = 50 ÷ 2 = 25 g

Answer 25 g [2]

12 A rectangle is divided into four triangles.

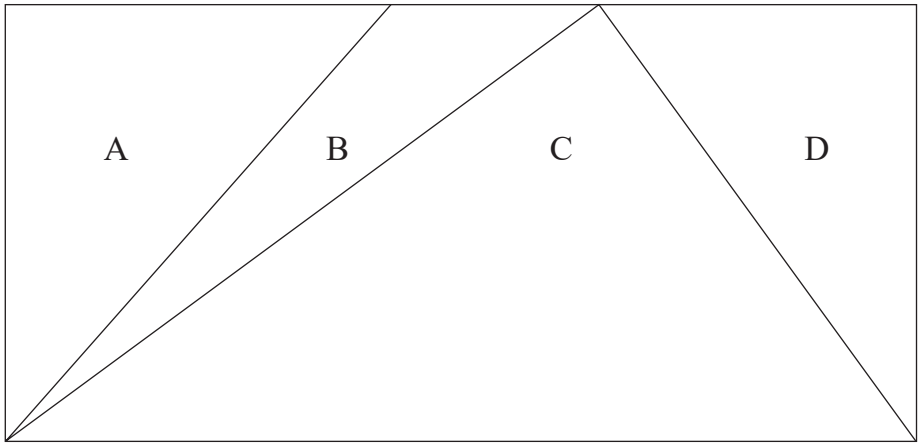


diagram not drawn accurately

The area of triangle C is 120 cm^2 and is **half** of the area of the rectangle.

The ratio of the area of triangle A to the area of the rectangle is 1 : 4

The ratio of the area of triangle D to the area of the rectangle is 1 : 6

What is the area of triangle B?

Area of rectangle = 120 × 2 = 240 cm^2

Area of A = 240 ÷ 4 = 60 cm^2

Area of D = 240 ÷ 6 = 40 cm^2

Area of B = 240 − (120 + 60 + 40)

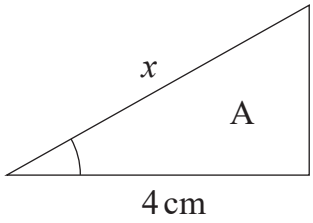
= 20 cm^2

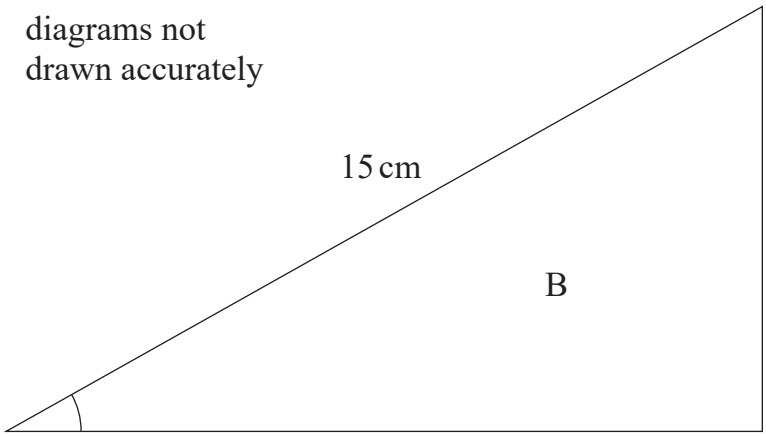
Answer 20 cm^2 [4]

[Turn over

13

diagrams not
drawn accurately





A and B are similar triangles.

Work out the length of x.

$\frac{4}{10} = \frac{x}{15}$

$10x = 60$

$x = 6$ cm

Answer 6 cm [2]

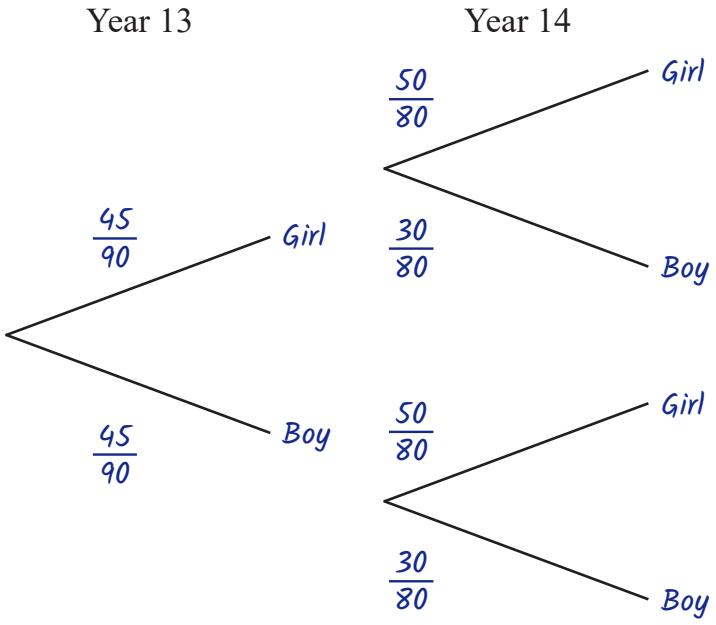
14 Two students from Sixth Form are given the opportunity to go on a trip to London to represent their school.

A student is taken at random from Year 13 and a student is taken at random from Year 14

The numbers of girls and boys in each year are given in the table.

	Year 13	**Year 14**
Girls	45	50
Boys	45	30

(a) Complete the probability tree diagram.



[2]

(b) What is the probability that two boys go on the trip?

$P(\text{boy, boy}) = \frac{1}{2} \times \frac{3}{8} = \frac{3}{16}$

Answer $\frac{3}{16}$ [2]

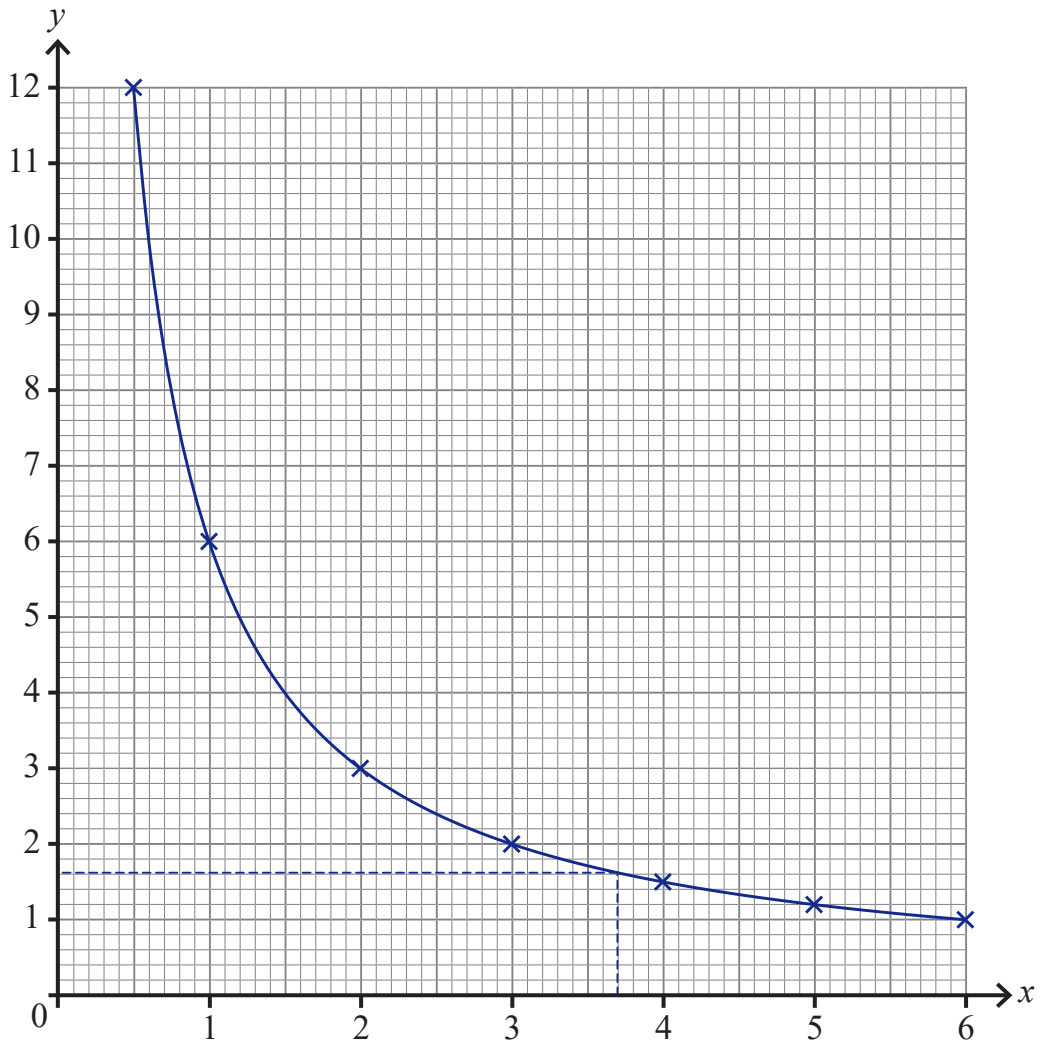
[Turn over

15 Simplify $(4x^2y^3) \times (x^3y^4)$

$4 \times x^{2+3} \times y^{3+4}$

Answer $4x^5y^7$ [2]

16 **(a)** Sketch the graph of $y = \frac{6}{x}$ on the grid below.



[3]

(b) Use your graph to estimate the value of $\frac{6}{3.7}$

x = 3.7 on the curve gives y ≈ 1.6

Answer *1.6* [1]

[Turn over

17 Rearrange to make x the subject of

$$Ax^2 = B$$

$Ax^2 = B$

$x^2 = \frac{B}{A}$

$x = \pm\sqrt{\frac{B}{A}}$

Answer $x =$ $\pm\sqrt{\frac{B}{A}}$ [2]

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