Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2019

Mathematics

StemUp Model Solution

Unit M7 Paper 2
(With calculator)
Higher Tier



[GMC72]

GMC72

THURSDAY 6 JUNE, 10.45am–12 noon

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.**
Answer **all sixteen** questions.
All working should be clearly shown in the spaces provided. Marks may be awarded for partially correct solutions.
You **may** use a calculator for this paper.

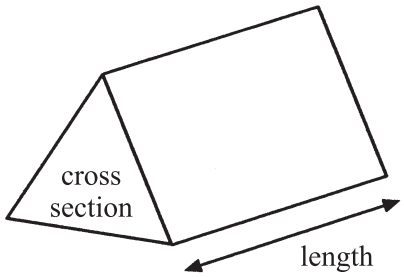
INFORMATION FOR CANDIDATES

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 calculator, ruler, compasses and a protractor.
The Formula Sheet is on page 2.

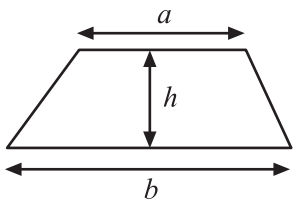
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Formula Sheet

Volume of prism = area of cross section × length

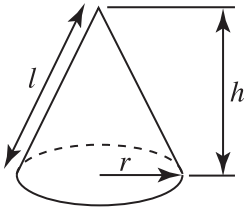


Area of trapezium = $\frac{1}{2}(a+b)h$



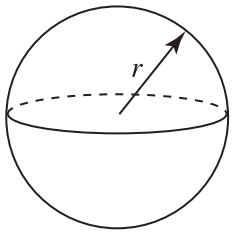
Volume of cone = $\frac{1}{3}\pi r^2 h$

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

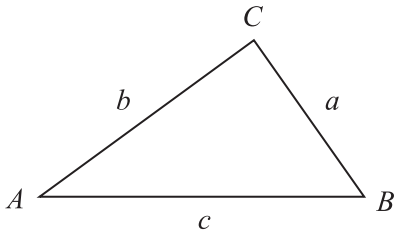


Volume of sphere = $\frac{4}{3}\pi r^3$

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 = $\frac{1}{2}ab\sin C$

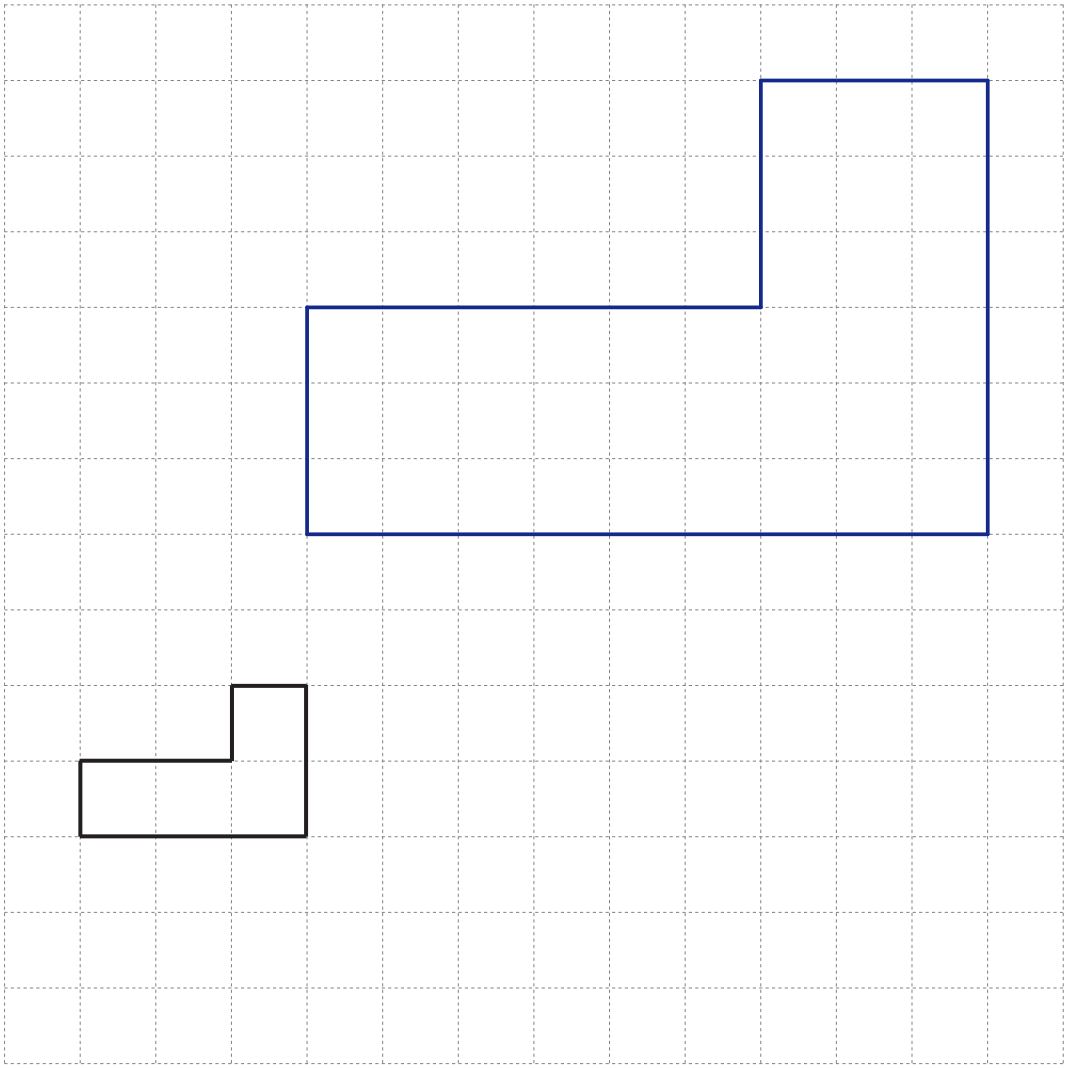
1 In a choir there are 36 female and 24 male singers.

Write down the ratio of female to male singers in its simplest form.

36 : 24
= 3 : 2 (÷ 12)

Answer 3 : 2 [2]

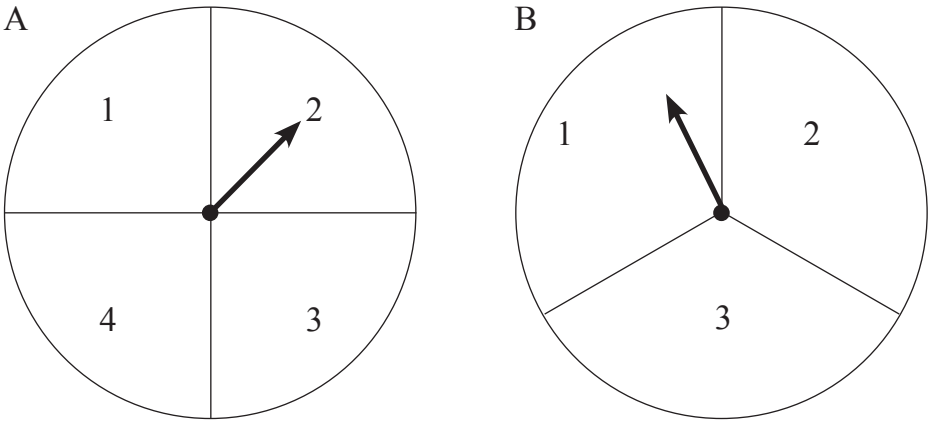
2 Enlarge the shape by scale factor 3



[2]

[Turn over

3



Spinners A and B are each spun once.

(a) Complete the table to show all the possible outcomes.

		Spinner B		
		1	**2**	**3**
Spinner A	**1**	1, 1	1, 2	1, 3
	2	2, 1	2, 2	2, 3
	3	3, 1	3, 2	3, 3
	4	4, 1	4, 2	4, 3

[1]

(b) What is the probability of getting the same number on each spinner?

(1, 1), (2, 2), (3, 3) = 3 out of 12

Answer $\frac{3}{12} = \frac{1}{4}$ [1]

(c) What is the probability of getting a bigger number on A than B?

(2, 1), (3, 1), (3, 2), (4, 1), (4, 2), (4, 3) = 6 out of 12

Answer $\frac{6}{12} = \frac{1}{2}$ [1]

4 There are 32 pupils in a class and all were present on Monday.

On Monday the teacher asked each pupil their favourite colour.

She recorded the results for green, blue and yellow accurately in a table.

	Green	**Blue**	**Yellow**	**Total**
Girls	3	5	4	12
Boys	4	7	2	13
Total	7	12	6	25

(a) Give a reason why the total number of boys and girls in the table is not 32

7 pupils chose a colour other than green, blue or yellow [1]

(b) There are 18 girls in the class.

What is the probability that a girl said the colour blue?

5 girls said blue out of 18 girls

Answer $\frac{5}{18}$ [1]

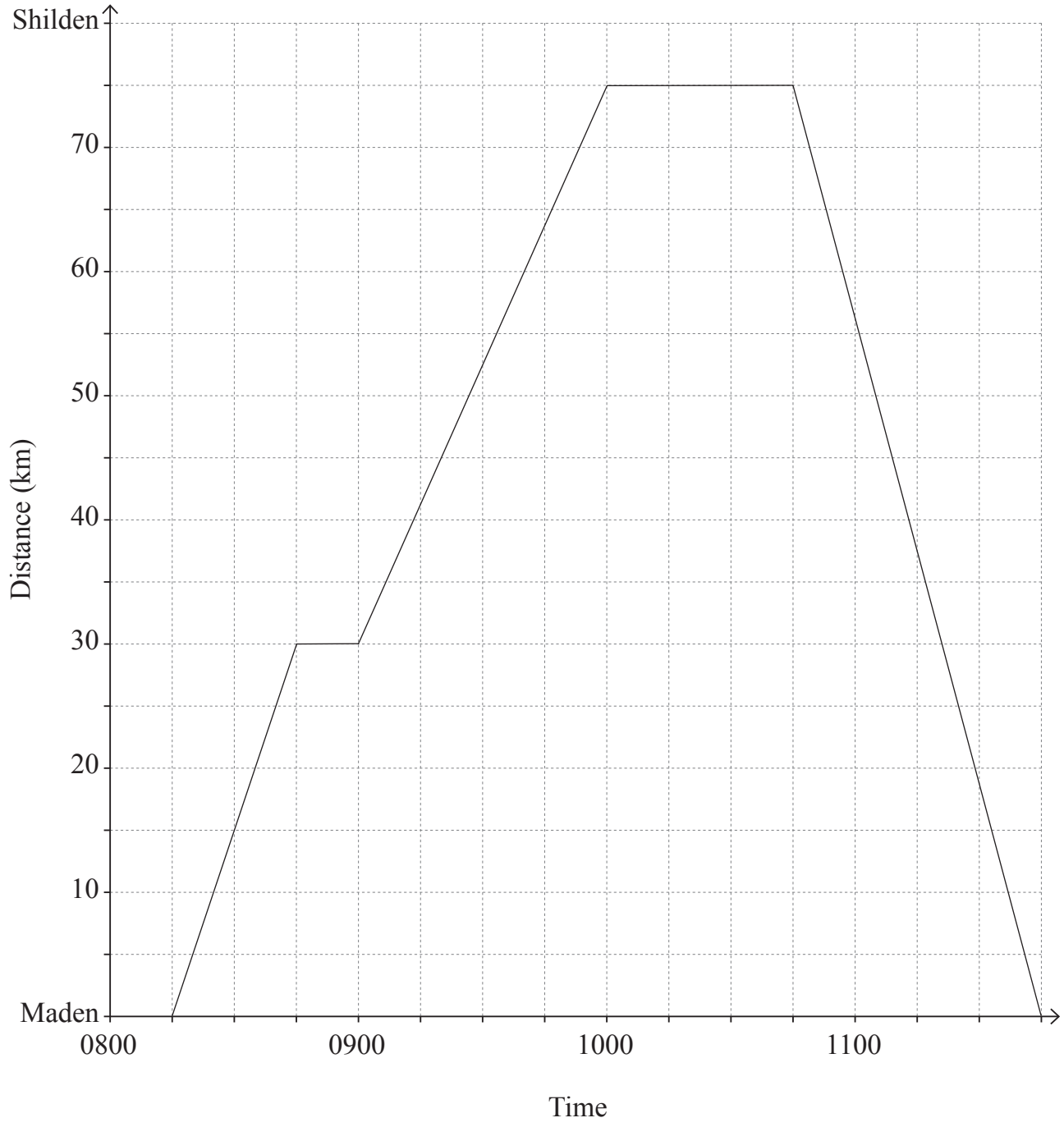
(c) What is the probability that a pupil in the class **did not** say green?

32 – 7 = 25 did not say green

Answer $\frac{25}{32}$ [1]

[Turn over

5 The graph shows Ryan's journey from Maden to Shilden and back to Maden.



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(a) How far is Ryan from Maden at 0930?

halfway from 30 km to 75 km: (30 + 75) ÷ 2 = 52.5

Answer 52.5 km [1]

(b) Calculate the average speed for the whole journey.

Answer 42.9 km/h [2]

Total distance = 75 + 75 = 150 km
Time = 0815 to 1145 = 3.5 hours
Speed = 150 ÷ 3.5 = 42.857... ≈ 42.9

[Turn over

6

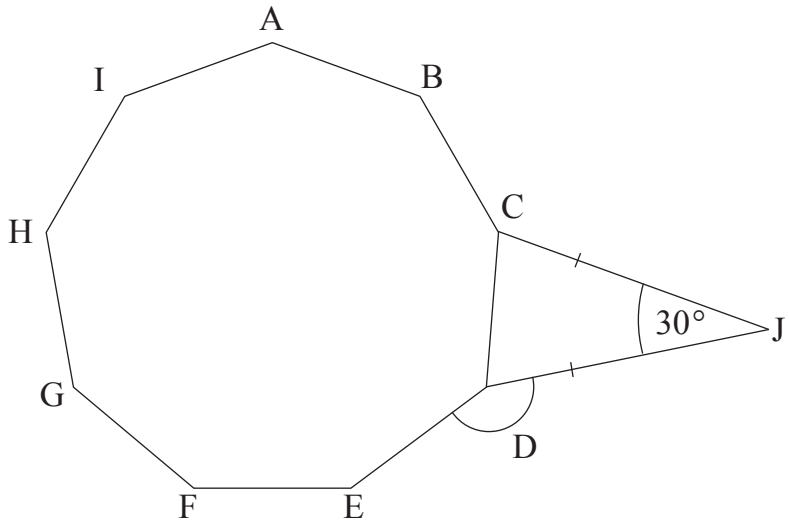


diagram not drawn accurately

The diagram shows a regular nonagon ABCDEFGHI with an isosceles triangle DCJ attached.

The angle DJC = 30°

Calculate the size of the angle EDJ.

Show your working clearly.

Exterior angle = 360° ÷ 9 = 40°
Interior angle EDC = 180° − 40° = 140°
Triangle DCJ is isosceles (DJ = CJ):
angle JDC = (180° − 30°) ÷ 2 = 75°
Angles at a point add to 360°:
angle EDJ = 360° − 140° − 75° = 145°

Answer 145 ° [4]

7 Sue bought 100 ml of suncream for £5.40 in Belfast.

While in Spain she bought 150 ml of suncream for 8.80 euro.

The exchange rate was £1 = 1.07 euro.

Was it better value in Belfast or in Spain?

Show your working.

Spain: 8.80 ÷ 1.07 = £8.224299...

so 150 ml costs £8.22 in pounds

100 ml in Spain = 8.22 ÷ 150 × 100 = £5.48

Belfast: 100 ml costs £5.40

£5.40 < £5.48, so 100 ml is cheaper in Belfast

Better value in Belfast

Answer Belfast [5]

[Turn over

8 There are four possible results from a music examination.

Result	Fail	Pass	Credit	Distinction
Probability		$\frac{1}{2}$	$\frac{3}{10}$	$\frac{1}{20}$

The probabilities of some results are recorded in the table.

(a) What is the probability of fail?

$1 - (\frac{1}{2} + \frac{3}{10} + \frac{1}{20}) = 1 - \frac{17}{20}$

Answer $\frac{3}{20}$ [2]

(b) What is the probability of credit or distinction?

$\frac{3}{10} + \frac{1}{20} = \frac{6}{20} + \frac{1}{20}$

Answer $\frac{7}{20}$ [2]

9 Simplify $\frac{m^5 \times m^3}{m^2}$

m^{5+3-2}

Answer m^6 [1]

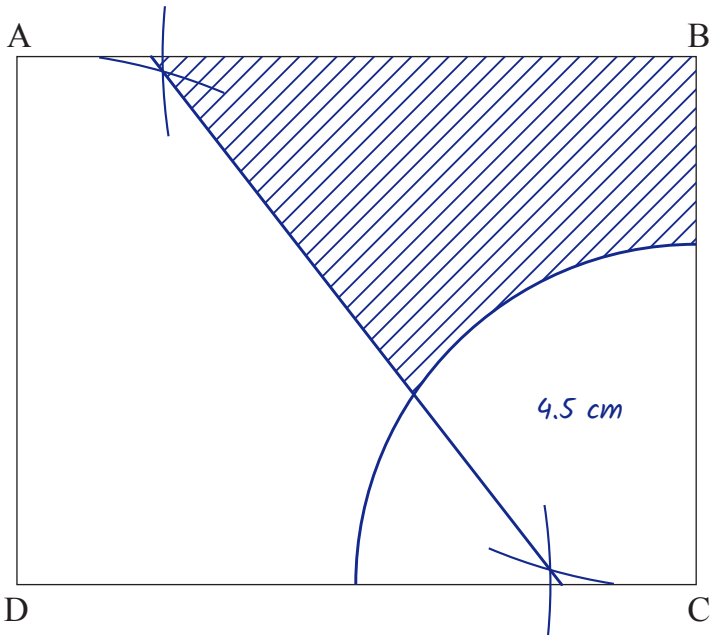
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10 Work out the n^{th} term of the sequence 6, 3, 0, −3, ...

differences are −3, so −3n
n = 1: −3 + 9 = 6

Answer 9 − 3n [2]

11



ABCD is a rectangle, with AB = 9 cm and BC = 7 cm.

Shade the region inside the rectangle which is the locus of all points that are

(i) greater than 4.5 cm from C

and **(ii)** nearer to B than D. [3]

[Turn over

12 Use trial and improvement to solve the equation $x^3 - 3x = 11$

Give your answer correct to one decimal place.

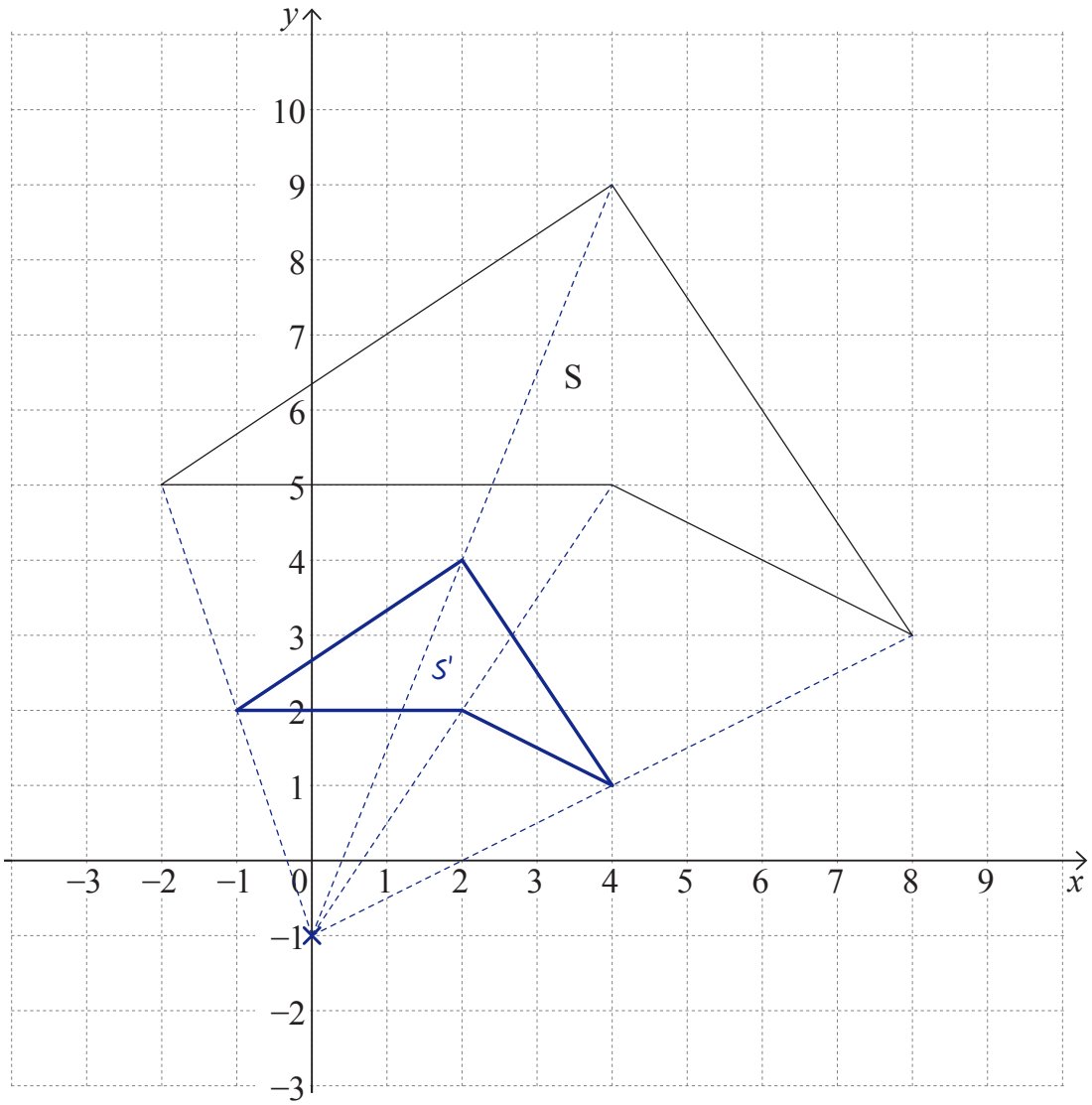
You must show your working

x	$x^3 - 3x$	
2	2	too small
3	18	too big
2.5	8.125	too small
2.6	9.776	too small
2.7	11.583	too big
2.65	10.659625	too small

2.65 gives too small, so x is between 2.65 and 2.7

Answer 2.7 [4]

13



(a) On the grid above, draw an enlargement of the shape S, using a scale factor of $\frac{1}{2}$ and centre (0, –1).

[3]

(b) If the shape S has an area of 20 cm^2, what is the area of the enlarged shape?

Area scale factor = $(\frac{1}{2})^2 = \frac{1}{4}$

$20 \times \frac{1}{4} = 5$

Answer 5 cm^2 [1]

[Turn over

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14 s is directly proportional to the square of v.

When $v = 20$, $s = 250$

Express s in terms of v.

$s = kv^2$

$250 = k \times 20^2$

$250 = 400k$

$k = 250 \div 400 = \frac{5}{8} (= 0.625)$

Answer $s = \frac{5}{8}v^2$ [3]

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15 A bag contains 60 coins.

Each coin in the bag is either a 20p coin or a 50p coin.

The total value of the coins in the bag is £22.80

Work out how many of each coin is in the bag.

A solution by trial and improvement will not be accepted.

Let x = number of 20p coins and y = number of 50p coins

$x + y = 60$ (1)

$20x + 50y = 2280$ (2)

(1) × 20: $20x + 20y = 1200$

(2) − (1) × 20: $30y = 1080$

$y = 36$

$x = 60 - 36 = 24$

Check: 24 × 20p + 36 × 50p = 480p + 1800p = 2280p = £22.80

Answer 24 20p coins

36 50p coins [5]

[Turn over

16 Make T the subject of $J = \sqrt{TR}$

$J = \sqrt{TR}$

$J^2 = TR$

Answer $T = \frac{J^2}{R}$ [2]

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For Examiner's use only	
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