Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2024

Mathematics

StemUp Model Solution

Unit M7 Paper 2
(With calculator)
Higher Tier



[GMC72]

GMC72

MONDAY 3 JUNE, 10.45 am–12 NOON

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

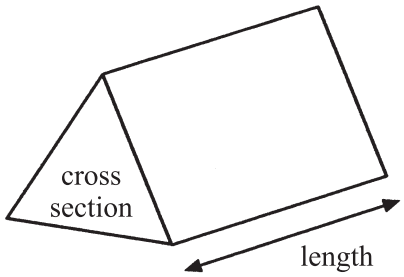
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page, on blank pages or tracing paper.
Complete in black ink only. **Do not write with a gel pen.**
Answer **all 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

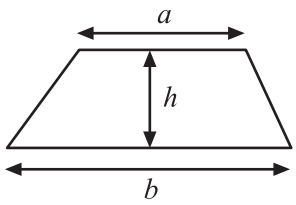
The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You should have a calculator, ruler, compasses and a protractor.
The Formula Sheet is on page 2.

Formula Sheet

Volume of prism = area of cross section × length

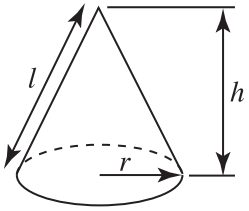


Area of trapezium = $\frac{1}{2}(a+b)h$



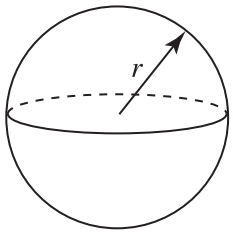
Volume of cone = $\frac{1}{3}\pi r^2 h$

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

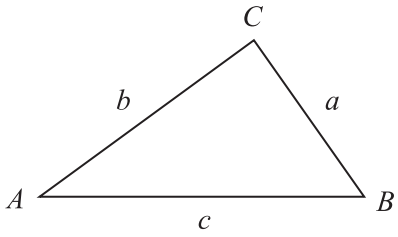


Volume of sphere = $\frac{4}{3}\pi r^3$

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

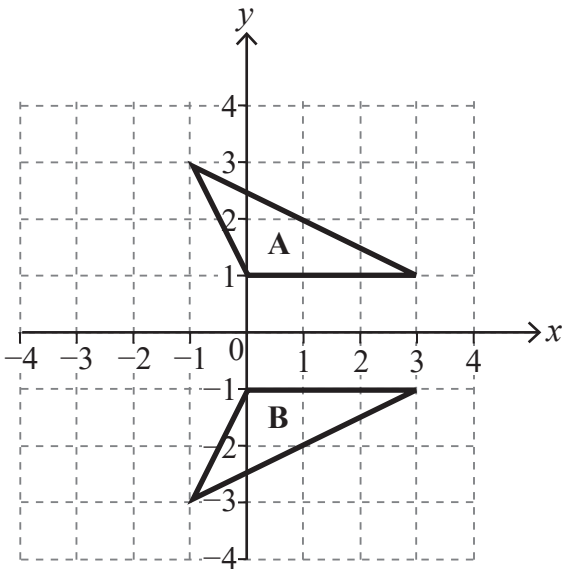
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

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 Describe fully the **single** transformation that takes triangle **A** to triangle **B**.



Answer Reflection in the x-axis [2]

2 Each new number in a sequence is found using the rule

divide by 3 and then subtract 5

Find the next number in this sequence.

24, 3 , −4

3 ÷ 3 = 1
1 − 5 = −4

[1]

[Turn over

3



Source: © Getty Images

Pete is filling 5-litre petrol cans from a large tank of petrol.

The tank contains 16 gallons.

Pete knows that 1 gallon = 4.5 litres.

How many 5-litre cans does he need to empty the tank?

16 × 4.5 = 72 litres

72 ÷ 5 = 14.4 cans

14.4 rounds up, so 15 cans are needed

Answer 15 cans [2]

4 Jack ran 4 km each day during the month of June.

He thinks he has run the length of 3 marathons.

A marathon is 26.2 miles long.

Is he right?

Explain your answer.

Distance run: 4 × 30 days = 120 km
3 marathons: 26.2 × 3 = 78.6 miles
78.6 miles × 1.6 = 125.76 km
120 km < 125.76 km

Answer No because he has only run 120 km, which is less than 125.76 km. He needs to run 5.76 km more. [4]

[Turn over

5 The heights (in cm) of students in a Year 1 class are recorded in the table below.

	$90 \leqslant h < 95$	$95 \leqslant h < 100$	$100 \leqslant h < 110$
Girl	6	5	2
Boy	4	7	6

A student is taken at random from the class.

(a) What is the probability of taking

(i) a girl with height $100 \leqslant h < 110$,

Total = 6 + 5 + 2 + 4 + 7 + 6 = 30

Answer $\frac{2}{30}$ [1]

(ii) a boy,

4 + 7 + 6 = 17

Answer $\frac{17}{30}$ [1]

(iii) a student with height $90 \leqslant h < 95$,

6 + 4 = 10

Answer $\frac{10}{30}$ [1]

(iv) a girl with height $90 \leqslant h < 100$?

6 + 5 = 11

Answer $\frac{11}{30}$ [1]

(b) An event is held for Year 1 students.

600 Year 1 students attend.

Estimate how many of the students have height $100 \leqslant h < 110$

Students with $100 \leqslant h < 110 = 2 + 6 = 8$

$\frac{8}{30} \times 600 = 160$

Answer 160 [2]

[Turn over

6 The number of oysters collected by divers for a number of dives is recorded.

Name	Number of dives	Number of oysters collected
Diving Dan	16	84
Scuba Sam	11	33
Clammy Colin	24	102

Which diver is the best at collecting oysters?

Show your working clearly.

Dan: 84 ÷ 16 = 5.25 oysters per dive

Sam: 33 ÷ 11 = 3 oysters per dive

Colin: 102 ÷ 24 = 4.25 oysters per dive

Answer Diving Dan

because he collects the most oysters per dive (5.25) [2]

7 Work out the value of x in the pentagon below.

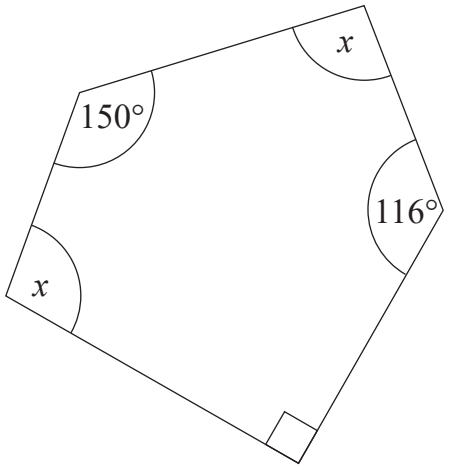


diagram not drawn accurately

Interior angles of a pentagon = (5 − 2) × 180 = 540°

2x = 540 − 150 − 116 − 90 = 184

x = 184 ÷ 2 = 92

Answer $x =$ 92 ° [4]

[Turn over

8 In a local election the following figures were recorded at three polling stations.

Station	Number who voted	Number registered to vote
A	645	1270
B	860	1548
C	1450	3015

Of the total number of those registered to vote, what percentage voted?

Total voted = 645 + 860 + 1450 = 2955

Total registered = 1270 + 1548 + 3015 = 5833

$\frac{2955}{5833} \times 100 = 50.660037... = 50.66\%$

Answer 50.66 % [3]

9 Tammy makes cordial using fruit juice and sparkling water in the ratio 1:3

Tammy has 800 ml of fruit juice and 2100 ml of sparkling water.

What is the greatest amount of cordial she can make?

800 ml fruit juice needs 800 × 3 = 2400 ml water

but there is only 2100 ml of sparkling water

2100 ml sparkling water needs 2100 ÷ 3 = 700 ml juice

Cordial = 2100 + 700 = 2800 ml

Answer *2800* ml [3]

[Turn over

10 Sarah rolls a fair dice and tosses a fair coin.

What is the probability that she gets a number less than 5 and a Head?

Show your working out.

H1 H2 H3 H4 H5 H6

T1 T2 T3 T4 T5 T6

12 outcomes; less than 5 and Head: H1, H2, H3, H4

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

Answer $\frac{1}{3}$ [2]

11 $x^a \times x^4 = x^{12}$

Find the value of a.

$a + 4 = 12$

$a = 12 - 4 = 8$

Answer $a =$ 8 [1]

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12 The equation $x^3 - 12x - 2 = 0$ has a solution between 2 and 5

Use a trial and improvement method to find this solution, correct to one decimal place.

You must show all your working.

x	$x^3 - 12x - 2$	
3	−11	too small
4	14	too big
3.5	−1.125	too small
3.6	1.456	too big
3.55	0.138875	too big

Solution lies between 3.5 and 3.55,

so x = 3.5 correct to 1 d.p.

Answer $x =$ 3.5 [4]

[Turn over

13 There are 200 students in Year 8 and 160 students in Year 9

There are 120 girls in Year 8 and 100 girls in Year 9

The probability that a girl plays a musical instrument is 0.3

The probability that a boy plays a musical instrument is 0.25

A student is taken at random from the students who play a musical instrument.

What is the probability that it is a boy?

Boys: Year 8 = 200 − 120 = 80, Year 9 = 160 − 100 = 60

Girls who play: 0.3 × (120 + 100) = 0.3 × 220 = 66

Boys who play: 0.25 × (80 + 60) = 0.25 × 140 = 35

Total who play = 66 + 35 = 101

$P(\text{boy}) = \frac{35}{101}$

Answer $\frac{35}{101}$ [4]

14 A varies directly as the square of x.

When $x = 5$, $A = 20$

Calculate the value of x when $A = 45$

$A = kx^2$

$20 = k \times 5^2$

$k = \frac{20}{25} = 0.8$

$45 = 0.8x^2$

$x^2 = 45 \div 0.8 = 56.25$

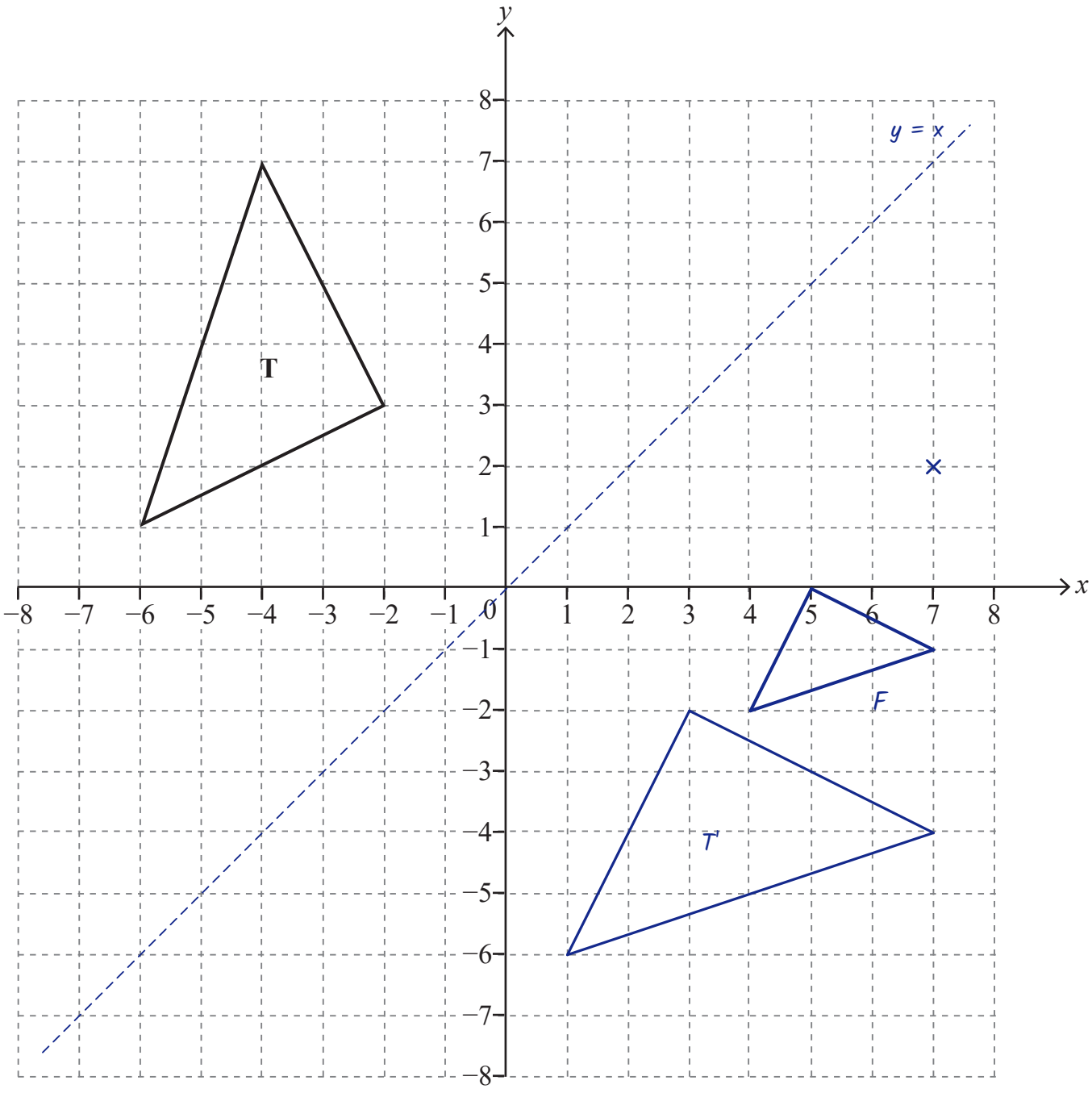
$x = \sqrt{56.25} = 7.5$

Answer $x =$ 7.5 [4]

[Turn over

15 Triangle T is reflected in the line $y = x$ and then enlarged by a scale factor of $\frac{1}{2}$ using the centre of enlargement (7, 2).

Draw the final image and label it F.



[4]

14390

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16 The table shows the probability of getting each number on a biased dice.

Number on dice	1	2	3	4	5	6
Probability	0.18	0.2	0.3	0.1	0.1	0.12

The dice is rolled twice and the numbers are added together.

What is the probability of getting a total of 5?

Total of 5: (1, 4), (4, 1), (2, 3), (3, 2)

P(1, 4) = 0.18 × 0.1 = 0.018

P(4, 1) = 0.1 × 0.18 = 0.018

P(2, 3) = 0.2 × 0.3 = 0.06

P(3, 2) = 0.3 × 0.2 = 0.06

0.018 + 0.018 + 0.06 + 0.06 = 0.156

Answer 0.156 [4]

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Question Number	**Marks**
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Examiner Number

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