Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
November 2024

Mathematics

StemUp Model Solution

Unit M7 Paper 2
(With calculator)
Higher Tier



[GMC72]

GMC72

THURSDAY 21 NOVEMBER, 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.**
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 **may** use a calculator for this paper.
Answer **all seventeen** questions.

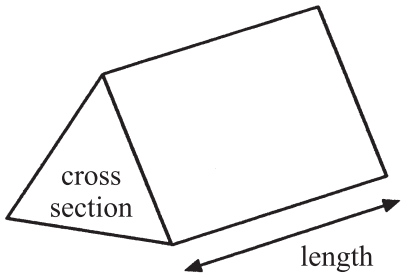
INFORMATION FOR CANDIDATES

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

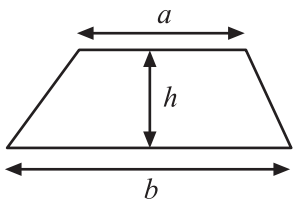
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Formula Sheet

Volume of prism = area of cross section × length

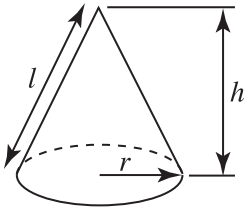


Area of trapezium = $\frac{1}{2}(a+b)h$



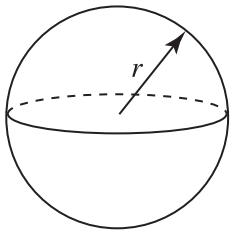
Volume of cone = $\frac{1}{3}\pi r^2 h$

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

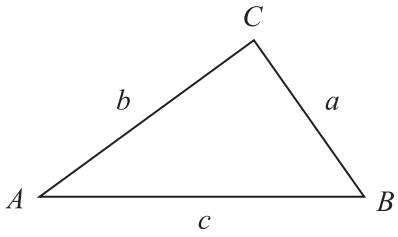


Volume of sphere = $\frac{4}{3}\pi r^3$

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

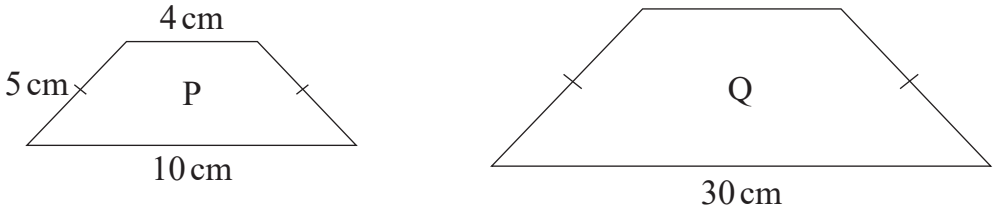
Cosine Rule: $a^2 = b^2 + c^2 - 2bc\cos A$

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

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1

diagrams not drawn accurately



Shape P is enlarged to give shape Q.

Work out the perimeter of shape Q.

Scale factor = 30 ÷ 10 = 3

Sloping sides of Q = 5 × 3 = 15 cm

Top of Q = 4 × 3 = 12 cm

Perimeter of Q = 30 + 15 + 15 + 12 = 72 cm

Answer 72 cm [3]

[Turn over

2 A 1200 ml tub of ice-cream costs £5.00

An 800 ml tub of ice-cream costs £3.60

Which is better value?

Show your working out clearly.

1200 ml: 500p ÷ 12 = 41.67p per 100 ml

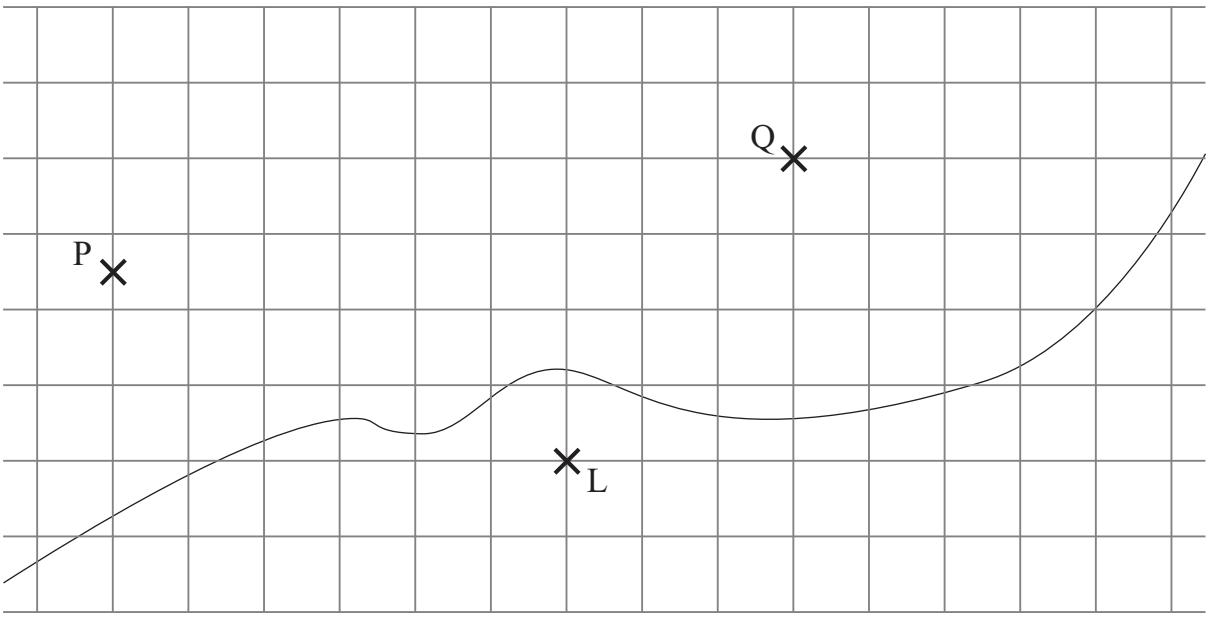
800 ml: 360p ÷ 8 = 45p per 100 ml

41.67p < 45p, so the 1200 ml tub is cheaper per 100 ml

Answer 1200 ml tub [3]

3 The diagram shows the position of two ships P and Q and a lighthouse L.

The scale is 1 cm represents 20 km.



Which ship is closer to L and how much closer is it?

Show your working out clearly.

LQ = 5 cm, LP = 6.5 cm

5 × 20 = 100 km, 6.5 × 20 = 130 km

130 − 100 = 30 km

Answer Q is closer by 30 km [3]

[Turn over

4 Dylan wants to calculate his car's fuel consumption.

(a) He travels 180 miles and uses 24 litres.

Calculate his car's number of miles per litre.

180 ÷ 24 = 7.5

Answer 7.5 miles per litre [1]

He wants to work out the number of miles per gallon.

1 gallon = 4.54 litres

(b) Calculate his car's number of miles per gallon.

7.5 × 4.54 = 34.05

Answer 34.05 miles per gallon [2]

5 Izzy's uncle sent her **four** 200 rand banknotes for her birthday.

£1 = 20.806 rand

(a) Izzy **estimates** in her head how much she will get for her four notes.

How much does she estimate?

Show your working out clearly.

4 × 200 = 800 rand

£1 ≈ 20 rand

800 ÷ 20 = £40

Answer £ 40 [1]

(b) How much **less** does Izzy get when the exact exchange rate is used?

Show your working out clearly.

800 ÷ 20.806 = 38.450447... = £38.45

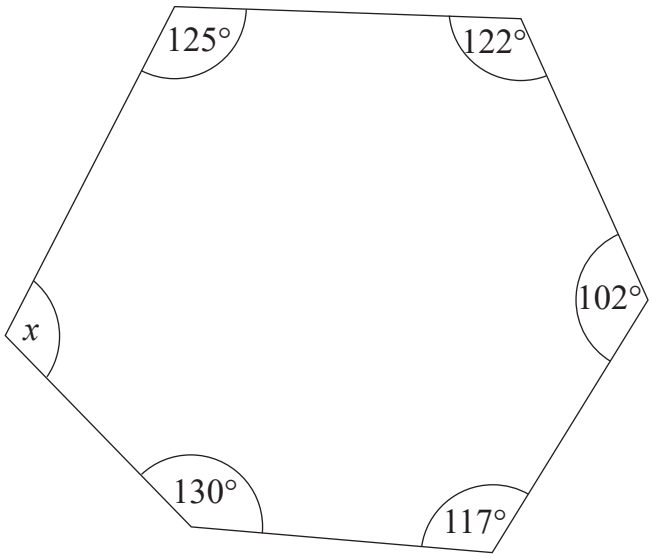
40 − 38.45 = £1.55

Answer £ 1.55 [2]

[Turn over

6 Work out the size of angle x in the hexagon.

diagram not drawn accurately



Sum of interior angles = (6 − 2) × 180 = 720°

125 + 122 + 102 + 117 + 130 = 596°

x = 720 − 596 = 124°

Answer $x =$ 124 ° [4]

7 A spinner is spun once.

It lands on A, B, C or D.

The probability of it landing on C and D is shown in the table.

The probability of it landing on A is the same as the probability of it landing on B.

Landing on	A	B	C	D
Probability	$\frac{1}{10}$	$\frac{1}{10}$	$\frac{1}{2}$	$\frac{3}{10}$

Work out the missing probabilities for A and B.

Write your answers in the table.

$P(C) + P(D) = \frac{1}{2} + \frac{3}{10} = \frac{5}{10} + \frac{3}{10} = \frac{8}{10}$

$P(A) + P(B) = 1 - \frac{8}{10} = \frac{2}{10}$

$P(A) = P(B) = \frac{2}{10} \div 2 = \frac{1}{10}$

[3]

[Turn over

8 Jill has ten 50 pence coins and eight 20 pence coins.

Jack also has 50 pence coins and 20 pence coins.

Jack has the same total number of coins as Jill, but his coins are worth £2.10 **less**.

How many 20 pence coins does Jack have?

Jill: $10 \times 50 + 8 \times 20 = 500 + 160 = 660p$

Jack: $660 - 210 = 450p$, with $10 + 8 = 18$ coins

$15 \times 20 + 3 \times 50 = 300 + 150 = 450p$ ✓

Jack has 15 twenty pence coins

Answer 15 20 pence coins [3]

9 The ingredients to make eight biscuits are:

Flour	160 g
Sugar	50 g
Butter	100 g

Pauline has 700 g of flour, 150 g of sugar and 520 g of butter.

How many grams of butter has she **left over** if she makes the **largest** number of biscuits she can?

For 1 biscuit: flour 160 ÷ 8 = 20 g, sugar 50 ÷ 8 = 6.25 g,

butter 100 ÷ 8 = 12.5 g

Flour: 700 ÷ 20 = 35 biscuits

Sugar: 150 ÷ 6.25 = 24 biscuits

Butter: 520 ÷ 12.5 = 41.6 biscuits

So the most biscuits she can make = 24

Butter used = 24 × 12.5 = 300 g

Butter left = 520 − 300 = 220 g

Answer *220* g [4]

[Turn over

10 There are 55 girls and 20 boys in Year 13

The probability that a girl in Year 13 has a part-time job is $\frac{2}{5}$

The probability that a boy in Year 13 has a part-time job is $\frac{3}{4}$

Work out the probability that a student in Year 13 has a part-time job.

Girls with a job: $\frac{2}{5} \times 55 = 22$

Boys with a job: $\frac{3}{4} \times 20 = 15$

Total with a part-time job = 22 + 15 = 37

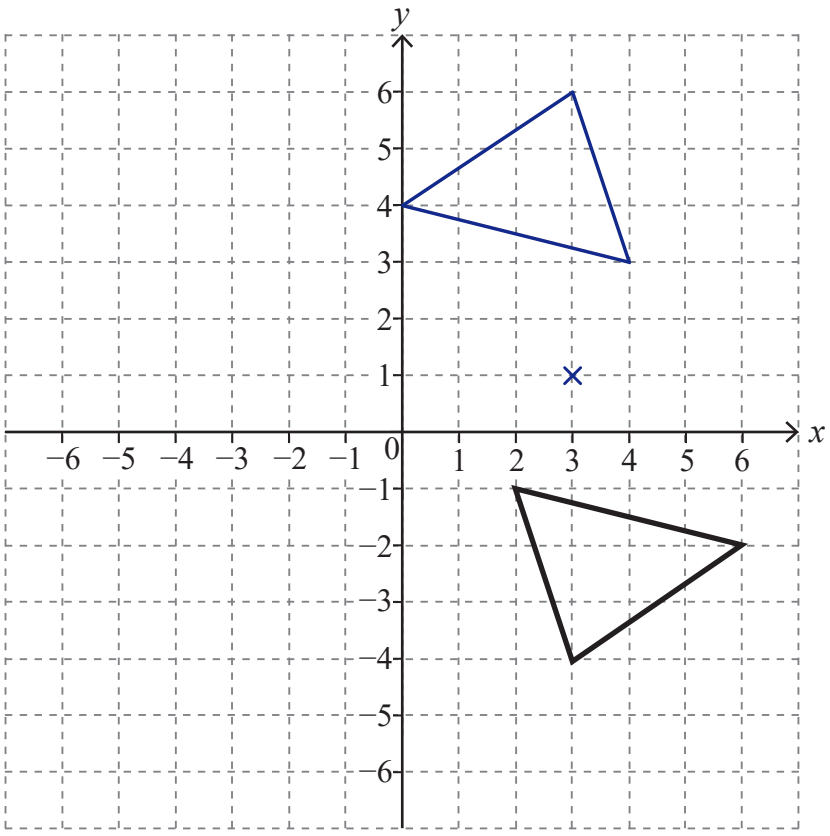
Total students = 55 + 20 = 75

P(part-time job) = $\frac{37}{75}$

Answer $\frac{37}{75}$ [4]

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11 Rotate the triangle 180° about the point (3,1)



[2]

[Turn over

12 The equation $x^2 - \frac{6}{x} = 16$ has a solution between 2 and 5

Use a trial and improvement method to find this solution.

Give your answer to 1 decimal place.

You must show all your working out.

x	$x^2 - \frac{6}{x}$	Comment
4	14.5	too low
5	23.8	too high
4.1	15.346...	too low
4.2	16.211...	too high
4.15	15.776...	too low

Solution lies between 4.15 and 4.2,
so x = 4.2 correct to 1 d.p.

Answer $x =$ 4.2 [4]

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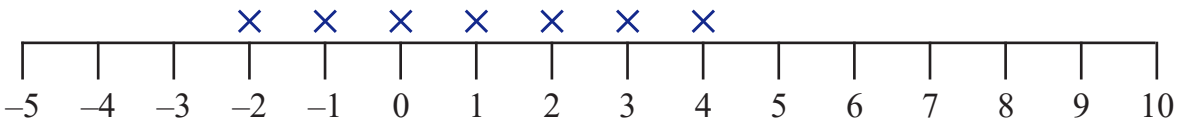
13 Solve the inequality

$$-5 < 2n \leqslant 8$$

showing all possible **integer** values for n on the number line below.

$-5 < 2n \leq 8$

$-2.5 < n \leq 4$ $\quad$ $n = -2, -1, 0, 1, 2, 3, 4$



[2]

14 Fill in the blank below.

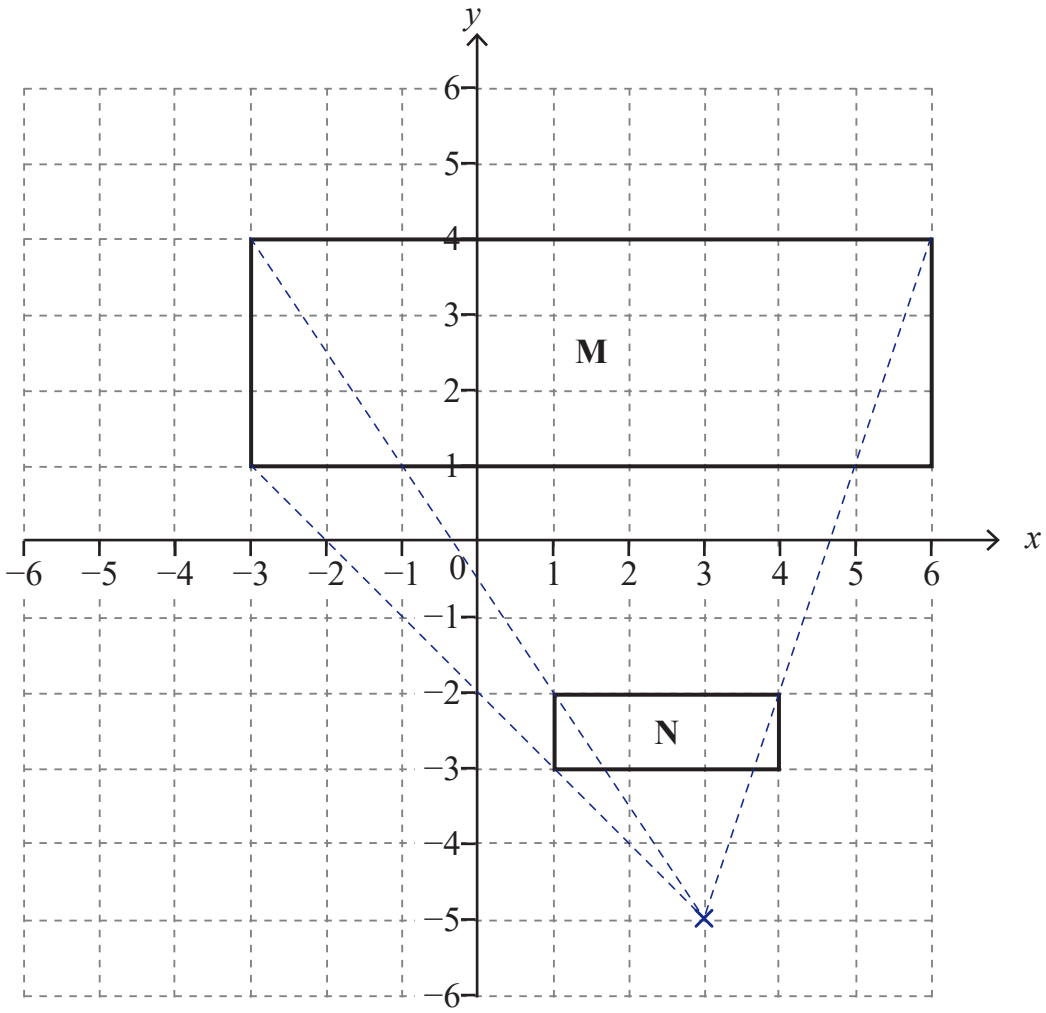
The dimensions of a large cylinder are twice the dimensions of a small cylinder.

The large cylinder will hold 8 times as much as the small cylinder.

[1]

[Turn over

15 Describe fully the single transformation that maps **M to N**.



Answer *Enlargement, scale factor $\frac{1}{3}$, centre (3, −5)*

[3]

16 A restaurant has three courses on its menu

Starter	**Main**	**Dessert**
Soup	Beef	Apple tart
Brie	Chicken	Pavlova
Prawns	Salmon	Lemon cake
Pâté	Lasagne	Ice cream
	Pork	Rhubarb crumble
		Fruit salad

There is a special deal when any two courses are ordered.

How many options are there when **any two different** courses are ordered?

Starter and main: 4 × 5 = 20

Starter and dessert: 4 × 6 = 24

Main and dessert: 5 × 6 = 30

Total = 20 + 24 + 30 = 74

Answer 74 [3]

[Turn over

17 Find the nth term of the sequence

$$\frac{1}{2}, \quad \frac{8}{3}, \quad \frac{27}{4}, \quad \frac{64}{5}, \quad \frac{125}{6}, \quad \ldots\ldots$$

Numerators: $1^3, 2^3, 3^3, 4^3, 5^3 \rightarrow n^3$

Denominators: $2, 3, 4, 5, 6 \rightarrow n + 1$

Answer $\frac{n^3}{n+1}$ [2]

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