Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
November 2021

Mathematics

StemUp Model Solution

Unit M7 Paper 2
(With calculator)
Higher Tier



[GMC72]

GMC72

THURSDAY 2 DECEMBER, 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 are provided with Higher Tier Additional Support Materials for use with this paper.
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 fifteen** 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.

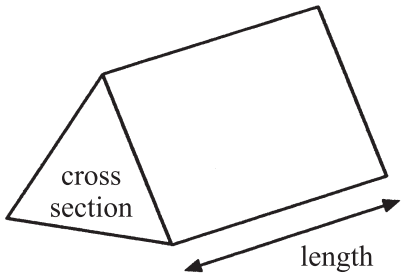
INFORMATION FOR CANDIDATES

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.

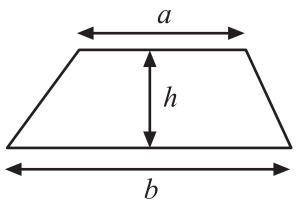
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Formula Sheet

Volume of prism = area of cross section × length

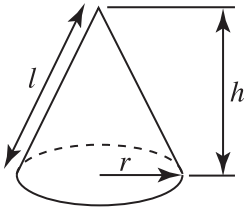


Area of trapezium = $\frac{1}{2}(a+b)h$



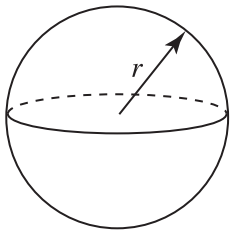
Volume of cone = $\frac{1}{3}\pi r^2 h$

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

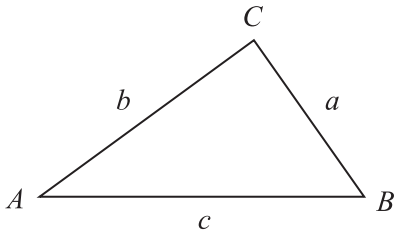


Volume of sphere = $\frac{4}{3}\pi r^3$

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

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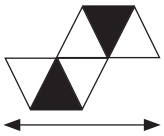
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1 A trapezium is divided into 3 equilateral triangles, 1 black and 2 white.

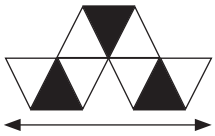
The trapezium has a side length of 20 cm as shown.



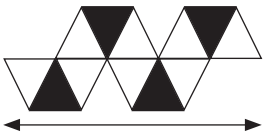
The trapeziums are lined up to make chain patterns.



Pattern 1



Pattern 2



Pattern 3

(a) Complete the table for the missing length for 10 trapeziums.

Number of trapeziums	1	2	3	4	.....	10
Length of chain (cm)	20	30	40	50	.....	110

Length goes up by 10 cm for each trapezium
Length = 10n + 10
10 × 10 + 10 = 110 cm

[2]

(b) Complete the table for the missing number of **white triangles** when the pattern number is 10

Pattern number	1	2	3	.....	10
Number of white triangles	4	6	8	.....	22

White triangles = 2n + 2
2 × 10 + 2 = 22

[1]

[Turn over

2



Raisins are sold in three different sizes of tubs.

Which is the best value for money?

You must show your working.

Cost per 100 g:

500 g: 350p ÷ 5 = 70p per 100 g

200 g: 150p ÷ 2 = 75p per 100 g

900 g: 650p ÷ 9 = 72.22...p per 100 g

70p is the cheapest per 100 g, so the 500 g tub is the best value for money

Answer *500 g tub* [4]

3 Bob changed £35 into euro.

Bev changed £42 into euro.

The exchange rate was £1 = 1.06 euro.

How many more euro did Bev get than Bob?

Bob: 35 × 1.06 = 37.10 euro

Bev: 42 × 1.06 = 44.52 euro

44.52 − 37.10 = 7.42 euro

Answer 7.42 euro [3]

[Turn over

4 **(a)** A roll of wallpaper has a width of 53 cm, measured to the nearest centimetre.

What is the maximum width of this roll of wallpaper?

Answer 53.5 cm [1]

(b) A television has a screen width of 88.6 cm, measured to one decimal place.

What is the minimum screen width of this television?

Answer 88.55 cm [1]

5 One Saturday, 460 people visited the museum.

180 were children of which $\frac{3}{5}$ were girls.

280 were adults and the ratio of men to women was 4:3

Paul says that, altogether, more males than females visited the museum that Saturday.

Is he correct?

Show all your working.

Children: girls = 3/5 × 180 = 108

boys = 180 − 108 = 72

Adults: 280 ÷ (4 + 3) = 40

men = 4 × 40 = 160, women = 3 × 40 = 120

Males = 72 + 160 = 232

Females = 108 + 120 = 228

232 > 228, so more males than females visited.

Yes, Paul is correct.

Answer Yes [4]

[Turn over

6

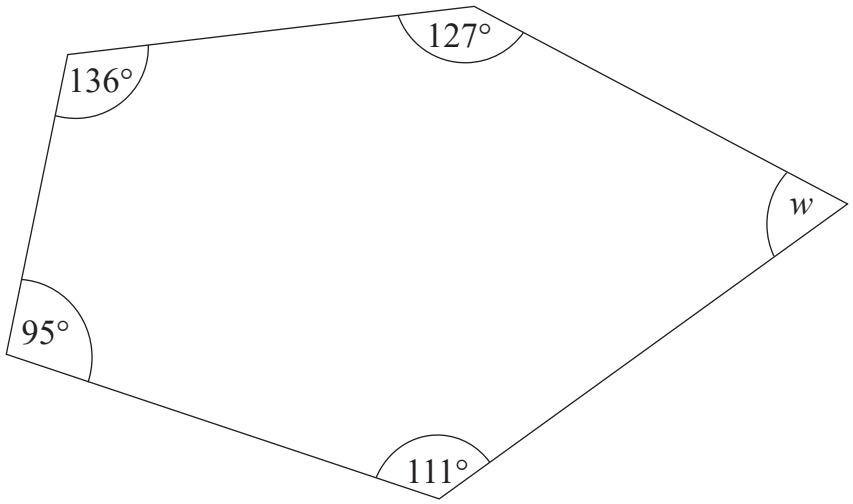


diagram not drawn accurately

Work out the size of the angle w in the pentagon drawn above.

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

w = 540 − (127 + 136 + 95 + 111)

= 540 − 469 = 71°

Answer w = 71 ° [3]

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7 A company makes memory chips.

The probability that one of these memory chips is faulty is 0.025

The company makes 1800 memory chips each hour.

Work out an estimate for the number of memory chips made per hour that will **not** be faulty.

P(not faulty) = 1 − 0.025 = 0.975

1800 × 0.975 = 1755

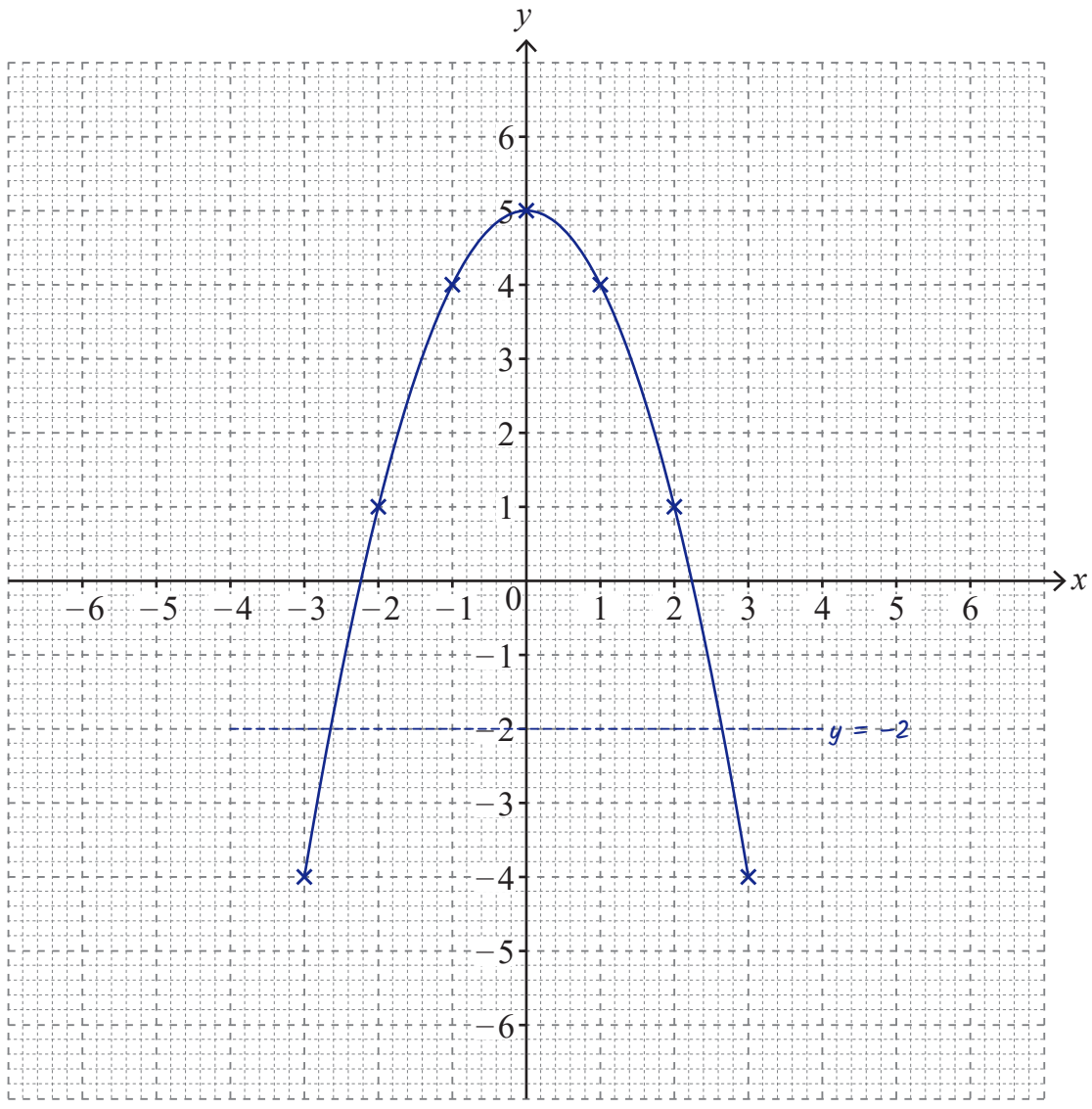
Answer 1755 [3]

[Turn over

8 **(a)** Draw the graph of $y = 5 - x^2$

Use the table below to help you.

x	–3	–2	–1	0	1	2	3
y	–4	1	4	5	4	1	–4



[3]

(b) Use the graph of $y = 5 - x^2$ to solve the equation $5 - x^2 = -2$

Read off where y = −2 meets the curve

Answer $x =$ *−2.6* or $x =$ *2.6* [1]

9 **(a)** Simplify

(i) $12x^5 \div 3x^3$

(12 ÷ 3) x^{5-3} = $4x^2$

Answer *$4x^2$* [2]

(ii) $(x^3)^4$

Answer *x^{12}* [1]

(b) Eva wants to find the nth term of this sequence.

1, 5 , 9, 13, 17 . . .

She knows that it starts with $4n$

Complete the nth term for this sequence.

Terms of 4n: 4, 8, 12, 16, 20
Subtract 3 to get 1, 5, 9, 13, 17

Answer *$4n - 3$* [1]

[Turn over

10 **(a)** Work out the size of an exterior angle of a 24-sided regular polygon.

$360 \div 24 = 15°$

Answer 15 ° [2]

(b) The sum of the interior angles of a regular polygon is 1800°

Work out how many sides this polygon has.

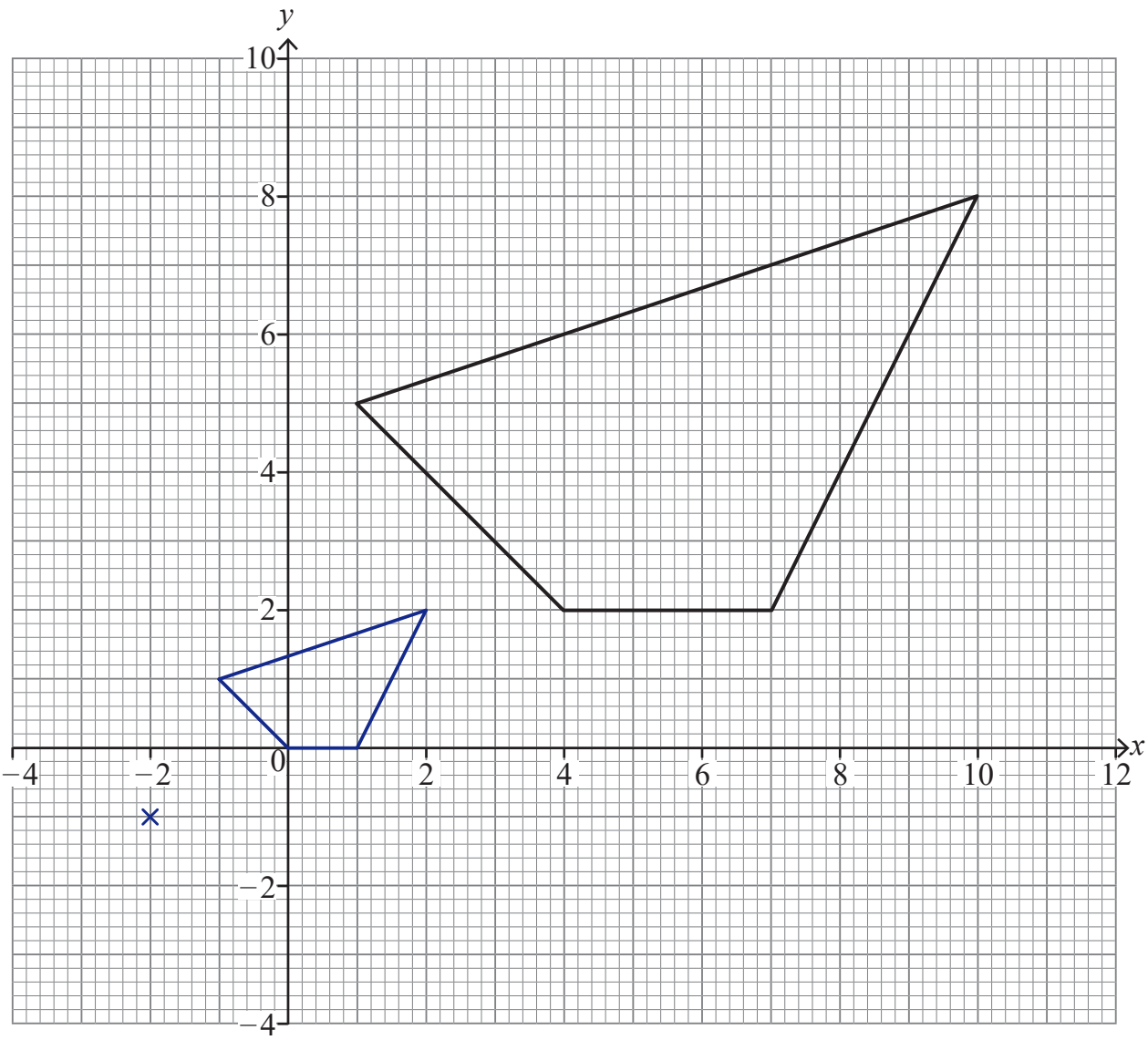
$180(n - 2) = 1800$

$n - 2 = 10$

$n = 12$

Answer 12 [2]

11 On the grid, draw the enlargement of the quadrilateral using a scale factor of $\frac{1}{3}$ and centre (−2, −1).



[3]

Centre (−2, −1): image = centre + 1/3 × (point − centre)
(1, 5) → (−1, 1) (10, 8) → (2, 2)
(7, 2) → (1, 0) (4, 2) → (0, 0)

[Turn over

12 Gina made a model of a pyramid.

The model has a height of 5.4 cm and a volume of 300 cm^3

She now plans to make a similar pyramid, four times as large, with a height of 21.6 cm.

What will the volume of this new pyramid be?

Length scale factor = 21.6 ÷ 5.4 = 4

Volume scale factor = 4^3 = 64

Volume = 300 × 64 = 19 200 cm^3

Answer *19 200* cm^3 [2]

13 Rob plans to travel to Australia by air.

His choice of destinations in Australia are Adelaide, Brisbane, Melbourne, Perth and Sydney.

He plans to make just one stop on his journey to Australia.

For each of these, he can choose to stop in Singapore, Hong Kong, Bangkok or Dubai.

How many different choices does he have for flying to Australia?

5 destinations × 4 stops

= 5 × 4 = 20

Answer *20* [2]

14 (a) The probability that it will snow in Enniskillen on Christmas Day in any year is 0.09

The probability that it will snow in Tokyo on Christmas Day in any year is 0.11

Work out the probability that it will snow in Enniskillen and in Tokyo on Christmas Day 2021

$0.09 \times 0.11 = 0.0099$

Answer 0.0099 [2]

(b) A survey of patients in a GP surgery found that

9% were seen within 5 minutes of their appointed time,

63% had to wait between 5 and 10 minutes and

28% had to wait longer than 10 minutes.

Work out the probability that a patient chosen at random was seen within 10 minutes of their appointed time.

$0.09 + 0.63 = 0.72$ (or $1 - 0.28 = 0.72$)

Answer 0.72 [2]

[Turn over

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15 T varies as the square of d

When $d = 0.3$, $T = 10.8$

(a) Express T in terms of d

$T = kd^2$

$10.8 = k \times 0.3^2$

$10.8 = 0.09k$

$k = 10.8 \div 0.09 = 120$

Answer $T = 120d^2$ [3]

(b) Find a value of d for which $T = 30$

$30 = 120d^2$

$d^2 = 30 \div 120 = 0.25$

$d = \sqrt{0.25} = 0.5$

Answer 0.5 [2]

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