Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
November 2023

Mathematics

StemUp Model Solution

Unit M7 Paper 1
(Non-Calculator)
Higher Tier

[GMC71]



GMC71

THURSDAY 23 NOVEMBER, 9.15 am – 10.30 am

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

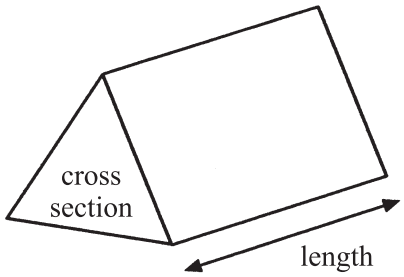
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page, on blank pages or tracing paper.
Complete in black ink only. **Do not write with a gel pen.**
Answer **all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

INFORMATION FOR CANDIDATES

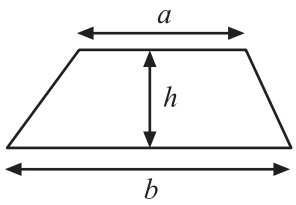
The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You should have a ruler, compasses and a protractor.
The Formula Sheet is on page 2.

Formula Sheet

Volume of prism = area of cross section × length

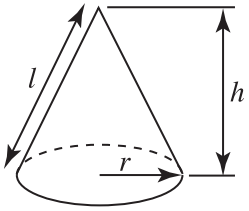


Area of trapezium = $\frac{1}{2}(a+b)h$



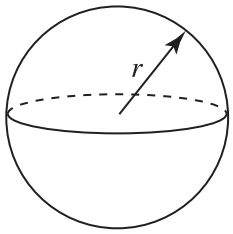
Volume of cone = $\frac{1}{3}\pi r^2 h$

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

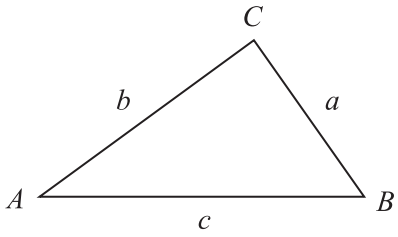


Volume of sphere = $\frac{4}{3}\pi r^3$

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

14121

1 The length of the side of a square is 51.1 cm.

Estimate the area of the square.

$51.1 \approx 50$

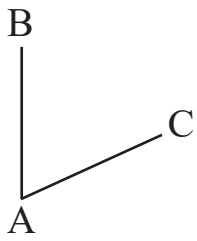
$\text{Area} \approx 50 \times 50 = 2500$

Answer 2500 cm^2 [2]

[Turn over

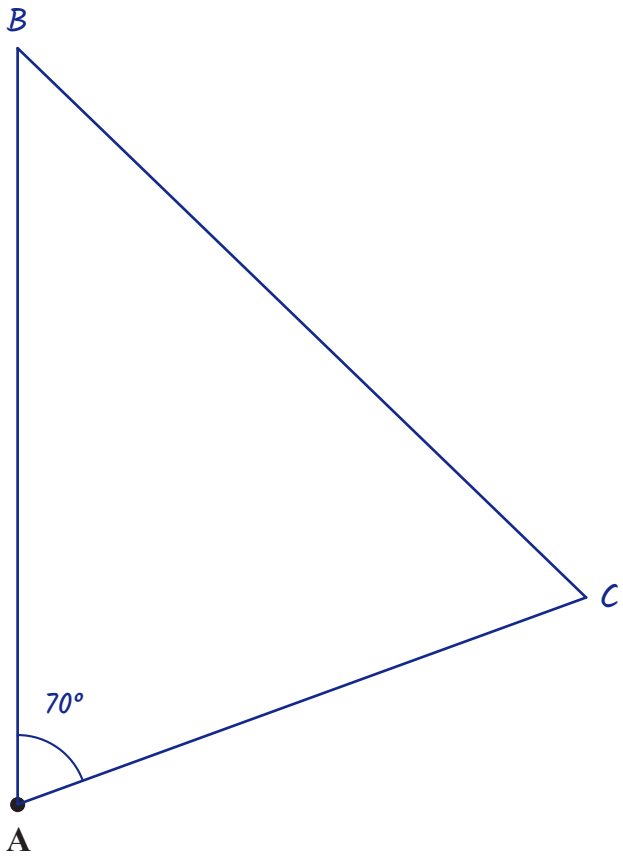
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2 Cara read the following instructions to draw a triangle.



- Using a ruler, draw a 10 cm **vertical line** from point A.
  Note: Point A has been marked below.
- Label the other end B.
- Place a protractor at point A and measure an angle of 70° to the right of the line AB and mark with a dot.
- Draw an 8 cm line from A through your dot.
- Label the end of this line C.
- Join B to C.

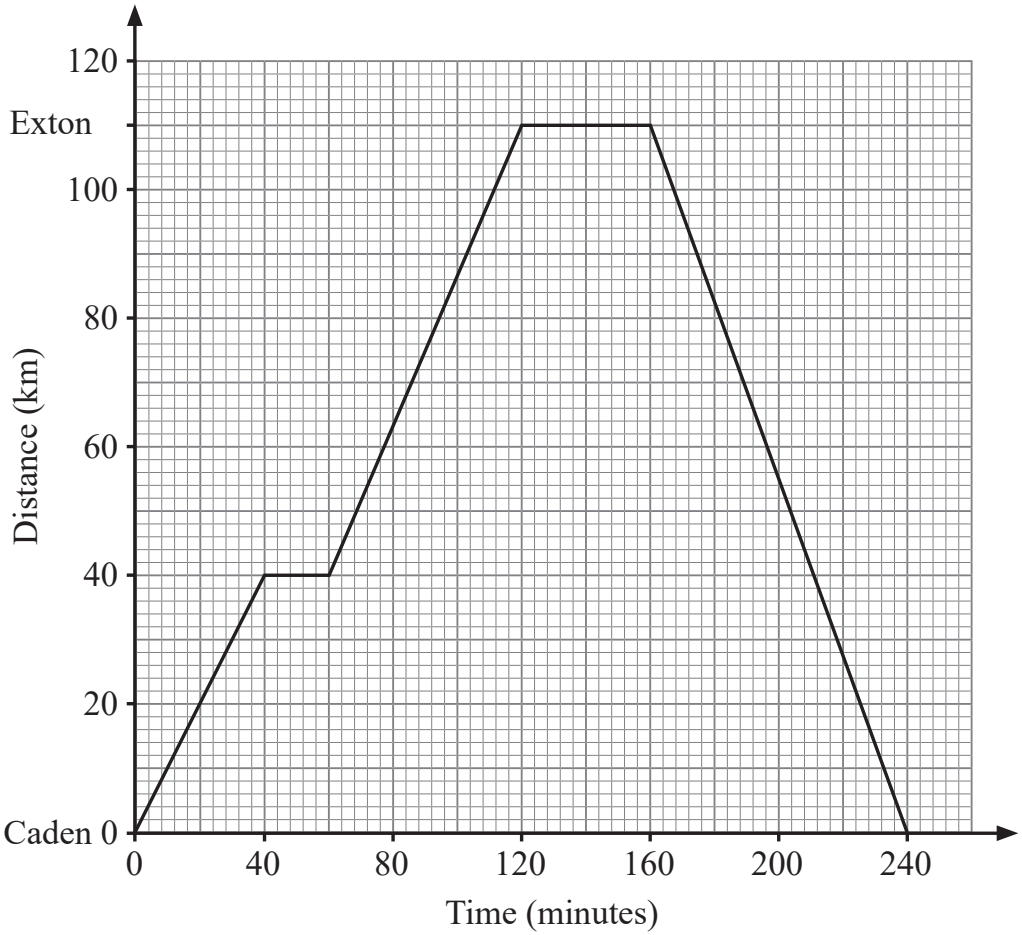
Follow the instructions and draw Cara's triangle below.



[3]

14121

3 The graph shows Paul's journey from Caden to Exton and back to Caden.



(a) How far is Paul from Caden when he first stops?

Answer 40 km [1]

(b) How long did Paul stay at Exton?

Answer 40 minutes [1]

(c) Paul left Caden at 8.30 am.

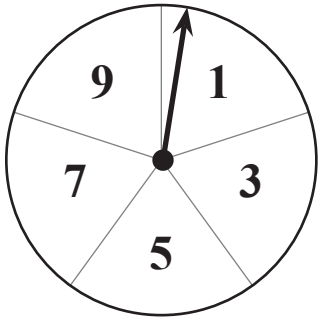
Leaves Exton at 160 min
= 2 h 40 min after 8.30

At what time did he leave Exton?

Answer 11.10 am [2]

[Turn over

4 A fair spinner has outcomes of 1, 3, 5, 7 and 9



The spinner is spun twice.

The two outcomes are **added** together to give a score.

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

First spin

Second spin	+	1	3	5	7	9
	1	2	4	6	8	10
	3	4	6	8	10	12
	5	6	8	10	12	14
	7	8	10	12	14	16
	9	10	12	14	16	18

[2]

(b) What is the probability of getting the "most likely" score?

Score 10 occurs 5 times out of 25

Answer $\frac{5}{25}$ [1]

5 A bag contains 140 g of crisps.

30% is fat.

How many grams is this?

10% of 140 = 14
30% = 14 × 3 = 42 g

Answer 42 g [2]

[Turn over

6 Kevin owns a business.

$\frac{3}{5}$ of his customers pay by card.

$\frac{2}{7}$ pay in cash.

The rest pay by cheque.

What fraction pay by cheque?

$\frac{3}{5} + \frac{2}{7} = \frac{21}{35} + \frac{10}{35} = \frac{31}{35}$

Cheque: $1 - \frac{31}{35} = \frac{35}{35} - \frac{31}{35} = \frac{4}{35}$

Answer $\frac{4}{35}$ [3]

7



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Look at the table below.

It shows the number of pastries sold in the morning.

Cinnamon rolls	**1**
Apple pies	**6**
Chocolate muffins	**8**
Carrot cake	**5**

Based on this data, how many of the 50 pastries sold in the afternoon would you expect to be chocolate muffins?

Total in morning = 1 + 6 + 8 + 5 = 20

$P(\text{chocolate muffin}) = \frac{8}{20} = \frac{2}{5}$

$\frac{2}{5} \times 50 = 20$

Answer 20 [3]

[Turn over

8 Given that $\frac{29400}{245} = 120$, **write down** the answer to

(a) $\frac{2940}{245}$

120 ÷ 10 = 12

Answer 12 [1]

(b) 245 × 240

245 × 240 = 2 × 29400

Answer 58800 [1]

(c) 24.5 × 1.2

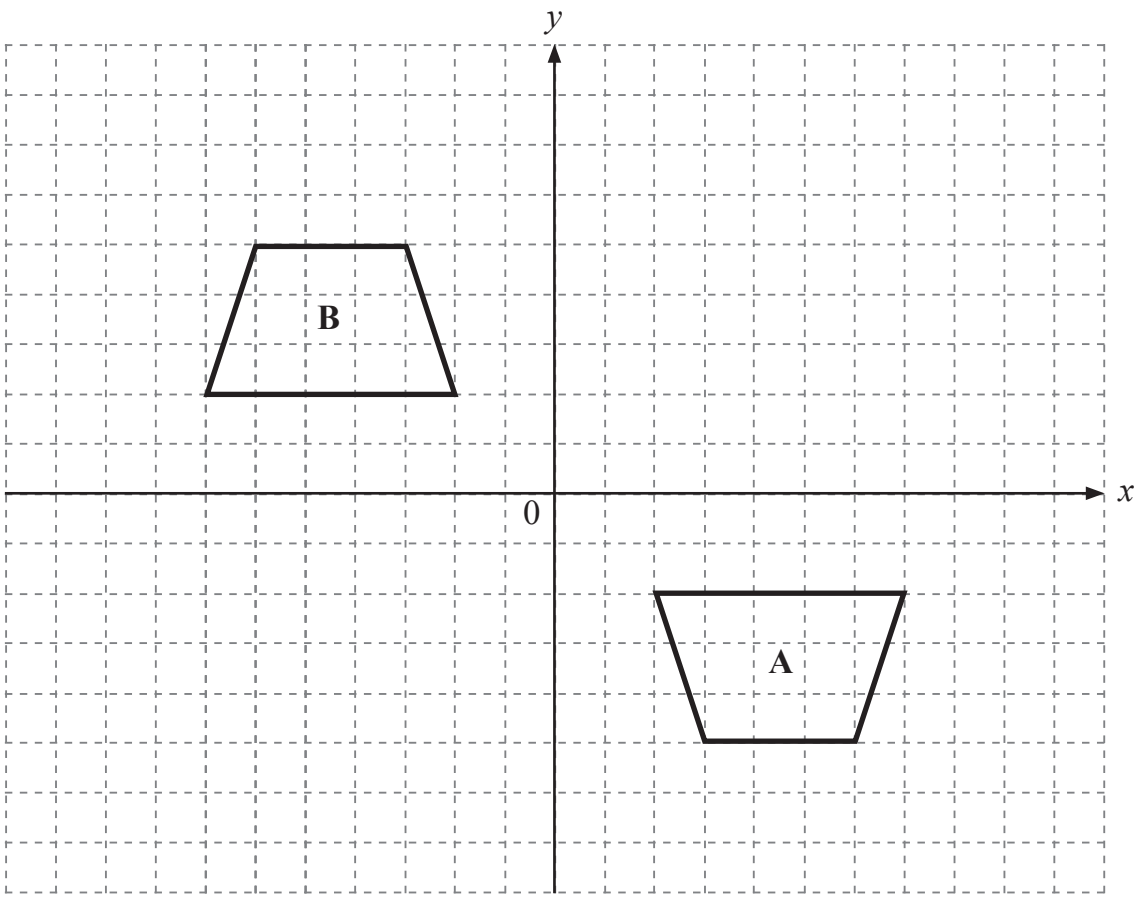
24.5 × 1.2 = 29400 ÷ 1000

Answer 29.4 [1]

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9 The diagram shows two identical shapes, A and B.

Describe fully the single transformation which takes shape A to shape B.



Answer *Rotation 180° about the origin (0, 0)* [3]

[Turn over

10 110110 is a binary number.

20 is a decimal number.

Work out the total of the two numbers.

Give your answer as a binary number.

110110 = 32 + 16 + 4 + 2 = 54

54 + 20 = 74

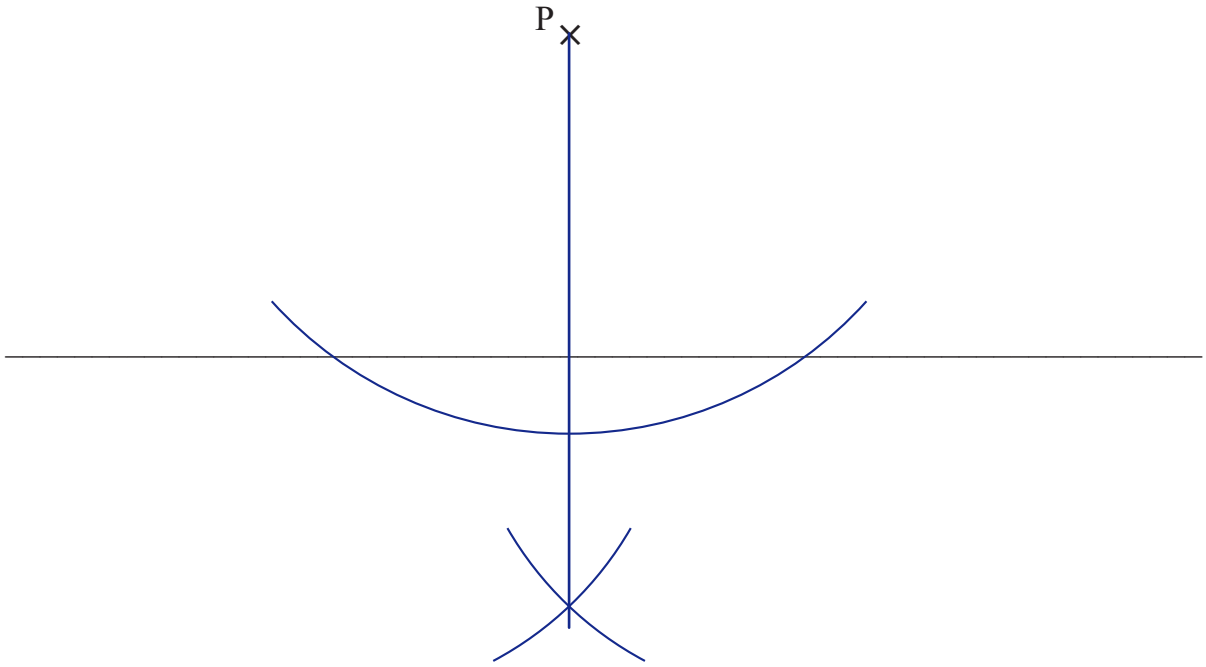
74 = 64 + 8 + 2

= 1001010 in binary

Answer 1001010 [3]

11 **Use a ruler and compasses** to construct the perpendicular from the point P to the line shown.

Leave all construction arcs and lines.



[2]

[Turn over

12 7, 10, 13, 16, ...

Using the *n*th term, find the smallest term in the sequence above which is bigger than 1000

Show your working.

Common difference 3, so nth term = 3n + 4

3n + 4 > 1000

3n > 996

n > 332

n = 333: 3 × 333 + 4 = 999 + 4 = 1003

Answer 1003 [5]

13



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September 1st is on a Sunday.

Nina has applied to do her driving test in September.

No test dates are given on a Sunday.

Nina is unable to do her test on Mondays or Fridays due to work.

What is the probability that Nina is given a test date that **she cannot** do?

September has 30 days

Sundays: 1, 8, 15, 22, 29 (5 days)

Possible test dates = 30 − 5 = 25

Mondays: 2, 9, 16, 23, 30 (5)

Fridays: 6, 13, 20, 27 (4)

Dates she cannot do = 5 + 4 = 9

P(date she cannot do) = $\frac{9}{25}$

Answer $\frac{9}{25}$ [3]

[Turn over

14 $A = 2.5 \times 10^8$

$B = 8 \times 10^{-2}$

$C = 5 \times 10^4$

Work out the value of $\frac{AB}{C}$

Give your answer in standard form.

$AB = 2.5 \times 10^8 \times 8 \times 10^{-2}$

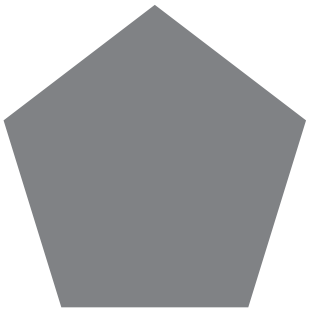
$= 20 \times 10^6$

$= 2 \times 10^7$

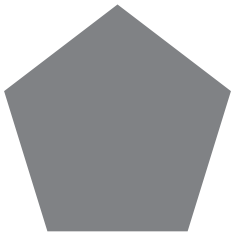
$\frac{AB}{C} = \frac{2 \times 10^7}{5 \times 10^4} = 0.4 \times 10^3 = 4 \times 10^2$

Answer 4×10^2 [3]

15



A



B

diagram
not drawn
accurately

A and B are similar pentagons.

The length of each side of pentagon B is $\frac{3}{4}$ of the length of the corresponding side of pentagon A.

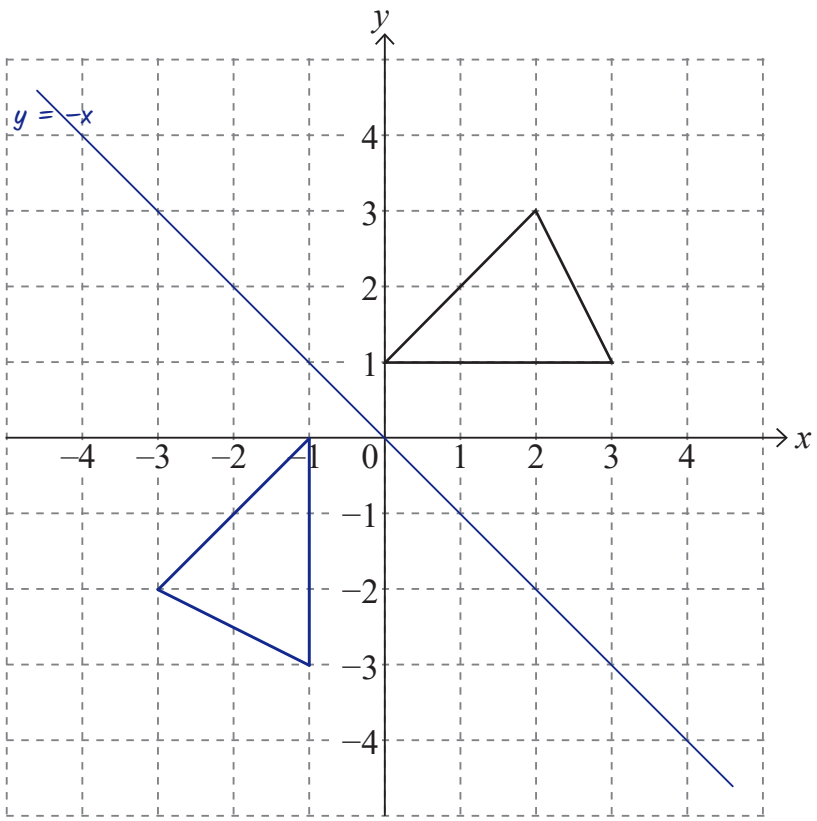
What fraction of the area of A is the area of B?

Area scale factor = $\left(\frac{3}{4}\right)^2 = \frac{9}{16}$

Answer $\frac{9}{16}$ [1]

[Turn over

16



Draw the reflection of the triangle in the line $y = -x$. [3]

17 M is directly proportional to d^2

$M = 36$ when $d = 3$

d is directly proportional to x

$d = 4$ when $x = 2$

Work out the value of M when $x = 4$

$M = kd^2$: $36 = k \times 3^2 = 9k$, $k = 4$

$M = 4d^2$

$d = cx$: $4 = 2c$, $c = 2$

$d = 2x$

$x = 4$: $d = 2 \times 4 = 8$

$M = 4 \times 8^2 = 4 \times 64 = 256$

Answer 256 [4]

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THIS IS THE END OF THE QUESTION PAPER

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Question Number	**Marks**
1	
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Examiner Number

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