Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
November 2025

Mathematics

StemUp Model Solution

Unit M7 Paper 1
(Non-Calculator)
Higher Tier

[GMC71]



GMC71

THURSDAY 20 NOVEMBER, 9.15am–10.30am

TIME

1 hour 15 minutes.

INSTRUCTIONS TO CANDIDATES

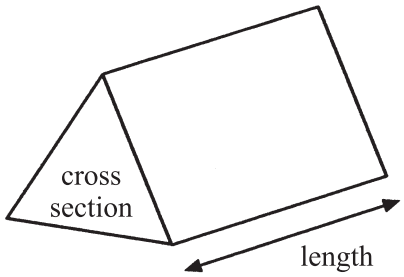
Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer the questions in the spaces provided.
Do not write outside the boxed area on each page, on blank pages or tracing paper.
Complete in black ink only. **Do not write with a gel pen.**
Questions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

INFORMATION FOR CANDIDATES

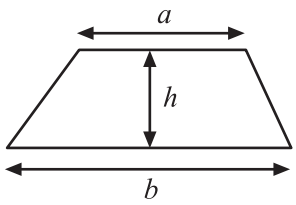
The total mark for this paper is 50.
Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.
You should have a ruler, compasses and a protractor.
The Formula Sheet is on page 2.

Formula Sheet

Volume of prism = area of cross section × length

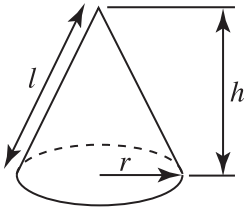


Area of trapezium = $\frac{1}{2}(a+b)h$



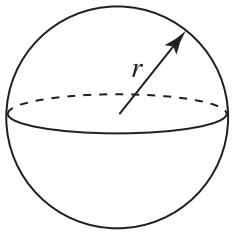
Volume of cone = $\frac{1}{3}\pi r^2 h$

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

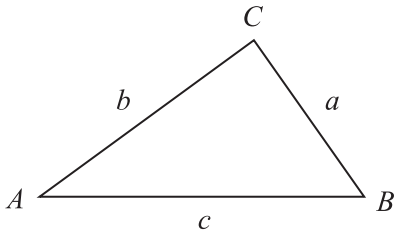


Volume of sphere = $\frac{4}{3}\pi r^3$

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 Pat's car journey took 7 hours.

She spent 15% of the journey stopped at service stations.

How many **minutes** of the journey were spent driving?

Show your working out clearly.

7 hours = 7 × 60 = 420 minutes

10% of 420 = 42, 5% of 420 = 21

15% = 42 + 21 = 63 minutes stopped

Driving = 420 − 63 = 357 minutes

Answer 357 minutes [4]

[Turn over

2 **(a)** Fill in the two missing numbers in this sequence.

−2 , 1, 6, 13, 22, 33, 46 [2]

+3 +5 +7 +9 +11 +13

(b) Each new number in a different sequence is found by using the rule

"Square the previous term and add 7"

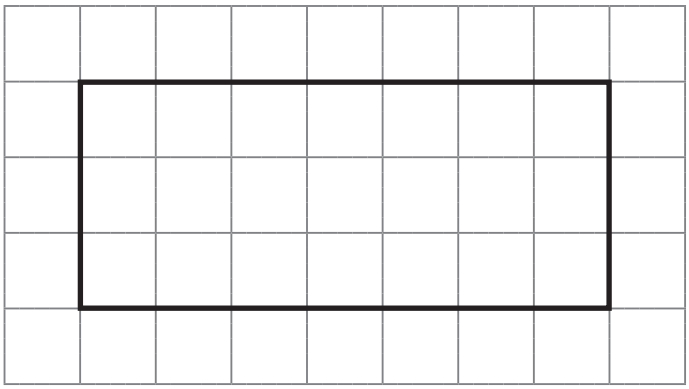
The first term is 3

Find the second term.

$3^2 + 7 = 9 + 7 = 16$

Answer 16 [1]

3 This is a scale drawing of the floor of Jacob's warehouse.



The scale is 1 cm = 5 m

Work out the actual perimeter of the floor of the warehouse.

Drawing: length = 7 cm, width = 3 cm

Perimeter on drawing = 7 + 3 + 7 + 3 = 20 cm

Actual perimeter = 20 × 5 = 100 m

Answer *100* m [3]

[Turn over

4 Jenny has some tins of soup.

4 are lentil

6 are lentil and bacon

3 are chicken

Total = 4 + 6 + 3 = 13 tins

One tin is taken at random.

What is the probability of taking a tin which

(a) is chicken, $\frac{3}{13}$ [1]

(b) is mushroom, 0 [1]

(c) contains lentils? $\frac{10}{13}$ [1]

5 The ratio of flour to sugar is 7 : 6 in a recipe.

There are 180 grams of sugar.

How many grams of flour are there?

180 ÷ 6 = 30 g for one part

Flour = 7 × 30 = 210 g

Answer 210 grams [2]

6 Chloe goes on holiday.

She spends $\frac{3}{7}$ of her time at the beach.

She spends 25% of her time sightseeing.

The rest of her time is spent at the hotel.

What **fraction** of Chloe's time is spent at the hotel?

Show your working out clearly.

$25\% = \frac{1}{4}$

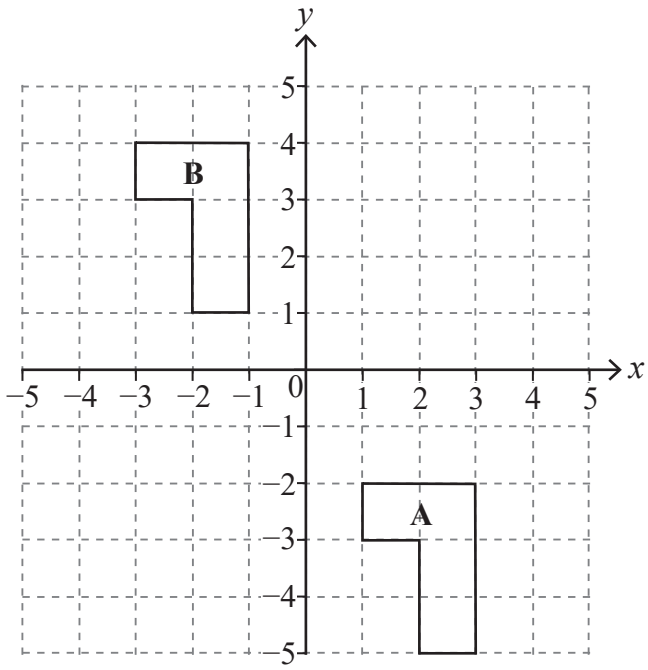
Beach + sightseeing $= \frac{3}{7} + \frac{1}{4} = \frac{12}{28} + \frac{7}{28} = \frac{19}{28}$

Hotel $= 1 - \frac{19}{28} = \frac{28}{28} - \frac{19}{28} = \frac{9}{28}$

Answer $\frac{9}{28}$ [3]

[Turn over

7 Describe fully the single transformation that maps B to A.



Answer *Translation, 4 units right and 6 units down* [2]

8 The length of a sports pitch is 92 m to the nearest metre.

Write down the shortest possible length of the sports pitch.

Answer *91.5* m [1]

9 Find the sum of the angles in the polygon ABCDEFGH.

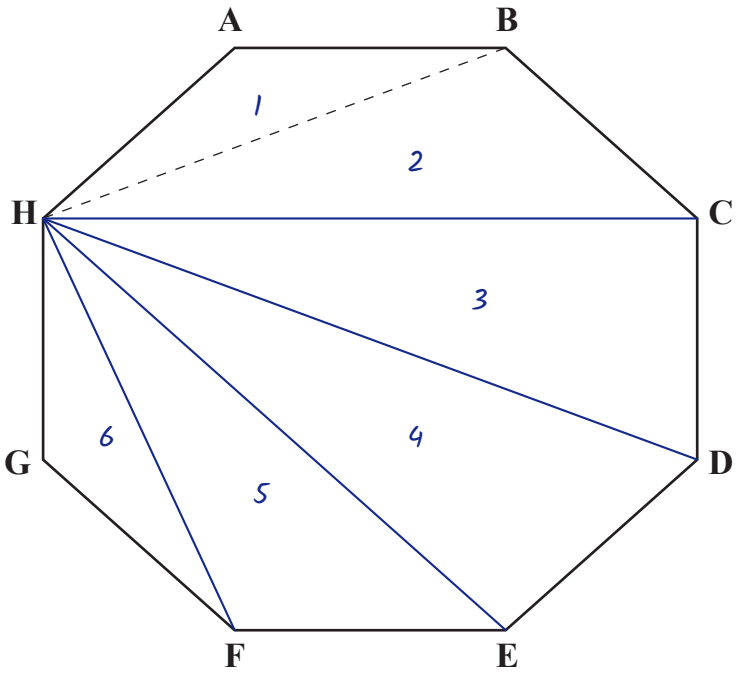


diagram not drawn accurately

Diagonals from H split the octagon into 6 triangles

Angles in each triangle add up to 180°

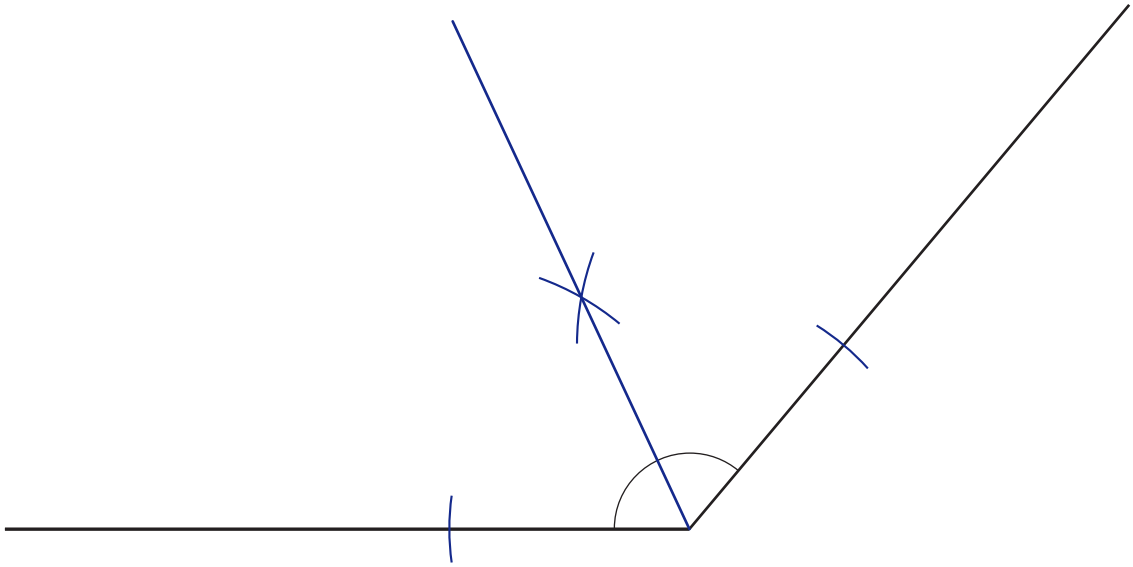
Sum = 6 × 180° = 1080°

Answer 1080 ° [3]

[Turn over

10 Use a ruler and compasses to construct the bisector of the angle.

You must show all your construction arcs.



[2]

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11 Jan asks some delivery drivers how much money they spend on fuel each week.

The results are shown below.

Amount, £A	Frequency
$0 < A \leqslant 40$	12
$40 < A \leqslant 80$	18
$80 < A \leqslant 120$	26
$120 < A \leqslant 160$	27
$160 < A \leqslant 200$	17

There are 2000 delivery drivers in the area.

Estimate how many delivery drivers in the area spend over £160 on fuel each week.

Show your working out clearly.

Total = 12 + 18 + 26 + 27 + 17 = 100 drivers

Over £160: 17 out of 100

$\frac{17}{100} \times 2000 = 17 \times 20 = 340$

Answer 340 [2]

[Turn over

12 A college has 270 students.

120 of the students are male.

The probability that a male student plays sport is $\frac{7}{20}$

The probability that a female student plays sport is 0.4

What **fraction** of the students who play sport are male?

Females = 270 − 120 = 150

Males who play sport: $\frac{7}{20} \times 120 = 7 \times 6 = 42$

Females who play sport: 0.4 × 150 = 60

Total who play sport = 42 + 60 = 102

Fraction male = $\frac{42}{102} = \frac{21}{51} = \frac{7}{17}$

Answer *$\frac{7}{17}$* [4]

13 **(a)** Explain why 105001 is not a binary number.

Answer *It has a 5; binary numbers only use the digits 0 and 1* [1]

(b) Write the number 23 as a binary number.

$23 = 16 + 4 + 2 + 1$

16	8	4	2	1
1	0	1	1	1

Answer *10111* [1]

(c) Jim says that the binary number 110001 is a square number when it is changed into a decimal number.

Is Jim correct?

Show your working out clearly.

32	16	8	4	2	1
1	1	0	0	0	1

$32 + 16 + 1 = 49$

$49 = 7 \times 7 = 7^2$

Answer *Yes* because *110001 = 49 = 7^2, a square number* [2]

[Turn over

14 The first 6 terms in sequence P are

3, 5, 7, 9, 11, 13, …

The first 6 terms in sequence Q are

1, 5, 9, 13, 17, 21, …

Joanne adds the first term of sequence P to the first term of sequence Q.

She adds the second term of sequence P to the second term of sequence Q.

She continues in this way to produce a new sequence.

(a) Write down the nth term for this new sequence.

New sequence: 4, 10, 16, 22, 28, 34, …
Common difference 6, so 6n
6n: 6, 12, 18, … subtract 2

Answer 6n − 2 [2]

(b) Find the 20th term for this new sequence.

6 × 20 − 2 = 120 − 2 = 118

Answer 118 [1]

15 E and F are independent events.

The probability of E happening = x

The probability of F happening = y

What is the probability of E and F happening?

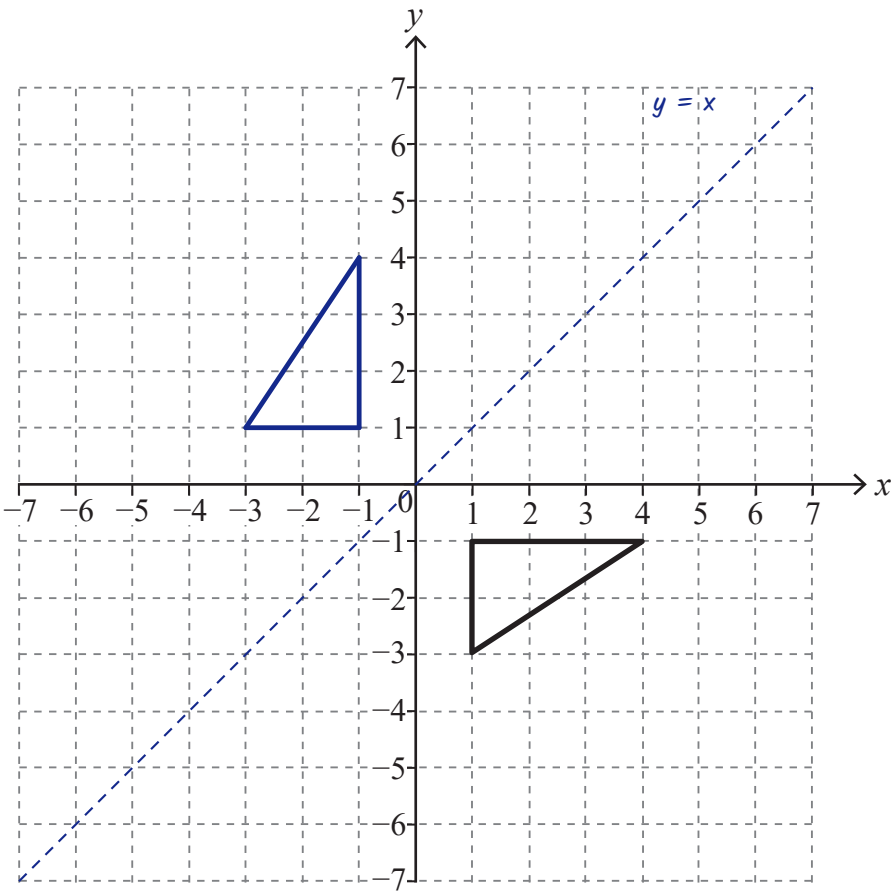
Circle the correct answer.

xy $\quad x - y \quad x + y \quad 1 - xy$

[1]

[Turn over

16 Reflect the triangle in the line $y = x$.



[2]

17 $A = (8 \times 10^{-5}) + (2 \times 10^{2})$

$B = (8 \times 10^{-5}) \times (2 \times 10^{2})$

$C = (8 \times 10^{-5}) \div (2 \times 10^{2})$

Write A, B, C in order of size, beginning with the smallest.

Show your working out clearly.

$A = 0.00008 + 200 = 200.00008$

$B = 16 \times 10^{-5+2} = 16 \times 10^{-3} = 0.016$

$C = 4 \times 10^{-5-2} = 4 \times 10^{-7} = 0.0000004$

Smallest is C, then B, then A

Answer C , B , A [3]

[Turn over

18 Mary works in a garage and in a café.

Last week she worked 5 hours in the garage and 8 hours in the café.

She earned £155

This week she worked 4 hours in the garage and 6 hours in the café.

She earned £119

How much does she earn per hour in the garage and per hour in the café?

A solution by trial and improvement will not be accepted.

Let g = £ per hour in garage, c = £ per hour in café

$5g + 8c = 155$ (1)

$4g + 6c = 119$ (2)

(1) × 4: $20g + 32c = 620$

(2) × 5: $20g + 30c = 595$

Subtract: $2c = 25$, $c = 12.50$

$5g + 8(12.50) = 155$

$5g + 100 = 155$, $5g = 55$, $g = 11$

Answer Garage £ 11 per hour, Café £ 12.50 per hour [5]

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Question Number	**Marks**
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