Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
2019

Mathematics

StemUp Model Solution

Unit M8 Paper 2
(With calculator)
Higher Tier



[GMC82]

GMC82

THURSDAY 6 JUNE, 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.**
Answer **all thirteen** 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.

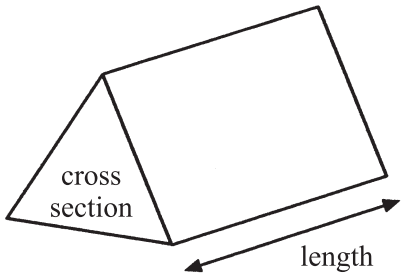
INFORMATION FOR CANDIDATES

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.

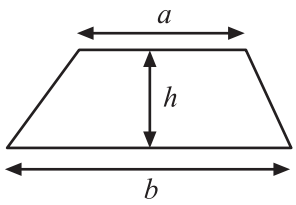
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Formula Sheet

Volume of prism = area of cross section × length

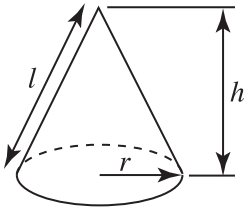


Area of trapezium = $\frac{1}{2}(a+b)h$



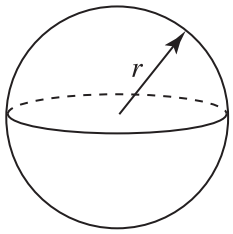
Volume of cone = $\frac{1}{3}\pi r^2 h$

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

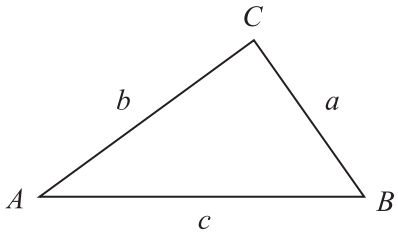


Volume of sphere = $\frac{4}{3}\pi r^3$

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

11948

1 Simplify $\dfrac{m^5 \times m^3}{m^2}$

$m^5 \times m^3 = m^8$

$m^8 \div m^2 = m^6$

Answer m^6 [1]

2 Work out the n^{th} term of the sequence 6, 3, 0, −3, ...

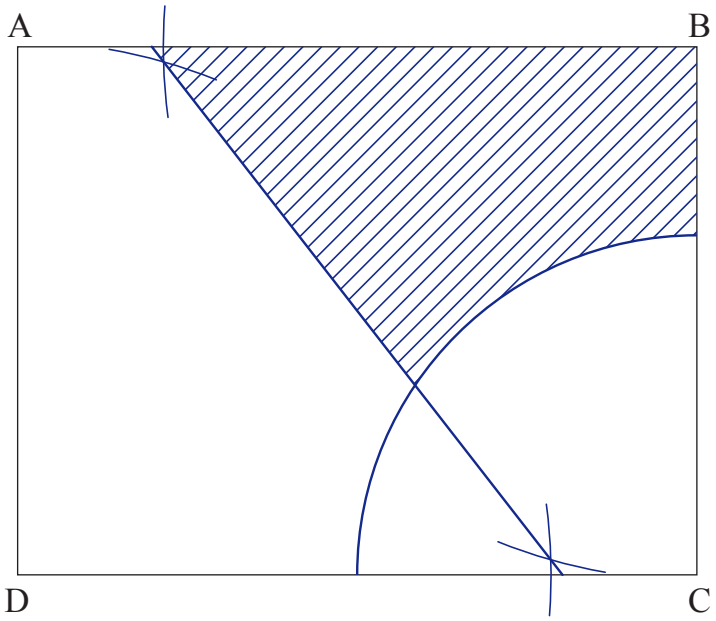
Difference = −3, so −3n

6 − (−3) = 9, so add 9

Answer $9 - 3n$ [2]

[Turn over

3



ABCD is a rectangle, with AB = 9 cm and BC = 7 cm.

Shade the region inside the rectangle which is the locus of all points that are

(i) greater than 4.5 cm from C

and **(ii)** nearer to B than D. [3]

4 Use trial and improvement to solve the equation $x^3 - 3x = 11$

Give your answer correct to one decimal place.

You must show your working

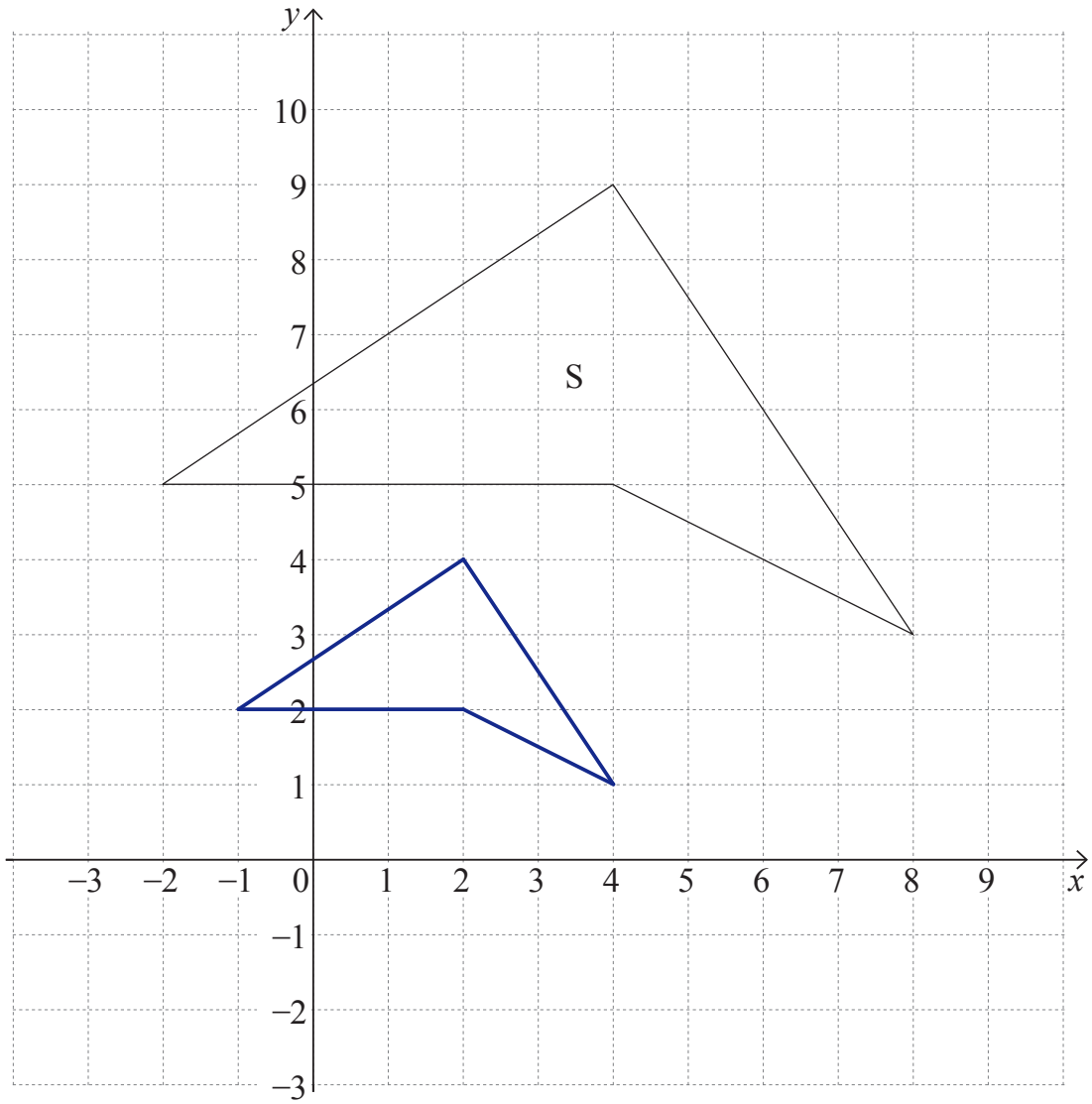
x	$x^3 - 3x$	
2	2	too small
3	18	too big
2.6	9.776	too small
2.7	11.583	too big
2.65	10.659625	too small

2.65 gives 10.66, too small, so x is between 2.65 and 2.7
x = 2.7 (to 1 d.p.)

Answer 2.7 [4]

[Turn over

5



(a) On the grid above, draw an enlargement of the shape S, using a scale factor of $\frac{1}{2}$ and centre (0, –1).

[3]

(b) If the shape S has an area of 20 cm^2, what is the area of the enlarged shape?

Area scale factor = (½)² = ¼
20 × ¼ = 5

Answer *5* cm^2 [1]

6 s is directly proportional to the square of v.

When $v = 20$, $s = 250$

Express s in terms of v.

$s = kv^2$

$250 = k \times 20^2$

$250 = 400k$

$k = \frac{250}{400} = \frac{5}{8} = 0.625$

Answer $s = \frac{5}{8} v^2$ [3]

[Turn over

7 A bag contains 60 coins.

Each coin in the bag is either a 20p coin or a 50p coin.

The total value of the coins in the bag is £22.80

Work out how many of each coin is in the bag.

A solution by trial and improvement will not be accepted.

Let x = number of 20p coins, y = number of 50p coins

$x + y = 60$

$20x + 50y = 2280$

$\times 20$: $20x + 20y = 1200$

subtract: $30y = 1080$

$y = 36$

$x = 60 - 36 = 24$

Check: $24 \times 20 + 36 \times 50 = 480 + 1800 = 2280p = £22.80$

Answer 24 20p coins

36 50p coins [5]

8 Make T the subject of $J = \sqrt{TR}$

$J = \sqrt{(TR)}$

$J^2 = TR$

$T = \frac{J^2}{R}$

Answer $T = \frac{J^2}{R}$ [2]

[Turn over



9

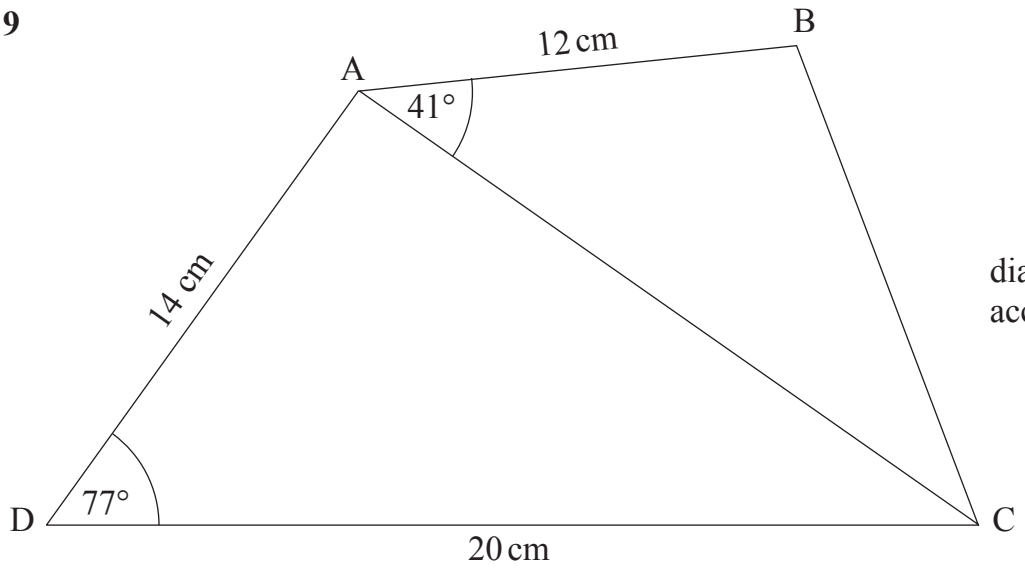


diagram not drawn accurately

Find the area of the triangle ABC.

Cosine rule in triangle ACD:

$AC^2 = 14^2 + 20^2 - 2 \times 14 \times 20 \times \cos 77°$

$AC^2 = 470.0274...$

$AC = 21.68011553$ cm

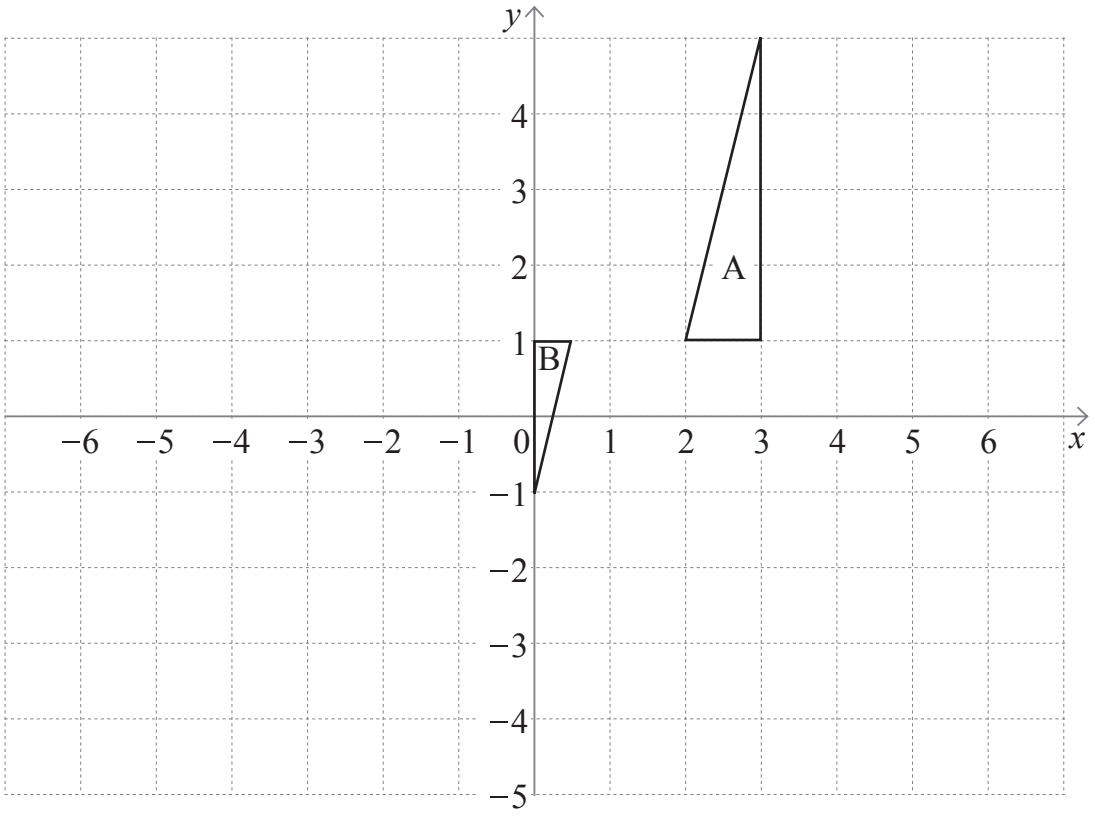
Area ABC $= \frac{1}{2} \times 12 \times 21.68011553 \times \sin 41°$

$= 85.34061327...$

$= 85.3$ cm^2

Answer 85.3 cm^2 [5]

10



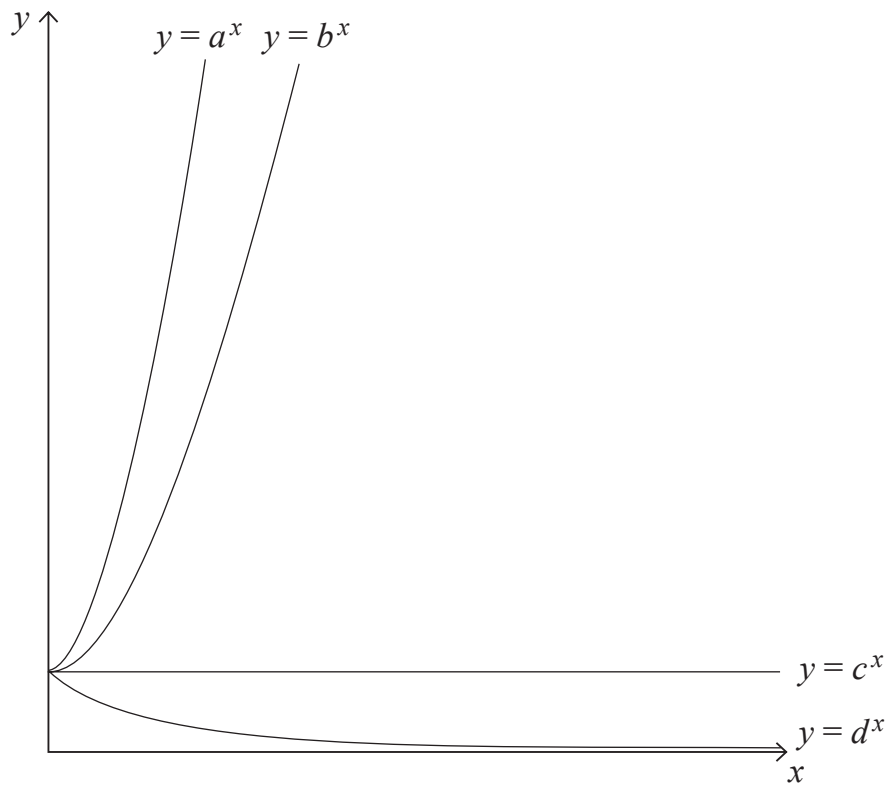
Describe fully the **single** transformation that maps triangle A to triangle B.

Answer *Enlargement, scale factor −½*

centre (1, 1) [3]

[Turn over

11



Sketches of $y = a^x, y = b^x, y = c^x, y = d^x$ are drawn above.

(a) a and b are numbers. One has the value 2 and the other has the value 3

Which is which?

Answer $a =$ 3 , $b =$ 2 [1]

(b) Write down the value of c

Answer $c =$ 1 [1]

(c) Estimate the value of d

Answer $d =$ 0.5 [1]

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12 A drawer contains two blue socks, four grey socks and six white socks.
Two socks are taken at random from the drawer.

What is the probability that

(a) they are both grey,

$P(GG) = \frac{4}{12} \times \frac{3}{11} = \frac{12}{132} = \frac{1}{11}$

Answer $\frac{1}{11}$ [2]

(b) the two socks are not the same colour as each other?

$P(BB) = \frac{2}{12} \times \frac{1}{11} = \frac{2}{132}$

$P(GG) = \frac{4}{12} \times \frac{3}{11} = \frac{12}{132}$

$P(WW) = \frac{6}{12} \times \frac{5}{11} = \frac{30}{132}$

$P(\text{same colour}) = \frac{2}{132} + \frac{12}{132} + \frac{30}{132} = \frac{44}{132}$

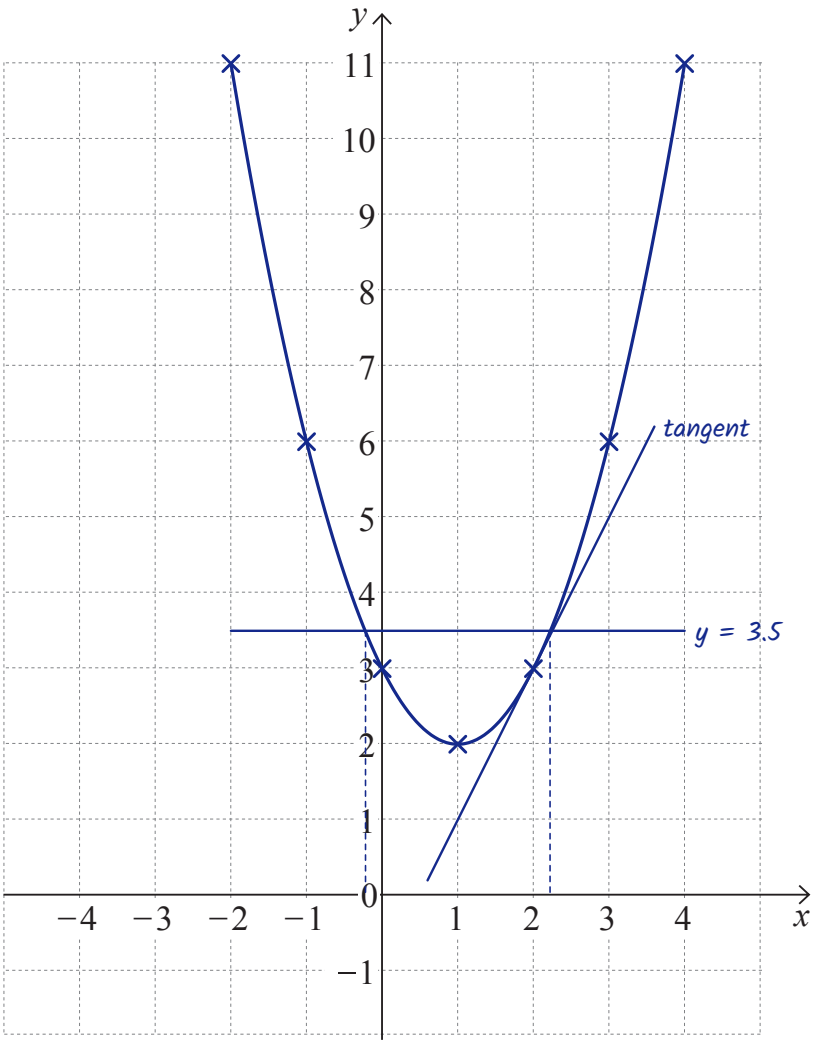
$P(\text{not the same}) = 1 - \frac{44}{132} = \frac{88}{132} = \frac{2}{3}$

Answer $\frac{2}{3}$ [5]

[Turn over

13

x	y
−2	11
−1	6
0	3
1	2
2	3
3	6
4	11



(a) Draw the graph of $y = x^2 - 2x + 3$ for $-2 \leq x \leq 4$ on the grid above. [2]

(b) Use your graph to find the gradient of the curve when $x = 2$

Tangent at (2, 3) passes through (0.5, 0) and (3.5, 6)

gradient = 6 ÷ 3 = 2

Answer *2* [2]

(c) By drawing an appropriate line solve $2x^2 - 4x - 1 = 0$

$2x^2 - 4x - 1 = 0 \rightarrow x^2 - 2x - 0.5 = 0$

$x^2 - 2x + 3 = 3.5$, so draw the line $y = 3.5$

Crosses the curve at $x = -0.2$ and $x = 2.2$

Answer *−0.2, 2.2* [2]

(d) What line would you draw on your graph to solve the equation $x^2 + 12x + 4 = 0$?

$x^2 + 12x + 4 = 0$

$x^2 - 2x + 3 = -14x - 1$

Answer *$y = -14x - 1$* [2]

THIS IS THE END OF THE QUESTION PAPER

DO NOT WRITE ON THIS PAGE

For Examiner's use only	
Question Number	**Marks**
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	
Total Marks	

Examiner Number

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