Rewarding Learning

Centre Number

Candidate Number

General Certificate of Secondary Education
January 2020

Mathematics

StemUp Model Solution

Unit M7 Paper 2
(With calculator)
Higher Tier



[GMC72]

GMC72

WEDNESDAY 15 JANUARY, 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 nineteen** 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.

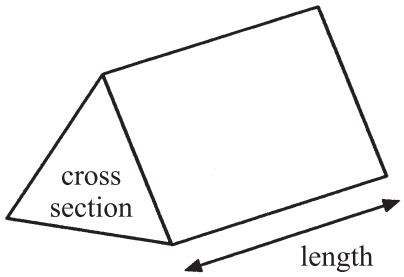
INFORMATION FOR CANDIDATES

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.

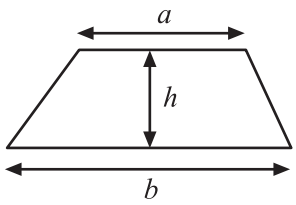
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Formula Sheet

Volume of prism = area of cross section × length

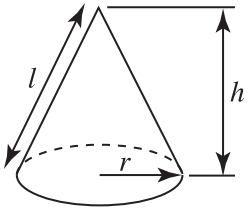


Area of trapezium = $\frac{1}{2}(a+b)h$



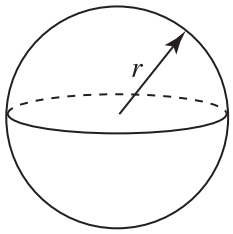
Volume of cone = $\frac{1}{3}\pi r^2 h$

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

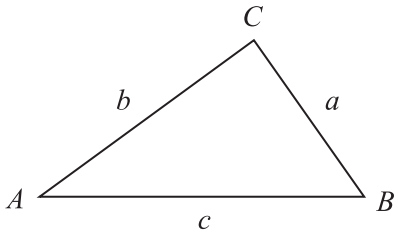


Volume of sphere = $\frac{4}{3}\pi r^3$

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

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

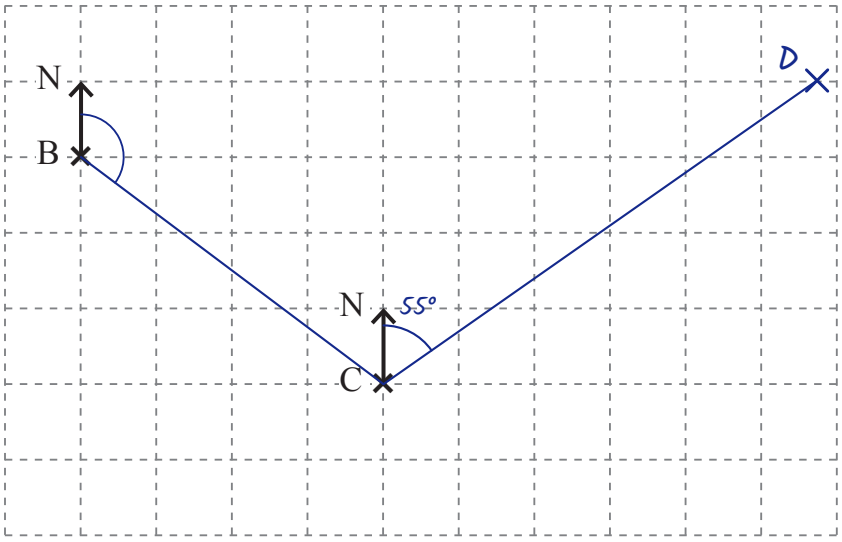
Sine Rule: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

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

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

12514

1 The diagram shows the position of two airports, B and C.



(a) Measure the bearing of C from B.

Answer 127 ° [1]

(b) A third airport D is 350 km on a bearing of 055° from airport C.

On the diagram, using a scale of 1 cm to 50 km, mark the position of airport D with a cross (✕) and label it D. [2]

350 ÷ 50 = 7 cm
D is 7 cm from C on a bearing of 055°

[Turn over

2

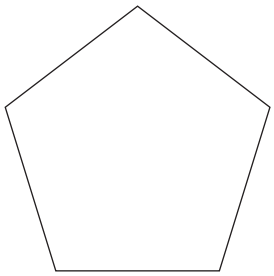


diagram not drawn accurately

Calculate the interior angle of a regular pentagon.

Exterior angle = 360 ÷ 5 = 72°
Interior angle = 180 − 72 = 108°

Answer 108 ° [2]

3 A fair dice has the numbers 1, 2, 2, 4, 5 and 8 marked on its faces.

Explain clearly why the probability of getting a prime number is less than the probability of getting an even number.

Primes are 2, 2, 5 so P(prime) = 3/6

Evens are 2, 2, 4, 8 so P(even) = 4/6

3/6 is less than 4/6, so P(prime) < P(even) [3]

4 Here are the first three terms of a number sequence.

90 84 78

(a) Write down the 8th term in this number sequence.

Goes down 6 each time:
90, 84, 78, 72, 66, 60, 54, 48

Answer 48 [1]

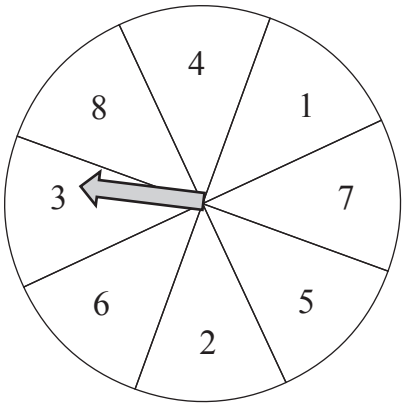
(b) Daniel says that 5 cannot be a term in this number sequence.

Is Daniel correct or not? Explain why.

Answer Correct, all terms are even (multiples of 6) and 5 is odd [1]

[Turn over

5



A spinner consists of a circular wheel which is divided into eight sectors numbered 1 to 8 as in the diagram.

When spun, the arrow will point to one of the sectors.

(a) What is meant if the spinner is described as a **fair** spinner?

Answer Each sector (number) has an equal chance of the arrow pointing to it [1]

(b) The spinner is **not** fair.

The probability of the arrow pointing to the sector numbered 7 is 0.15

Work out the probability of the arrow not pointing to the sector numbered 7

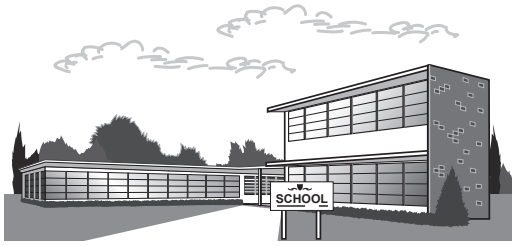
1 − 0.15 = 0.85

Answer 0.85 [2]

6 There are 648 pupils in a school.

The ratio of boys to girls is 4 : 5

How many girls are in the school?



4 + 5 = 9 parts
648 ÷ 9 = 72
72 × 5 = 360

Answer 360 [2]

[Turn over

7

Instructions for Fizzy Juice

Mix 3 parts Fruit Juice

with

7 parts Lemonade



Molly has 600 ml of fruit juice.

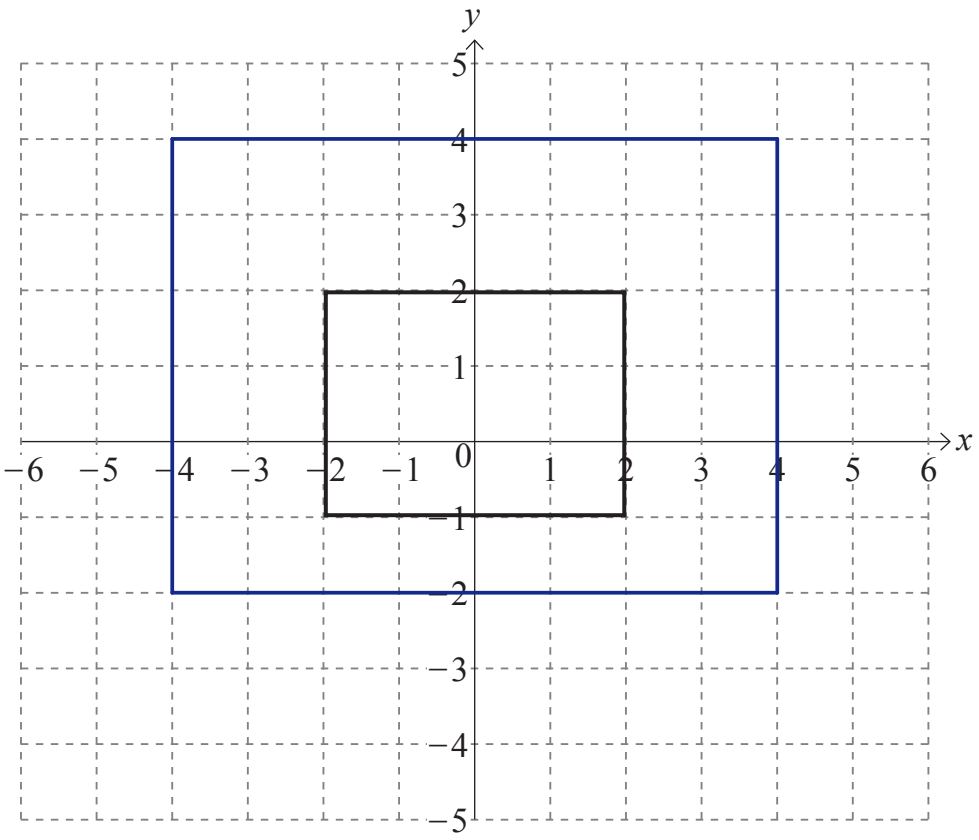
She also has 1800 ml of lemonade.

What is the maximum number of litres of fizzy juice she can make?

Fruit juice: 600 ÷ 3 = 200 ml per part
Lemonade needed: 7 × 200 = 1400 ml (less than 1800 ml)
Fizzy juice = 600 + 1400 = 2000 ml = 2 litres

Answer 2 litres [3]

8



Enlarge the rectangle shown using a scale factor of 2 and centre of enlargement (0,0)

[3]

[Turn over

9 In America, Dave bought a book for 28 dollars.

The exchange rate was 1 dollar = 81p.

In France, Evie bought a book for 25 euro.

The exchange rate was £1 = 1.09 euro.

Who paid more and how much more?

Dave: 28 × 0.81 = £22.68
Evie: 25 ÷ 1.09 = 22.9357... = £22.94
22.94 − 22.68 = 0.26
Evie paid 26p more

Answer _____Evie_____ paid _____26p_____ more [4]

10 The equation $x^3 + 3x = 25$ has a solution between 2 and 3

Use a trial and improvement method to find this solution.

Give your answer correct to one decimal place.

You must show **all** your working.

x	$x^3 + 3x$	
2	14	too low
3	36	too high
2.5	23.125	too low
2.6	25.376	too high
2.55	24.231375	too low

2.55 is too low, so x is between 2.55 and 2.6
x = 2.6 (to 1 d.p.)

Answer 2.6 [3]

[Turn over

11 The first four terms of a sequence are

2 7 12 17

Write down an expression for the n^{th} term of the sequence.

Difference = 5, so Sn: 5 10 15 20
Each term is 3 less than Sn

Answer *Sn − 3* [2]

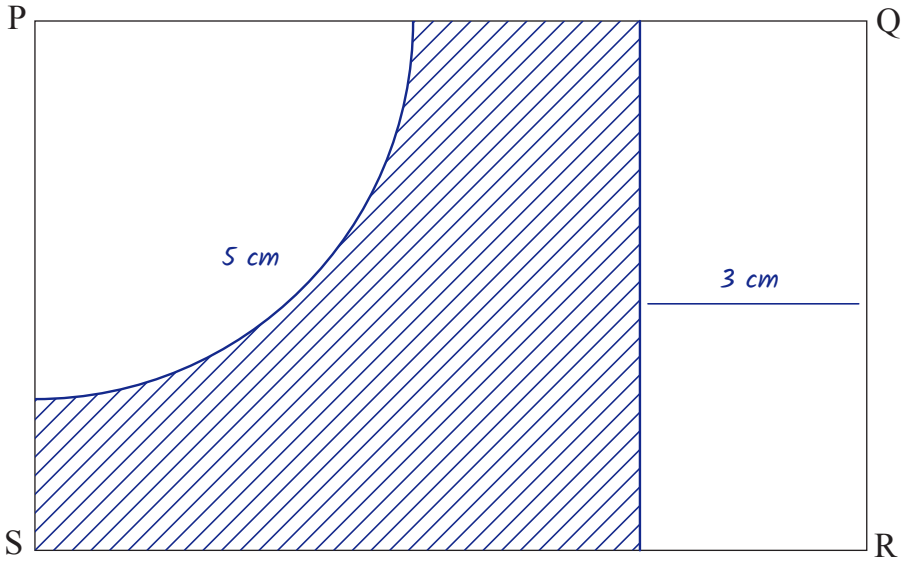
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12 PQRS is a rectangle.

Shade the region inside the rectangle which is

more than 5 cm from P

and more than 3 cm from the line QR.



[3]

[Turn over

13 A survey is carried out to find out the number of electric cars on the road.

One hundred cars are surveyed each day for four days.

The results are recorded in the following table along with the relative frequencies so far.

Day	Number of cars surveyed	Number of electric cars	Relative frequency
1	100	11	0.11
2	100	12	0.115
3	100	16	0.13
4	100	9	0.12

(a) Work out the missing relative frequency and record it in the table. [1]

(11 + 12 + 16 + 9) ÷ 400 = 48 ÷ 400 = 0.12

(b) What would be the best estimate for the probability that a car chosen at random is electric?

Use the relative frequency from all 400 cars

Answer 0.12 [1]

14 Write the following in standard form.

(a) 0.00000385

Answer 3.85×10^{-6} [1]

(b) 167×10^{-9}

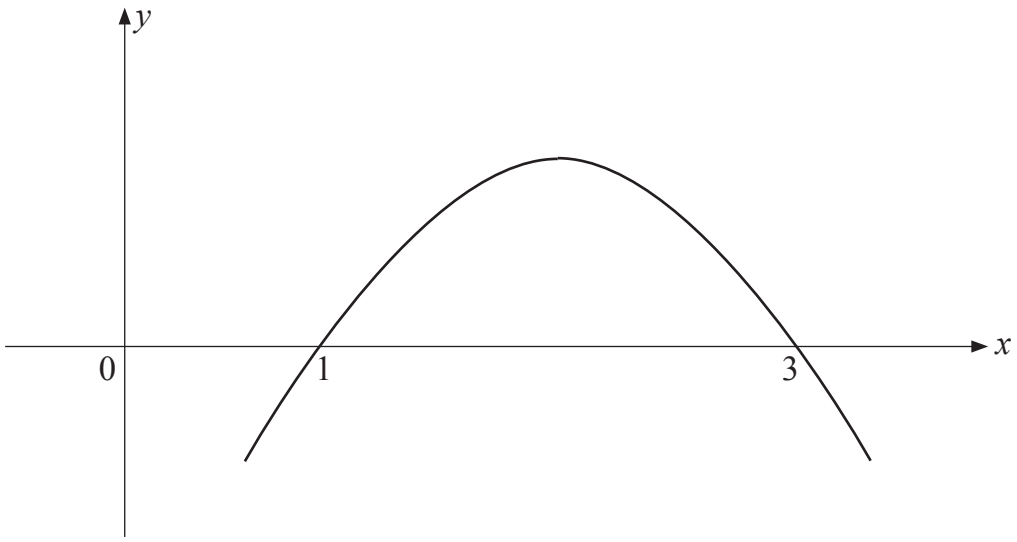
$167 = 1.67 \times 10^{2}$

$1.67 \times 10^{2} \times 10^{-9} = 1.67 \times 10^{-7}$

Answer 1.67×10^{-7} [1]

[Turn over

15



The sketch above shows part of the graph of the quadratic function $y = -x^2 + 4x - 3$

(a) Write down the coordinates of the point where the graph will cross the y-axis.

$x = 0$: $y = -0 + 0 - 3 = -3$

Answer (0, −3) [1]

(b) Work out the coordinates of the highest point on the graph.

Symmetrical, so highest point at $x = (1 + 3) \div 2 = 2$

$y = -2^2 + 4 \times 2 - 3 = -4 + 8 - 3 = 1$

Answer (2, 1) [1]

16 A model of a building site is to be made.

The length of the building site is 100 times the length of the model.

How many times larger is the area of the building site than the area of the model?

Area scale factor = 100^2 = 10 000

Answer 10 000 [1]

17 A bag contains nine discs.

Five of the discs are red and four of the discs are blue.

Kyoko takes a disc at random from the bag.

The disc is replaced in the bag.

Kyoko takes a disc at random from the bag.

Work out the probability that the disc was blue both times.

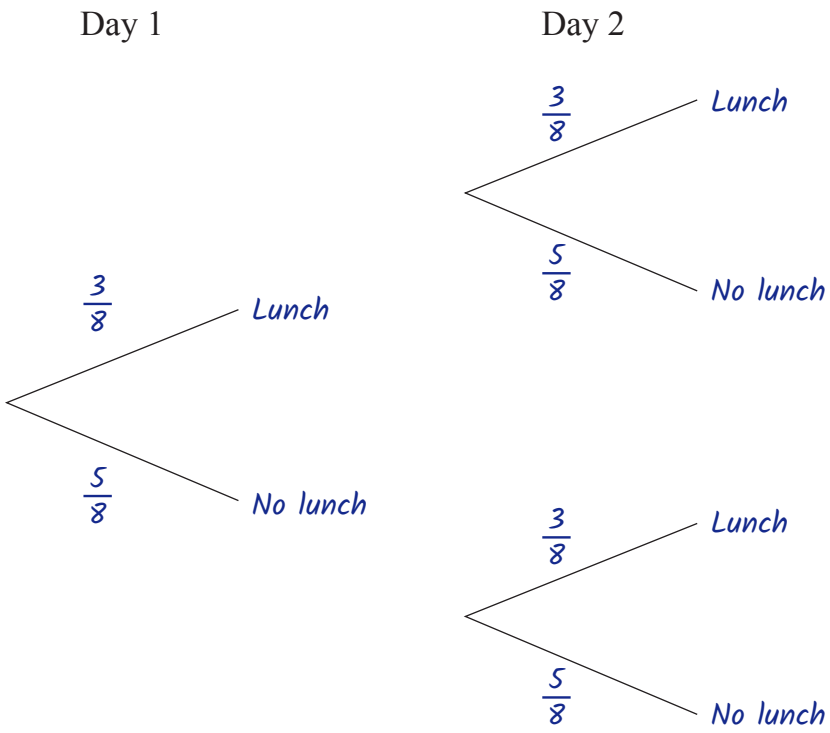
$P(\text{blue, blue}) = \frac{4}{9} \times \frac{4}{9} = \frac{16}{81}$

Answer $\frac{16}{81}$ [2]

[Turn over

18 The probability that Jack takes a packed lunch to school on any given day is $\frac{3}{8}$

(a) Complete the tree diagram to show this information for two days.



[2]

(b) What is the probability that Jack takes a packed lunch to school on only one of the two days?

$\frac{3}{8} \times \frac{5}{8} + \frac{5}{8} \times \frac{3}{8} = \frac{15}{64} + \frac{15}{64} = \frac{30}{64} = \frac{15}{32}$

Answer $\frac{15}{32}$ [2]

19 There are two types of ticket available for a concert, seated and standing.

Julie buys three seated tickets and one standing ticket for £82

Gemma buys five seated tickets and four standing tickets for £174

Work out the cost of each type of ticket.

A solution by trial and improvement will not be accepted.

Let s = seated, t = standing

3s + t = 82 (1)

5s + 4t = 174 (2)

(1) × 4: 12s + 4t = 328

Subtract (2): 7s = 154

s = 154 ÷ 7 = 22

Sub into (1): 66 + t = 82

t = 16

Check (2): 5 × 22 + 4 × 16 = 110 + 64 = 174

Answer Seated tickets cost £ 22 each

Standing tickets cost £ 16 each [4]

THIS IS THE END OF THE QUESTION PAPER

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For Examiner's use only	
Question Number	**Marks**
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Examiner Number

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