



Rewarding Learning

General Certificate of Secondary Education  
January 2020

Centre Number

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Candidate Number

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# Mathematics

Unit M7 Paper 1  
(Non-Calculator)

Higher Tier



[GMC71]

\*GMC71\*

WEDNESDAY 15 JANUARY, 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.**

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.

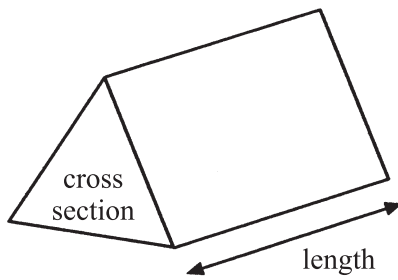
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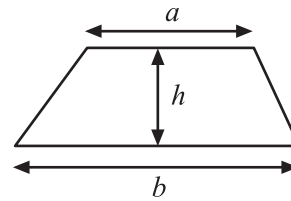
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# Formula Sheet

**Volume of prism** = area of cross section  $\times$  length

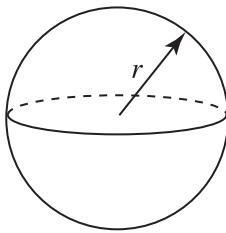


**Area of trapezium** =  $\frac{1}{2}(a+b)h$



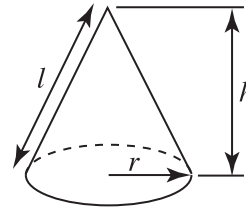
**Volume of sphere** =  $\frac{4}{3}\pi r^3$

**Surface area of sphere** =  $4\pi r^2$

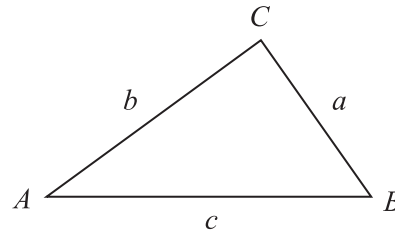


**Volume of cone** =  $\frac{1}{3}\pi r^2 h$

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



**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 A sequence is formed using the rule:

**“Find the next term by adding the previous two terms”**

Use this rule to complete the sequence below.

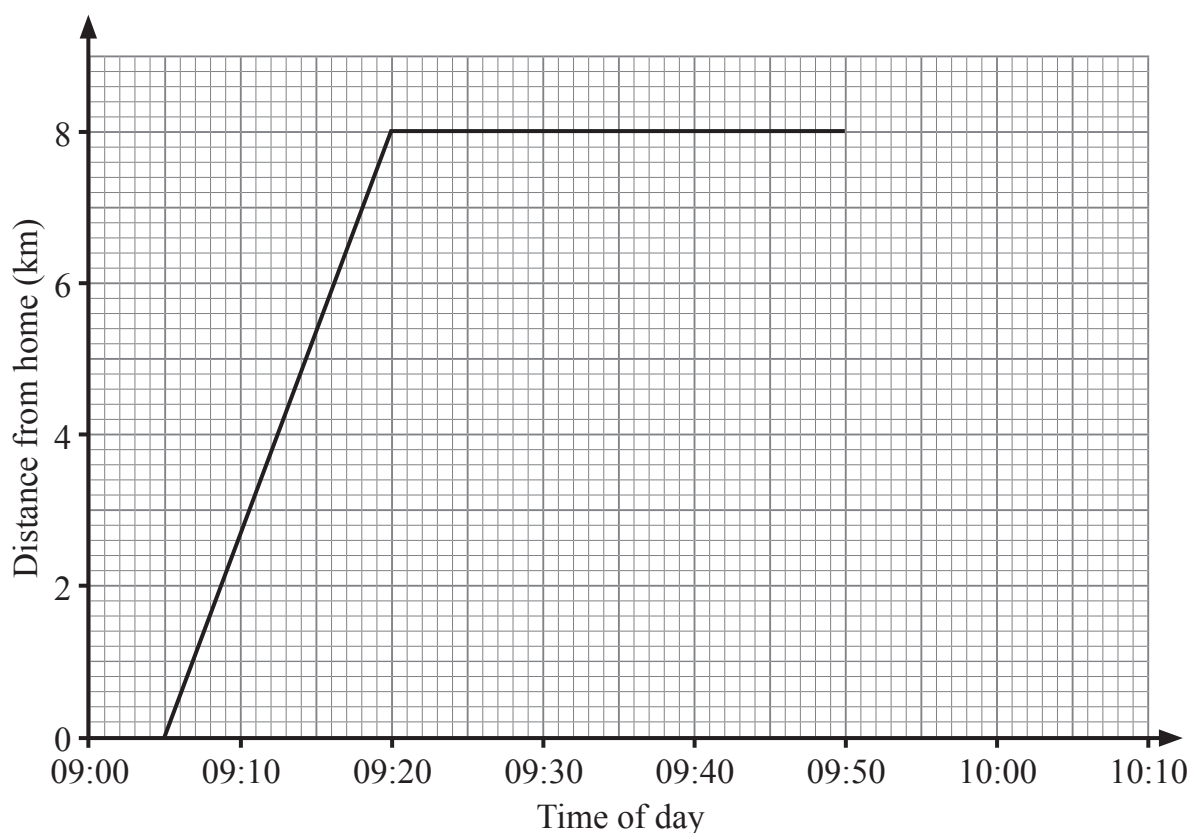
$x$ , 4, \_\_\_\_\_, \_\_\_\_\_, \_\_\_\_\_ [1]

[Turn over



2 Seb cycles from his home to his piano teacher's house on Saturday morning.

He stays there for 30 minutes and then returns directly home.



(a) At what time did Seb leave his home?

Answer \_\_\_\_\_ [1]

(b) How long did Seb take to get to his teacher's house?

Answer \_\_\_\_\_ minutes [1]

Seb arrived home at 10:03

(c) Complete the distance–time graph.

[1]



(d) What distance did Seb travel in total?

Answer \_\_\_\_\_ km [1]

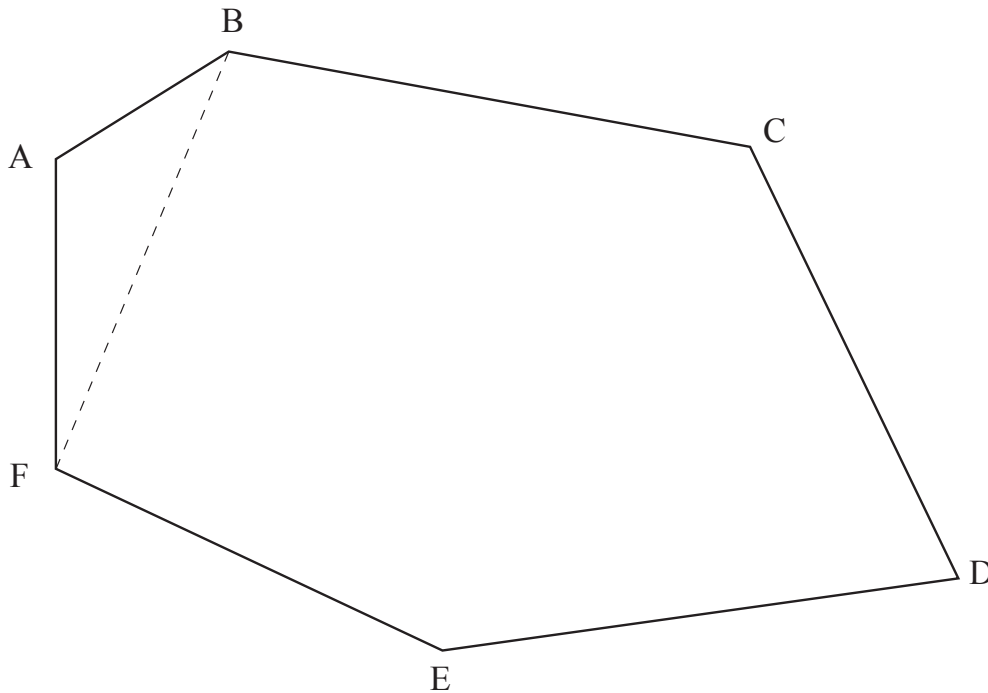
(e) Did Seb travel home at a faster or slower speed?

Explain your answer clearly.

Answer \_\_\_\_\_ because \_\_\_\_\_

\_\_\_\_\_ [1]

3 Polygon ABCDEF may be divided into triangles. One triangle is shown.



Use triangles to work out the sum of the interior angles of the polygon ABCDEF.

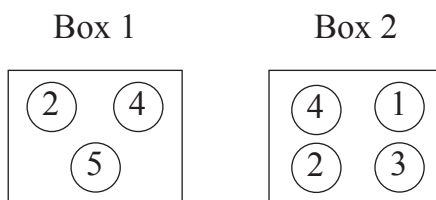
You **must** show your working.

Answer \_\_\_\_\_ ° [2]

[Turn over



4



There are two boxes of counters.

Each counter has a number on it as shown.

Mike takes one counter at random from Box 1 and then one counter at random from Box 2

(a) Complete the table to show all possible outcomes of counters taken.

|       |   | Box 2  |        |   |   |
|-------|---|--------|--------|---|---|
|       |   | 1      | 2      | 3 | 4 |
| Box 1 | 2 | (2, 1) | (2, 2) |   |   |
|       | 4 | (4, 1) |        |   |   |
|       | 5 |        |        |   |   |

[2]

(b) What is the probability that Mike takes a counter with the same number on it from each box?

Answer \_\_\_\_\_ [1]



(c) The numbers on the counters taken are **multiplied**.

What is the probability of this multiplication giving an **even** number?

Answer \_\_\_\_\_ [1]

(d) On another day, Laura takes one counter from each box and **multiplies** the numbers together.

She replaces the counters and does the same thing again for a total of 30 times.

How many times would you expect her to get an **odd** number answer?

Answer \_\_\_\_\_ [3]

[Turn over



5 Estimate the value of  $\frac{593}{4.1 \times 9.7}$

Show all your working.

Answer \_\_\_\_\_ [2]

6 The prize money in a golf tournament is divided between the three golfers who finish first, second and third in the ratio 7 : 4 : 3

What **fraction** of the prize money does each of the first three golfers receive?

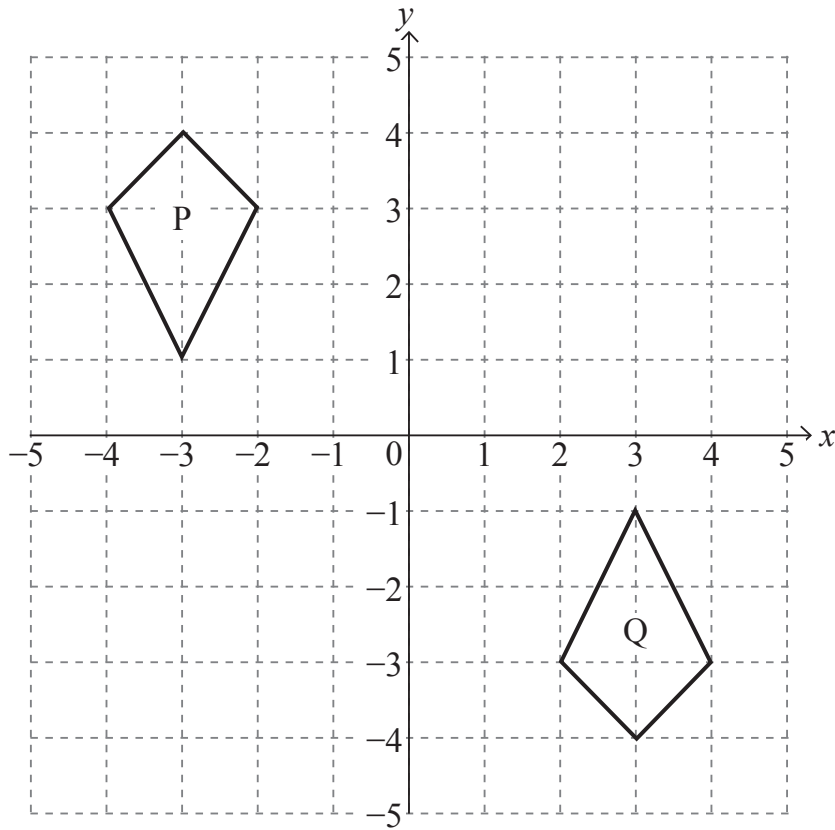
Write each fraction in its simplest form.

Answer 1st \_\_\_\_\_ 2nd \_\_\_\_\_ 3rd \_\_\_\_\_ [3]





7



(a) Describe fully the single transformation which would move shape P to shape Q.

Answer \_\_\_\_\_ [3]

(b) Translate shape P by 2 units to the right and 5 units down.

Label the image T. [1]

(c) Describe fully the single transformation which would move shape T back to shape P.

Answer \_\_\_\_\_ [2]

[Turn over



8 Simplify the following.

(a)  $4y^3 \times 3y^4$

Answer \_\_\_\_\_ [1]

(b)  $(m^4)^5$

Answer \_\_\_\_\_ [1]

9 (a) Solve the inequality  $6y + 5 \geq 2$

Answer \_\_\_\_\_ [2]

(b) Write down the smallest **integer** value of  $y$  which satisfies the inequality

$$6y + 5 \geq 2$$

Answer  $y =$  \_\_\_\_\_ [1]



10 (a) Write 25 as a binary number.

Answer \_\_\_\_\_ [1]

(b) Write the binary number 1101001 in decimal form.

Answer \_\_\_\_\_ [1]

11 Make  $m$  the subject of the formula  $H = mr + s$

Answer  $m =$  \_\_\_\_\_ [2]

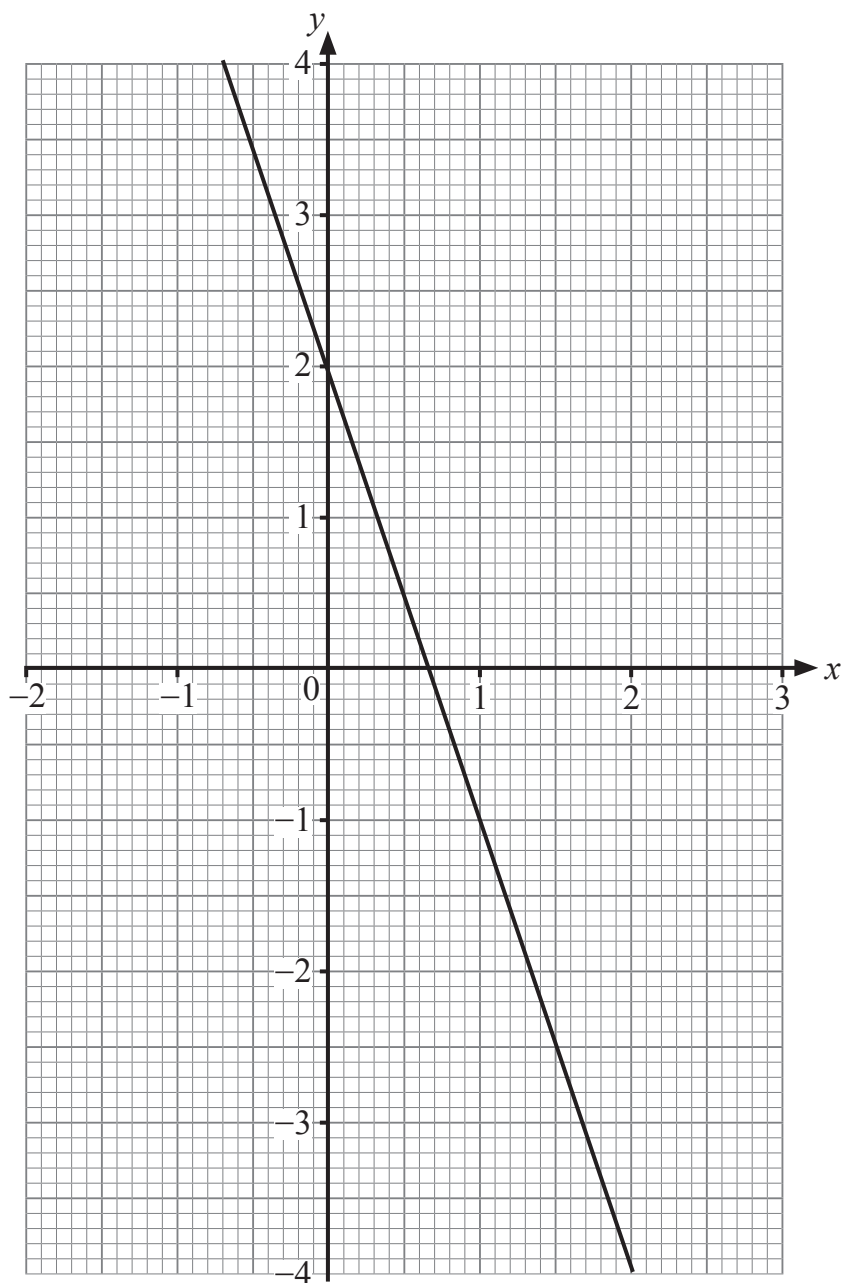
12 Two fair dice are rolled.

Make a list of all the ways it is possible to get a total score of 7 on the two dice.

Answer \_\_\_\_\_ [2]

[Turn over





By drawing a suitable line on the grid opposite solve the simultaneous equations

$$y = 2x - 2$$

$$y = -3x + 2$$

Answer  $x =$  \_\_\_\_\_  $y =$  \_\_\_\_\_ [4]



14 Find the value of  $(-2)^{-2}$

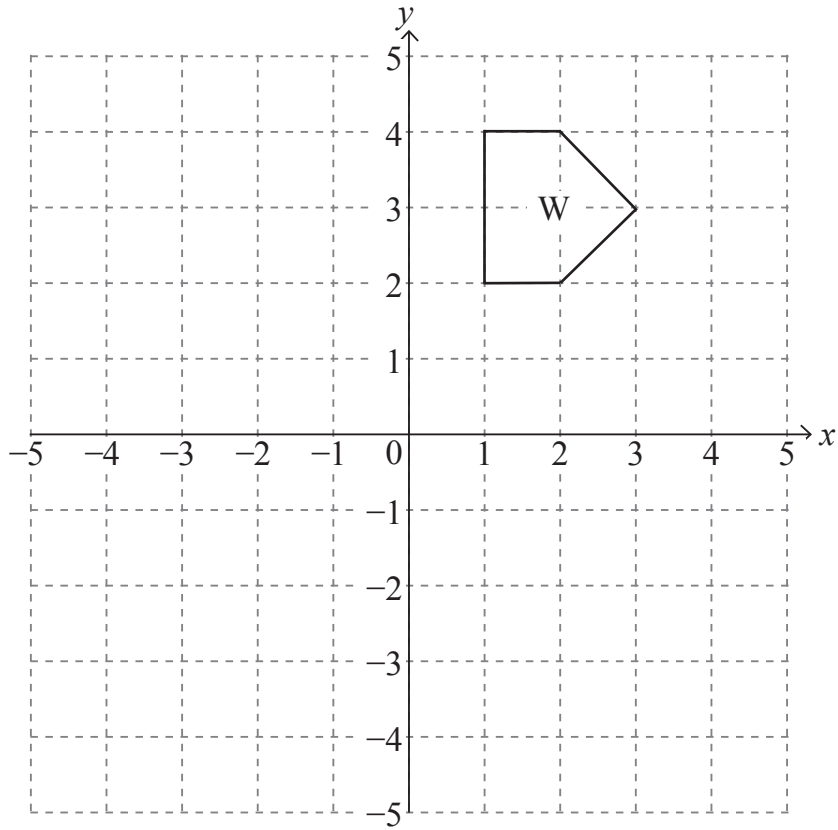
Answer \_\_\_\_\_ [2]

15 Make  $x$  the subject of the formula  $y = \frac{b}{\sqrt{x}}$

Answer  $x =$  \_\_\_\_\_ [2]



16



On the grid, draw the reflection of the shape W in the line  $y = -x$

[2]

[Turn over



17 There are three main routes from Belleek to Enniskillen by car.

There are five main routes from Enniskillen to Fintona by car.

- (a) How many different ways can James travel from Belleek to Enniskillen to Fintona by car using only main routes?

Answer \_\_\_\_\_ [1]

- (b) On a particular day, two of the main routes from Enniskillen to Fintona were closed.

By what percentage has the number of different ways for James to travel from Belleek to Enniskillen to Fintona by car using only main routes been reduced?

Answer \_\_\_\_\_% [2]

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**THIS IS THE END OF THE QUESTION PAPER**

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| <b>Question Number</b>         | <b>Marks</b> |
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Examiner Number

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