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Rewarding Learning

General Certificate of Secondary Education
November 2021

Mathematics

Unit M8 Paper 1
(Non-Calculator)
Higher Tier

[GMC81]   *GMC81*
THURSDAY 2 DECEMBER, 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 are provided with Higher Tier Additional Support Materials for use with this paper.
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 twelve** 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.
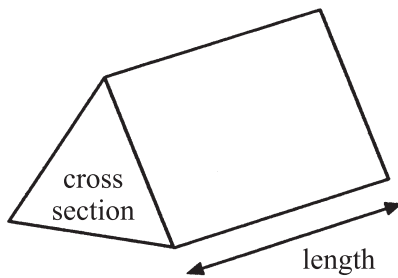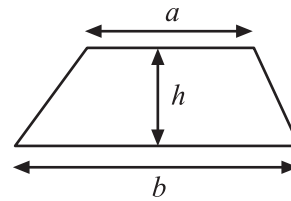The Formula Sheet is on page 2.

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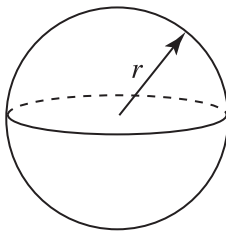# Formula Sheet

Volume of prism = area of cross section × length

cross section

length

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

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

Quadratic Equation
The solutions of $ax^2 + bx + c = 0$
where $a \neq 0$, are given by

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

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

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

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

In any triangle ABC

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

Cosine Rule: $a^2 = b^2 + c^2 - 2bc \cos A$
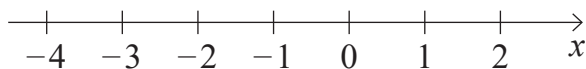
Area of triangle $= \frac{1}{2} ab \sin C$

1 **(a)** Solve $2x - 1 \leq -5$

Answer _____ [2]

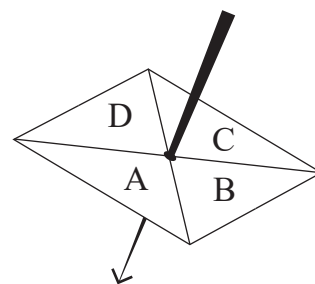**(b)** Show your solution on the number line.

[1]

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2 A spinner has sections labelled A, B, C and D.

The spinner is spun, and the relative frequency of landing on D is recorded after every 10 spins.

Some of the results are recorded in the table below.

Number of spins	Relative frequency of D
10	0.5
20	0.3
30	0.4
40	0.35
50	
60	0.45

(a) After 50 spins the spinner had landed on D 19 times.

Fill in the missing relative frequency in the table above. [1]

(b) How many times had the spinner landed on D after 60 spins?

Answer _____ [1]

(c) Do you think that the spinner is biased? Give a reason for your answer.

Answer _____ because _____

_____ [2]

(d) If the spinner is spun 400 times how many times would you expect it to land on D?
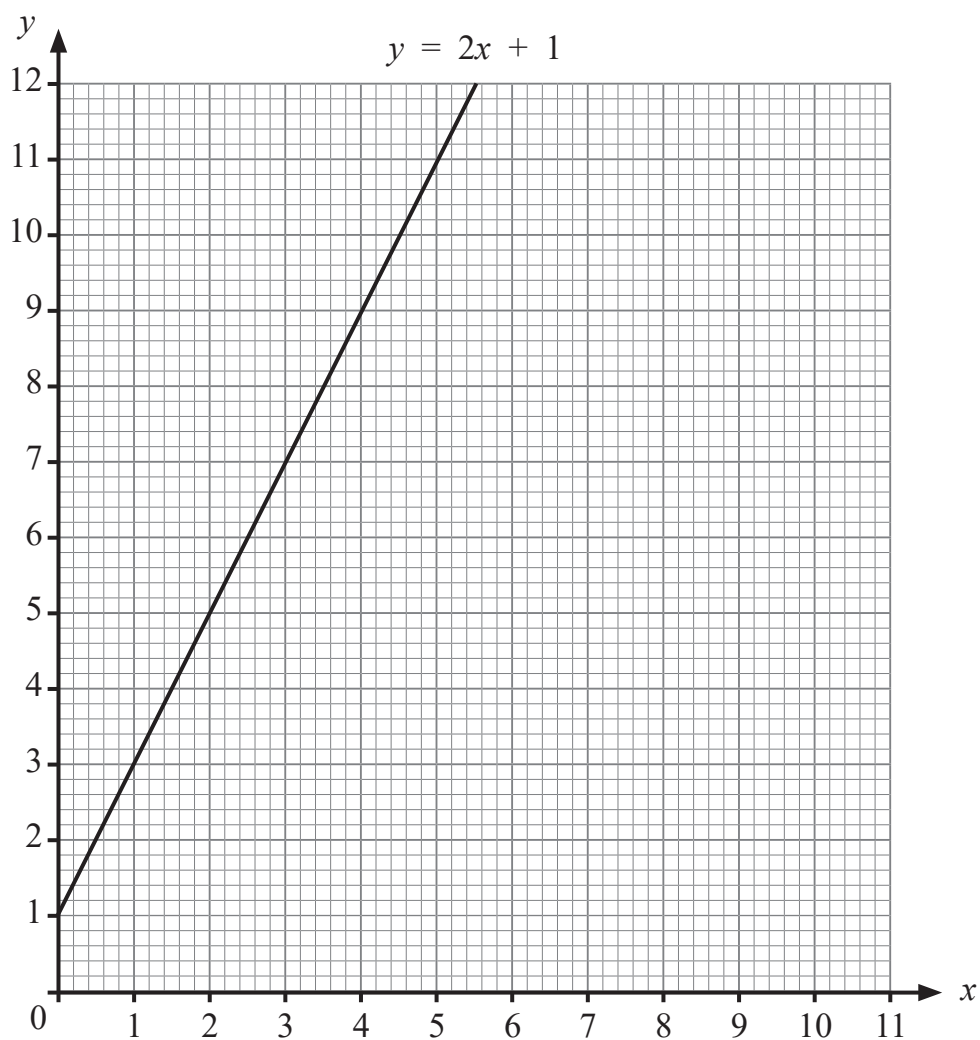
Answer _____ [2]

[Turn over

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3 Use graphs to solve the simultaneous equations
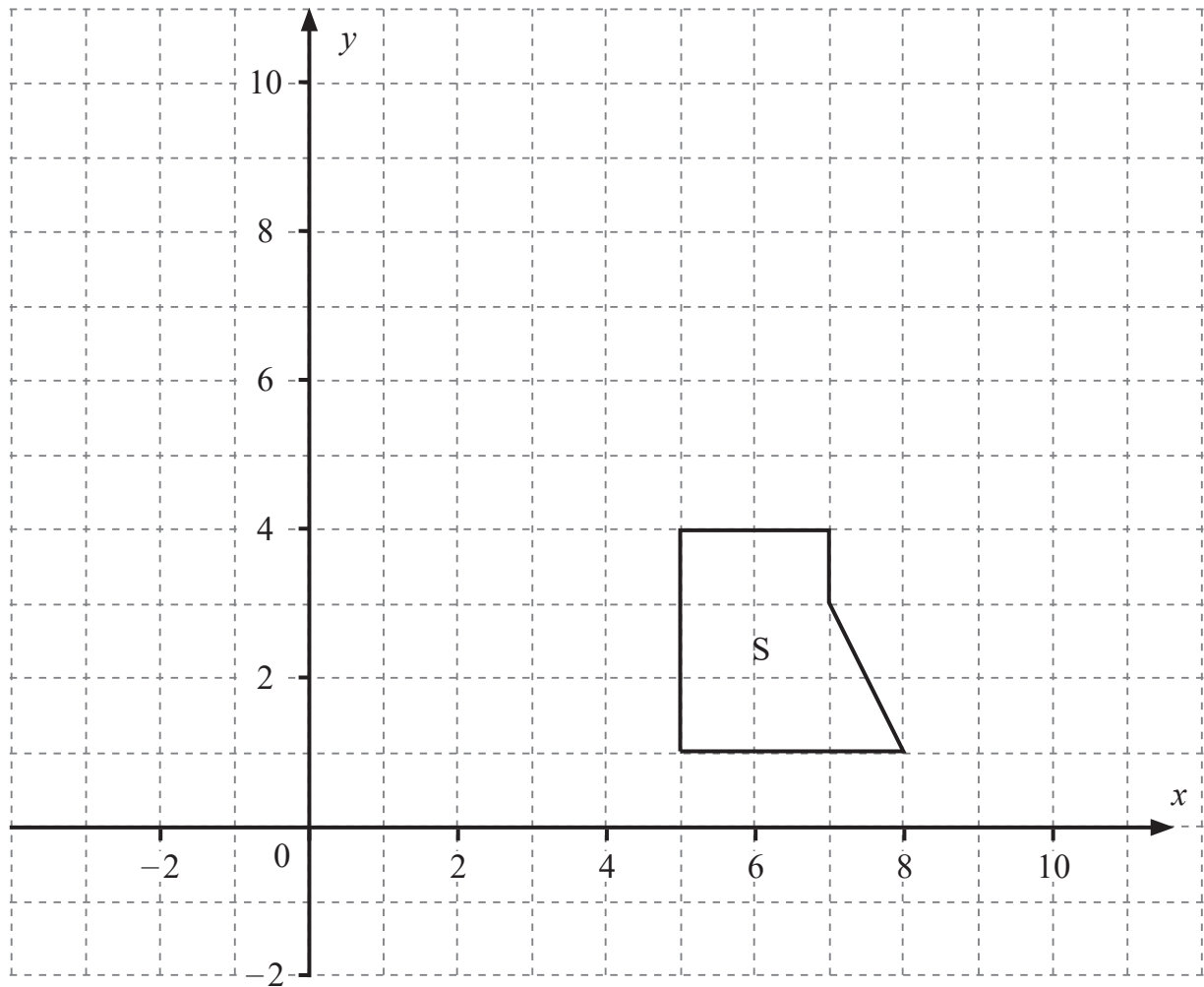
$$y = 2x + 1 \quad \text{and} \quad y = 10 - x$$

The graph of $y = 2x + 1$ has already been drawn for you.

$y = 2x + 1$

Answer $x =$ _____ and $y =$ _____ [4]

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4 On the grid reflect shape S in the line $y = x$

[2]

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5   Andy and Zoe have the same rates of pay.

Andy worked 12 hours normal time and 8 hours overtime and earned £238

Zoe worked 10 hours normal time and 15 hours overtime and earned £315

Calculate the rates of pay for normal time and overtime.

A solution by trial and improvement will not be accepted.

Answer normal £ _____ per hour; overtime £ _____ per hour

[5]

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6 $1\,000\,000\,\text{cm}^3$ of gas has mass of $1.5 \times 10^4\,\text{g}$.

Giving your answer in standard form, calculate the mass of one cubic centimetre of the gas.

Answer _____ g [2]

7 Change 0.0858585… into a fraction.

Answer _____ [2]

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8   The probability that Jo will be late for work on any Monday is 0.3

If Jo is late on Monday, the probability that she will be late on Tuesday is 0.1

If Jo is not late on Monday, the probability that she will be late on Tuesday is 0.3

(a) Draw a tree diagram to show this information.

[3]

(b) Use the tree diagram to work out the probability that Jo is late on Monday or Tuesday, but not both days.

Answer _____ [2]

9 P (2, 3) lies on the circumference of the circle $x^2 + y^2 = a^2$

(a) Work out the value of a, giving your answer in surd form.

Answer _____ [2]

(b) Work out the equation of the tangent to this circle at P.

Answer _____ [4]

(c) Work out the equation of the other tangent to this circle which is parallel to the tangent at P.

Answer _____ [3]

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10 A fair dice is rolled three times.

What is the probability of getting 6 exactly once?
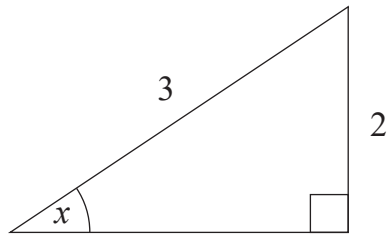
Answer _____ [3]

11

$$\frac{\sqrt{2}}{3^b} = 3 \times (2^a)^3$$

Work out the values of a and b.

Answer $a = $ _____ , $b = $ _____ [4]

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12

Show that $\cos x + \tan x = \dfrac{11\sqrt{5}}{15}$

[5]

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