AQA

Surname

Forename(s)

Candidate signature

I declare this is my own work.

GCSE
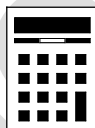# MATHEMATICS

H

Higher Tier

Paper 2 Calculator

Shadow paper based on November 2021 question paper

Time allowed: 1 hour 30 minutes

Materials

For this paper you must have:
- a calculator
- mathematical instruments.

Instructions

- Use black ink or black ball-point pen. Draw diagrams in pencil.
- Fill in the boxes at the top of this page.
- Answer **all** questions.
- You must answer the questions in the spaces provided. Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- Do all rough work in this book. Cross through any work you do not want to be marked.

Information

- The marks for questions are shown in brackets.
- The maximum mark for this paper is 80.
- You may ask for more answer paper, graph paper and tracing paper. These must be tagged securely to this answer book.

Advice

In all calculations, show clearly how you work out your answer.

For Examiner's Use	
Pages	Mark
2–3	
4–5	
6–7	
8–9	
10–11	
12–13	
14–15	
16–17	
18–19	
20–21	
22–23	
24	
TOTAL	

8300/2H

Answer **all** questions in the spaces provided.

1 Circle the factor of $x^2 + 2x$

[1 mark]

$x + 1$ $-2x$ $x + 2$ $2x$

2 B is one third of A.

Work out the ratio $A : B$

Circle your answer.

[1 mark]

1 : 3   3 : 1   1 : 4   4 : 1

3 The first three terms of a geometric progression are $\dfrac{2}{5}$ $\dfrac{4}{25}$ $\dfrac{8}{125}$

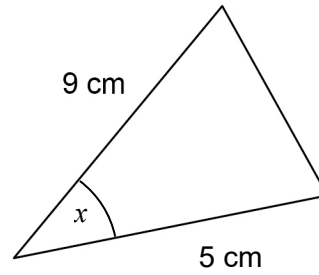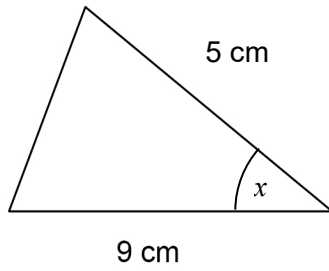Circle the fourth term.

[1 mark]

$\dfrac{10}{625}$ $\dfrac{12}{625}$ $\dfrac{16}{625}$ $\dfrac{32}{625}$

4

5 cm

9 cm

9 cm

5 cm

x

x

Not drawn accurately

Circle the reason why these triangles are congruent.

[1 mark]

ASA   RHS   SAS   SSS
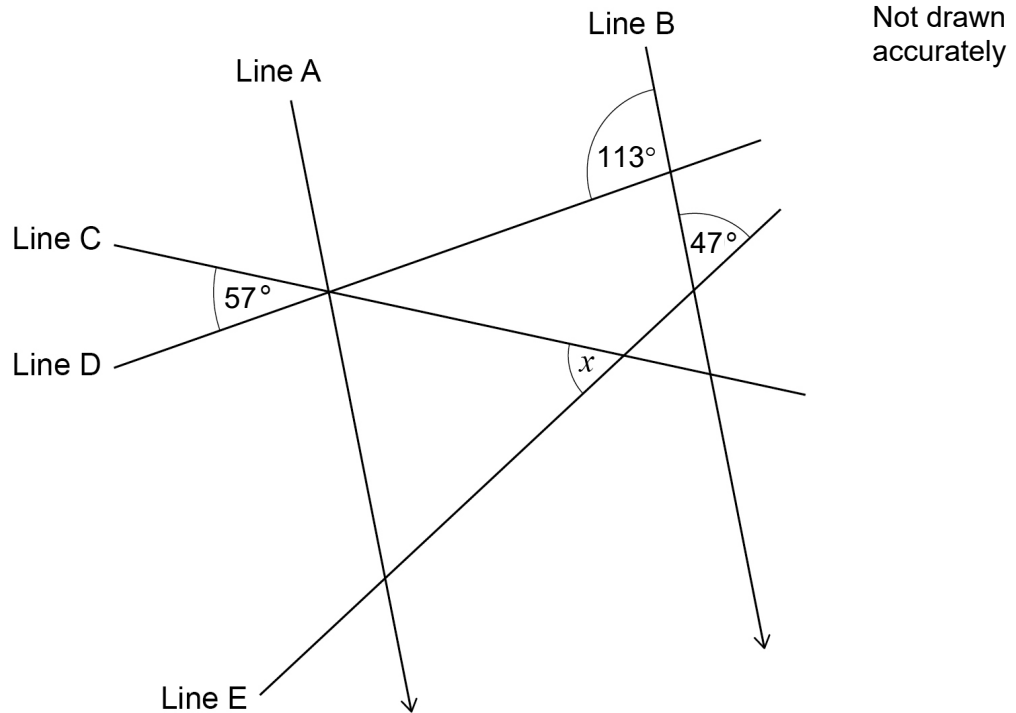
5   Solve $12x = 98.8 - 7x$

[2 marks]

$x =$ _____

Turn over ►

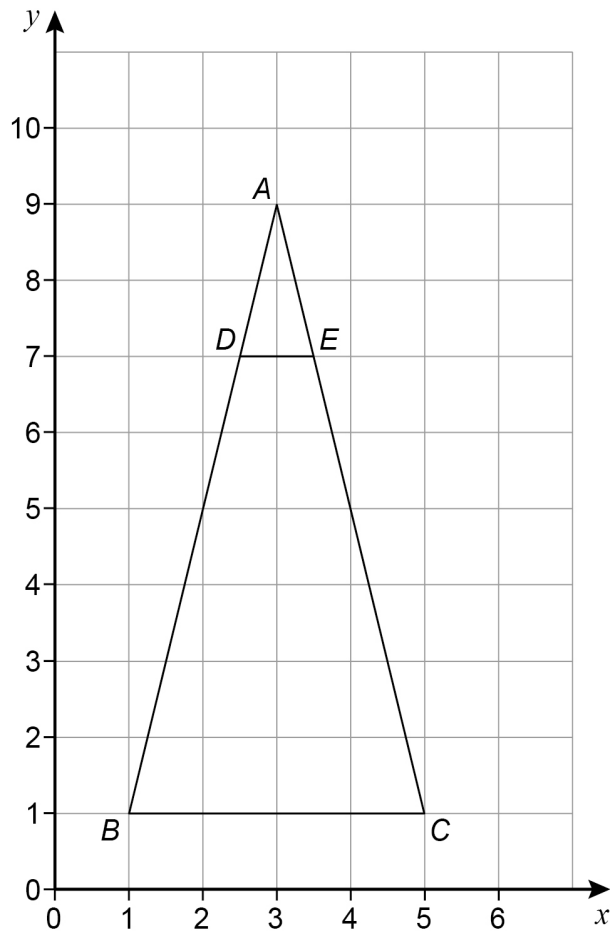**6** Lines A, B, C, D and E intersect as shown.

Lines A and B are parallel.

Line B

Line A

Not drawn accurately

113°

Line C

47°

57°

Line D

x

Line E

Work out the size of angle x.

[3 marks]

Answer _____ degrees

Shadow paper based on November 2021 question paper

8300/2H

7 112 women and 95 men from Bolton went clothes shopping in February.

The table shows information about the mean amount spent, in pounds, by each person.

	Women	Men
Number of people	112	95
Mean amount spent (£)	68.50	52.40

The national mean for clothes spending per person in February was £63.

Was the mean spend for the people in Bolton greater than the national mean in February?

You **must** show your working.

[3 marks]

Turn over ▶

8

Describe fully the **single** transformation that maps triangle *ADE* to triangle *ABC*.

[3 marks]

_____

_____

_____

_____

_____

9   A ball contains 3000 cm^3 of air.

More air is pumped into the ball at a rate of 500 cm^3 per second.

The ball is full of air when it becomes a sphere with radius 20 cm

$$\text{Volume of a sphere} = \frac{4}{3}\pi r^3 \quad \text{where } r \text{ is the radius}$$

Does it take **less than** 1 minute to fill the ball?

You **must** show your working.

[4 marks]

Turn over ▶

Shadow paper based on November 2021 question paper

8300/2H

10 a is a negative number.

b is a negative number.

For each statement, tick the correct box.

[4 marks]

	Always true	Sometimes true	Never true
$a + b$ is positive	☐	☐	☐
$a - b$ is positive	☐	☐	☐
$a^2 + b^2$ is positive	☐	☐	☐
$a^3 \div b^3$ is positive	☐	☐	☐

_____

_____

_____

_____

_____

_____

11 250 trains arrived at a station.

The number of trains that were on time was recorded after every 50 trains.

The table shows some information about the results.

Total number of trains	50	100	150	200	250
Total number of trains on time	32	42	108	160	185
Relative frequency of trains on time	0.64	0.42			

11 (a) Complete the relative frequency graph.

[3 marks]

Relative frequency of trains on time

Total number of trains

11 (b) Write down the best estimate of the probability that a train arriving at the station is on time.

[1 mark]

Answer _____

Turn over ▶

Shadow paper based on November 2021 question paper

8300/2H

8

12 *A*, *B* and *C* are three points on a circle.

The radii from *A*, *B* and *C* are shown.

Not drawn accurately

B

A

x

2(2*x*+25°)

5*x*+30°

C

Is *AC* a diameter of the circle?

You **must** show your working.

[3 marks]

Shadow paper based on November 2021 question paper

8300/2H

13 A straight line

has gradient 5

and

passes through the point (3, 11)

Work out the equation of the line.

Give your answer in the form $y = mx + c$

[3 marks]

Answer _____

Turn over for the next question

Turn over ▶

6

14 The population of moths in a park is 5800

14 (a) Assume that the population increases by 15% each day.

Show that after 12 days the population would be greater than 30 000

[2 marks]

14 (b) In fact, the population

increases by 17% each day for 11 days

then

decreases by 9% for 1 day.

After the 12 days, is the actual population greater than 30 000 ?

Tick a box.

☐ Yes   ☐ No

Show working to support your answer.

[2 marks]

14 (c) The expected number of visitors to the park each day depends on the temperature.

Temperature	Expected number of visitors each day
Less than 20°C	500
20°C or more	700

On each of the 31 days in July

the park is open

the probability that the temperature is less than 20°C is 0.3

Work out the **total** number of expected visitors to the park in July.

[3 marks]

Answer _____

7

Turn over ▶

15 y is inversely proportional to x^2

$y = 6$ when $x = 2$

15 (a)   Work out an equation connecting y and x.
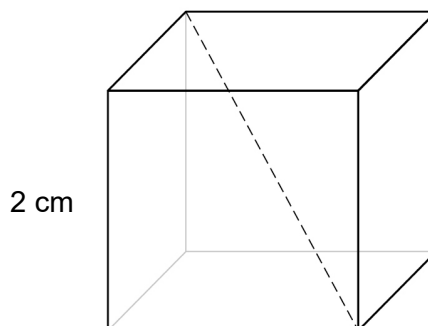
[3 marks]

Answer _____

15 (b)   Work out the value of y when $x = 5$

[2 marks]

Answer _____

16 Here is a cube with edge length 2 cm

One diagonal is shown.

2 cm

16 (a) Circle the length, in centimetres, of the diagonal.

[1 mark]

$\sqrt{6}$	$\sqrt{8}$	$\sqrt{12}$	8

16 (b) The total length, in centimetres, of the edges of a different cube is a multiple of 24

Circle the correct statement.

[1 mark]

The length of each side is a whole number	The length of each side is **not** a whole number	The length of each side **might** be a whole number

Turn over for the next question

7

Turn over ▶

17 30 people were asked which public transport they used more often, bus or train.

The table shows the results.

	Bus	Train
Male	4	10
Female	9	7

17 (a) One male and one female are chosen at random.

Work out the probability that **exactly** one of them said bus.

[3 marks]

Answer _____

17 (b) Two males are chosen at random.

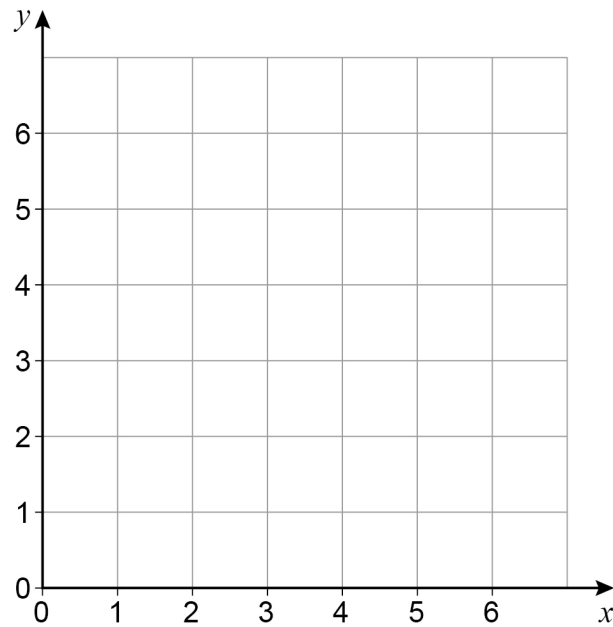Work out the probability that they **both** said train.

[2 marks]

Answer _____

18 On the grid, identify the region represented by

$$x \leq 4 \qquad y < 6 \qquad x + y \geq 6$$
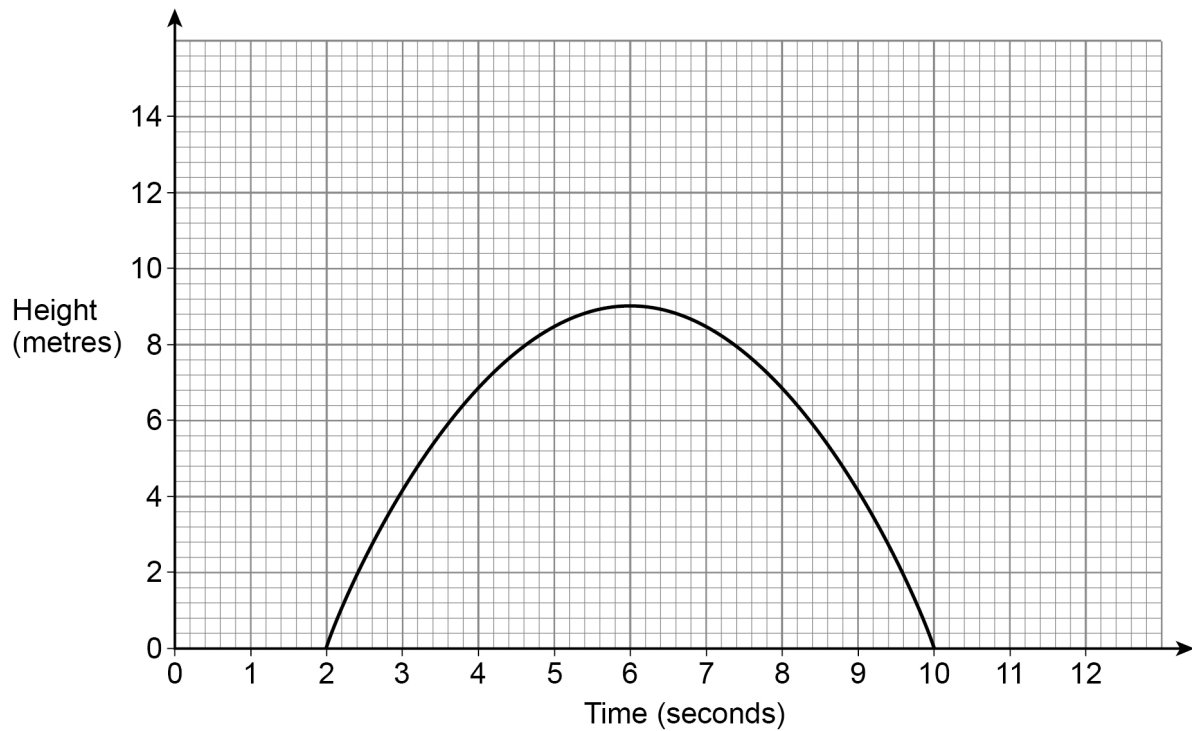
Label the region R.

[3 marks]

Turn over for the next question

8

Turn over ►

19   The graph shows the height above ground of a toy rocket for 10 seconds.

19 (a)   For how long is the rocket in the air?

Circle your answer.

[1 mark]

10 seconds   8 seconds   5 seconds   2 seconds

19 (b) Using the graph, estimate the speed of the rocket after 4 seconds.

State the units of your answer.

[3 marks]

Answer _____ _____

20 A square has an area of 1.44 square centimetres.

Circle the length, in **millimetres**, of one side of the square.

[1 mark]

1.2 mm   12 mm   120 mm   1200 mm

Turn over for the next question

5

Turn over ▶

21 x is an integer.

Prove that $(3x - 1)^2 - 2x(4x + 2) + 24$ is a square number.

[4 marks]

22 Maria is trying to remember a 3-digit password using the digits 1–9.

She knows the rule that

the first digit is an even number

the second digit is a factor of 18

the third digit is a square number.

Maria tries at random a password that matches the rule.

Work out the probability that this is the correct password.

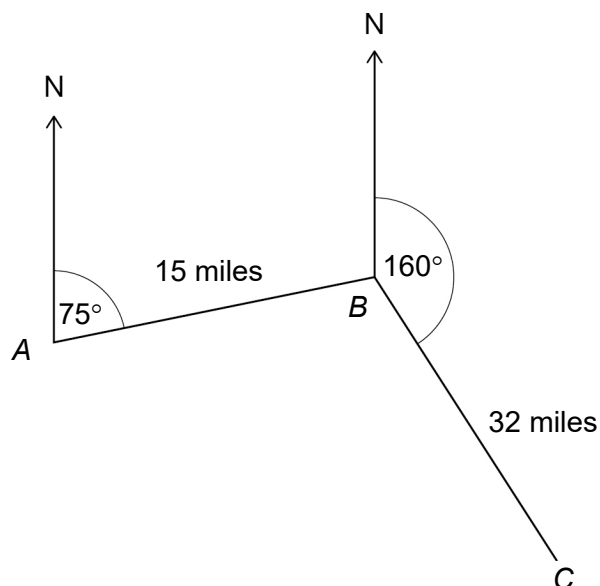**[4 marks]**

Answer

8

Turn over ▶

23 A ship sails from *A* to *B* and then from *B* to *C*.

B is 15 miles from *A*, on a bearing of 075°

C is 32 miles from *B*, on a bearing of 160°

Not drawn accurately

Work out the direct distance from *A* to *C*.

[4 marks]

Answer _____ miles

24 The journey of a train was in two stages.

The table shows information about the journey.

	Distance (km)	Speed (km/h)	Time (hours)
1st stage	306	$x - 16$	$\dfrac{306}{x-16}$
2nd stage	550	x	$\dfrac{550}{x}$

In total, the journey lasted 4 hours.

Work out the value of x.

[5 marks]

Answer _____

9

Turn over ▶

25 The equation of a curve is $y = x^2 - 12x + 32$

By completing the square, work out the coordinates of the turning point.

You **must** show your working.

[3 marks]

Answer (_____ , _____)

END OF QUESTIONS

3

Do not write outside the box

There are no questions printed on this page

**DO NOT WRITE ON THIS PAGE
ANSWER IN THE SPACES PROVIDED**

Question number	Additional page, if required. Write the question numbers in the left-hand margin.

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Shadow paper based on November 2021 question paper

8300/2H

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