AQA

GCSE
Mathematics
Specification (8300/3H)

Paper 3 Higher tier

H

Date	Morning	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 bottom of this page.
- Answer **all** questions.
- You must answer the questions in the space provided. Do not write outside the box around each page or on blank pages.
- Do all rough work in this book. Cross through any work that you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

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 booklet.

Please write clearly, in block capitals, to allow character computer recognition.
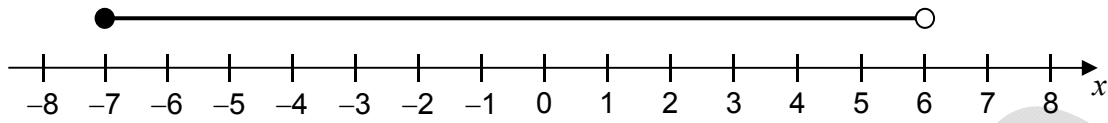
Centre number ☐☐☐☐☐   Candidate number ☐☐☐☐

Surname ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Forename(s) ☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐☐

Candidate signature _____

8300/3H

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

1 Circle the inequality shown by the diagram.

[1 mark]

$-7 < x < 6$ $-7 \leqslant x < 6$ $-7 < x \leqslant 6$ $-7 \leqslant x \leqslant 6$

2 The probability that a biased coin lands on heads is $\dfrac{2}{3}$

The coin is spun twice.
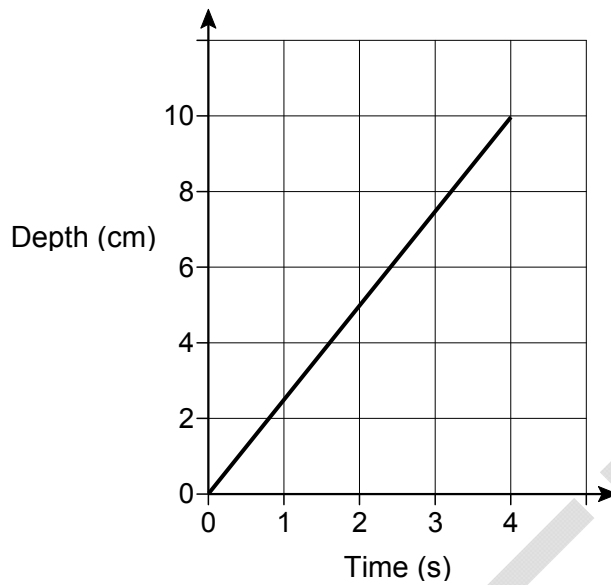
Circle the probability of two heads.

[1 mark]

$\dfrac{2}{9}$ $\dfrac{4}{6}$ $\dfrac{4}{9}$ $\dfrac{4}{3}$

3 Water is poured into a glass for 4 seconds.

The graph shows the depth of the water in the glass.

What is the rate of change of the depth of the water?

Circle your answer.

[1 mark]

0.4 cm/s   1.25 cm/s   2.5 cm/s   10 cm/s

4 The ratio of $x : y$ is $2 : 3$

Circle the correct statement.

[1 mark]

x is $\frac{2}{3}$ of y y is $\frac{2}{3}$ of x x is $\frac{2}{5}$ of y y is $\frac{3}{5}$ of x

5 Factorise fully $9a^2 - 6a$

[2 marks]

Answer _____

6 Work out the next term of this quadratic sequence.

[2 marks]

4   12   24   40   _____

Answer _____

7 Here is an ordinary dice.

7 **(a)** Ali is going to throw the dice six times.

He says,

"I will get one of each number."

Give a reason why he could be wrong.

[1 mark]

_____

_____

7 **(b)** Lucy throws the dice 50 times.

Her results are shown.

Number thrown	1	2	3	4	5	6
Frequency	7	4	12	5	9	13

Work out the relative frequency of throwing an odd number.

[2 marks]

Answer _____

8   Polygon *ABCDE* is divided into triangles as shown.
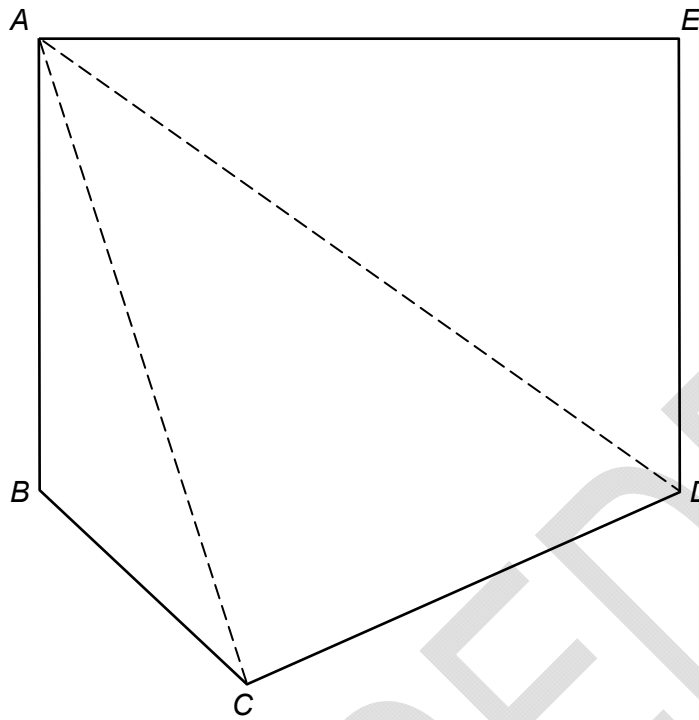
Not drawn accurately

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

You **must** show your working.

[2 marks]

Answer _____ degrees

9 In a school, 60% of the students are girls.

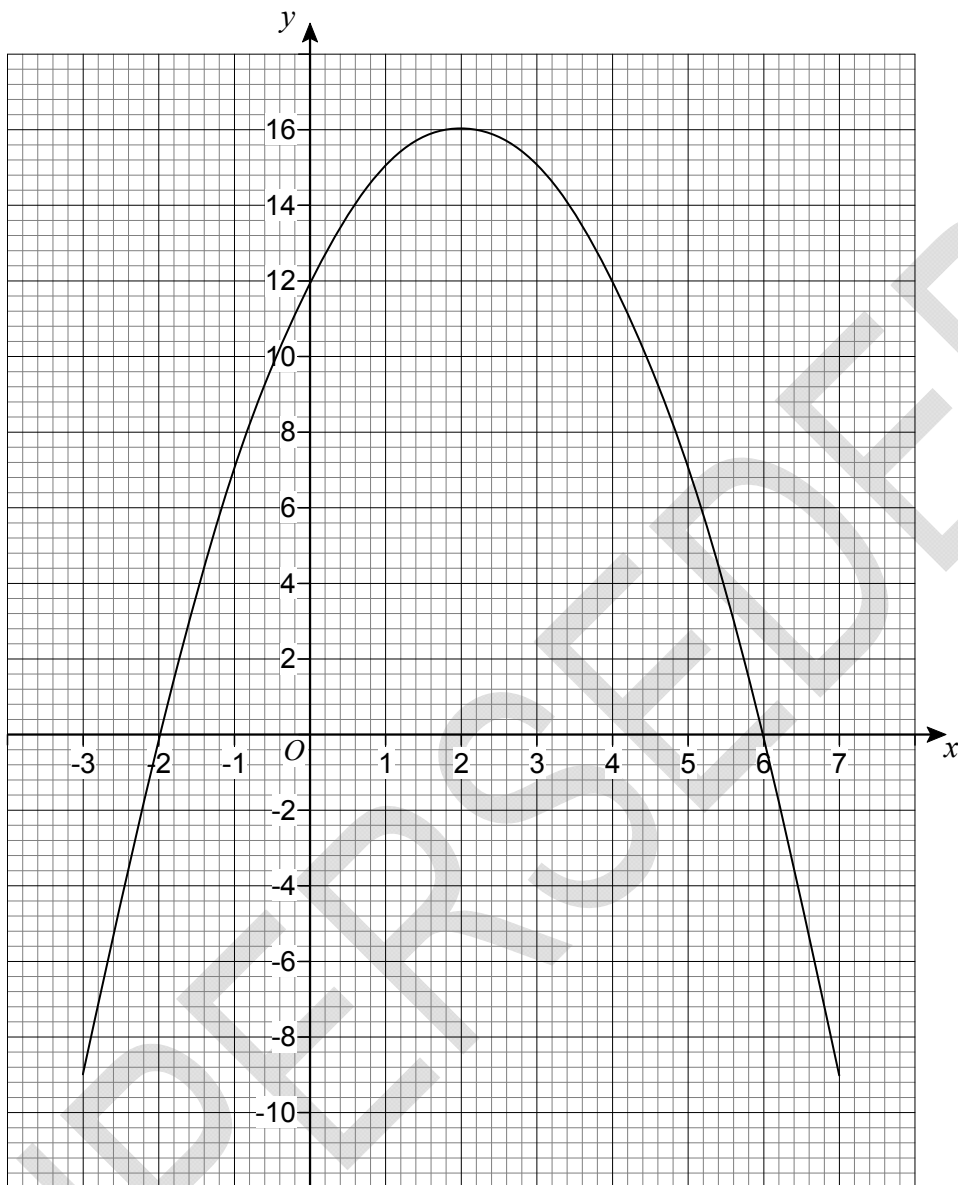50% of the girls walk to school.

20% of the boys walk to school.

What percentage of the students walk to school?

[3 marks]

Answer _____ %

Turn over for the next question

10 The graph $y = a + bx - x^2$ is shown.

10 (a) Circle the coordinates of the turning point of the curve.

[1 mark]

(−2, 0)   (0, 12)   (2, 16)   (6, 0)

10 (b) Circle the value of a.

[1 mark]

−2   12   16   6

10 (c) Circle the two roots of $a + bx - x^2 = 0$

[1 mark]

−2 and 6   2 and −6   2 and 6   −2 and −6

11 Adam and six other men ran a race.

The times, in seconds, of the six other men are shown.
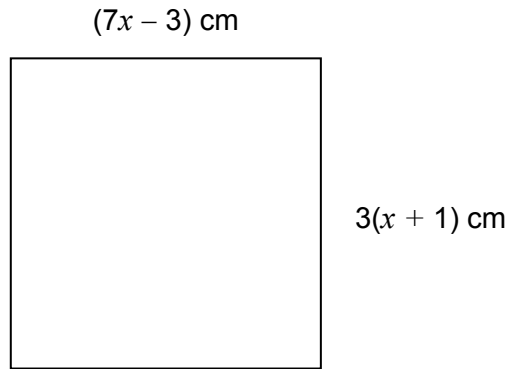
9.75   9.79   9.80   9.88   9.94   9.98

The mean time for **all** seven men was 9.83 seconds.

Did Adam win the race?

You **must** show your working.

[3 marks]

12 The diagram shows a square.

$(7x - 3)$ cm

$3(x + 1)$ cm

Work out the length of one side of the square.

[4 marks]

Answer _____ cm

13 A circle has equation $x^2 + y^2 = 4$

Circle the length of its radius.

[1 mark]

2   4   8   16

14 a, b and c are **different** prime numbers less than 20

$$a = \sqrt{4b + c}$$

Work out **two** possible sets of values of a, b and c.

[3 marks]

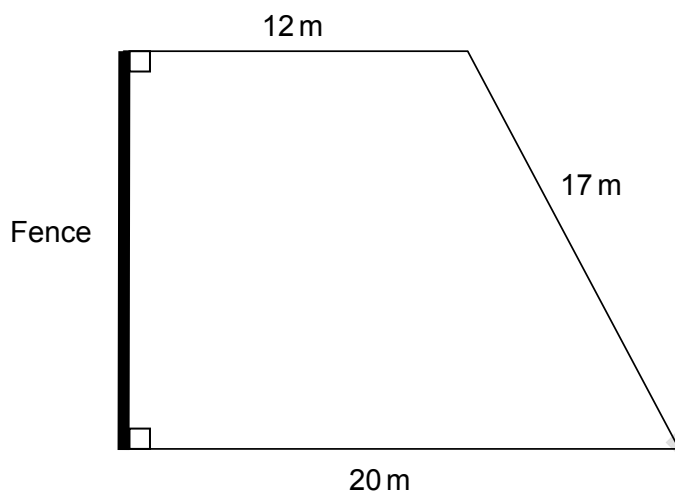Set 1 $a =$ _____ $b =$ _____ $c =$ _____

Set 2 $a =$ _____ $b =$ _____ $c =$ _____

15 Simplify fully $(8x^3 y^5)^2$

[2 marks]

Answer _____

16   The diagram shows a lawn with a fence along one edge.

12 m

Not drawn
accurately

17 m

Fence

20 m

One can of weedkiller covers 90 square metres.

Each can costs £19.25

Work out the total cost of the cans of weedkiller needed to cover the lawn.

[5 marks]

Answer £ _____

17 Expand and simplify $(2x + 5y)(3x - 8y)$

[3 marks]

Answer _____

18 The ratio of the number of boys to girls at a party is 3 : 4

Six boys leave the party.

The ratio of the number of boys to girls at the party is now 5 : 8

Work out the number of girls at the party.
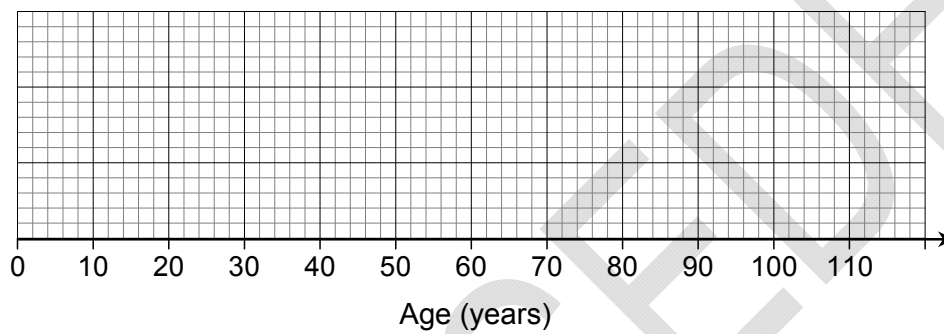
[3 marks]

Answer _____

19 In the UK in 2000

25% of the population were under 24 years old

50% of the population were under 37 years old

the inter-quartile range of the ages was 32 years

the oldest person was 107 years old.

19 (a) Show the information on a box plot.

[3 marks]

19 (b)   It is predicted that in 2050 the age distribution in the UK will have

lower quartile   26 years

median   44 years

upper quartile 66 years

Make **two** comments about the predicted change in the age distribution in the
UK from 2000 to 2050

[2 marks]

Comment 1 _____

_____

_____

Comment 2 _____

_____

_____

Turn over for the next question

20 £x was invested for 8 years.

It earned **compound** interest at 2.5% per year.

20 (a) Tom is working out the total interest earned.

Tom

Interest for 1 year   = £x × 0.025

Interest for 8 years = £x × 0.025 × 8

= £$0.2x$

State what is wrong with Tom's method.

[1 mark]

_____

_____

20 (b) After 8 years the total value of the investment is £11 696.67

Work out the value of the original investment, £x

[3 marks]

_____

_____

_____

_____

Answer £ _____

21 Mersenne primes are prime numbers that can be written in the form

$2^n - 1$ where n is a whole number.

For example,   3 can be written as $2^2 - 1$

21 (a) Prove that $2^9 - 1$ is **not** a Mersenne prime.

[2 marks]

21 (b) There are Mersenne primes when $n = 5$ and when $n = 7$
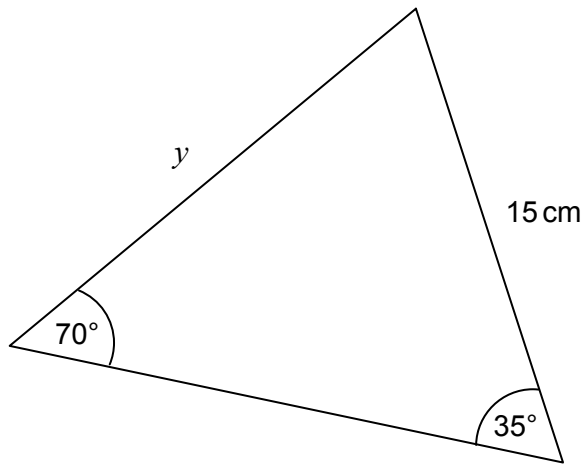
Ama says,

"The ratio of the indices is 5 : 7

This means the ratio of the Mersenne primes is 5 : 7"

Show that Ama is wrong.

[1 mark]

22

Not drawn accurately

y

15 cm

70°

35°

Work out the value of y.

[2 marks]

Answer _____ cm

23 Write $2x^2 - 20x + 65$ in the form $a(x - b)^2 + c$

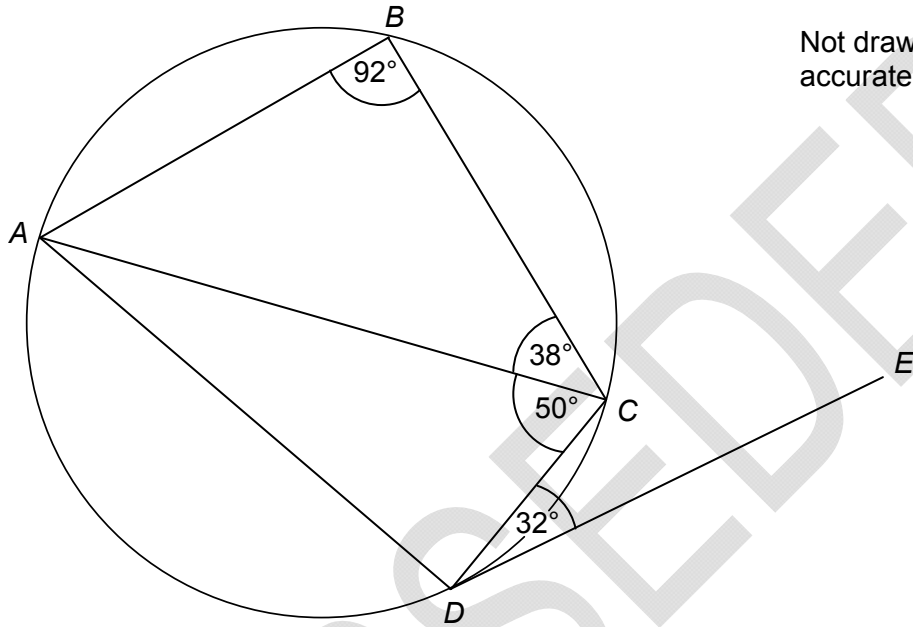**[3 marks]**

Answer _____

Turn over for the next question

Turn over ▶

24   *A*, *B*, *C* and *D* are points on a circle.

Angle *ABC* = 92°

Angle *ACB* = 38°

Angle *ACD* = 50°

Angle *CDE* = 32°

B

92°

Not drawn
accurately

A

38°

50° C

E

32°

D

Tick whether each statement is true or false.

Give a reason for each answer.

[4 marks]

Statement	**True**	**False**
AC is a diameter	☐	☐

Reason _____

_____

_____

Statement	True	False
Angle *ADC* = 88°	☐	☐

Reason _____

_____

_____

Statement	True	False
ABCD is a trapezium	☐	☐

Reason _____

_____

_____

Statement	True	False
DE is a tangent to the circle	☐	☐

Reason _____

_____

_____

25 A formula connecting speed (s), distance (d) and time (t) is

$$s = \frac{d}{t}$$

$d = 160$ to 2 significant figures

$t = 7.2$ to 2 significant figures

Work out the upper and lower bounds for s.

Give your answers to 3 significant figures.

[4 marks]

Upper bound _____

Lower bound _____

26 For all values of x, $\quad$ f$(x) = x^2 + 1$ $\qquad$ g$(x) = x - 5$

26 (a) Show that $\quad$ fg$(x) = x^2 - 10x + 26$
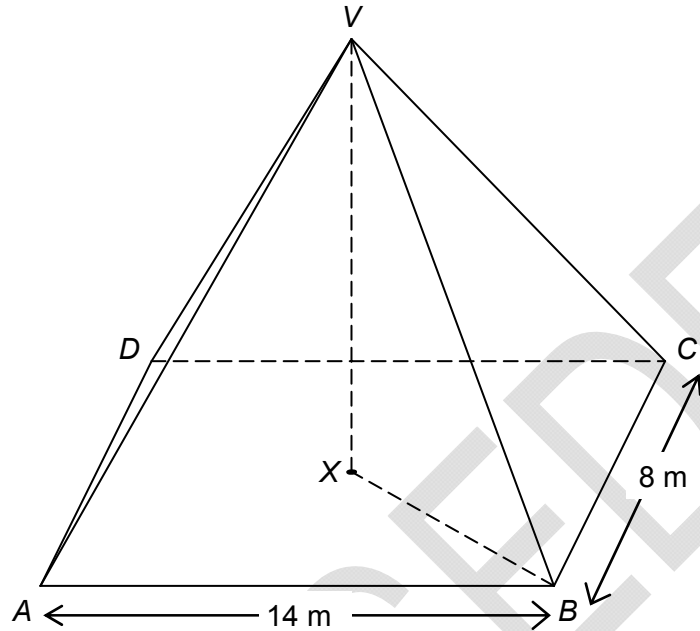
[2 marks]

26 (b) Solve $\quad$ fg$(x) =$ gf(x)

[4 marks]

$x = $ _____

27 Volume of a pyramid = $\frac{1}{3}$ × area of base × perpendicular height

VABCD is a rectangular-based pyramid with volume 336 m³

X is the centre of the base, directly below *V*.

Work out the angle between *VB* and the base.

[6 marks]

_____

_____

_____

_____

_____

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_____

_____

_____

Answer _____ degrees

END OF QUESTIONS

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