AQA

Please write clearly in block capitals.

Centre number | | | | | | Candidate number | | | | |

Surname _____

Forename(s) _____

Candidate signature _____

# GCSE MATHEMATICS

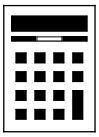
**H**

Higher Tier Paper 2 Calculator

Thursday 7 November 2019 Morning 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.
- 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 | |
| 24–25 | |
| TOTAL | |

Answer **all** questions in the spaces provided

*Do not write outside the box*

**1** Expand $4x^2(3x + 5)$

Circle your answer.

**[1 mark]**

$32x^3$ $12x^3 + 20x^2$ $7x^3 + 9x^2$ $12x^2 + 5$

**2** How many millimetres are there in a kilometre?

Circle your answer.

**[1 mark]**

$10^3$ $10^5$ $10^6$ $10^9$

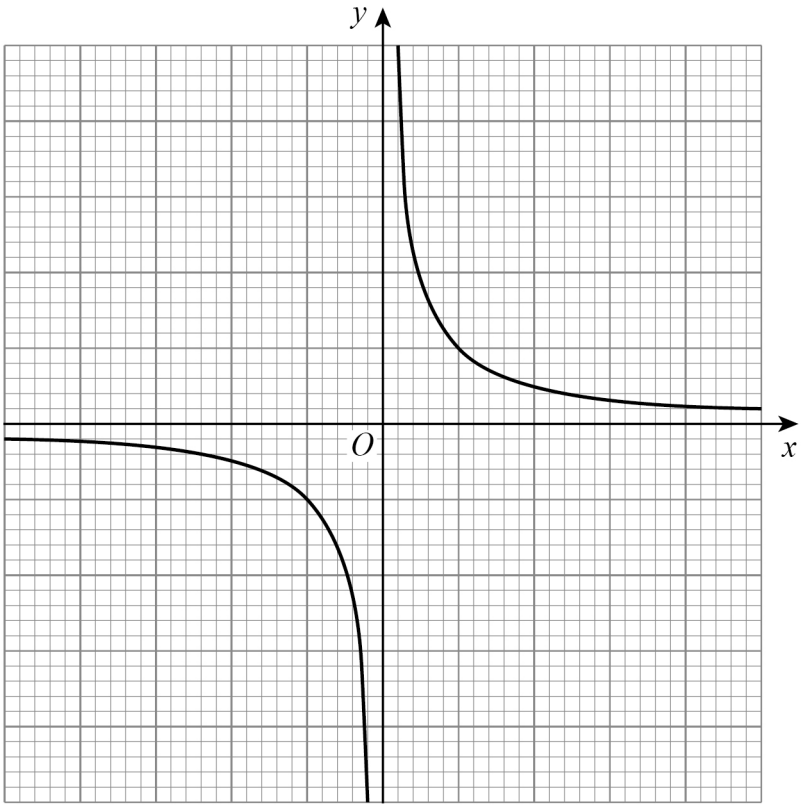
**3** Circle the number half way between $\frac{7}{12}$ and $\frac{3}{4}$

**[1 mark]**

$\frac{7}{32}$ $\frac{5}{8}$ $\frac{2}{3}$ $\frac{1}{2}$

*Do not write outside the box*

**4** Here is the sketch of a graph.




Circle the equation of the graph.

**[1 mark]**

$y = x$ $y = -x^2$ $y = -x^3$ $y = \frac{1}{x}$

**5** Work out the lowest common multiple (LCM) of 120 and 144

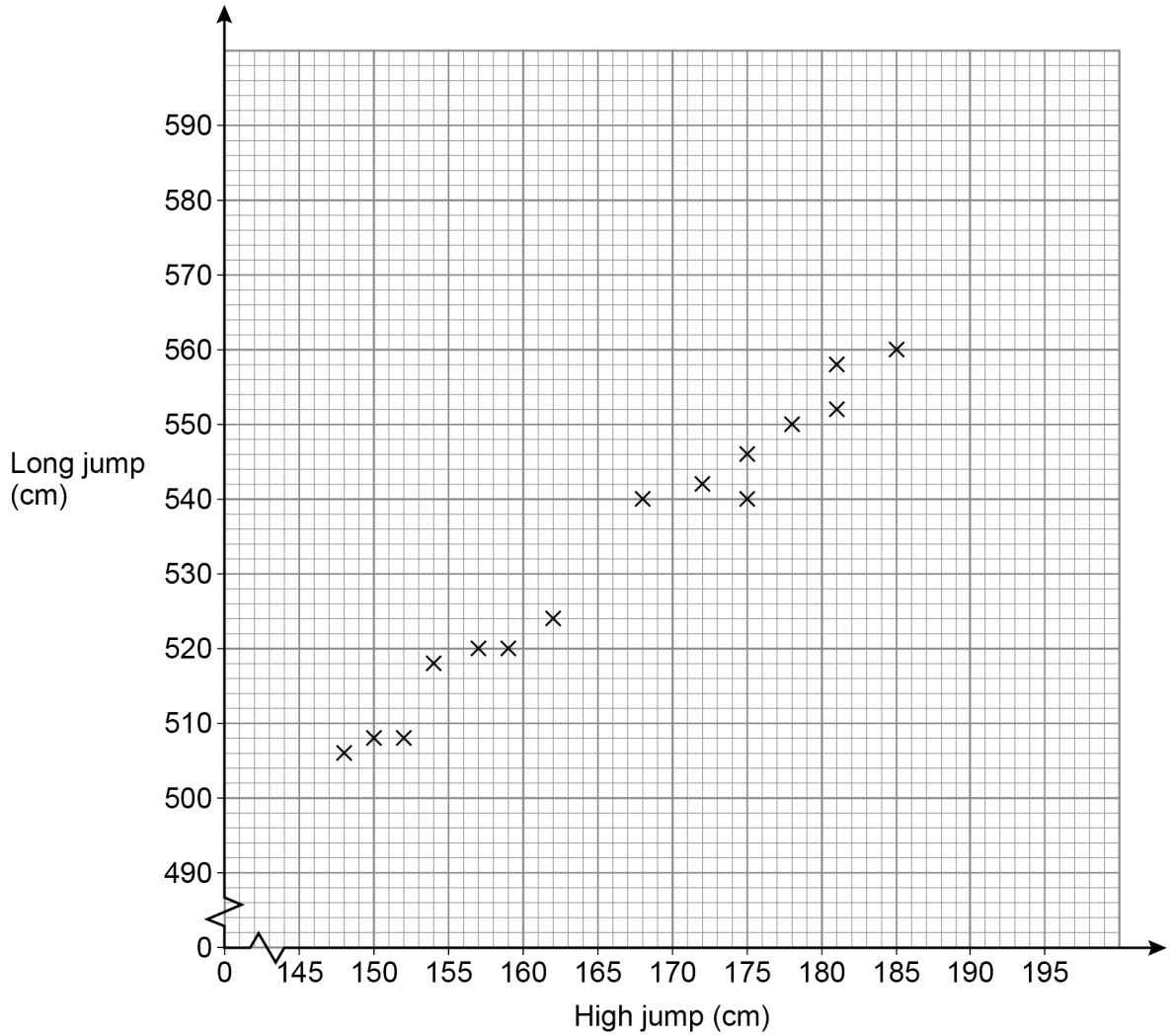
**[2 marks]**

Answer _____

6

**Turn over ►**

**6** The scatter graph shows the best high jump and the best long jump for 15 boys.




**6 (a)** Write down the type of correlation shown.

**[1 mark]**

Answer _____

*Do not write outside the box*

**6 (b)** Liam has a best high jump of 166 cm

Use a line of best fit to estimate his best long jump.

**[2 marks]**

Answer _____ cm

**6 (c)** Another boy has a best high jump of 195 cm

Give a reason why you should **not** use a line of best fit to estimate his best long jump.

**[1 mark]**

_____

_____

**Turn over for the next question**

4

**7** A car journey is in two stages.

Stage 1 The car travels 110 miles in 2 hours.

Stage 2 The car travels 44 miles at the same average speed as Stage 1

Work out the time for Stage 2

Give your answer in minutes.

**[3 marks]**

Answer _____ minutes

**8** Here is an identity.

$$a(3x - 10) \equiv 21x + 2b$$

Work out the values of $a$ and $b$.

**[3 marks]**

$a =$ _____ $b =$ _____

*Do not write outside the box*

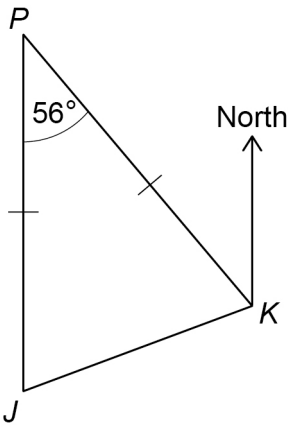
**9** *J* and *K* are ships.

*P* is a port.

*J* is due South of *P*.

Angle *JPK* = 56°

*JP* = *KP*




Not drawn accurately

Work out the bearing of *J* from *K*.

**[3 marks]**

Answer _____ °

**Turn over for the next question**

9

*Do not write outside the box*

**10** The 5th term of a linear sequence is 17

The 6th term of the sequence is 21

Work out the 100th term of the sequence.

**[3 marks]**

Answer _____

**11** The value of a house is £120 000

The value is expected to increase by 5% each year.

Work out the expected value after 4 years.

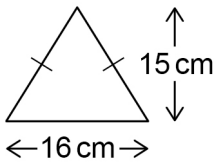
Give your answer to 2 significant figures.

You **must** show your working.

**[4 marks]**

Answer £_____

**12** An isosceles triangle has base 16 cm and perpendicular height 15 cm

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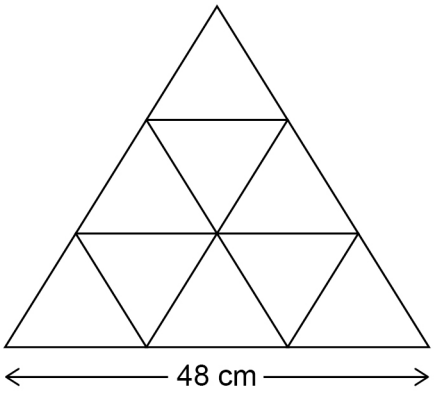
Some of these triangles are used to make a large triangle.




Not drawn accurately

Work out the perimeter of the large triangle.

**[4 marks]**

Answer _____ cm

11

**13** 200 people recorded the time they spent on social media one day.

The table shows the results.

| Time, $t$ (mins) | Frequency | Midpoint | |
|---|---|---|---|
| $0 \leqslant t < 30$ | 24 | | |
| $30 \leqslant t < 50$ | 76 | | |
| $50 \leqslant t < 60$ | 52 | | |
| $60 \leqslant t < 90$ | 48 | | |
| | Total = 200 | | |

**13 (a)** Work out an estimate of the mean time.

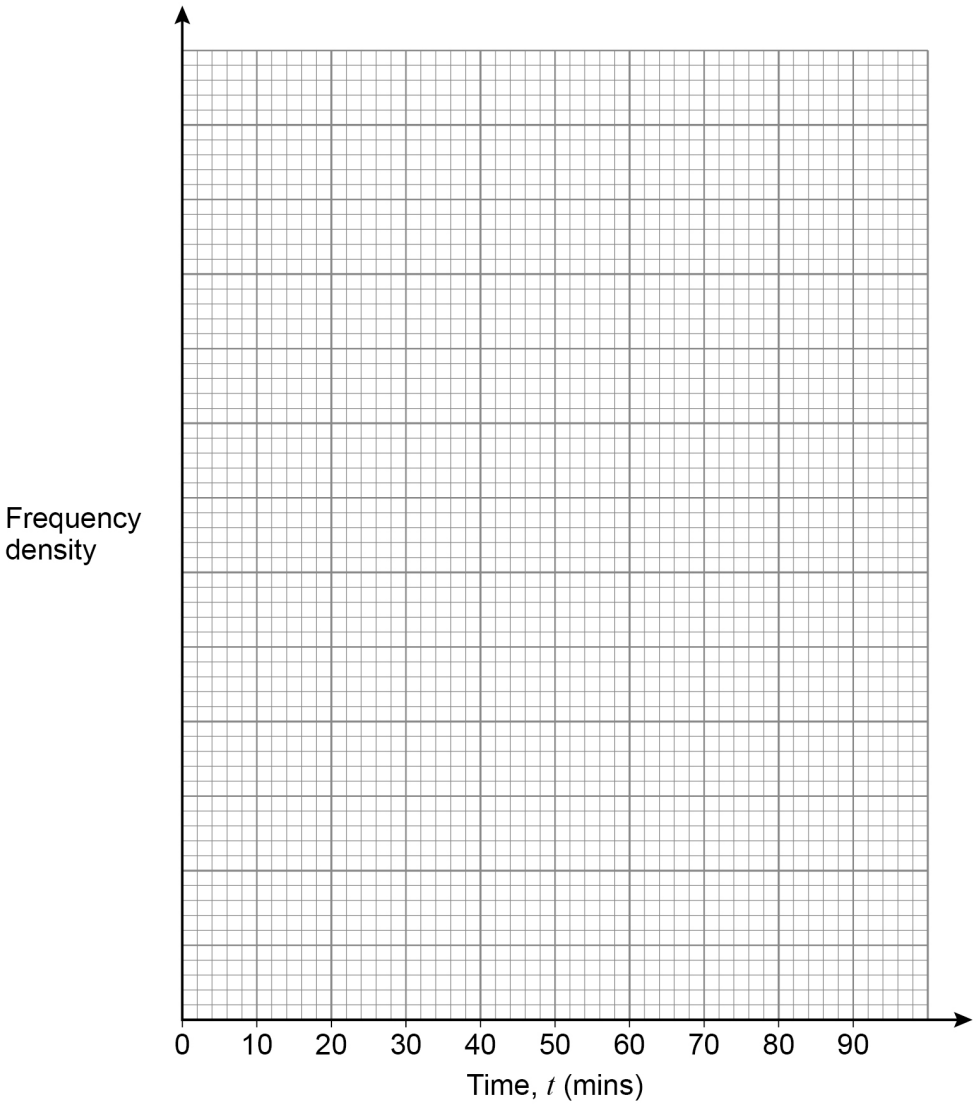
**[3 marks]**

Answer _____ mins

**13 (b)** Draw a histogram to represent the results.

**[4 marks]**

| Time, $t$ (mins) | Frequency | Class width | |
|---|---|---|---|
| $0 \leqslant t < 30$ | 24 | | |
| $30 \leqslant t < 50$ | 76 | | |
| $50 \leqslant t < 60$ | 52 | | |
| $60 \leqslant t < 90$ | 48 | | |

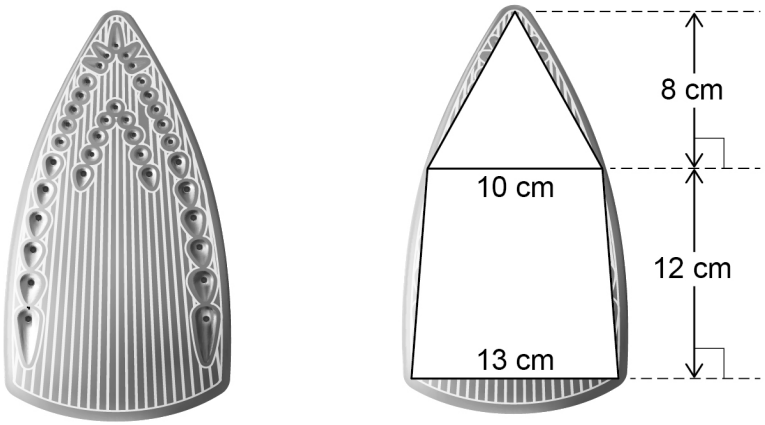



7

**14** Ralf has an iron.

He models the base as a triangle joined to a trapezium.

Not drawn accurately




**14 (a)** The iron applies a force of 25 newtons (N)

$$\text{pressure} = \frac{\text{force}}{\text{area}}$$

Work out the pressure using Ralf's model.

**[4 marks]**

Answer _____ $N/cm^2$

*Do not write outside the box*

**14 (b)** Is the actual pressure greater than, equal to or less than your answer to part (a)?

Tick **one** box.

☐ greater than ☐ equal to ☐ less than

Give a reason for your answer.

**[2 marks]**

**15** Rearrange $y = \sqrt{w^3}$ to make $w$ the subject.

Circle your answer.

**[1 mark]**

$w = y^6$ $w = \sqrt[3]{y^2}$ $w = \sqrt{y^3}$ $w = y^5$

**Turn over for the next question**

7

*Do not write outside the box*

**16 (a)** Show that $a\%$ of $b = b\%$ of $a$

**[1 mark]**

**16 (b)** Rosie says,

"160% of 40 = 140% of 60 because $a\%$ of $b = b\%$ of $a$"

Is she correct?

Tick a box.

☐ Yes ☐ No

Give a reason for your answer.

**[1 mark]**

*Do not write outside the box*

**17** A packet contains 80 sweets.

The flavour of each sweet is lemon, orange or apple.

A sweet is taken at random.

**17 (a)** P(lemon or orange) $\leqslant 0.85$

Work out the minimum possible number of **apple** sweets in the packet.

**[2 marks]**

Answer _____

**17 (b)** P(lemon or apple) $< 0.71$

There are 31 lemon sweets.

Work out the maximum possible number of **apple** sweets in the packet.

**[2 marks]**

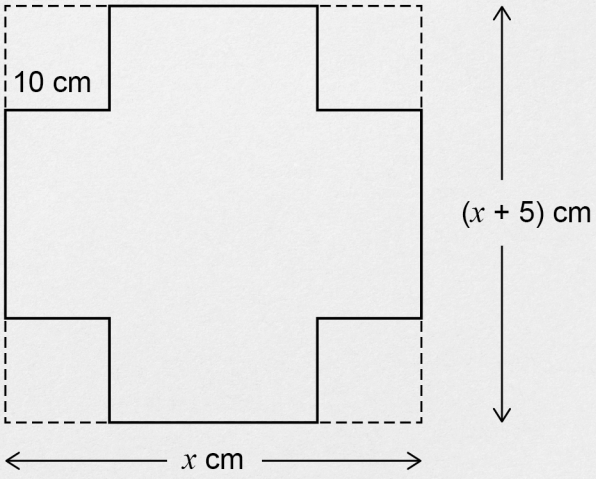
Answer _____

6

**18** Kate has the following question for homework.

The net of a box is made by cutting four squares from a piece of cardboard.
The cardboard is a rectangle with width $x$ cm and length $(x + 5)$ cm
Each square has side length 10 cm
The area of the net is 1000 cm$^2$
Work out the value of $x$.

Not drawn accurately




**18 (a)** Show that Kate can form the equation $x^2 + 5x - 1400 = 0$

**[3 marks]**

*Do not write outside the box*

**18 (b)** Kate correctly factorises the equation to get $(x + 40)(x – 35) = 0$

Her answer to the homework question is $x = –40$ or $x = 35$

Is her answer correct?

Tick a box.

☐ Yes ☐ No

Give a reason for your answer.

**[1 mark]**

**19** Circle the word that describes the graph $y = \sin x$

**[1 mark]**

periodic exponential cubic quadratic

**20** (7, 28) is a point on the graph $y = f(x)$

Circle the point which **must** be on the graph $y = f(x) + 2$

**[1 mark]**

(7, 26) (7, 30) (5, 28) (9, 28)

6

*Do not write outside the box*

**21** $n$ is the middle integer of three consecutive positive integers.

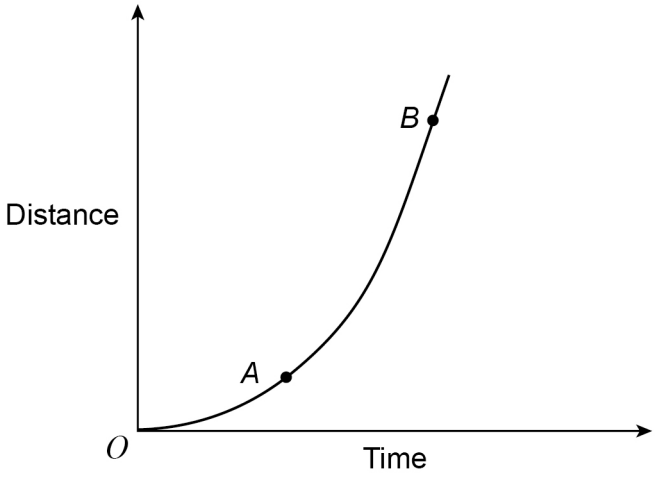
The three integers are multiplied to give a product.

$n$ is then added to the product.

Prove that the result is a cube number.

**[4 marks]**

**22** Here is a sketch of a distance-time graph.




Which of these represents the average speed between *A* and *B*?
Tick **one** box.

**[1 mark]**

- ☐ The gradient of the tangent at *A*
- ☐ The gradient of the tangent at *B*
- ☐ The gradient of the chord from *A* to *B*
- ☐ The gradient of the chord from *O* to *B*

**Turn over for the next question**

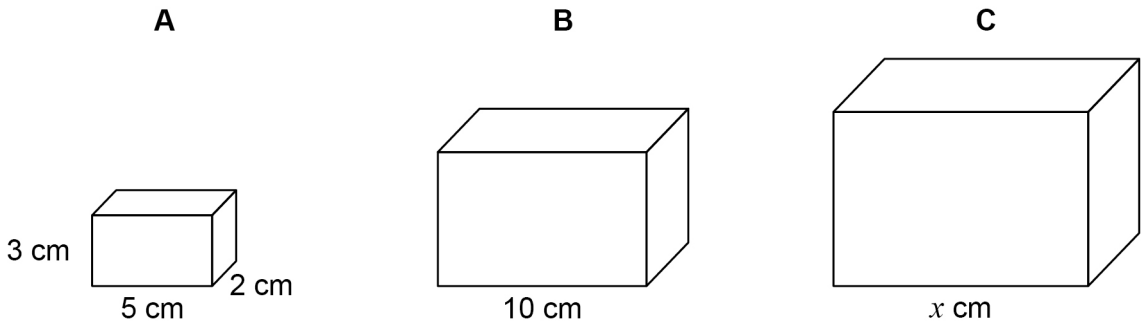
5

**23** Here are three similar cuboids, A, B and C.

A has length 5 cm, width 2 cm and height 3 cm

B has length 10 cm

C has length $x$ cm




**23 (a)** The total surface area of A is 62 cm$^2$

Tim wants to work out the total surface area of B.

Here is his working.

| | |
|---|---|
| $10 \div 5 =$ | 2 |
| $62 \times 2 =$ | 124 |
| Total surface area of B = | 124 cm$^2$ |

Make **one** criticism of Tim's method.

**[1 mark]**

**23 (b)** Volume of A $\times \frac{125}{8}$ = Volume of C

Work out the value of $x$.

**[3 marks]**

Answer _____

**Turn over for the next question**

4

**24** Here are two inequalities.

$$-2 \leqslant x \leqslant 3$$

$$9 \leqslant x + y \leqslant 11$$

$x$ and $y$ are integers.

Work out the **greatest** possible value of $y - x$

**[3 marks]**

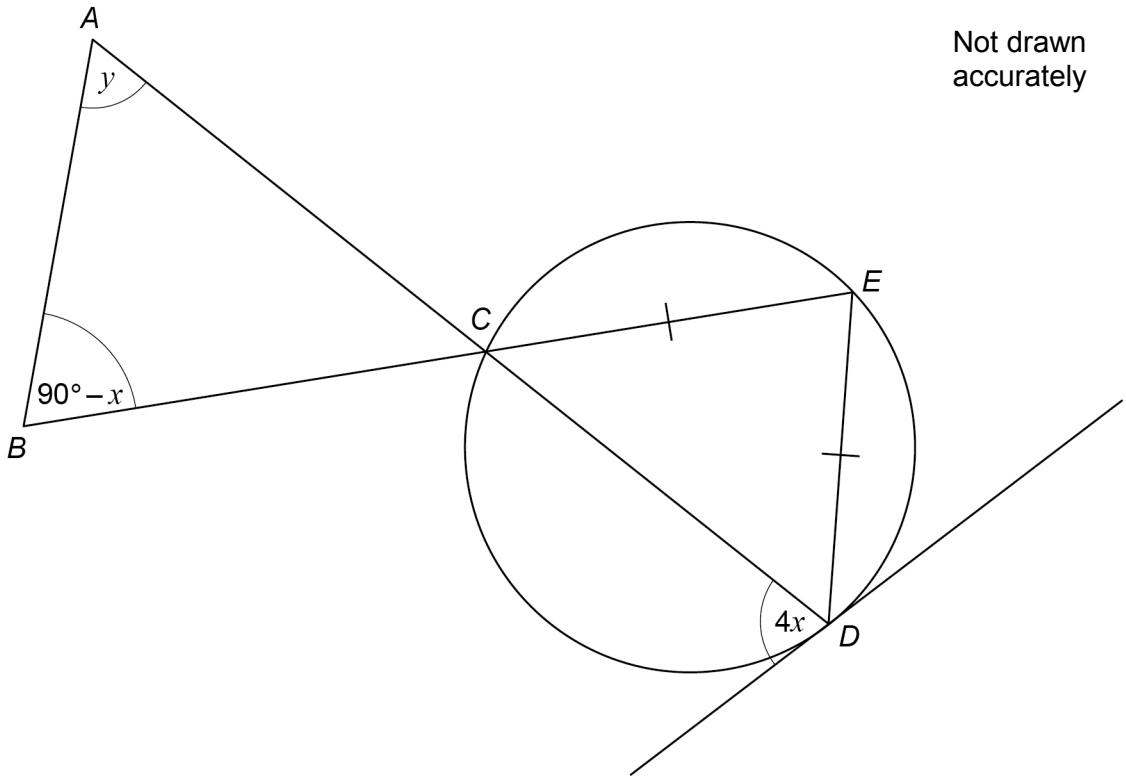
Answer _____

**25** *C*, *D* and *E* are points on a circle.

$CE = DE$

The tangent at *D* is shown.

*ACD* and *BCE* are straight lines.




Prove that $y = 3x$

**[4 marks]**

**7**

**26** $P$, $Q$ and $R$ have positive values.

$P$ is directly proportional to the square of $Q$.

When $P = 1.25$, $Q = 0.5$

$Q$ is inversely proportional to $R$.

When $Q = 0.5$, $R = 6$

Work out the value of $R$ when $P = 0.8$

**[5 marks]**

Answer _____

**27** $x_{n+1} = \sqrt[3]{3x_n + 7}$

Use a starting value of $x_1 = 2$ to work out a solution to $x = \sqrt[3]{3x + 7}$

Give your answer to 3 decimal places.

**[3 marks]**

Answer _____

**END OF QUESTIONS**

**8**

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