

Please write clearly in block capitals.

Centre number

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Candidate number

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Surname

Forename(s)

Candidate signature

GCSE MATHEMATICS

H

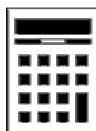
Higher Tier Paper 2 Calculator

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.

| 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 | |

Advice

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



Answer **all** questions in the spaces provided

- 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]

$\frac{7}{32}$

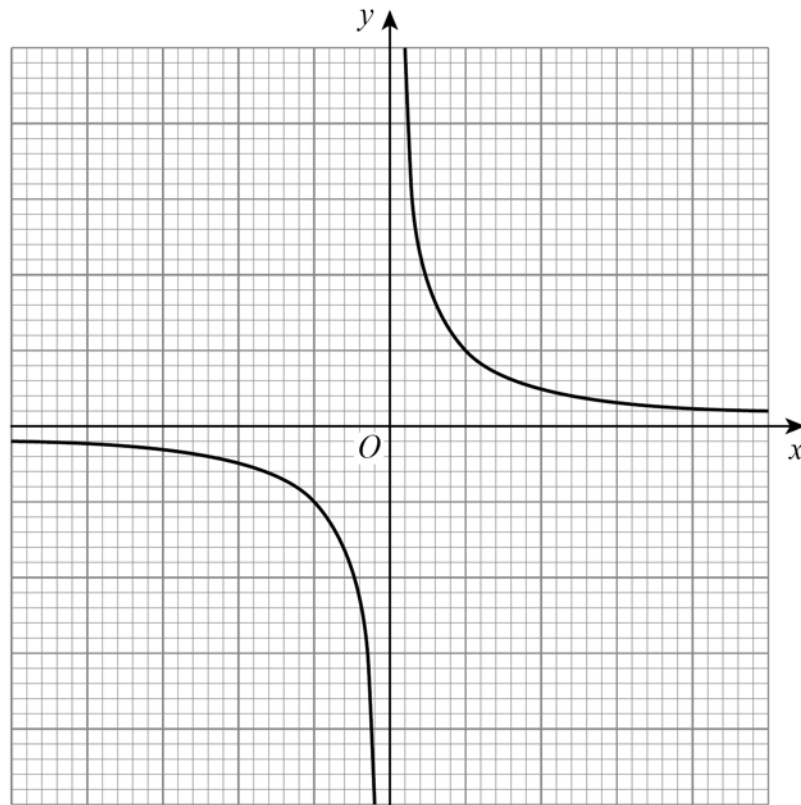
$\frac{5}{8}$

$\frac{2}{3}$

$\frac{1}{2}$



- 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

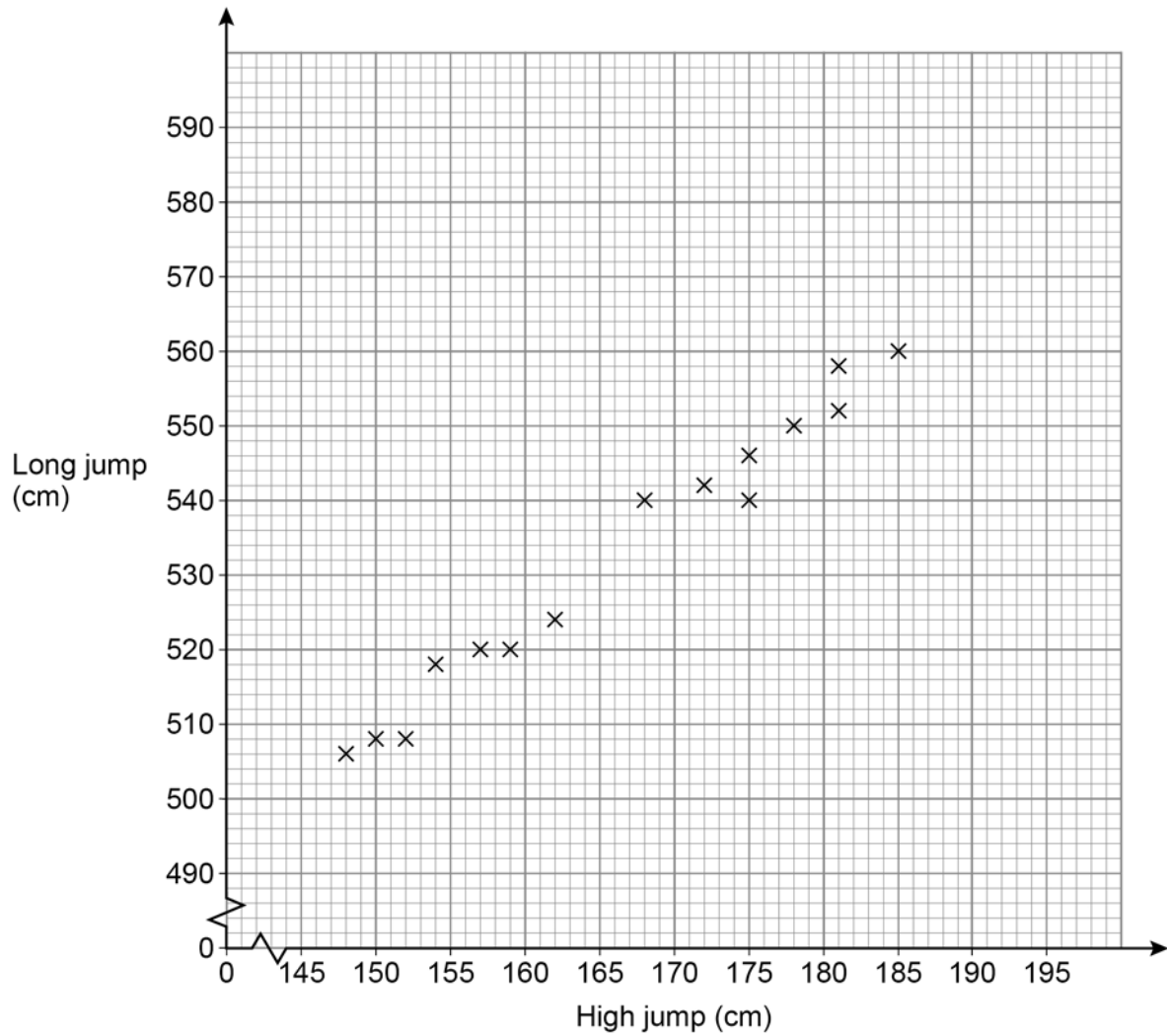
[2 marks]

Answer _____

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 _____



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



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.

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

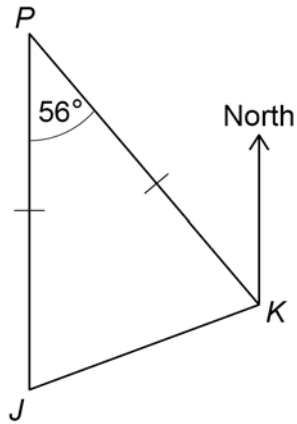
Work out the values of a and b .

[3 marks]

$a =$ _____ $b =$ _____



9

J and *K* are ships.*P* is a port.*J* is due South of *P*.Angle $JKP = 56^\circ$ $JP = KP$ Not drawn
accuratelyWork out the bearing of *J* from *K*.**[3 marks]**

Answer _____ °

Turn over for the next question



- 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 _____

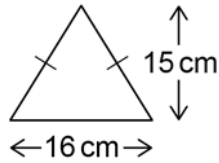
- 11** The value of a house is £120 000
The value is expected to increase by 5% each year.
Work out the expected value after 4 years.
Give your answer to 2 significant figures.
You **must** show your working.

[4 marks]

Answer £ _____

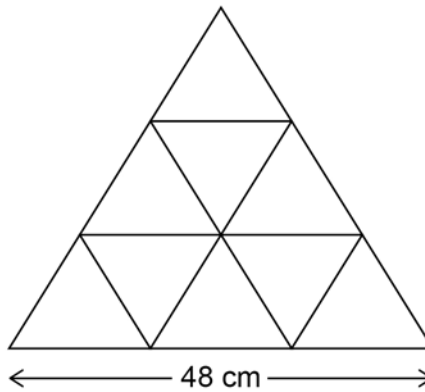


12 An isosceles triangle has base 16 cm and perpendicular height 15 cm



Not drawn
accurately

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



- 13** 200 people recorded the time they spent on social media one day.
The table shows the results.

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

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

[3 marks]

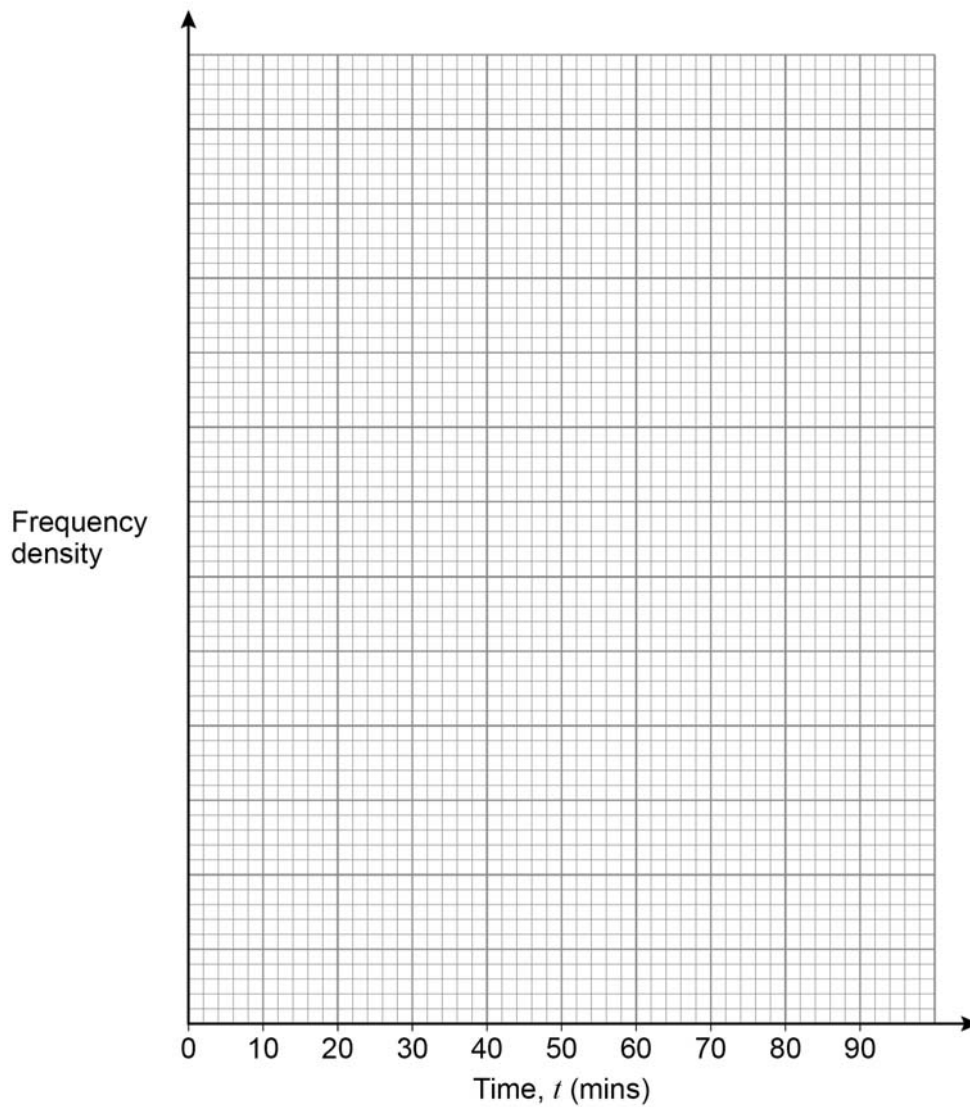
Answer _____ mins



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

[4 marks]

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

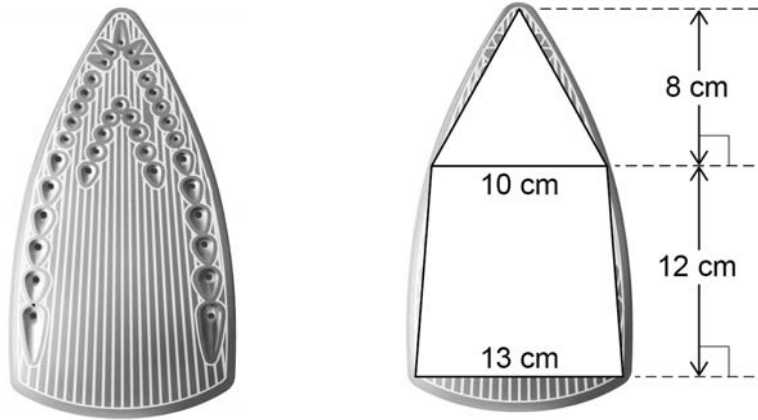


Turn over ►



- 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/cm²



- 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

Turn over ►



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]



- 17** A packet contains 80 sweets.
The flavour of each sweet is lemon, orange or apple.
A sweet is taken at random.

17 (a) $P(\text{lemon or orange}) \leq 0.85$

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

[2 marks]

Answer _____

- 17 (b)** $P(\text{lemon or apple}) < 0.71$
There are 31 lemon sweets.

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

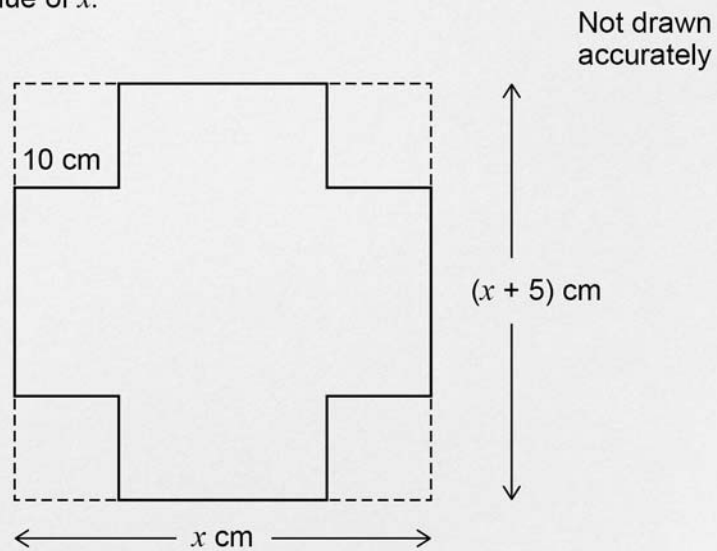
[2 marks]

Answer _____



- 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 .



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

[3 marks]



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]

$(7, 26)$

$(7, 30)$

$(5, 28)$

$(9, 28)$



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

The three integers are multiplied to give a product.

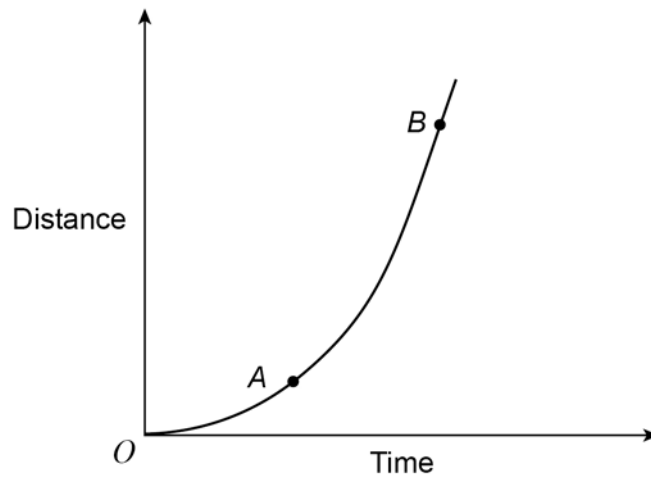
n is then added to the product.

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

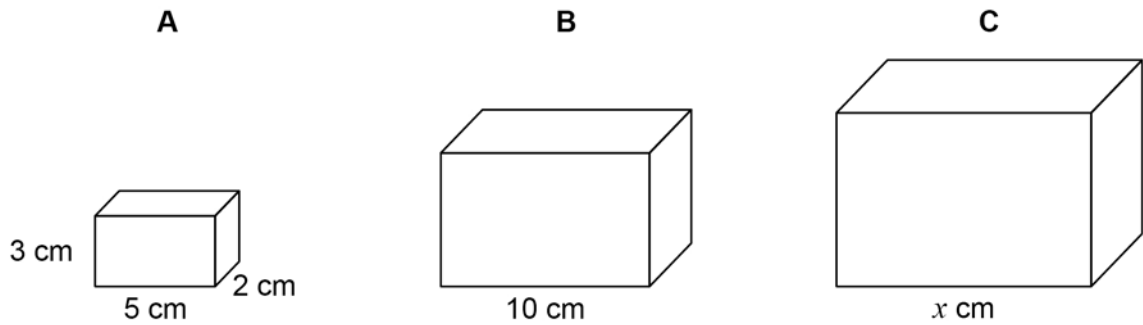


23 Here are three similar cuboids, A, B and C.

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.

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

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

Turn over ►



24

Here are two inequalities.

$$-2 \leq x \leq 3$$

$$9 \leq x + y \leq 11$$

x and y are integers.

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

[3 marks]

Answer _____



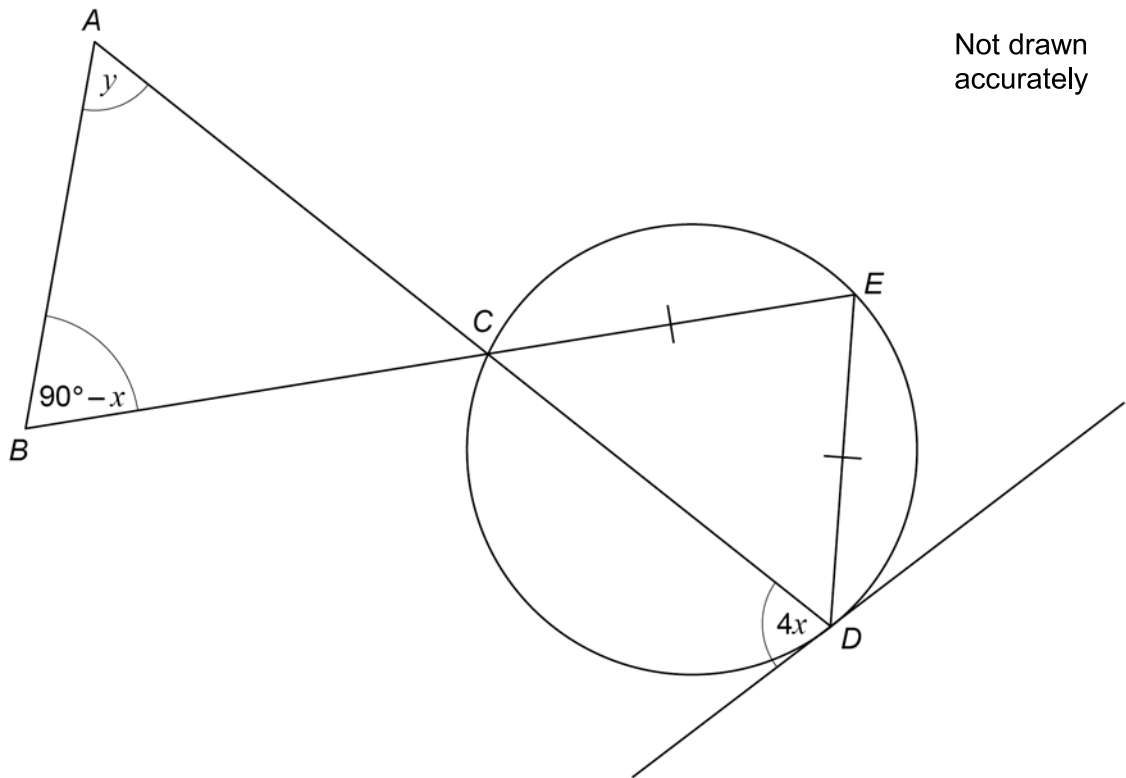
25

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 |
|---|

Turn over ►



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 _____



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1 9 B G 8 3 0 0 / 2 H

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