

For **AQA**

Name

Class

GCSE
Mathematics
Specification
Paper 2 Higher Tier

H

Churchill Paper 2E

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.
- Write your name and class in the box at the top of the 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.
- 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.

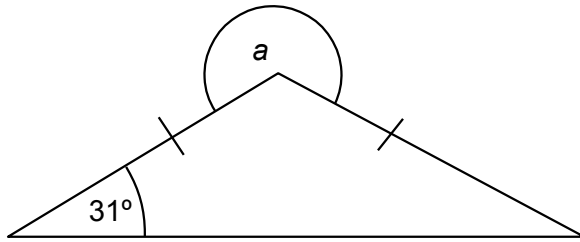


Written by Shaun Armstrong

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

1 (a)



Not drawn accurately

Circle the size of angle a .

[1 mark]

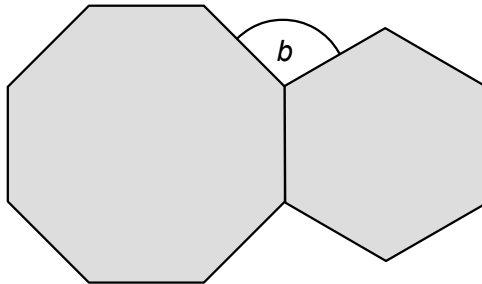
62°

118°

222°

242°

1 (b)



Not drawn accurately

The diagram shows two regular polygons.

Circle the size of angle b .

[1 mark]

95°

105°

111°

115°

2 Circle the expression that is equivalent to $(2p^3)^2$ [1 mark]

$2p^6$

$4p^5$

$4p^6$

$32p^5$

3 Circle the fraction with a value between $\sqrt{0.58}$ and $\sqrt{0.59}$. [1 mark]

$\frac{10}{13}$

$\frac{13}{17}$

$\frac{17}{22}$

$\frac{35}{46}$

4 Jamal and Kevin share some money in the ratio 5 : 8

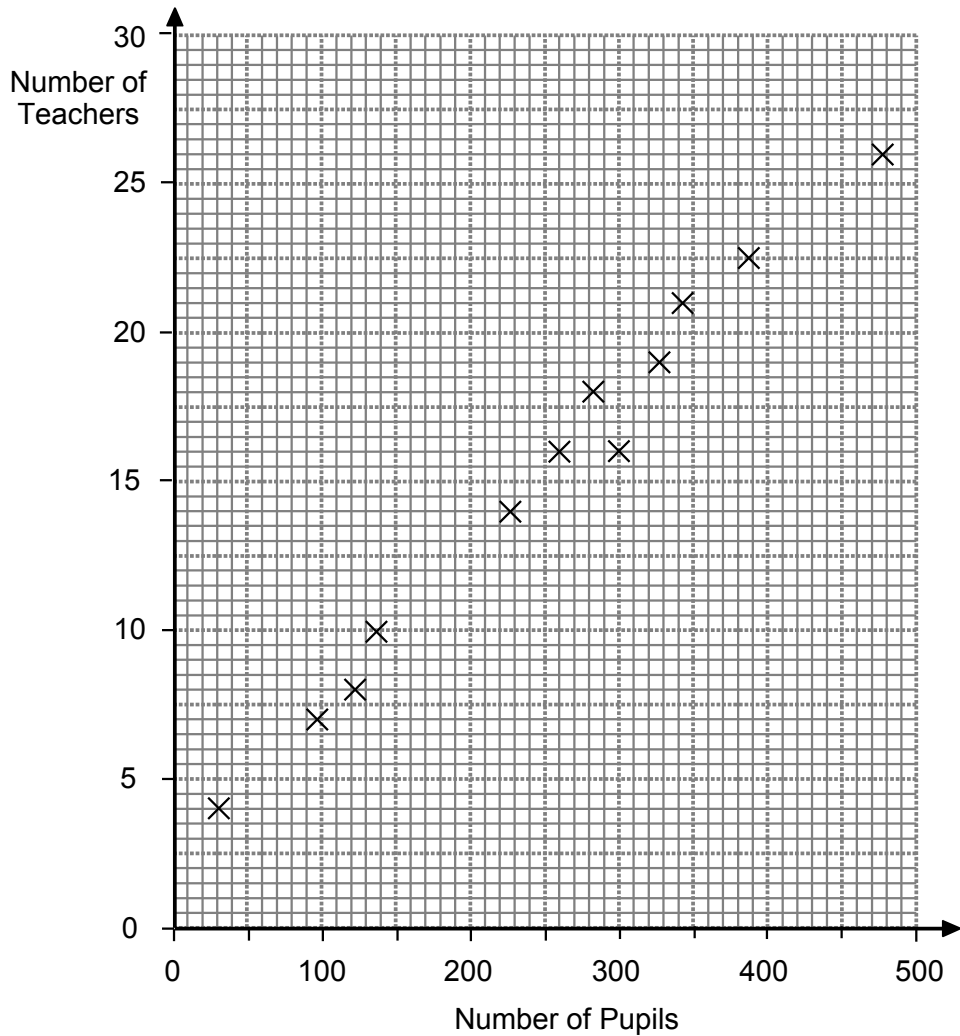
Kevin then gives $\frac{1}{3}$ of his share to Lennie.

Given that Lennie receives £36, how much did Jamal get?

[3 marks]

Answer £ _____

- 5 Meg collected information on the number of pupils and the number of teachers at some primary schools near her home. Her results are shown on the scatter diagram.



- 5 (a) Two of the schools had the same number of teachers.

Work out the difference between the number of pupils in these two schools.

[1 mark]

Answer _____

- 5 (b) Another primary school near Meg's home has 180 pupils.

Use a line of best fit to estimate the number of teachers at this school.

[2 marks]

Answer _____

5 (c) Find the gradient of your line of best fit.

[2 marks]

Answer _____

5 (d) Explain what the gradient found in part (c) tells us.

[1 mark]

6 Luther wants to buy 3 packets of his favourite snack, Kryptonbix.

There are 2 local shops that usually sell Kryptonbix for the same price.

Today one of the shops is offering 20% off.

Also today, the other shop is offering "Buy 2 get 1 half price".

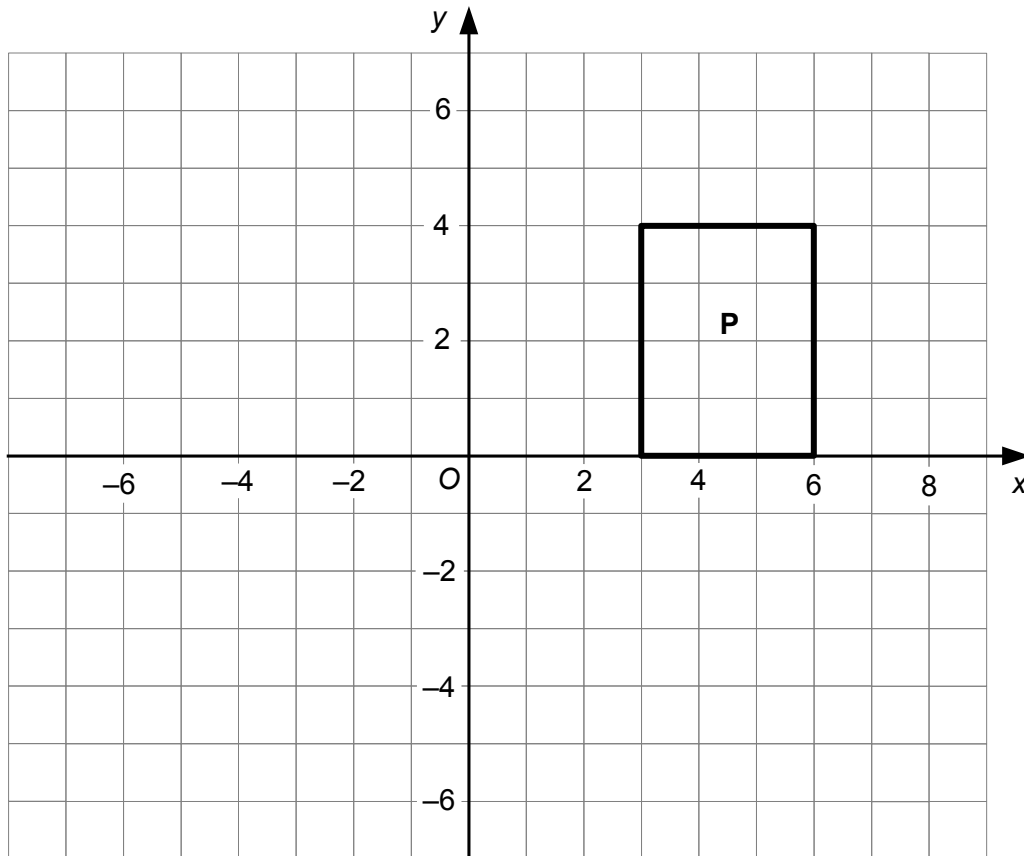
Which offer gives Luther better value?

You must justify your answer.

[3 marks]

Answer _____

7



The rectangle **P** is shown on the grid above.

7 (a) Reflect **P** in the line $y = x$.

Label the image **Q**.

[2 marks]

7 (b) Write down the coordinates of any points on **P** that are invariant when it is reflected in the line $y = x$ to give **Q**.

[1 mark]

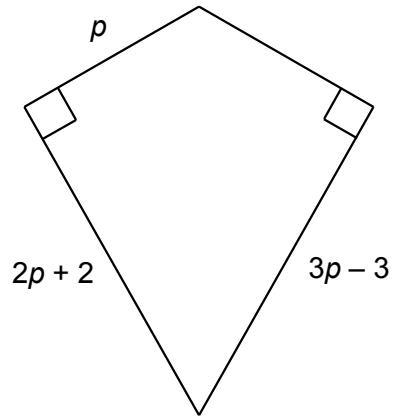
Answer _____

7 (c) **Q** is translated by the vector $\begin{pmatrix} 0 \\ -9 \end{pmatrix}$ to give the rectangle **R**.

Describe fully the single transformation that maps **P** onto **R**.

[3 marks]

8



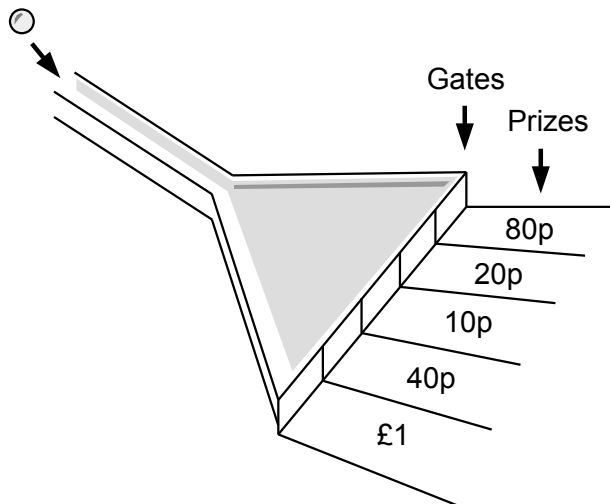
Not drawn accurately

The diagram shows a kite.
Three of the side lengths are shown in centimetres.

Show that the area of the kite is 60 cm^2 .

[4 marks]

9



In a fairground game, a ball is rolled down a slope. The slope becomes wider and the ball goes through one of five gates.

The prize you win depends on which gate the ball goes through, as shown above. The gates are all the same size.

The boy running the game says

“The average prize is 50p but it only costs you 40p for a roll!”

- 9 (a) Which average, the mode, the mean or the median, is the boy talking about?

Explain how you know.

[2 marks]

Average: _____ Explanation: _____

- 9 (b) What assumption has he made in claiming the average prize is 50p.

[1 mark]

9 (c) Comment on the boy's assumption and how it affects his claim.

[2 marks]

10 (a) Circle the correct expansion of $(x - 5)(x - 1)$

[1 mark]

$x^2 - 6x + 5$

$x^2 - 6x - 5$

$x^2 - 4x + 5$

$x^2 - 5x + 6$

10 (b) Circle the correct factorisation of $x^2 + 3x - 10$

[1 mark]

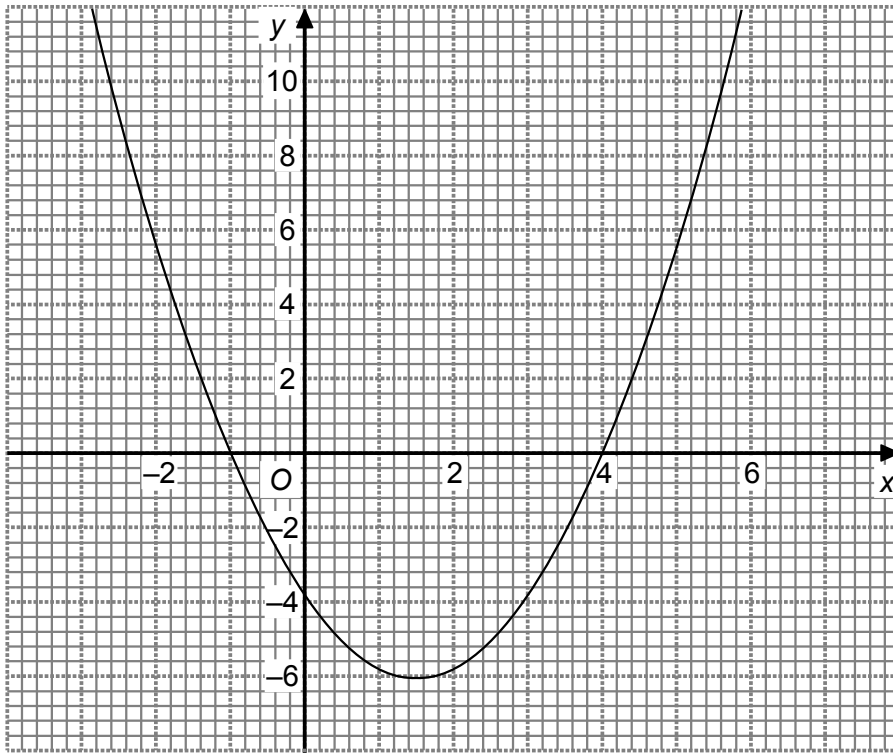
$(x - 1)(x + 10)$

$(x + 2)(x - 5)$

$(x - 2)(x - 5)$

$(x - 2)(x + 5)$

11



Part of the graph of $y = f(x)$ is shown on the grid.

11 (a) Use the graph to write down the value of $f(3)$.

[1 mark]

Answer _____

11 (b) Use the graph to find the roots of $f(x) = 0$.

[1 mark]

Answer _____

12 $f(x) = \frac{1}{3}(x - 2)$

Circle the correct expression for $f^{-1}(x)$.

[1 mark]

$$\frac{3}{x + 2}$$

$$3(x + 2)$$

$$\frac{3}{2 - x}$$

$$3x + 2$$

13 Without using a calculator, prove that

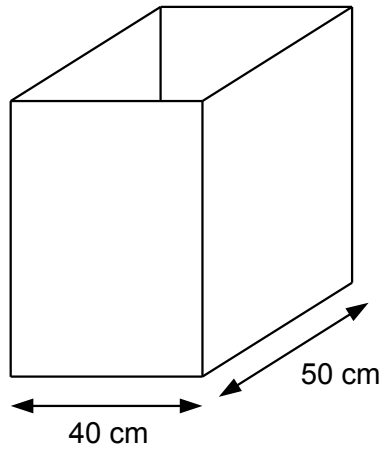
$$\sqrt[4]{40\,000} = k\sqrt{2}$$

where k is an integer to be found.

[3 marks]

Answer _____

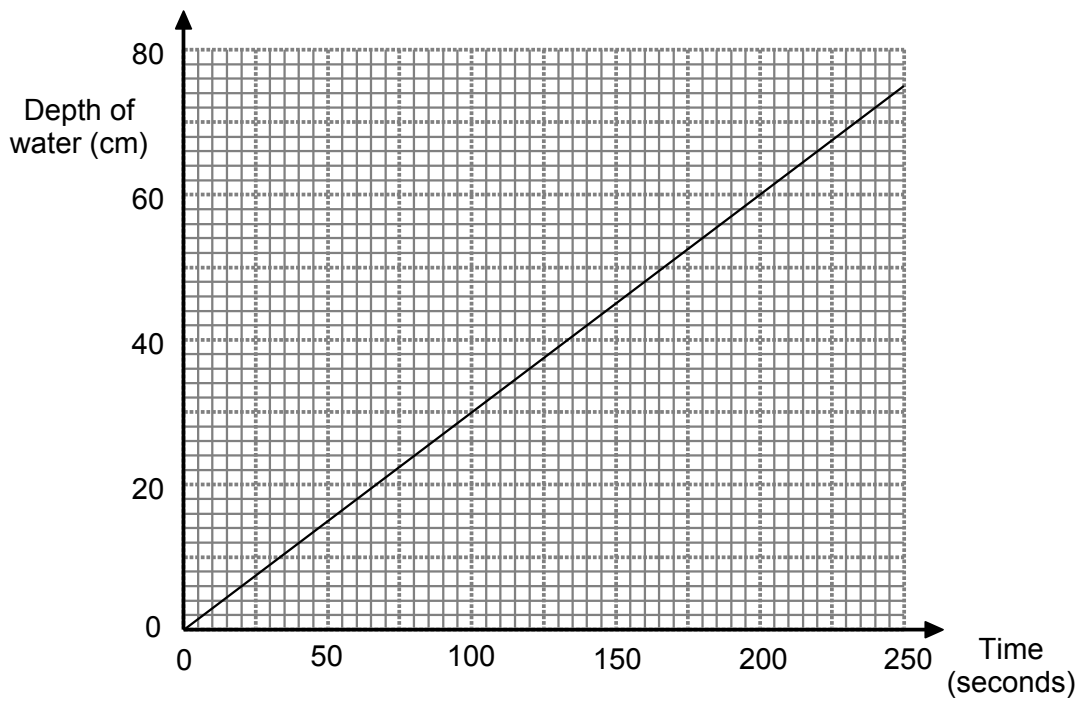
- 14 An empty water tank is in the shape of a cuboid.
The base of the tank measures 40 cm by 50 cm.



Not drawn accurately

A tap is used to fill the tank with water.

The graph shows how the depth of the water in the tank changes with time.



14 (a) Use the graph to work out the rate at which water is supplied to the tank.

Give your answer in litres per hour.

[3 marks]

Answer _____ litres per hour

14 (b) State an assumption you have made in your calculation in part **(a)** and explain how it has affected your answer.

[2 marks]

15 Solve algebraically the simultaneous equations

$$y = 3x^2 - x + 7$$

$$y = 9 - 6x$$

[4 marks]

Answer _____

16 An alloy is made from a mixture of gold and silver.

The density of gold is 19.3 g/cm^3 .
The density of silver is 10.5 g/cm^3 .

16 (a) Explain why the percentage of the mass of the alloy that is gold will be different from the percentage of the volume that is gold.

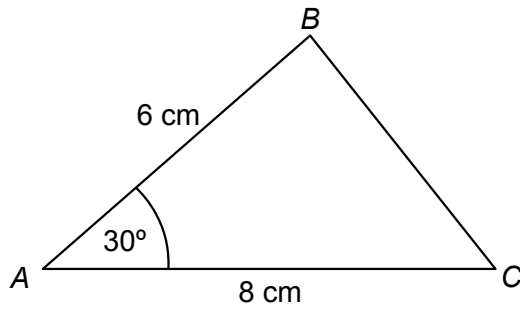
[1 mark]

A ring is made from the alloy.
The mass of the ring is 10g and its volume is 0.6 cm^3 .

16 (b) Use algebra to show that about 70% of the volume of the ring is gold.

[4 marks]

17 (a)



Not drawn accurately

Circle the area of triangle ABC.

[1 mark]

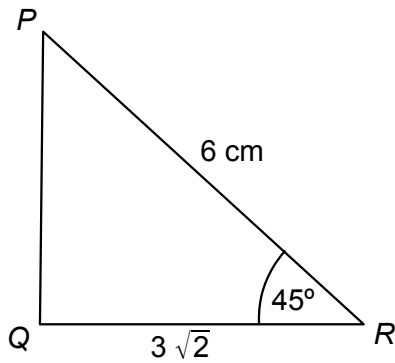
12 cm^2

$12\sqrt{2} \text{ cm}^2$

$12\sqrt{3} \text{ cm}^2$

24 cm^2

17 (b)



Not drawn accurately

Sam says

“PQR is a right-angled triangle.”

Is Sam correct?

Show calculations to justify your answer.

[3 marks]

Answer _____

18 Dihya plays a pool game on his phone.

The app shows that he has played 523 games.

It also shows that he has won 52% of the games he has played.

The win percentage shown by the app is rounded to the nearest whole number.

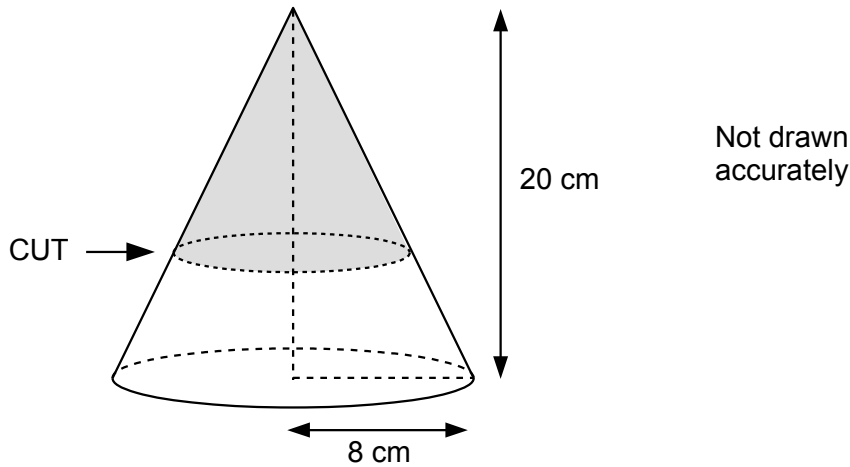
Dihya plays another 20 games and the app now shows that he has won 53% of all the games he has played.

Work out the smallest number of games that Dihya could have won out of the 20 games he has just played.

[4 marks]

Answer _____

- 19 Two friends have a shared birthday party.
The birthday cake is in the shape of a cone.



The radius of the base of the cone is 8 cm and the height of the cone is 20 cm.

The cake is to be cut into two pieces of the same volume.
The cut is to be horizontal as shown in the diagram.

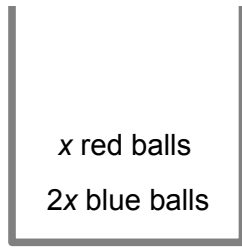
Calculate how high above the base the cut should be made.
Give your answer in centimetres correct to 1 decimal place.

[The volume V of a cone with base radius r and height h is $V = \frac{1}{3} \pi r^2 h$.]

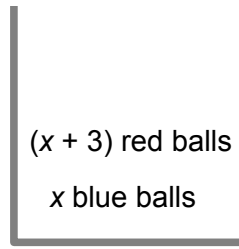
[4 marks]

Answer _____ cm

20



Box P



Box Q

Box P contains x red balls and $2x$ blue balls.
Box Q contains $(x + 3)$ red balls and x blue balls.

A ball is picked at random from box P and placed into box Q.
A ball is now picked at random from box Q.

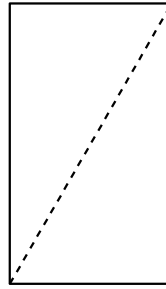
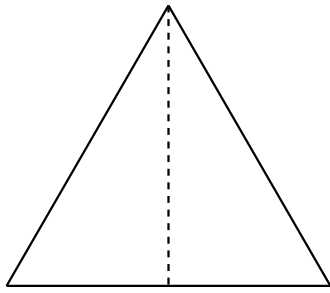
The probability that both balls picked are red is $\frac{1}{4}$.

Work out the probability that both balls picked are blue.

[5 marks]

Answer _____

21



Not drawn accurately

A piece of card in the shape of an equilateral triangle is cut in half. The two pieces are then put together to make a rectangle as shown.

The perimeter of the rectangle is 20 cm.

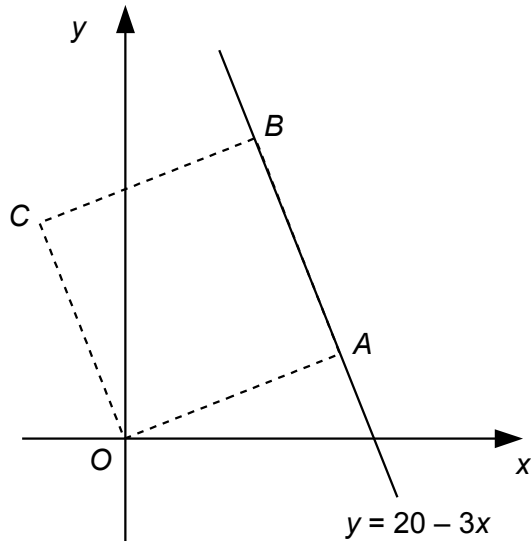
Find the perimeter of the equilateral triangle.

Give your answer correct to 3 significant figures.

[5 marks]

Answer _____ cm

22



Not drawn accurately

O is the origin, (0, 0).

The points A and B lie on the line with equation $y = 20 - 3x$.

Given that OABC is a square, find a possible set of coordinates for point C.

[5 marks]

Answer (_____ , _____)

END OF QUESTIONS