



EXAM PAPERS PRACTICE

GCSE OCR Math J560

Equation and Problem Solving

Answers

*"We will help you to
achieve A Star "*



Answer 1

Kalinda buys x packs of currant buns and y boxes of iced buns.

There are 6 currant buns in a pack of currant buns.

There are 8 iced buns in a box of iced buns.

$\rightarrow 6x$ CBs
 $\rightarrow 8y$ IBs

Kalinda buys a total of T buns.

Write down a formula for T in terms of x and y .

$$T = \text{CBs} + \text{IBs}$$

$$\underline{\underline{T = 6x + 8y}}$$



Answer 2

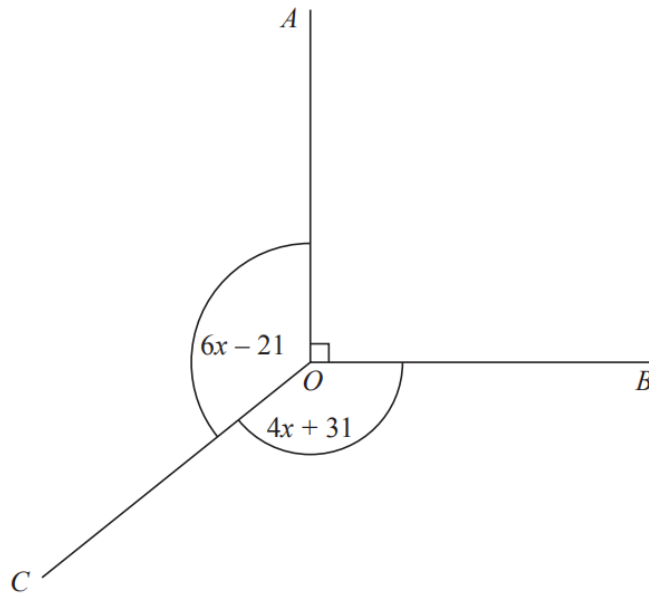


Diagram **NOT** accurately drawn

In the diagram, all angles are in degrees.

Angle AOB is a right angle.

Angle $AOC = \text{Angle } BOC$.

Work out the value of x .

$$\begin{aligned} \rightarrow 6x - 21 &= 4x + 31 \\ &\quad +21 \qquad \qquad +21 \\ 6x &= 4x + 52 \\ -4x &\quad -4x \\ 2x &= 52 \\ \frac{2x}{2} &= \frac{52}{2} \\ x &= \underline{\underline{26^\circ}} \end{aligned}$$



Answer 3

Gemma has the same number of sweets as Betty.

Gemma gives 24 of her sweets to Betty.

Betty now has 5 times as many sweets as Gemma.

Work out the total number of sweets that Gemma and Betty have.

$$G = x \quad B = x$$

$$G = x - 24 \quad B = x + 24$$

$$B = 5 \times G$$

$$x + 24 = 5 \times (x - 24)$$

SOLVE THIS!

$$x + 24 = 5x - 120$$

$-x$

$-x$

$$24 = 4x - 120$$

$+120$

$+120$

$$\frac{144}{4} = \frac{4x}{4}$$

$$\underline{36} = x$$

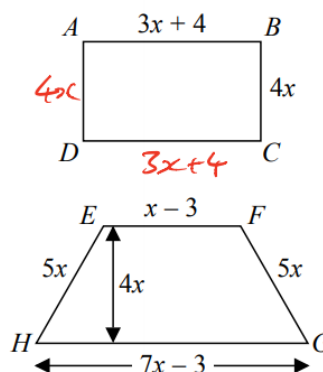
$$\text{TOTAL} = x + x = 36 + 36$$

$$= \underline{\underline{72 \text{ SWEETS}}}$$



Answer 4

$ABCD$ is a rectangle.
 $EFGH$ is a trapezium.



All measurements are in centimetres.
The perimeters of these two shapes are the same.

Work out the area of the rectangle.

PERIMETER OF RECTANGLE = PERIMETER OF TRAPEZIUM

$$3x + 4 + 4x + 3x + 4 + 4x = x - 3 + 5x + 7x - 3 + 5x$$

$$14x + 8 = 18x - 6$$

$$8 = 4x - 6$$

$$\frac{14}{4} = \frac{4x}{4}$$

$$x = 3.5$$

RECTANGLE: LENGTH = $3 \times 3.5 + 4 = 14.5$

WIDTH = $4 \times 3.5 = 14$

AREA = LENGTH \times WIDTH

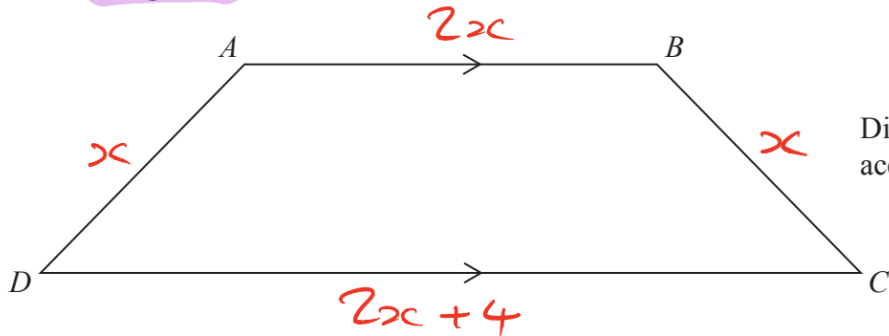
$$= 14.5 \times 14$$

$$= \underline{\underline{203 \text{ cm}^2}}$$



Answer 5

The diagram shows a trapezium.



$AD = x$ cm.

BC is the same length as AD .

AB is twice the length of AD .

DC is 4 cm longer than AB .

The perimeter of the trapezium is 38 cm.

Work out the length of AD .

$$\text{PERIMETER} = 38$$

$$x + 2x + x + 2x + 4 = 38$$

$$6x + 4 = 38$$

$$\begin{array}{r} 6x = 34 \\ \hline 6 \quad 6 \end{array}$$

$$x = \frac{34}{6} = \frac{17}{3} = \underline{\underline{5.6}}$$



Answer 6

A shop sells packets of envelopes.

There are 5 envelopes in a small packet.

There are 20 envelopes in a large packet.

There is a total of T envelopes in x small packets and y large packets.

Write down a formula for T in terms of x and y .

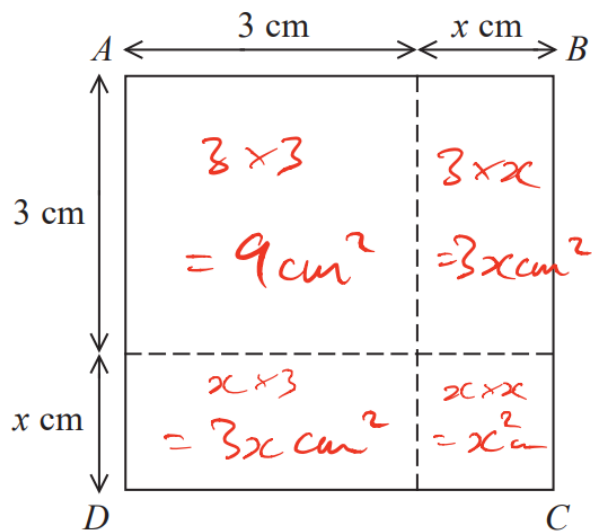
$$x \text{ SMALL PACKETS} = x \times 5 \text{ ENVELOPES}$$

$$y \text{ LARGE PACKETS} = y \times 20 \text{ ENVELOPES}$$

$$\text{So } \underline{\underline{T = 5x + 20y}}$$



Answer 7



The area of square $ABCD$ is 10 cm^2 .

Show that $x^2 + 6x = 1$

$$\text{TOTAL AREA} = 10$$

$$9 + 3x + 3x + x^2 = 10$$

$$9 + 6x + x^2 = 10$$

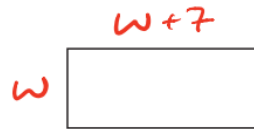
$$\begin{array}{r} -9 \\ 9 + 6x + x^2 = 10 \\ \hline x^2 + 6x = 1 \end{array}$$

$$\underline{\underline{x^2 + 6x = 1}}$$



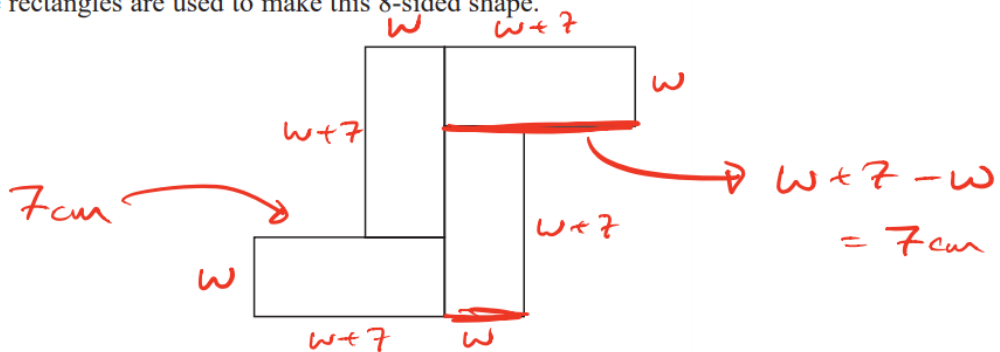
Answer 8

Here is a rectangle.



The length of the rectangle is 7 cm longer than the width of the rectangle.

4 of these rectangles are used to make this 8-sided shape.



The perimeter of the 8-sided shape is 70 cm.

Work out the area of the 8-sided shape.

$$\text{PERIMETER} = 70 \text{ cm}$$

$$4 \times (w + w + 7) + 2 \times 7 = 70$$

$$4(2w + 7) + 14 = 70$$

$$8w + 28 + 14 = 70$$

$$8w + 42 = 70$$

$$\begin{array}{r} 8w = 28 \\ \hline 8 \quad 8 \end{array}$$

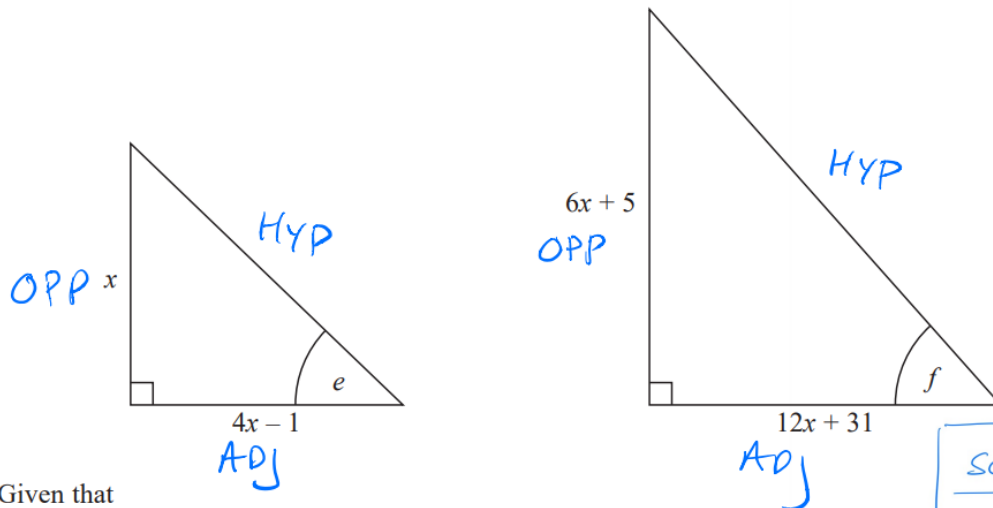
$$w = 3.5$$

$$\begin{aligned} \text{AREA} &= 4 \times \square = 4 \times 3.5 \times \underbrace{10.5}_{w+7} \\ &= \underline{\underline{147 \text{ cm}^2}} \end{aligned}$$



Answer 9

Here are two right-angled triangles.



Given that

$$\tan e = \tan f$$

find the value of x .

You must show all your working.

SOHCAHTOA

$$\sin \theta = \frac{\text{OPP}}{\text{HYP}}$$
$$\cos \theta = \frac{\text{ADJ}}{\text{HYP}}$$
$$\tan \theta = \frac{\text{OPP}}{\text{ADJ}}$$

$$\cancel{(4x-1)} \cancel{(12x+31)} \times \frac{x}{\cancel{(4x-1)}} = \frac{6x+5}{\cancel{(12x+31)}} \times \cancel{(4x-1)} \cancel{(12x+31)}$$

$$x(12x+31) = (6x+5)(4x-1)$$

$$12x^2 + 31x = 24x^2 - 6x + 20x - 5$$

-12x² -31x -12x² -31x

$$0 = 12x^2 - 17x - 5$$

$$x = \frac{17 \pm \sqrt{529}}{2 \times 12}$$

$x = \frac{5}{3}$ (OR $x = -\frac{1}{4}$)
LENGTH CAN'T BE NEGATIVE

QUADRATIC FORMULA

$$ax^2 + bx + c = 0$$
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

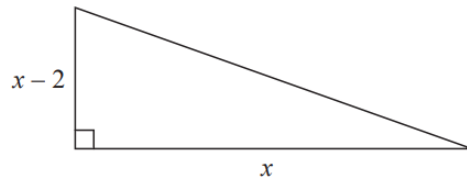
$$a = 12$$
$$b = -17$$
$$c = -5$$

$$b^2 - 4ac = 17^2 - 4 \times 12 \times (-5)$$
$$= 529$$



Answer 10

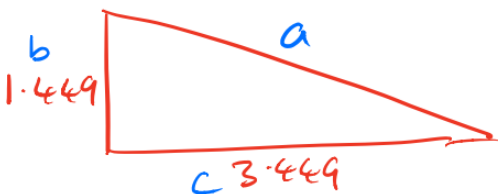
Here is a right-angled triangle.



All measurements are in centimetres.
The area of the triangle is 2.5 cm^2 .

Find the perimeter of the triangle.
Give your answer correct to 3 significant figures.
You must show all of your working.

$$\begin{aligned} A &= 2.5 \\ 2 \times \frac{1}{2} \times x \times (x-2) &= 2.5 \times 2 \\ x(x-2) &= 5 \\ x^2 - 2x - 5 &= 5 \\ x^2 - 2x - 5 &= 0 \\ x &= \frac{2 \pm \sqrt{24}}{2} \\ x &= \underline{3.464} \text{ (or } -1.464) \end{aligned}$$



$$\begin{aligned} a^2 &= 1.464^2 + 3.464^2 \\ a &= \sqrt{1.464^2 + 3.464^2} \\ a &= \underline{3.741} \end{aligned}$$

$$\begin{aligned} a &= 1 \\ b &= -2 \\ c &= -5 \\ b^2 - 4ac &= 4 - 4 \times 1 \times (-5) \\ &= 4 + 20 \\ &= 24 \end{aligned}$$

AREA OF TRIANGLE

$$A = \frac{1}{2}bh$$

QUADRATIC FORMULA

$$ax^2 + bx + c = 0$$
$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

PYTHAGORAS THEOREM

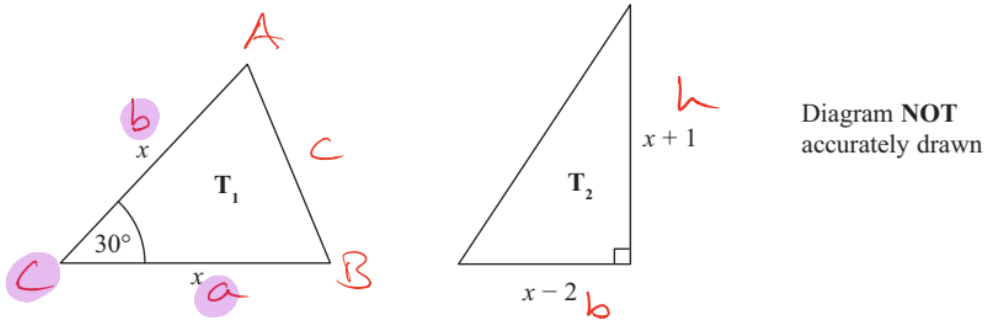
$$a^2 = b^2 + c^2$$

$$\begin{aligned} \text{PERIMETER} &= 1.464 + 3.464 + 3.741 \\ &= 8.639 \\ &= \underline{8.64} \text{ cm} \end{aligned}$$



Answer 11

Here are two triangles T_1 and T_2 .



The lengths of the sides are in centimetres.

The area of triangle T_1 is equal to the area of triangle T_2 .

Work out the value of x , giving your answer in the form $a + \sqrt{b}$ where a and b are integers.

$$A \text{ of } T_1 = A \text{ of } T_2$$

$$\frac{1}{2} \times x \times x \times \sin 30^\circ = \frac{1}{2} \times (x-2) \times (x+1)$$

$$\frac{1}{4} x^2 \times 1 = \frac{1}{2} (x-2)(x+1) \times 1$$

GRUF

$$x^2 = 2(x^2 + x - 2x - 2)$$

$$x^2 = 2x^2 - 2x - 4$$

$$0 = x^2 - 2x - 4$$

$$+5 \quad 0 = (x-1)^2 - 5 + 5$$

$$\sqrt{\quad} \quad 5 = (x-1)^2$$

$$\sqrt{5} = x-1$$

$$\underline{\underline{1 + \sqrt{5} = x}}$$

TRIANGLE AREAS

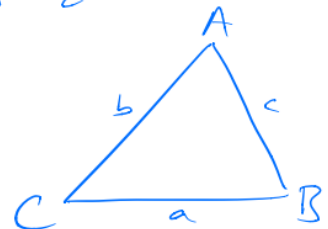
RIGHT ANGLED

$$A = \frac{1}{2}bh$$



NON-RIGHT ANGLED

$$A = \frac{1}{2}ab \sin C$$



$$(x-1)^2 = x^2 - 2x + 1$$

COMPLETING THE SQUARE.



Answer 12

Julie and Liam write down the same number.

Julie multiplies the number by 5 and then adds 4 to the result.
She writes down her answer.

Liam subtracts the number from 10
He writes down his answer.

Julie's answer is two thirds of Liam's answer.

Work out the number that Julie and Liam started with.
You must show your working.

→ x

JULIE: $5x + 4$

LIAM: $10 - x$

→ $3(5x + 4) = \frac{2}{3}(10 - x) \times 3$

GROF GROB LET
FIND ANSWER!

GROF: $3(5x + 4) = 2(10 - x)$

GROB: $15x + 12 = 20 - 2x$
 $\quad \quad \quad -12 \quad \quad \quad -12$

LET: $15x = 8 - 2x$
 $\quad \quad \quad +2x \quad \quad \quad +2x$

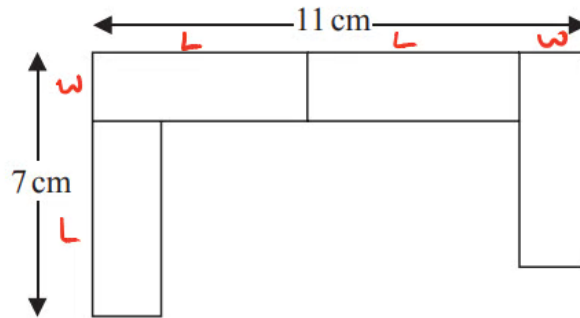
D: $\frac{17x}{17} = \frac{8}{17}$

$x = \frac{8}{17}$ Answer!



Answer 13

A pattern is made using identical rectangular tiles.



Find the total area of the pattern.

$$2L + W = 11 \quad \text{--- (1)}$$

$$L + W = 7 \quad \text{--- (2)}$$

$$\textcircled{1} - \textcircled{2}$$

$$\underline{\underline{L = 4}}$$

$$\rightarrow \textcircled{2}$$

$$\begin{array}{r} 4 + W = 7 \\ -4 \qquad -4 \end{array}$$

$$\underline{\underline{W = 3}}$$

$$1 \text{ TILE: AREA} = 4 \times 3 = 12 \text{ cm}^2$$

$$\begin{aligned} 4 \text{ TILES: AREA} &= 12 \times 4 \\ &= \underline{\underline{48 \text{ cm}^2}} \end{aligned}$$



Answer 14

Becky has some marbles. $\rightarrow x$
Chris has two times as many marbles as Becky.
Dan has seven more marbles than Chris.

They have a total of 57 marbles.

Dan says,
"If I give some marbles to Becky, each of us will have the same number of marbles."

Is Dan correct?
You must show how you get your answer.

$$B = x$$

$$C = 2x$$

$$D = 2x + 7$$

$$B + C + D = 57$$

$$x + 2x + 2x + 7 = 57$$

$$5x + 7 = 57$$

$$\begin{array}{r} -7 \\ 5x + 7 = 57 \\ \hline \end{array}$$

$$\begin{array}{r} 5x = 50 \\ \hline 5 \quad 5 \end{array}$$

$$\underline{x = 10}$$

$$B = 10, C = 20, D = 27.$$

SINCE CHRIS HAS 20 MARBLES THERE WOULD
HAVE TO BE $20 \times 3 = 60$ IN TOTAL FOR DAN
TO BE CORRECT, SO DAN IS WRONG