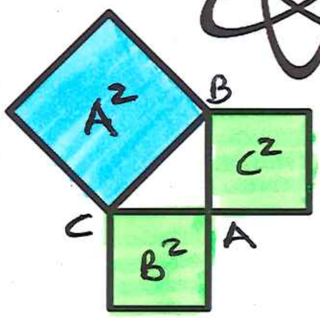
MATHSDIY

SOLUTIONS

GCSE TOPIC BOOKLET
PYTHAGORAS

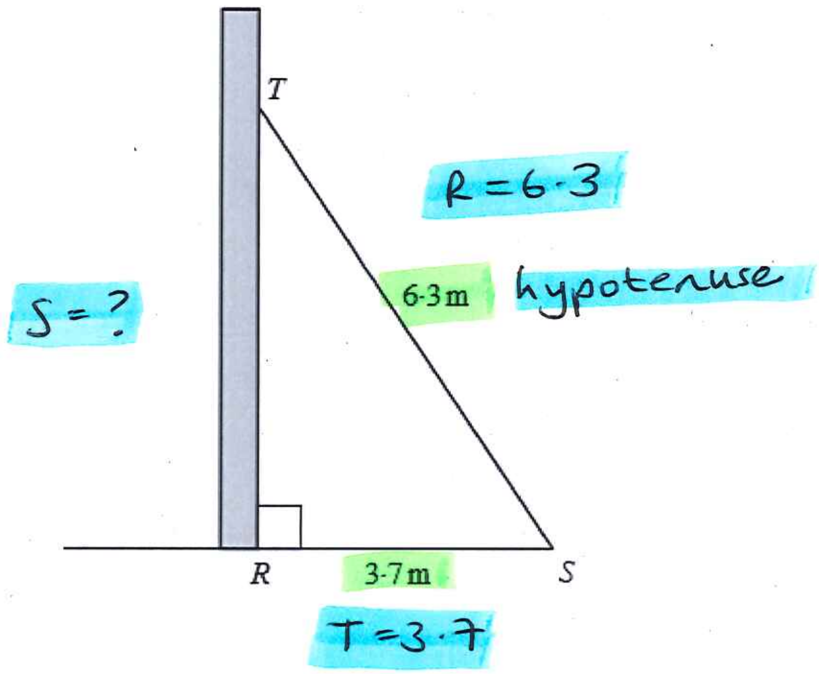
The area of the square on the hypotenuse of a right-angled triangle is equal to the sum of the areas of the squares on the two other sides

$\boxed{a^2 = b^2 + c^2}$



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

1. A ladder, ST, of length 6·3 m rests against a vertical wall. The foot of the ladder S is on horizontal ground, 3·7 m from the base of the wall.
Calculate the height, TR, of the top of the ladder above the ground, giving your answer to an appropriate degree of accuracy.



$S^2 = R^2 - T^2$

$S^2 = 6{\cdot}3^2 - 3{\cdot}7^2$

$S^2 = 26$

$S = \sqrt{26}$ $\quad S = 5{\cdot}099\ldots$

$\underline{S = 5{\cdot}1\text{m}}$ (1dp)

[3]

2.

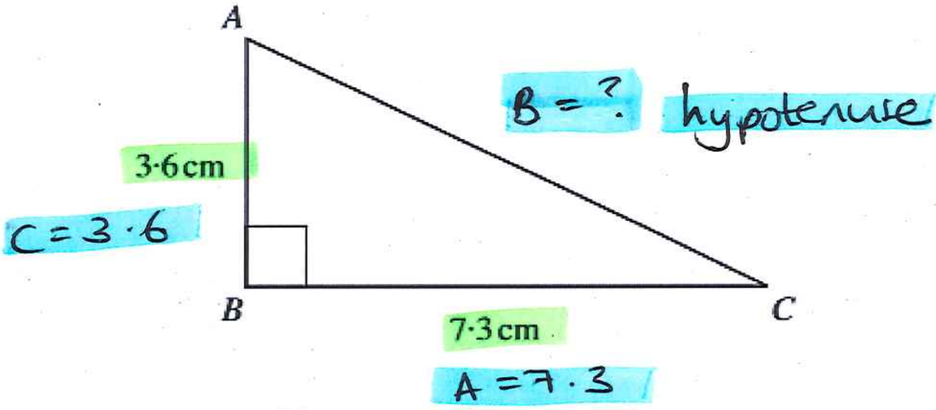


Diagram not drawn to scale.

Find the length of *AC*.
Give your answer to an appropriate degree of accuracy.

$B^2 = A^2 + C^2$

$B^2 = 7{\cdot}3^2 + 3{\cdot}6^2$

$B^2 = 66{\cdot}25$

$B = \sqrt{66{\cdot}25} = 8{\cdot}1394\ldots$

[4]

$\underline{B = 8{\cdot}1\text{ cm}}$ (1dp)

3.

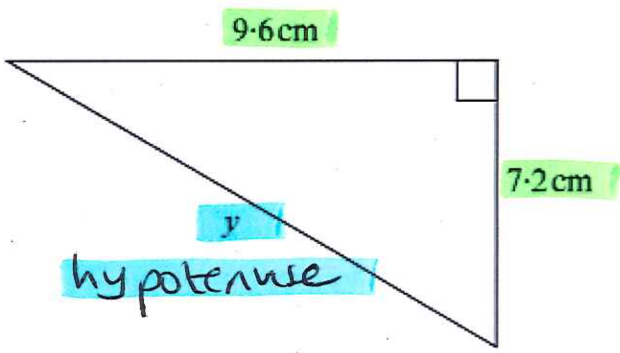


Diagram not drawn to scale

Calculate the length of the side marked y.

$y^2 = 9.6^2 + 7.2^2$

$y^2 = 144$

$y = \sqrt{144}$

$\underline{\underline{y = 12\text{cm}}}$

[3]

4.

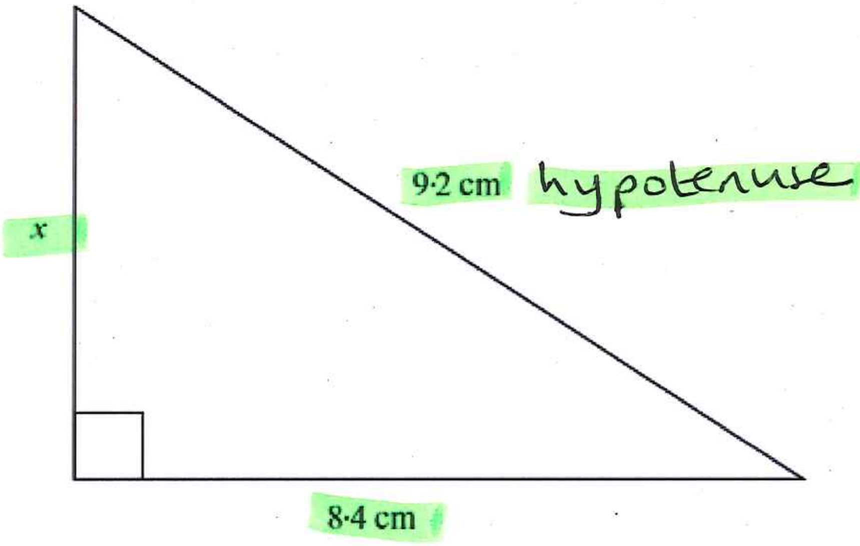


Diagram not drawn to scale

Calculate the length of the side marked x.

$x^2 = 9.2^2 - 8.4^2$

$x^2 = 14.08$

$x = \sqrt{14.08}$

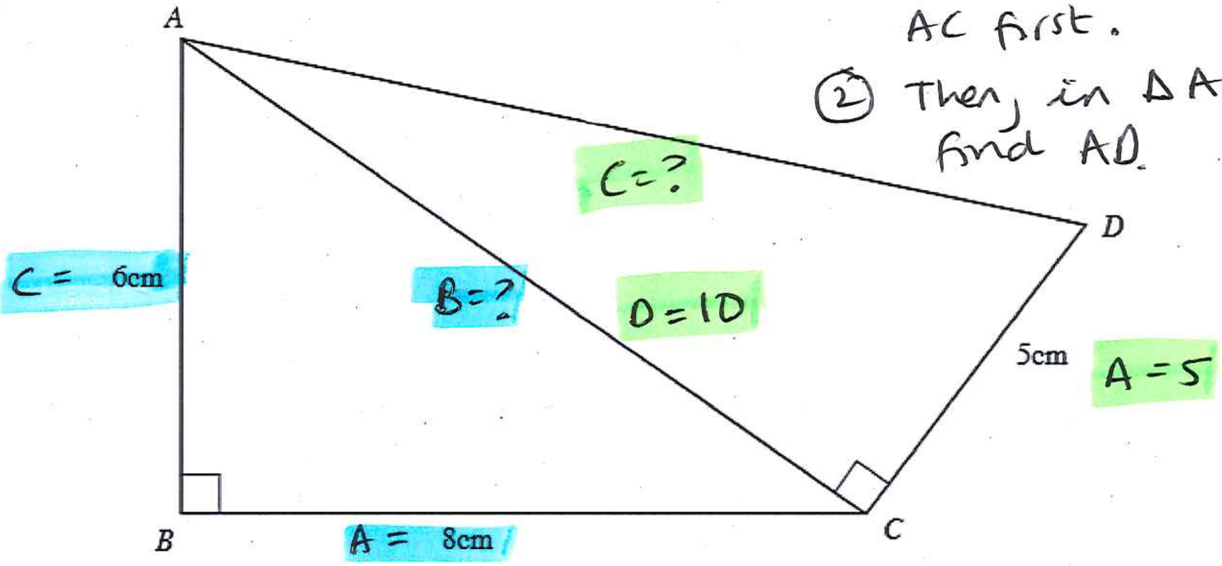
$x = 3.7523\ldots$

[3]

$\underline{\underline{x = 3.8\text{ cm}}}$ (1dp)

5. In the diagram below, triangle ABC has a right-angle at B and triangle ACD has a right-angle at C.
$AB = 6\text{cm}$, $BC = 8\text{cm}$ and $CD = 5\text{cm}$.
Calculate the length of AD.

Method ① In ΔABC find AC first.
② Then, in ΔACD find AD.



① In triangle ABC

$B^2 = A^2 + C^2$

$B^2 = 8^2 + 6^2$

$B^2 = 100$

$B = \sqrt{100}$ $\quad$ $B = 10\text{cm}$

② In triangle ACD

$C^2 = A^2 + D^2$

$C^2 = 5^2 + 10^2$

$C^2 = 125$

$C = \sqrt{125}$ $\quad$ $C = 11.1803\ldots$

$AD = 11.2\text{ cm}$ (1dp)

[6]

6. The diagram shows three points A, B and C, which are on level ground.
The point B is 55m due East of A.
The point C is due North of A and 95m from B.

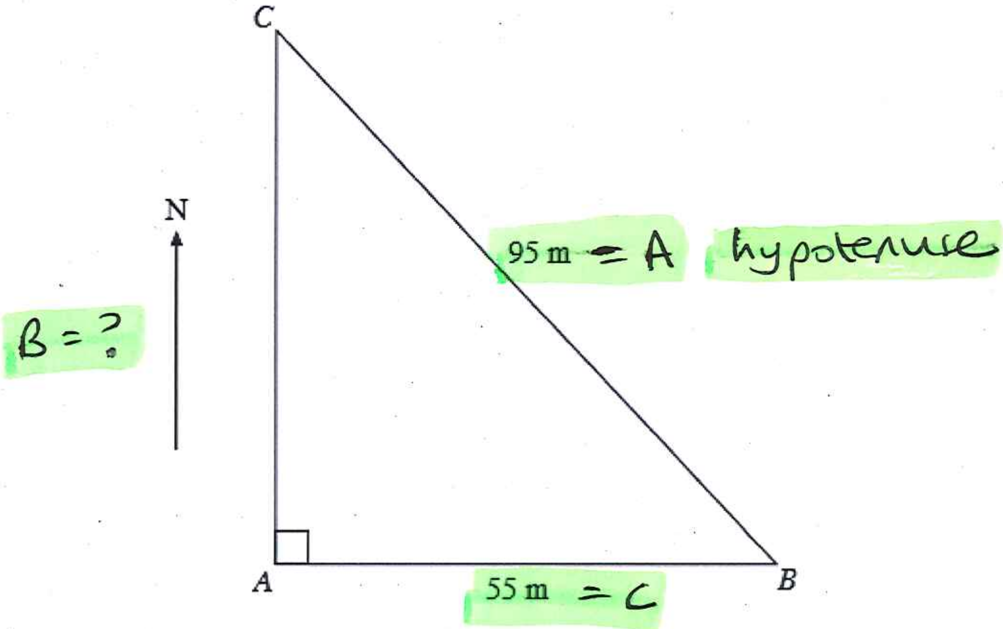


Diagram not drawn to scale.

Calculate the distance AC, giving your answer to an appropriate degree of accuracy.

$B^2 = A^2 - C^2$

$B^2 = 95^2 - 55^2$

$B^2 = 6000$

$B = \sqrt{6000} = 77.4596\ldots$

$\underline{B = 77.5\text{ m}}$ (1dp)

[4]

7.

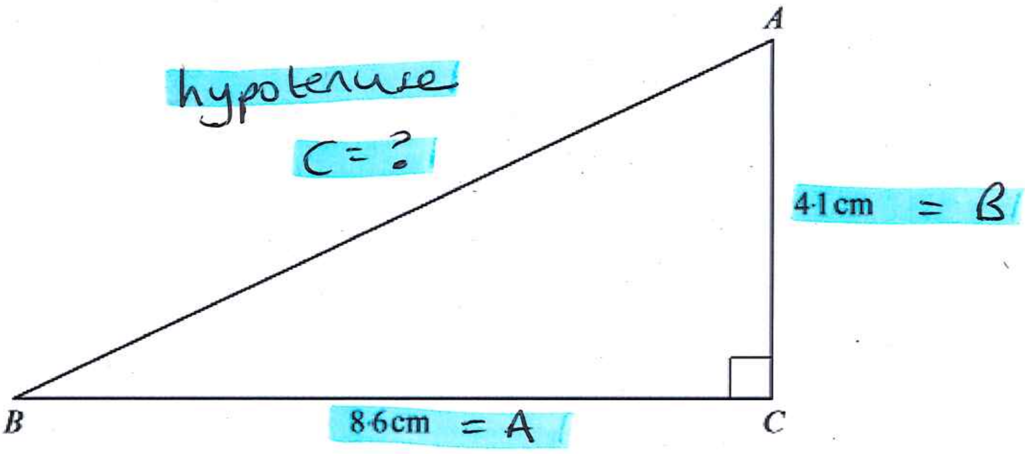


Diagram not drawn to scale

Calculate the perimeter of the triangle ABC, giving your answer correct to 2 significant figures.

$$c^2 = A^2 + B^2$$

$$c^2 = 8.6^2 + 4.1^2$$

$$c^2 = 90.77$$

$$c = \sqrt{90.77}$$

$$c = 9.52739\ldots$$

$$c = 9.5\text{ cm} \quad (2sf)$$

Perimeter $= 4.1 + 8.6 + 9.5 = 22.2\text{cm}$ (but 2sf)

[5]

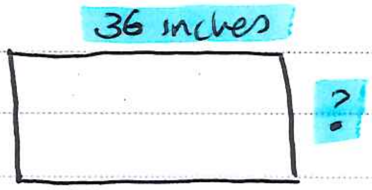
$$22\text{ cm} \quad (2sf)$$

Remember!

You must give your final answer to 2 significant figures because the question specifies

8.

(a) The length and width of rectangular television screens are often in the ratio 4 : 3. Calculate the length of the shorter side of such a television screen when the longer side is 36 inches long. [2]



$\times 9 \quad 4 : 3 \quad \times 9$

$36 : ?$

shorter side = 27 inches

(b) The 'size' of a television screen, given in inches, is the length of the diagonal, as shown in the diagram below.

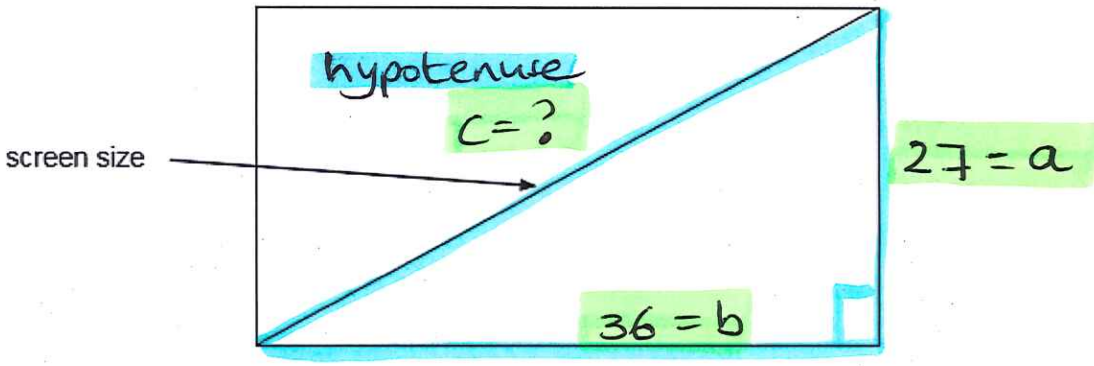


Diagram not drawn to scale

Calculate the screen size of the television described in part *(a)*. [3]

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

$c^2 = 27^2 + 36^2$

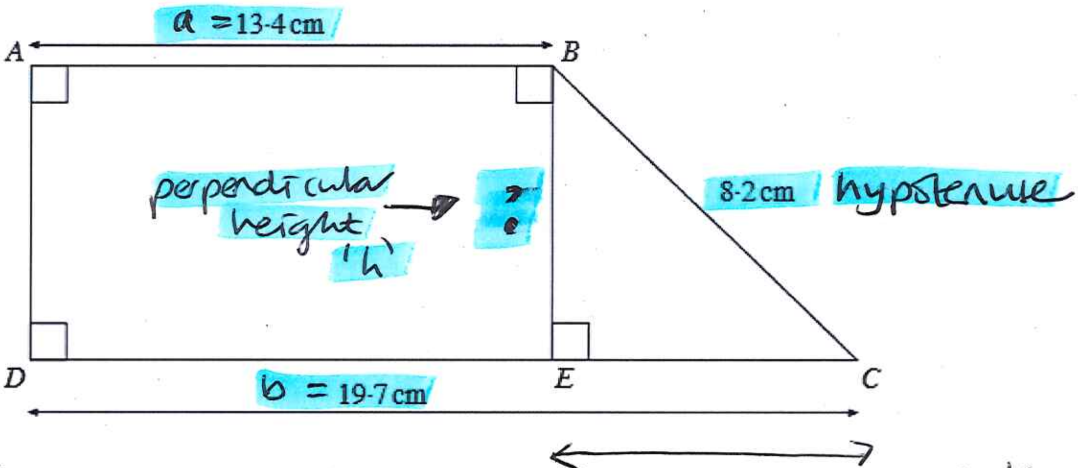
$c^2 = 2025$

$c = \sqrt{2025}$

$c = 45$

screen size = 45 inches

9.



$EC = 19{\cdot}7 - 13{\cdot}4$

Diagram not drawn to scale.

$EC = 6{\cdot}3\text{cm}$

Calculate the area of the trapezium *ABCD*.

Method ① First we need BE because this is the perpendicular height. So use pythagoras in triangle BEC.

② Next use $\frac{1}{2}(a+b)\times h$ to work out the area of the trapezium.

① In ΔBCE :-

$c^2 = E^2 - B^2$

$c^2 = 8{\cdot}2^2 - 6{\cdot}3^2 = 27{\cdot}55$, $c = \sqrt{27{\cdot}55}$

$c = 5.2488\ldots$ $\quad c = 5.25\text{cm}$

② Area of a trapezium $= \frac{1}{2}(a+b)\times h$

[7]

$= \frac{1}{2}(13{\cdot}4 + 19{\cdot}7)\times 5{\cdot}25$

$= 86{\cdot}8875 = 86{\cdot}9\text{cm}^2$ (1dp)