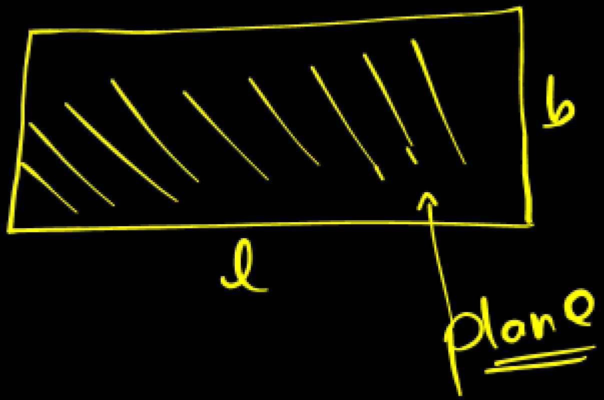
Pythagorean Theorem

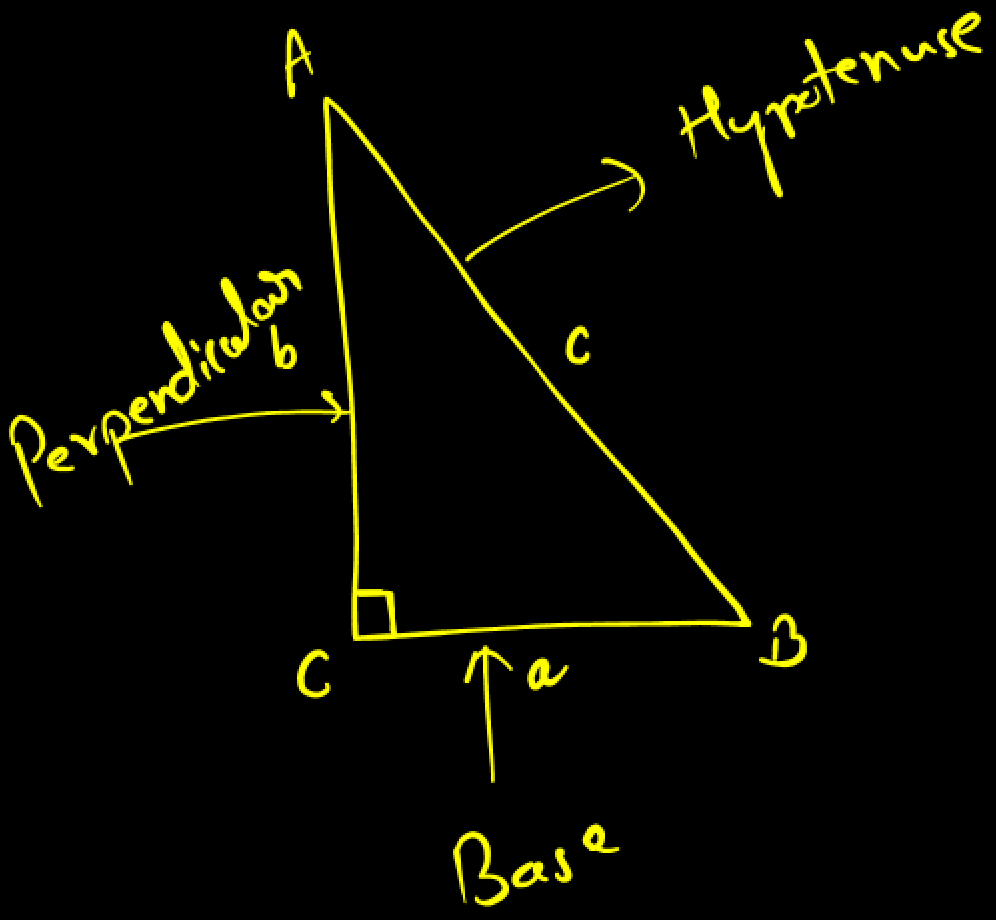
Pythagorean theorem

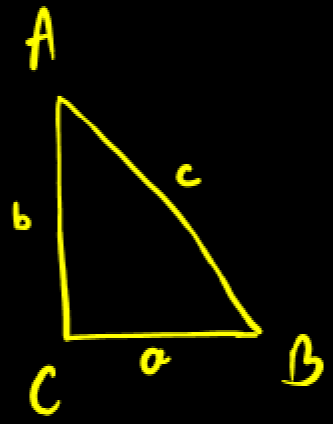
→ Right angle triangle → $\boxed{2D}$ → $\boxed{\text{Planer}}$

1D

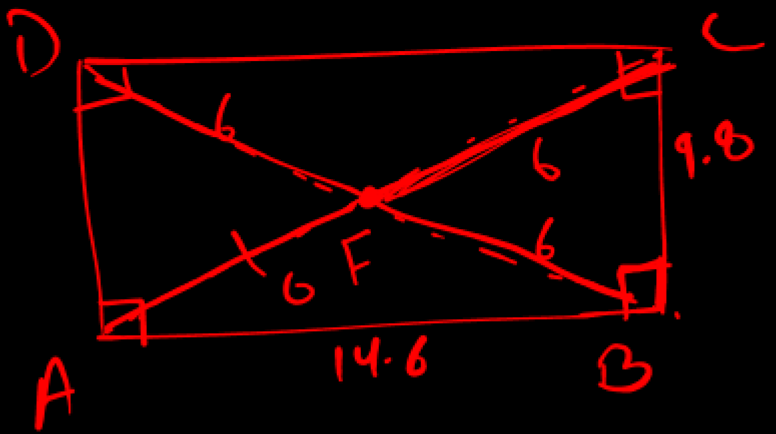
$\boxed{2D}$ →







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



Diagonal of rectangle

Bisects each other.

Two equal parts.

Diagonal. $\boxed{AC = BD}$

if 12cm → $FC = ?$ $\boxed{6\text{ cm}}$

ABCD is a rectangle.

$AC^2 = (14.6)^2 + (9.8)^2$

$AC^2 = 213.16 + 96.04$

$AC^2 = 309.2$

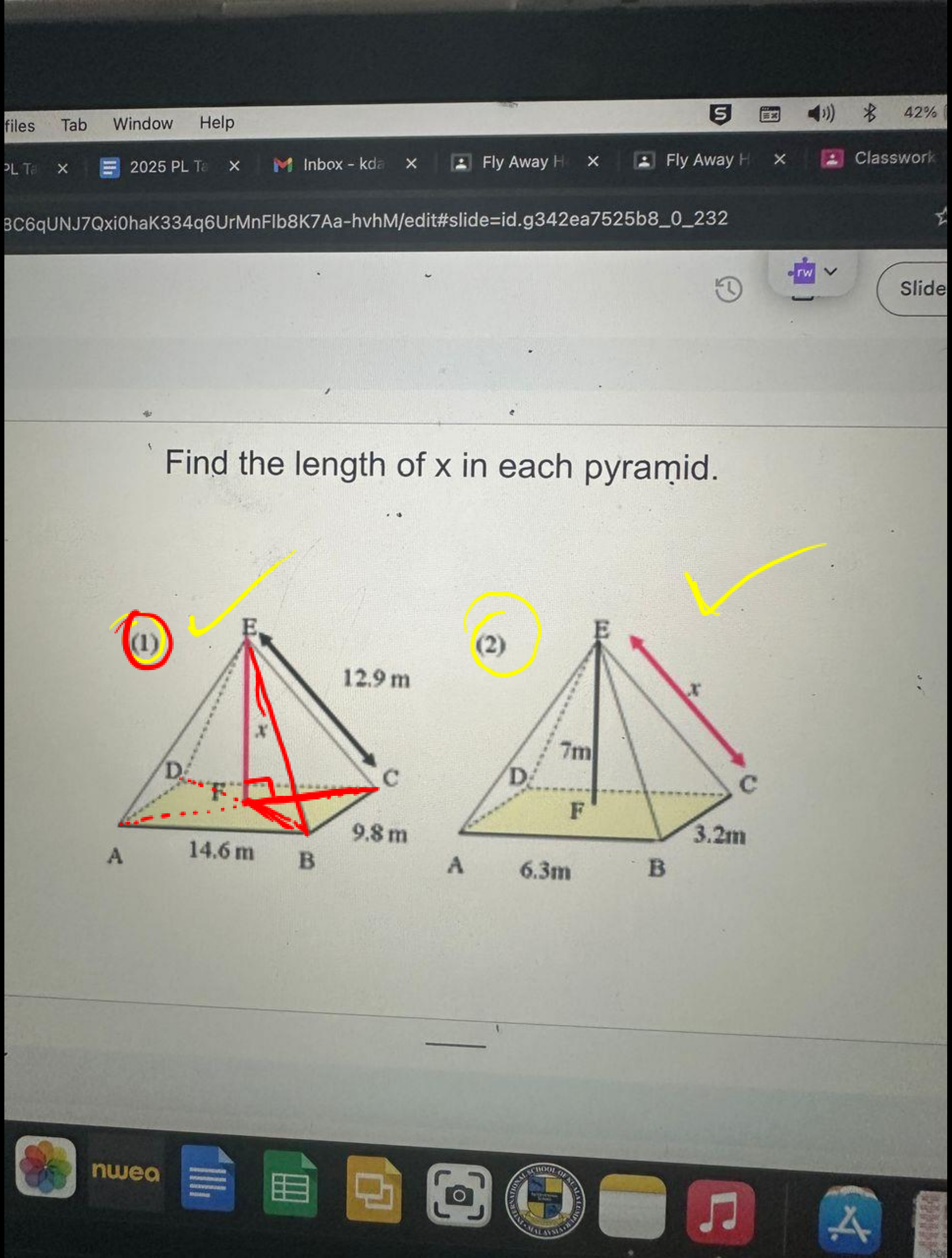
$AC = \sqrt{309.2}$ m

$AC =$

$FC = \frac{1}{2} AC$

$= \frac{1}{2}\sqrt{309.2}$ m

$= \frac{\sqrt{309.2}}{2}$ m



Applying P.T. in rt. △ EFC

$(12.9)^2 = x^2 + \left(\frac{\sqrt{309.2}}{2}\right)^2$

$166.41 = x^2 + \frac{309.2}{4}$

$166.41 = x^2 + 77.3$

$\boxed{\left(\frac{a}{b}\right)^2 = \frac{a^2}{b^2}}$

$x^2 = 166.41 - 77.3$

$x^2 = 89.11$

$\boxed{x = \sqrt{89.11}\ \text{m}}$

ABCD ⇒ A square.

Using ~~Pyth~~ P.T.

$10^2 = x^2 + x^2$

$100 = 2x^2$

$x^2 = 50$

$x = \sqrt{50}$ cm

In rt. Δ DFE,

$DE^2 = DF^2 + FE^2$

$DE^2 = (5)^2 + (8)^2$

$DE^2 = 25 + 64$

$= 89$

2025 PL T… | Inbox - kda… | Fly Away H… | Fly Away H… | Classwork

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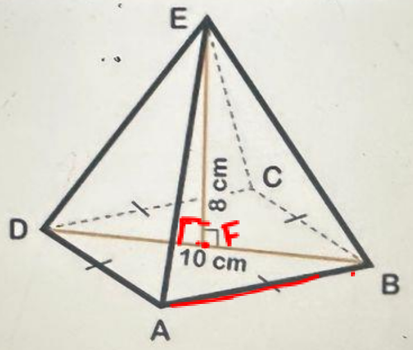
Slidesho…

$DE^2 = 89$

$DE = \sqrt{89}$ cm.

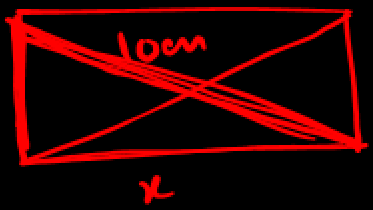
3)

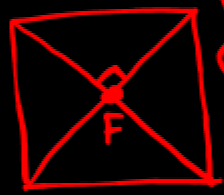


Calculate:

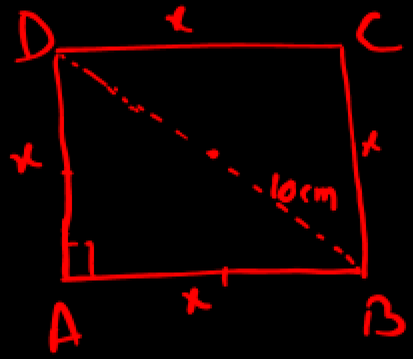
a) AB = $\sqrt{50}$ cm.

b) DE





{Diagonals Perpendicularly Bisects.



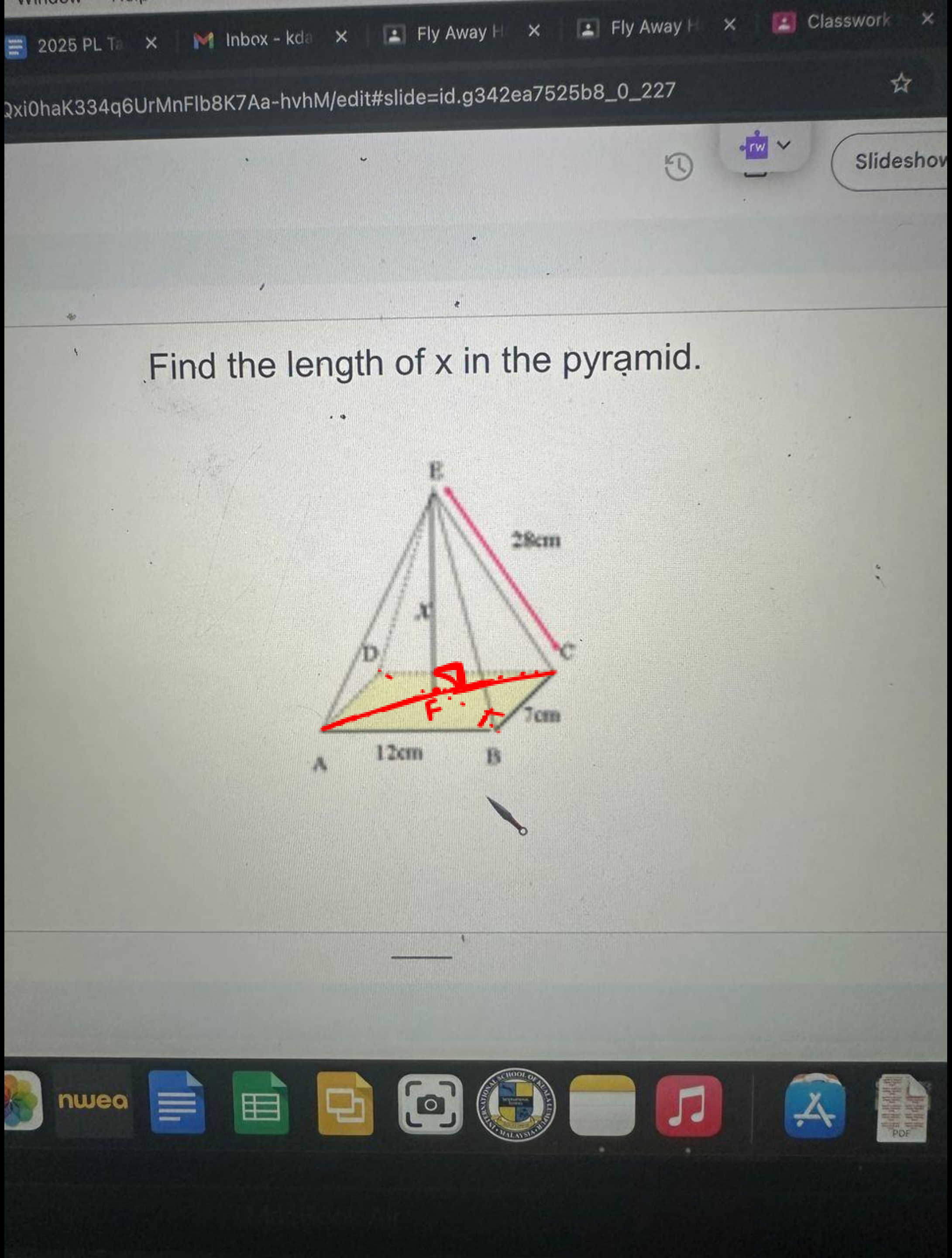
$$\boxed{FC = \frac{1}{2}\sqrt{193}}$$

144
49

$EC = 28$ cm

$FC = \frac{\sqrt{193}}{2}$ cm.

$EF = x$



P.T.

$$(28)^2 = x^2 + \left(\frac{\sqrt{193}}{2}\right)^2$$

$$784 = x^2 + \frac{193}{4}$$

$$x^2 = 784 - \frac{193}{4}$$

$$x^2 = 735.75$$

$$x = \sqrt{735.75} \text{ cm.}$$

$\sqrt{928}$

$BD = \sqrt{928}$ cm.

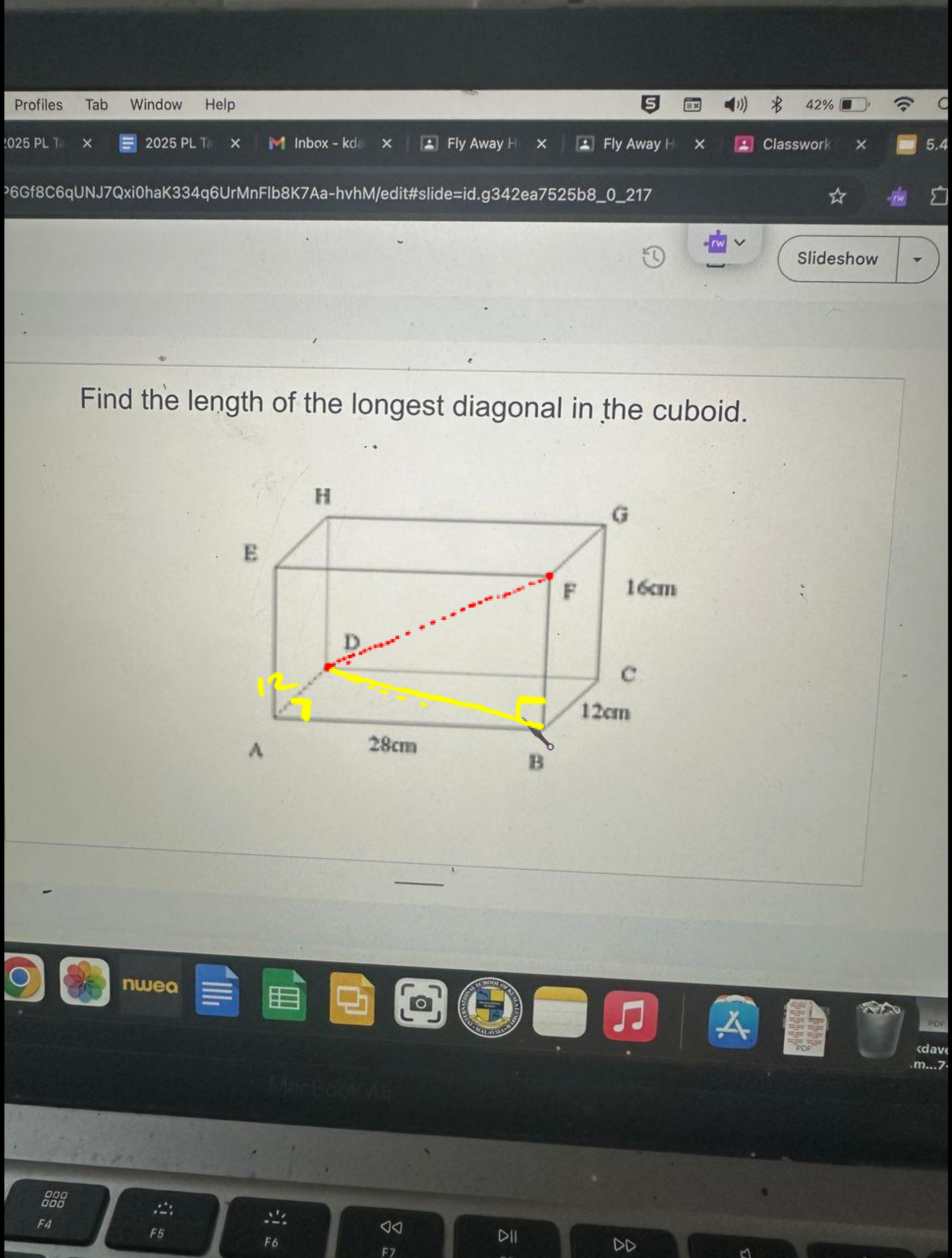
rt Δ DBF, P.T.

$DF^2 = (\sqrt{928})^2 + 16^2$

$DF^2 = 928 + 256$

$DF^2 = 1184$

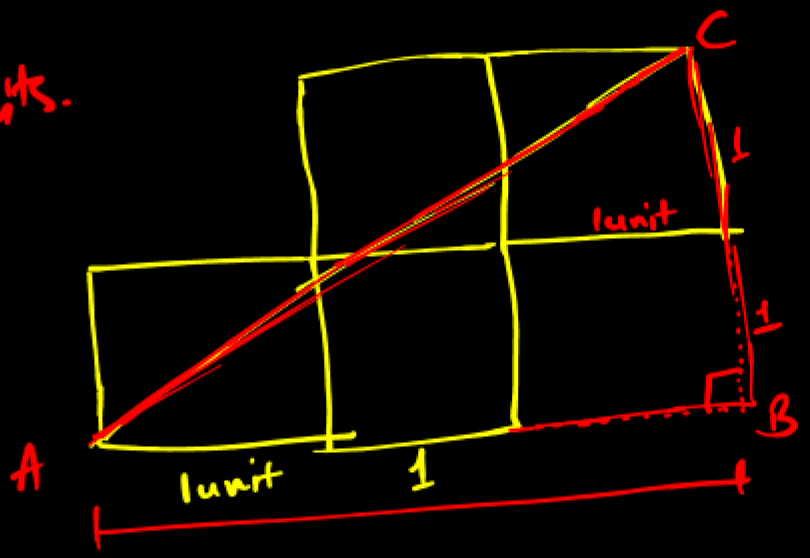
$\boxed{DF = \sqrt{1184} \text{ cm}}$



Unit Square → length of sides = 1 unit.

$AB = 3$ units

$BC = 2$ units.



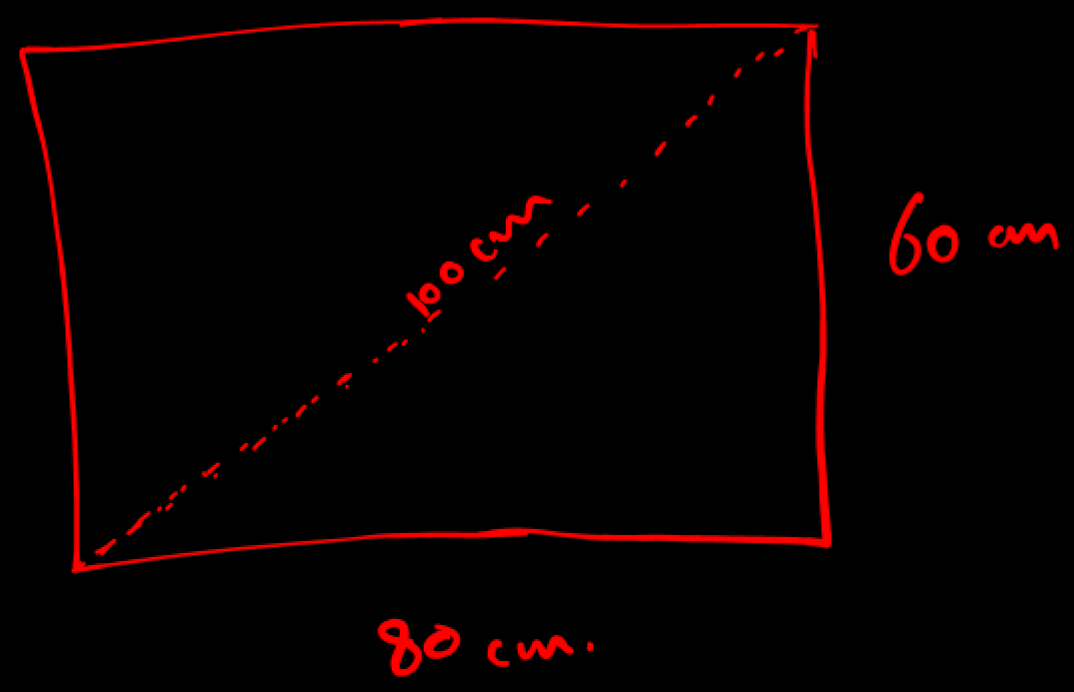
$AC^2 = AB^2 + BC^2$

$AC^2 = 3^2 + 2^2$

$AC^2 = 9 + 4$

$AC^2 = 13$

$AC = \sqrt{13}$ units


100 cm
60 cm
80 cm.

$AC^2 = AB^2 + BC^2$

$AC^2 = 10^2 + 10^2$

$AC^2 = 200$

$AC = \sqrt{200}$

$= \sqrt{2 \times 100}$

$= \sqrt{2} \times \sqrt{100}$

$= \sqrt{2} \times 10$

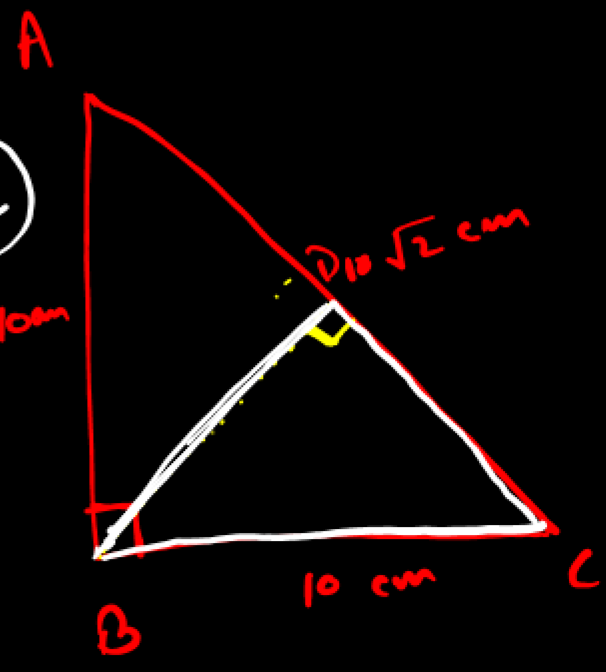
$AC = 10\sqrt{2}$ cm

Difference $= (20 + 10\sqrt{2}) - (10 + 10\sqrt{2})$

$= 20 + \cancel{10\sqrt{2}} - 10 - \cancel{10\sqrt{2}}$

$= 20 - 10$

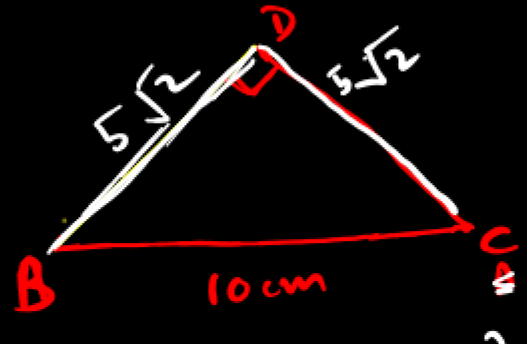
$= 10$ cm.



BD

$5\sqrt{2} \times 5\sqrt{2}$

25×2



$5\sqrt{2} \times 5\sqrt{2}$

25×2

$= 50$

$BD = \sqrt{50}$

$= \sqrt{25 \times 2}$

$= \sqrt{5 \times 5 \times 2}$

$= 5\sqrt{2}$

$10^2 = BD^2 + (5\sqrt{2})^2$

$BD^2 = 100 - 50$

$= 50$

Perimeter of Large $\Delta = 20 + 10\sqrt{2}$ cm.

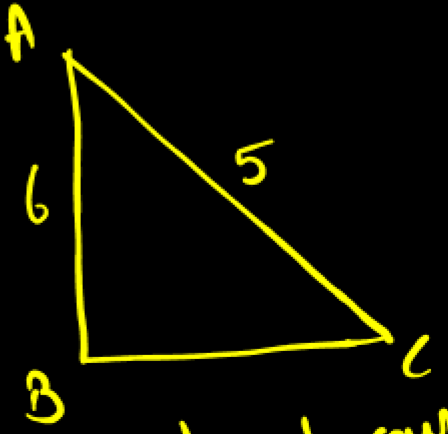
Perimeter of smaller $\Delta = 10 + 5\sqrt{2} + 5\sqrt{2}$ cm.

$= 10 + 10\sqrt{2}$

Given,
Two of the sides 5cm & 6cm.

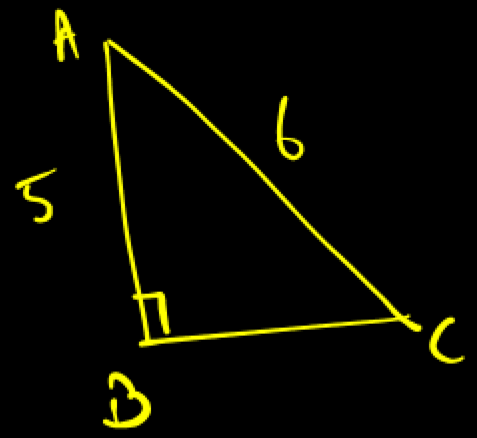
Possibility 2:

X



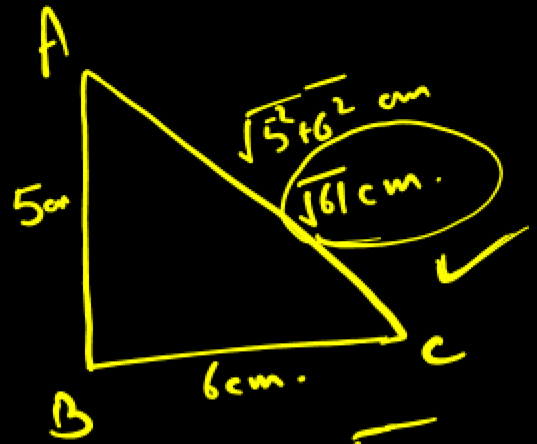
Not possible because AC can not be smaller.

Possibility 3 →



⇒

Possibility 1:



Third side can be $\sqrt{61}$ cm

⇒ There are two possibilities ($\sqrt{61}$ cm & $\sqrt{11}$ cm) for the length of third side.

$AC^2 = AB^2 + BC^2$

$BC^2 = AC^2 - AB^2$

$BC^2 = 6^2 - 5^2$

$BC^2 = 36 - 25$

$BC^2 = 11$

$BC = \sqrt{11}$ cm.

After rearranging we have created a bigger triangle DEC,

where $EC = 6$ cm. & $DE = 8$ cm.

Using PT,

$$DC^2 = DE^2 + EC^2$$

$$DC^2 = 8^2 + 6^2$$

$$DC^2 = 64 + 36$$

$$DC^2 = 100$$

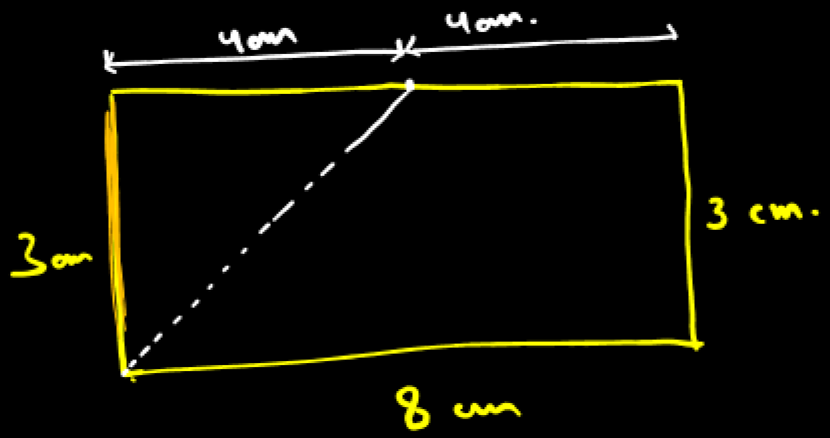
$$DC = \sqrt{100}$$

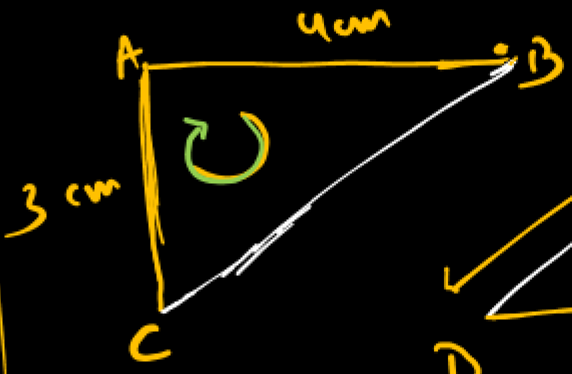
$$DC = 10 \text{ cm}$$

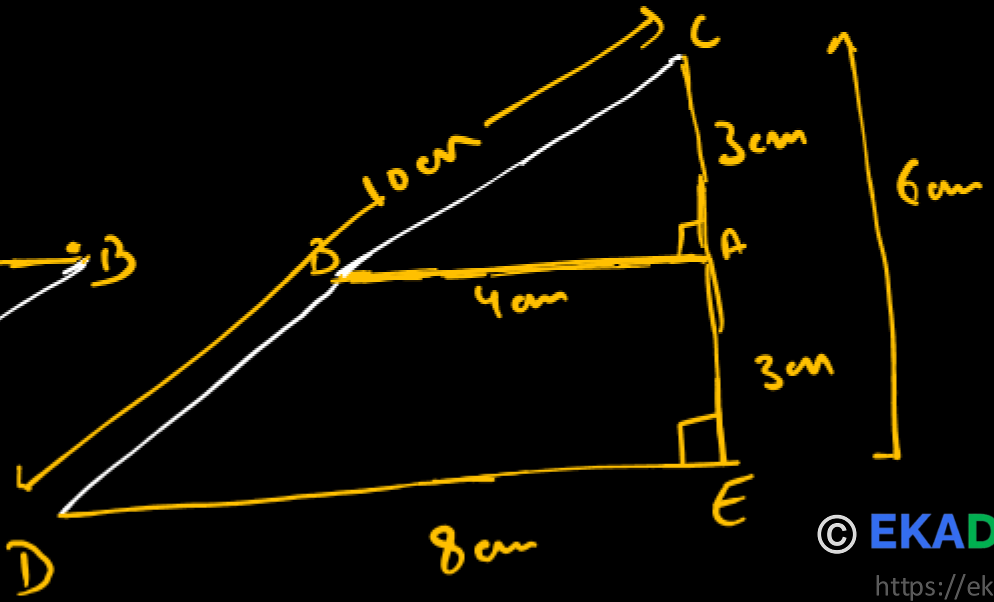
$\therefore$ Perimeter of $\triangle DEC$

$= 8\text{cm} + 6\text{cm} + 10\text{cm}$

$= 24\text{cm}.$



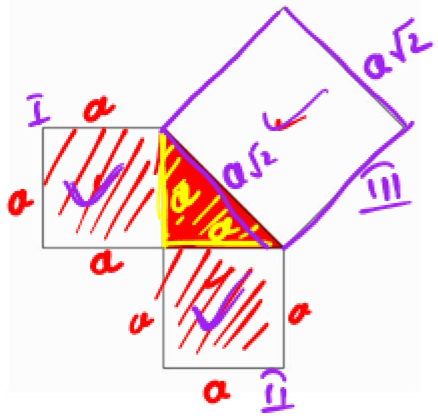




An isosceles right-angled triangle has a square drawn along each of its sides.

The sum of the areas of the squares is 72 cm^2.

What is the area of the triangle?



$$ar(I) + ar(II) + ar(III) = 72\ cm^2$$

$$(a \times a) + (a \times a) + (a\sqrt{2} \times a\sqrt{2}) = 72$$

$$a^2 + a^2 + 2a^2 = 72 \quad | \quad 4a^2 = 72$$

$$a^2 = \frac{72}{4} = 18$$

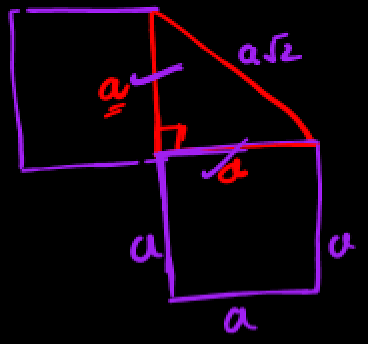
$$a^2 = 18 \qquad \boxed{a = \sqrt{18}}$$

$$(a\sqrt{2})^2$$

$$a \times a \times \sqrt{2} \times \sqrt{2}$$

$$a^2 \quad 2$$

$$\text{Area } \Delta = \frac{1}{2} \times b \times \boxed{h}$$



$$\text{Area}(\Delta) = \frac{1}{2} \times a \times a$$

$$= \frac{1}{2} \times \sqrt{18} \times \sqrt{18}$$

$$= \frac{1}{2} \times 18$$

$$= 9\ cm^2$$

A sphere of radius 3 has its centre at the origin.

How many points on the surface of the sphere have coordinates that are all integers?

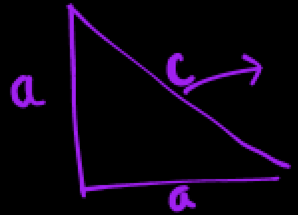
$$\sqrt{4} = 2$$

$$\sqrt{3^2} = 3$$

$$\sqrt{2} = \sqrt{2}$$

$$\sqrt{a^2} = a$$

$$\boxed{\sqrt{2a^2}}$$



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

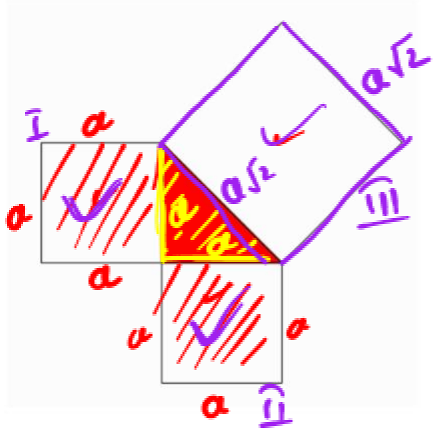
$$c^2 = 2a^2$$

$$c = \sqrt{2a^2} = \boxed{a\sqrt{2}}$$

An isosceles right-angled triangle has a square drawn along each of its sides.

The sum of the areas of the squares is 72 cm^2.

What is the area of the triangle?



$$ar(I) + ar(II) + ar(III) = 72\ cm^2$$

$$(a \times a) + (a \times a) + (a\sqrt{2} \times a\sqrt{2}) = 72$$

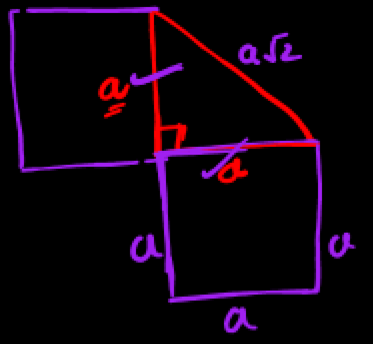
$$a^2 + a^2 + 2a^2 = 72 \quad | \quad 4a^2 = 72$$

$$a^2 = \frac{72}{4} = 18$$

$$a^2 = 18 \quad \boxed{a = \sqrt{18}}$$

$$(a\sqrt{2})^2 = \underbrace{a \times a}_{a^2} \times \underbrace{\sqrt{2} \times \sqrt{2}}_{2}$$

$$\text{Area } \Delta = \frac{1}{2} \times b \times \boxed{h}$$



$$\text{Area}(\Delta) = \frac{1}{2} \times a \times a$$
$$= \frac{1}{2} \times \sqrt{18} \times \sqrt{18}$$
$$= \frac{1}{2} \times 18$$
$$= 9\ cm^2$$

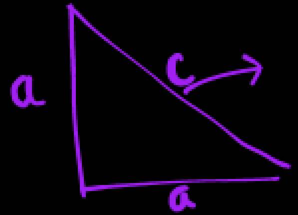
A sphere of radius 3 has its centre at the origin.

How many points on the surface of the sphere have coordinates that are all integers?

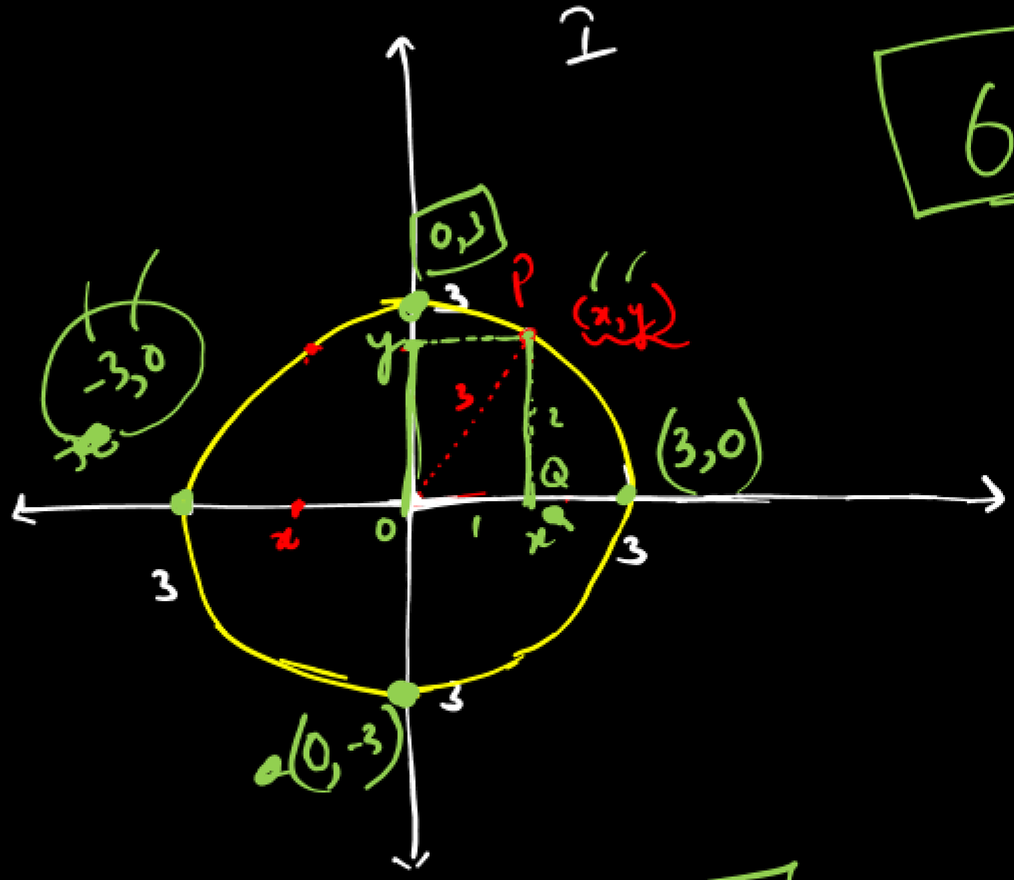
$$\sqrt{4} = 2 \qquad \sqrt{2} = \sqrt{2}$$

$$\sqrt{3^2} = 3$$

$$\sqrt{a^2} = a \qquad \boxed{\sqrt{2a^2}}$$



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



6 Integers

Integers : ..., -2, -1, 0, 1, 2, 3, 4, ... ∞

rt Δ OPQ.

$\boxed{OP = 3}$

OQ = ?

PQ = ?

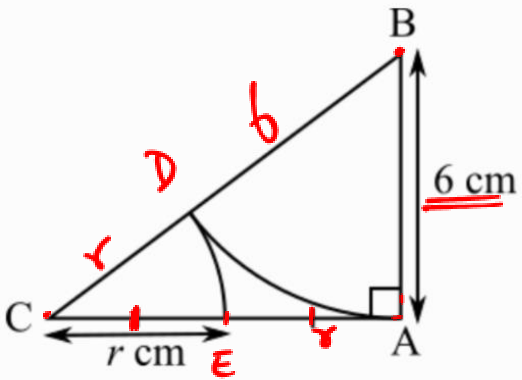
$\boxed{0,3}$

3

Triangle ABC is right-angled at A and side AB is 6 cm long.

An arc of radius r cm is drawn with centre C such that it bisects side AC.

An arc of radius 6 cm is drawn with centre B such that the arcs both meet BC at the same point, as shown below.



$BC = (6+r)$ cm.

$AC = 2r$ cm

$AB = 6$ cm

P.T.

$BC^2 = AC^2 + AB^2$

$(6+r)^2 = (2r)^2 + 6^2$

Find the value of r.

$\cancel{36} + r^2 + 12r = 4r^2 + \cancel{36}$

$12r = 4r^2 - r^2$

$\frac{12r}{r} = \frac{3r^2}{r}$

$12 = 3r$

$\frac{12}{3} = r$

$\boxed{r = 4\text{ cm}}$

$\frac{12r}{12} = \frac{3r^2}{12}$

$\frac{r}{1} = \frac{1}{4} r^2$

$\frac{r^{\cancel{2}}}{\cancel{r}} = \frac{4\cancel{r}}{\cancel{r}}$

$\boxed{r = 4}$

$\boxed{1 \text{ inch} \approx 96 \text{ pixel}}$

$\frac{1920}{96} = 20$ 12.5

$AC^2 = AB^2 + BC^2$

$AC^2 = (1200)^2 + (1920)^2$

$= 1440000 + 3684400$

$AC^2 = \cancel{5050000}\ 5126400$

$\cancel{AC = \sqrt{5050000}}$

$AC = \sqrt{5126400}$ pixel

$AC = \boxed{2264.2}$ pixels.

$\sqrt{5126400}$ pixel $= 5$ inch.

1 pixel $= \frac{5}{\sqrt{5126400}}$ inch.

A smartphone's display is given as the diagonal distance between the vertices. A certain smartphone has a 5 inch display and a resolution of 1920 pixels (length) x 1200 pixels (width).

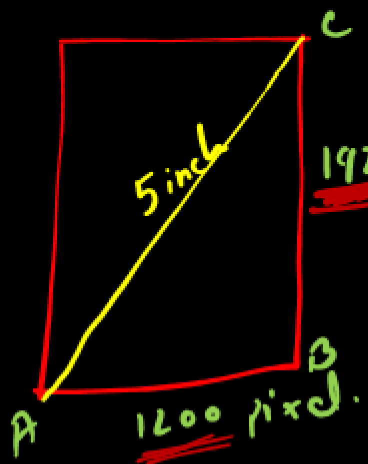
What are the length and width of the display, in inches? Leave your answer in the form $\frac{a}{\sqrt{b}}$, where a, b are integers.

AB = 1200 pixel $= 1200 \times \frac{5}{\sqrt{5126400}}$

$= \frac{6000}{\sqrt{5126400}}$ inch.

BC = 1920 pixel.

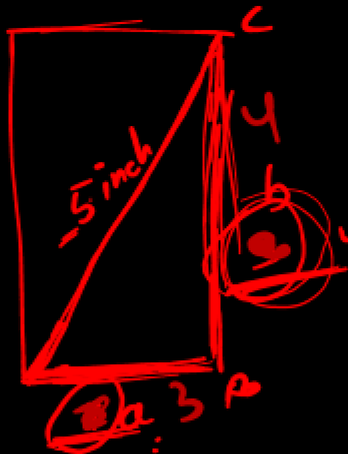
$= \frac{1920 \times 5}{\sqrt{5126400}}$ inch. $\frac{a}{\sqrt{b}}$



1920 pixel

$\boxed{1920 \times \frac{5}{2264.2}}$

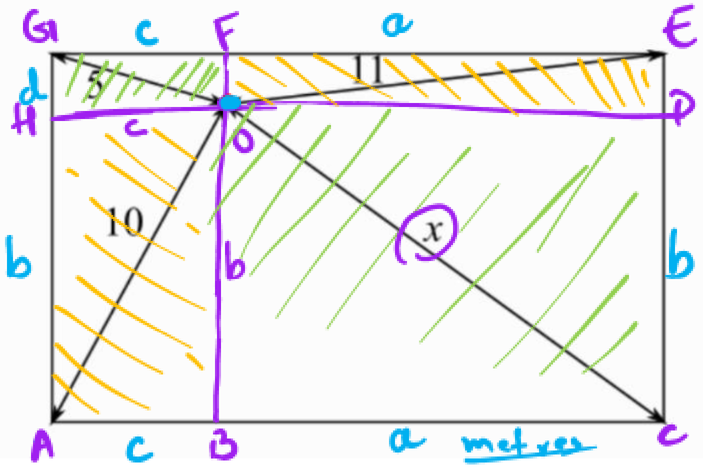
$\boxed{4.24 \text{ inch}}$



$AC = \sqrt{a^2 + b^2}$

A well is dug in a courtyard. The distances from the well to three of the corners are 10 metres, 5 metres and 11 metres, as shown in the diagram below.

Find the distance from the well to the fourth corner.



Using PT,

$$\boxed{a^2+b^2=x^2} \quad \text{—— (i)}$$

$$b^2+c^2=10^2 \quad \text{—— (ii)}$$

$$\boxed{c^2+d^2=5^2} \quad \text{—— (iii)}$$

$$a^2+d^2=11^2 \quad \text{—— (iv)}$$

Adding (ii), (iii), (iv),

$$b^2+c^2+c^2+d^2+a^2+d^2 = 121+100+25$$

$$\boxed{a^2+b^2}+2c^2+2d^2 = 246$$

$$x^2+2(c^2+d^2) = 246$$

$$x^2+50 = 246$$

$$x^2 = 246-50$$

$$x^2 = 196$$

$$x = \sqrt{196}$$

$$\boxed{x = 14 \text{ metres}}$$

Volume

3D shapes (Regular)

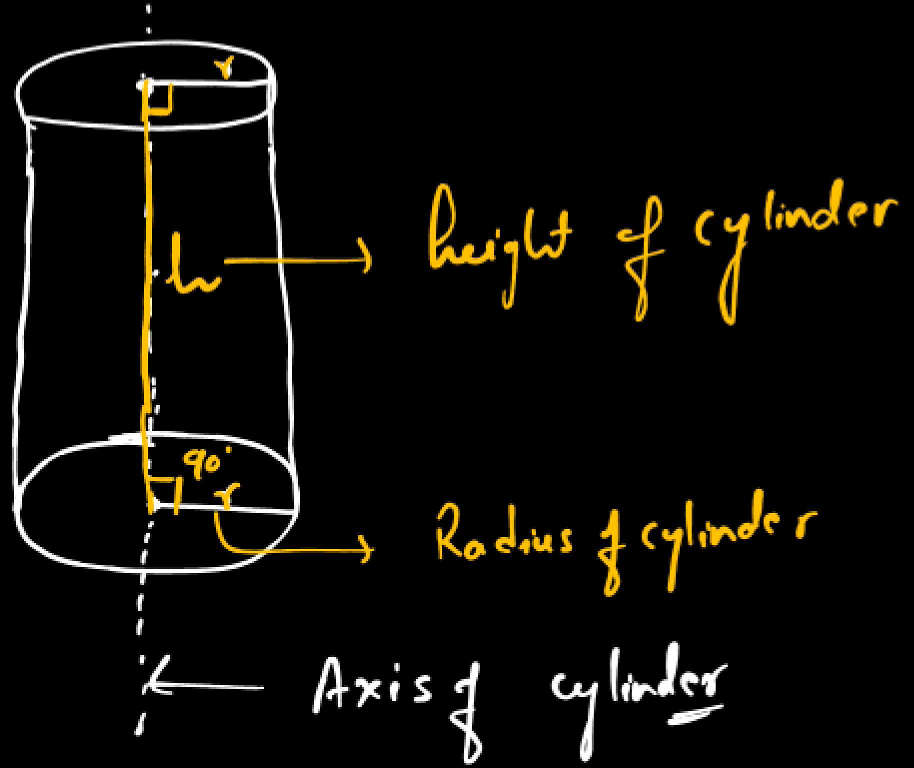
Cube, Cuboid, Cylinder, Cone, Sphere

Volume of cube: $l \times l \times l = l^3$ $(\text{unit})^3$

$$\boxed{\text{SI unit} = (m)^3}$$

volume of cuboid $= l \times b \times h$ $(\text{unit})^3$

Cylinder (Right circular cylinder)



End of the chapter