Perimeter and Area of Rectilinear Figures

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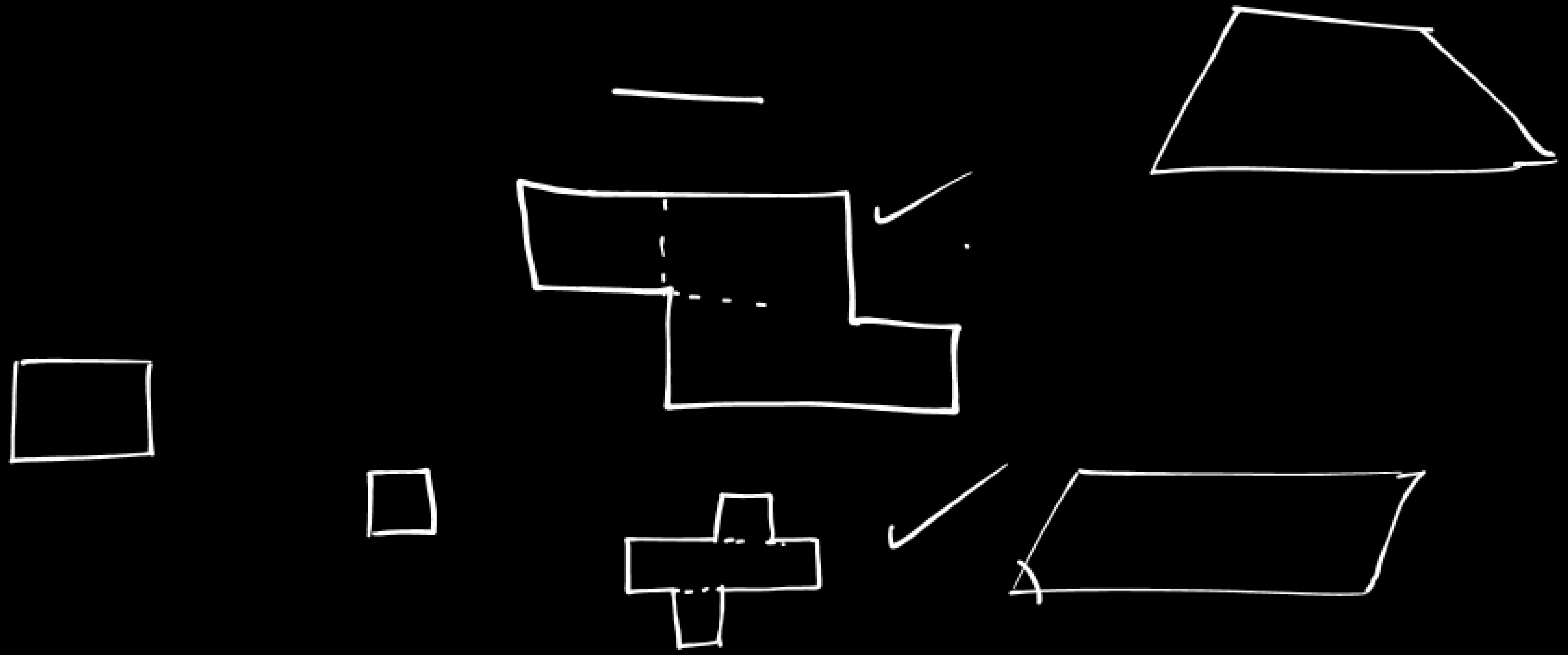

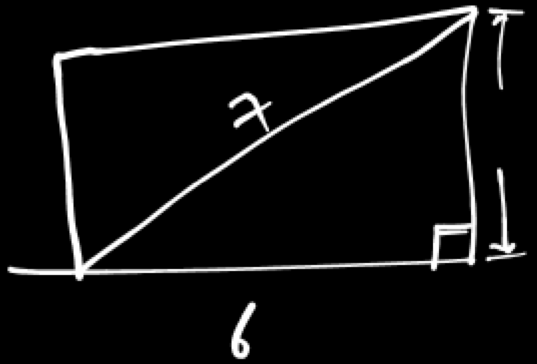
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6

① Rectangle

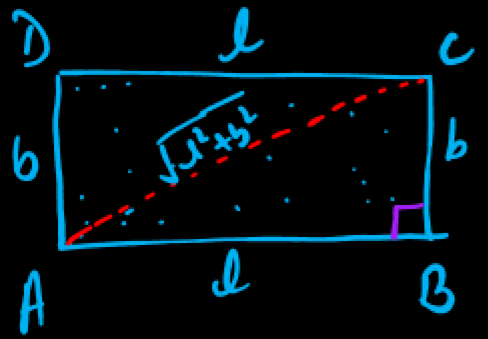
$$\text{Perimeter} = 2(l+b) \text{ unit}$$

$$\boxed{\text{Area} = l \times b} \quad \text{unit}^2$$

$$\text{length of diagonal} = \sqrt{l^2+b^2} \quad \text{unit}$$

$$\boxed{l = \frac{\text{Area}}{b}}$$

$$\boxed{b = \frac{\text{Area}}{l}}$$



In right triangle ABC, using P.T.

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

$$AC^2 = l^2 + b^2$$

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

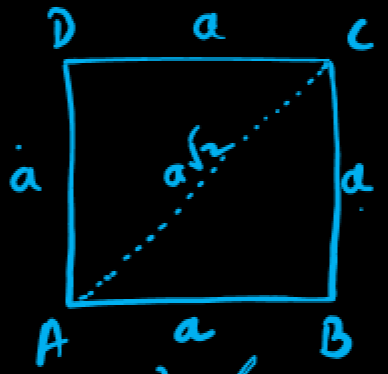
① Square.

Perimeter $= 4a$ units

$\boxed{\text{Area} = a^2}$ unit^2

Side of the square $= \sqrt{\text{area}}$

$\boxed{\text{Diagonal} = a\sqrt{2}}$ $\Rightarrow$ ✓



$\boxed{\sqrt{2} \approx 1.414}$

$\sqrt{2a^2}$

$a\sqrt{2}$

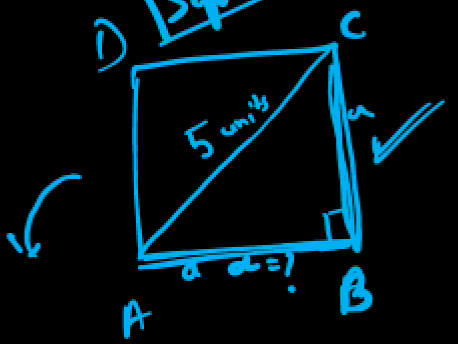
$2a^2 = 25$

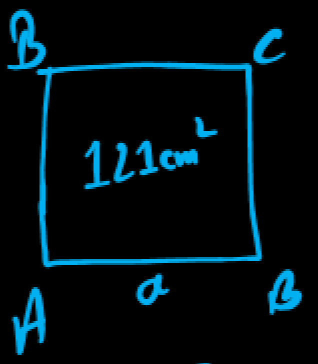
area $= a^2 = \frac{25}{2} = 12.5$ unit^2 ✓

$AC^2 = 2a^2$

$AC =$

Square





what would be the length of its sides.

area =

$AB^2 + BC^2 = 5^2$

$a^2 + a^2 = 25$

$$\boxed{\begin{aligned} a^2 &= 121 \\ a &= \sqrt{121} \\ a &= 11\text{cm} \end{aligned}}$$

$$\left(\underline{\text{Diagonal}}\right)^2 = \left(a\sqrt{2}\right)^2$$

$$\frac{1}{2}\left(\text{Diagonal}\right)^2 = a^2 \times 2$$

$$\boxed{a^2 = \frac{1}{2}\left(\text{Diagonal}\right)^2}$$

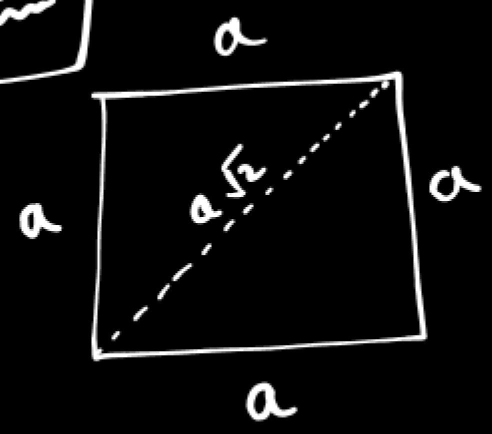
$$\boxed{\text{Area} = \frac{1}{2}\left(\text{Diagonal}\right)^2}$$

$$\boxed{\text{Area} = a^2}$$

$\boxed{3}\sqrt{2}$

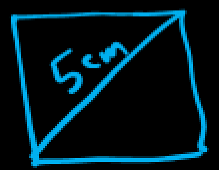
$\sqrt{2 \times 3^2} = \sqrt{2 \times 9} = \sqrt{18}$

$\sqrt{18} = 3\sqrt{2}$



$(2)^2 = (2)^2$

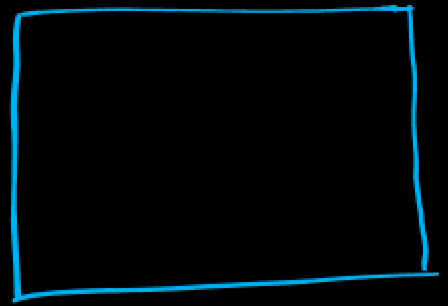
$4 = 4$



$\text{area} = \frac{1}{2}(\text{diagonal})^2$

$= \frac{1}{2} \times (5)^2$

$= \frac{25}{2} = 12.5$



$\boxed{l, b, h}$

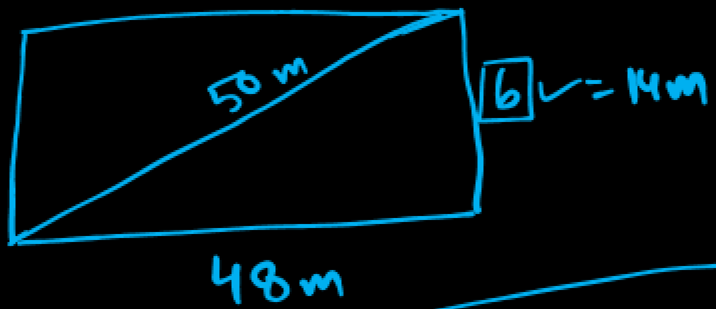
Area of four walls = ?

Diagonal of Room = ?

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

$$\begin{array}{r} 13 \\ 13 \\ \hline 9 \end{array}$$

Q. Find the area of a rectangle plot one side of which is 48 m and its diagonal is 50 m.



Area = $l \times b$

$50^2 = b^2 + 48^2$

$b^2 = 50^2 - 48^2$

$b^2 = (98)(2)$

$b^2 = 196$

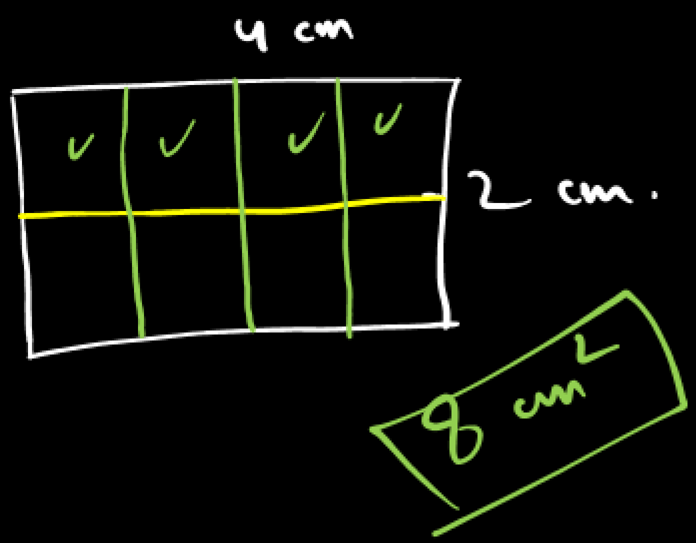
$b = \sqrt{196} = 14$

$\boxed{b = 14m}$

$\boxed{a^2 - b^2 = (a+b)(a-b)}$

Area $= 48 \times 14 \ m^2$

$= 672 \ m^2$


4 cm
2 cm.
8 cm²

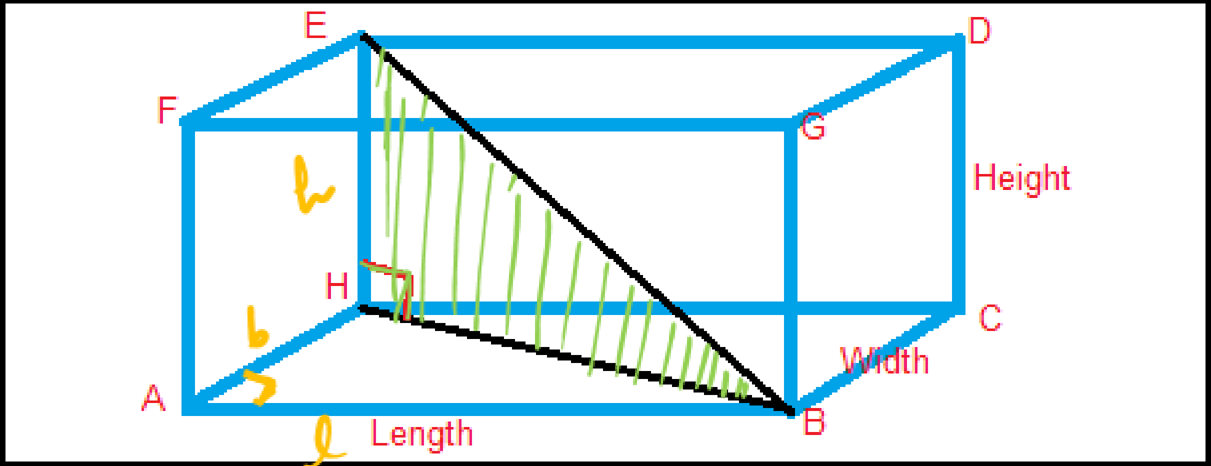
Area of four walls of a room. $= 2(l \times h) + 2(b \times h)$ ✓

l, b, h

$= 2lh + 2bh$

$= 2h(l+b)$ units^2

Length of diagonal of the room : $\sqrt{l^2+b^2+h^2}$ units



rt.
$\boxed{\Delta EHB}$

P.T.

$HB^2 = l^2 + b^2$

$$\boxed{HB = \sqrt{l^2+b^2}}$$

$EB^2 = h^2 + HB^2$

$= h^2 + \left(\sqrt{l^2+b^2}\right)^2$

$= h^2 + l^2 + b^2$

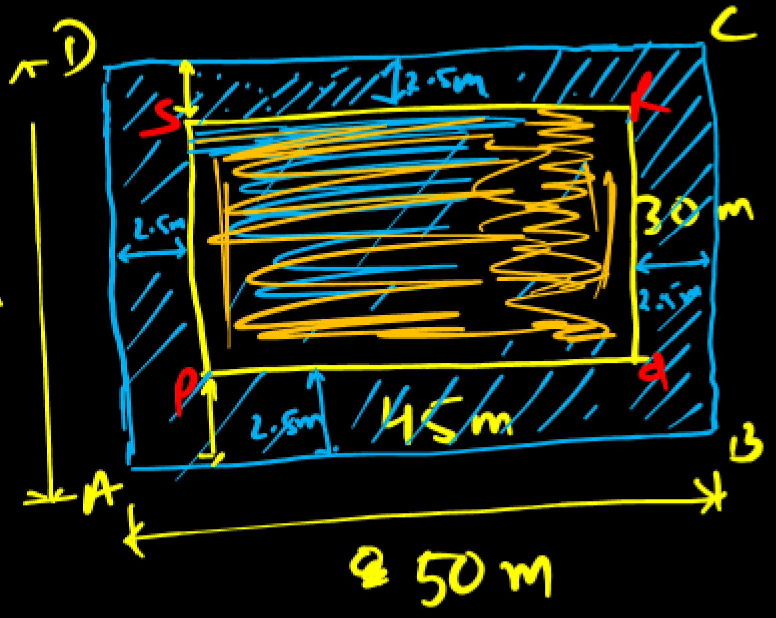
$$\boxed{EB = \sqrt{l^2+b^2+h^2}}$$

Q. A rectangular park is 45 m long and 30 m wide. A path 2.5 m wide is constructed outside the park. Find the area of the path.

Area of path $= (35 \times 50) - (45 \times 30)$

$= [1750 - 1350]\ m^2$

$= \underline{400\ m^2}$.

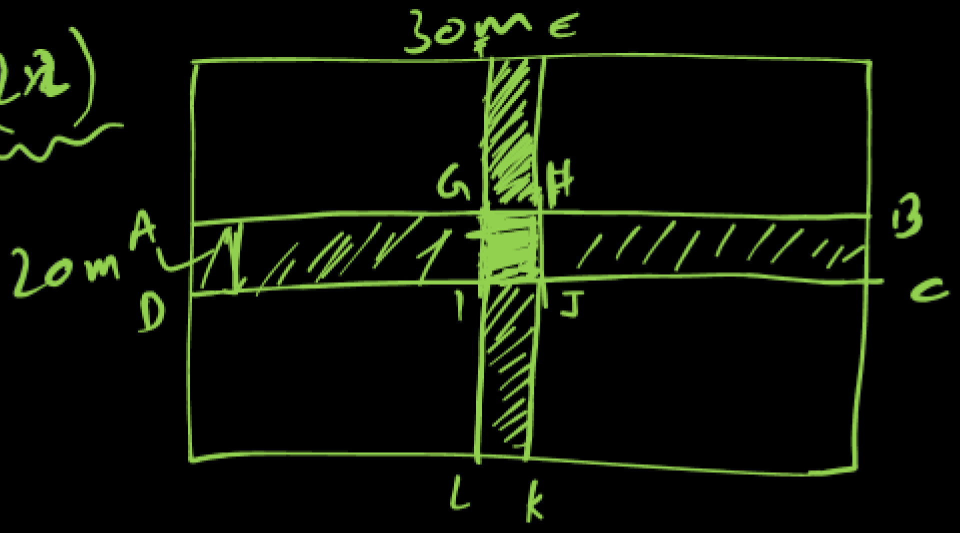


Q. A rectangular lawn is 30 m by 20 m. It has two roads each 2 m wide running in the middle of it, one parallel to the length and other parallel to the breadth. Find the area of the roads.

Area of road = $(30 \times 2) + (20 \times 2) - (2 \times 2)$

$= 60 + 40 - 4$

$= \underline{96 \text{ m}^2}$



$\boxed{22 + 2r + 16 + 2r + 22} = AB = \boxed{4r + 60}$

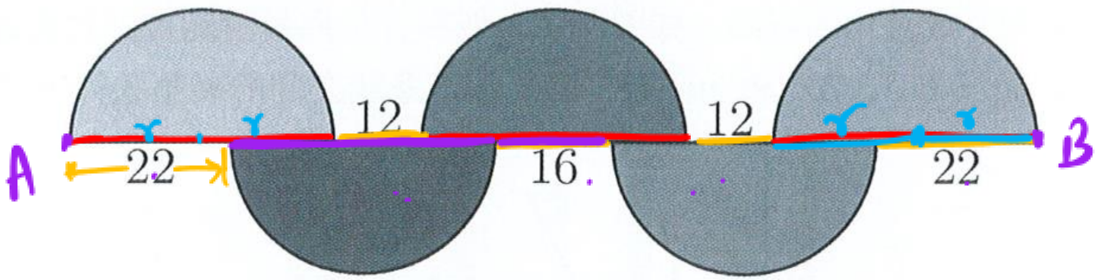
$\boxed{2r + 12 + 2r + 12 + 2r} = AB \quad \boxed{6r + 24}$

$6r + 24 = 4r + 60$

$6r - 4r = 60 - 24$

$2r = 36$

$r = \frac{36}{2} = 18$



(A) 12 (B) 16 (C) 18 (D) 22 (E) 36

P1

10000

10001

10000

999999
− 10009

98000

989998

21

17

−4

+2

3, 4, 5

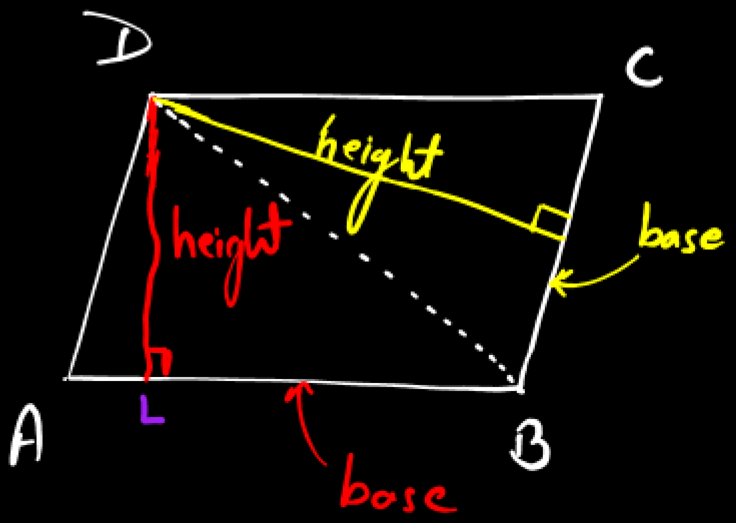
4, 5, 9

5, 9, 10

~~9, 10, 11~~

Area of a parallelogram and a rhombus.

⇒ Perpendicular distance between opposite sides of a $\parallel^{gm}$ is called its height.

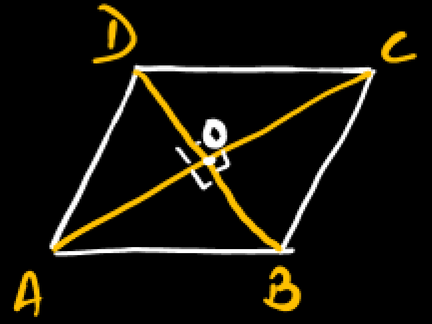


Area of a parallelogram

$= \text{Base} \times \text{height}$

Area of a Rhombus

Parallelogram with equal sides.



① Area of Rhombus = Area of parallelogram = base × height

② If $AC = d_1$ units and $BD = d_2$ units, then

$$\boxed{\text{area of rhombus} = \frac{1}{2}(d_1 \times d_2)}$$

$\triangle ABC$

→ OB is perpendicular to AC

→ $OB = \frac{1}{2} BD$

Area $\triangle ABC = \frac{1}{2} AC \times OB$

Area $\triangle ADC = \frac{1}{2} AC \times OD$

Area of Rhombus,

$= \frac{1}{2} AC \times OB + \frac{1}{2} AC \times OD$

$= \frac{1}{2} AC (OB + OD)$

$= \frac{1}{2} AC \times BD$

$= \frac{1}{2} \times d_1 \times d_2$

Q. If the area of a rhombus is 48 cm^2 and one of its diagonal is 6 cm, find its altitude/height.

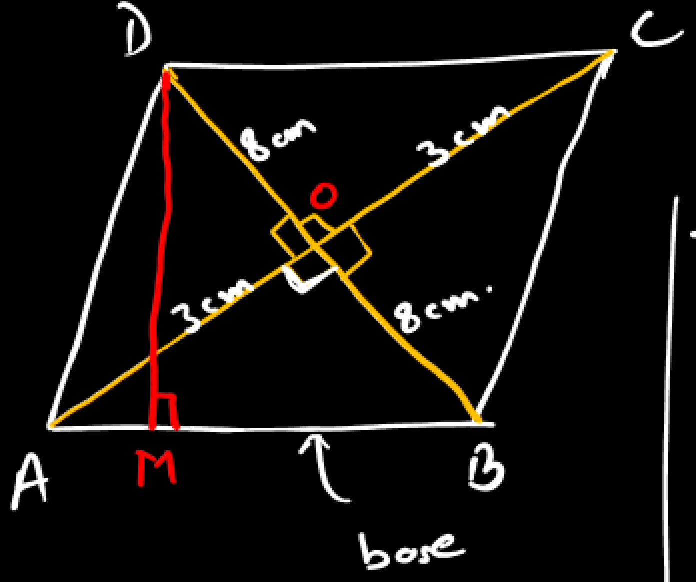
DM = height/altitude

AC = 6 cm

$$\boxed{\text{area} = 48\ cm^2}$$

$\frac{1}{2} \times AC \times BD = 48$

$BD = \frac{48 \times 2}{6} = 16$ cm.



$\Rightarrow \because$ diagonals of rhombus bisects each ~~and~~ other perpendicularly.

$AB^2 = 64 + 9$

$AB = \sqrt{73}$ cm.

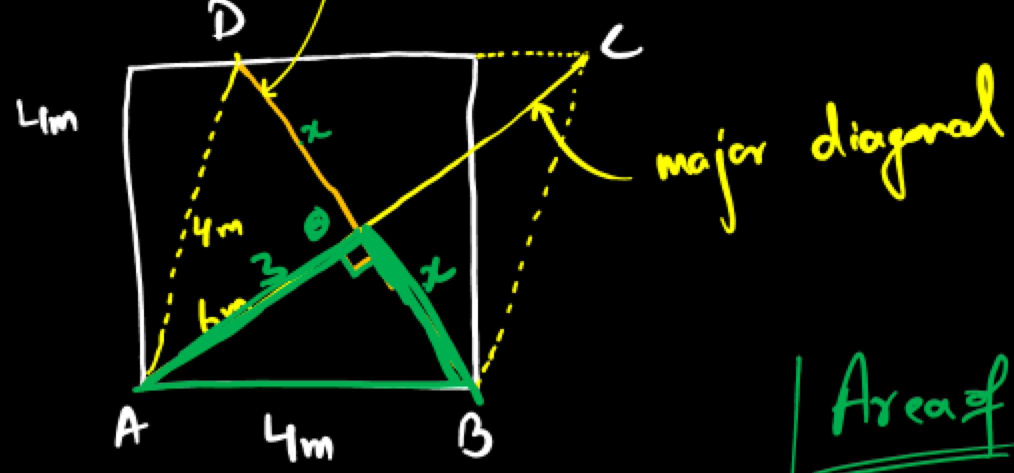
Area = 48 cm^2

$\sqrt{73} \times DM = 48$

$$\boxed{DM = \frac{48}{\sqrt{73}}\ cm}$$

$$\boxed{DM = 5.62\ cm}$$

Q. If the side of a square is 4 m and it is converted into rhombus whose major diagonal is 6m, find the other diagonal and the area of the rhombus.



⇒ Diagonal's of rhombus
- Bisect each other.
- Bisect perpendicularly.

$\boxed{BD = 2x}$

$\boxed{BD = 2\sqrt{7}\ m}$

By Pythagoras theorem,

$4^2 = 3^2 + x^2$

$x^2 = 16 - 9$

$x^2 = 7$

$\boxed{x = \sqrt{7}\ m}$

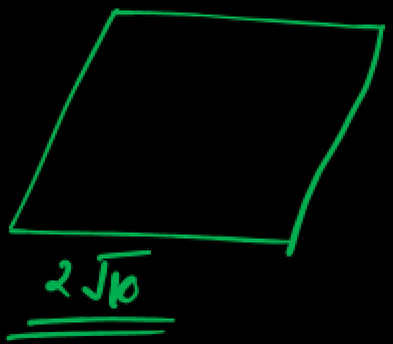
Area of rhombus.

$= \frac{1}{2}(d_1 \times d_2)$

$= \frac{1}{2} \times 6 \times 2\sqrt{7}$

$= 6\sqrt{7}\ m^2$

If the area of rhombus is 24 cm^2 and one of its diagonals be 4 cm. Find the perimeter of the rhombus.



$$\text{Perimeter} = \underbrace{4}(2\sqrt{10})$$

$$= 8\sqrt{10}$$

$$\sqrt{40} = \sqrt{2\times2\times2\times5}$$

$$= 2\sqrt{10}$$

$\sqrt{40} + \sqrt{40} = 2\sqrt{40}$

$3\sqrt{2} + 4\sqrt{2} = 7\sqrt{2}$

$x + x =$

$3x + 4x =$

$4\sqrt{2} + 2\sqrt{3} = 6\sqrt{2} + 6\sqrt{3}$

$4x + 2y =$

$3\sqrt{3} \times 4\sqrt{3} = 12 \times 3 = 36$

$\sqrt{3} \times \sqrt{3} = 3$

$3\sqrt{7} \times 1\sqrt{2} = 3\sqrt{7 \times 2} = 3\sqrt{14}$

$\boxed{x\sqrt{a} \ \overset{\times}{\div} \ y\sqrt{b} = xy\sqrt{a \times b}}$

$\boxed{x\sqrt{a} \pm y\sqrt{a} = (x \pm y)\sqrt{a}}$

$$\boxed{3\sqrt{5} + 7\sqrt{45}}$$

$\sqrt{45} = \cancel{5} \quad \sqrt{5\times3\times3} =$

$4\sqrt[3]{5} + 1\cdot\sqrt[3]{5} = \cancel{4}\ 5\sqrt[3]{5}$

$2x + 1x =$

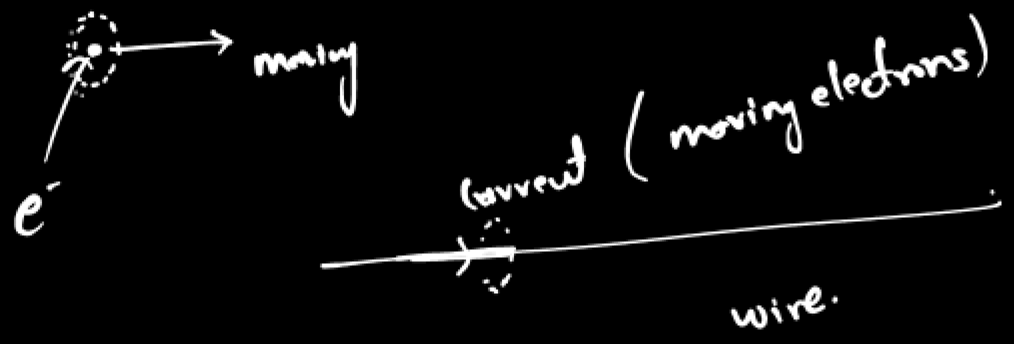
$3\sqrt{5} + 7\sqrt{45}$

$3\sqrt{5} + 7\cdot3\sqrt{5}$

$3\sqrt{5} + 21\sqrt{5}$

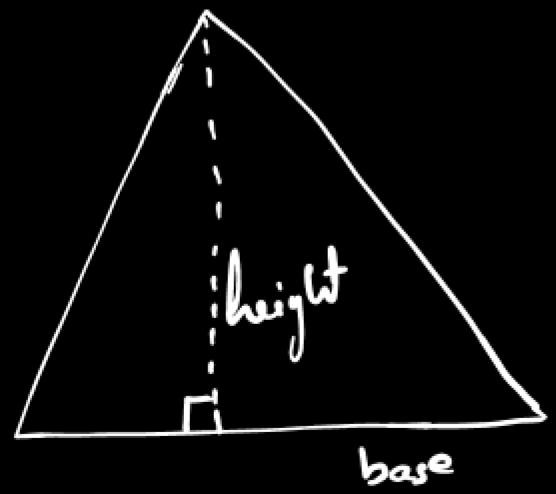
$\boxed{24\sqrt{5}}$

⇒ Moving charge produces magnetic field around it.



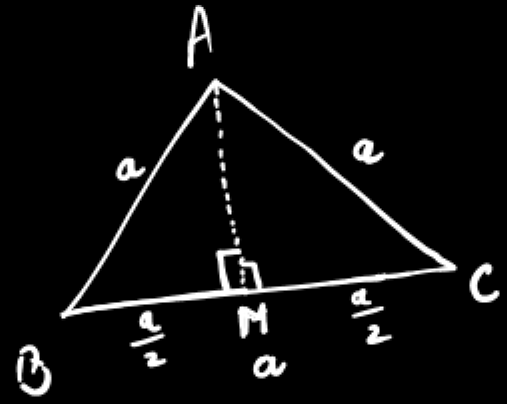
geotail

Area of Triangles



area of ~~equ~~ triangle $= \frac{1}{2} \times \text{base} \times \text{height}$

Equilateral triangle



$\Rightarrow$ [Perpendicular from a vertex on opposite side, bisects the side.]

Using pythagoras theorem,

$$AM^2 + BM^2 = AB^2$$

$$AM^2 = a^2 - \left(\frac{a}{2}\right)^2$$

$$AM^2 = \frac{a^2}{1} - \frac{a^2}{4}$$

$$AM^2 = \frac{4a^2}{4} - \frac{a^2}{4}$$

$$AM^2 = \frac{4a^2 - a^2}{4}$$

$$AM^2 = \frac{3a^2}{4}$$

$$AM = \sqrt{\frac{3a^2}{4}}$$

$$= \frac{\sqrt{3}\sqrt{a^2}}{\sqrt{4}}$$

$$\boxed{AM = \frac{a\sqrt{3}}{2}} \Rightarrow \text{height of equilateral triangle.}$$

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

$$\sqrt{4} = 2$$

$$\Rightarrow \boxed{\begin{aligned} \sqrt{\frac{a}{b}} &= \frac{\sqrt{a}}{\sqrt{b}} \\ \sqrt{xy} &= \sqrt{x}\cdot\sqrt{y} \end{aligned}}$$

$$\text{Area} = \frac{1}{2} \times \text{base} \times \text{height}$$

$$= \frac{1}{2} \times a \times \frac{a\sqrt{3}}{2}$$

$$\boxed{\text{Area} = \frac{a^2\sqrt{3}}{4}}$$

$\sqrt{2} \approx 1.414$

$\sqrt{3} \approx 1.732$

$\pi \approx 3.14 = \frac{22}{7}$

(i) $\underbrace{\sqrt{3} + 9\sqrt{3}}_{10\sqrt{3}} - 7\sqrt{3} =$

$10\sqrt{3} - 7\sqrt{3} = \underbrace{3\sqrt{3}}_{\text{Simplest form}} = \boxed{\sqrt{27}}$

(ii) $\left(3\sqrt{5} + 4\sqrt{2}\right) - \left(9\sqrt{125} + 16\sqrt{8}\right)$

$3\sqrt{5} - 45\sqrt{5} + 4\sqrt{2} - 32\sqrt{2}$

$\Rightarrow -42\sqrt{5} + \left(-28\sqrt{2}\right)$

$\Rightarrow -42\sqrt{5} - 28\sqrt{2}$

$\Rightarrow -7\left(6\sqrt{5} + 4\sqrt{2}\right)$ Ans

Q. Find the area of an isosceles triangle having the base 6 cm and the length of each equal side 5 cm.

Method 1:

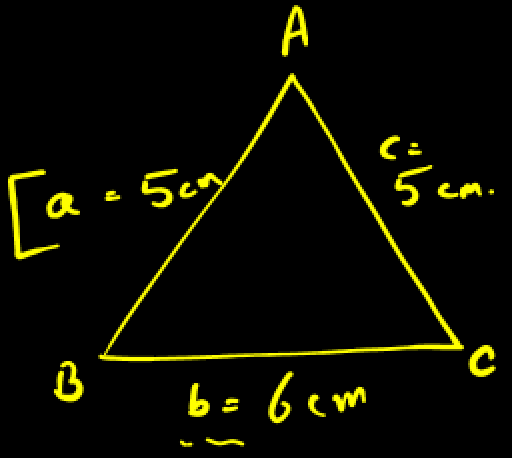
$\boxed{\text{Heron's Formula}}$ ⇒ when all the sides are known.

Step 1: Find semiperimeter.

$$\text{Semi-perimeter } (s) = \left(\frac{a+b+c}{2}\right) =$$

Step 2:

$$\boxed{\text{Area of triangle} = \sqrt{s(s-a)(s-b)(s-c)}}$$



$\boxed{s \Rightarrow \text{semiperimeter}}$

$$s = \frac{5+5+6}{2} = \frac{16}{2} = 8\text{ cm}$$

$$\text{area} = \sqrt{8(8-5)(8-6)(8-5)}$$

$$= \sqrt{8 \cdot 3 \cdot 3 \cdot 2}$$

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

$$= 2 \times 2 \times 3$$

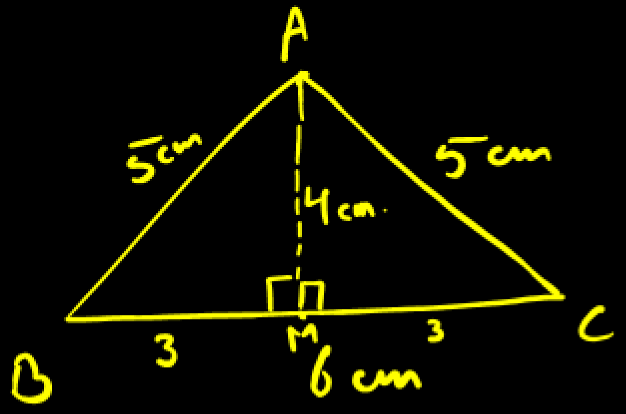
$$\boxed{\text{area} = 12 \text{ cm}^2}$$

Method 2:

~~Perpend.~~

[Perpendicular on base, bisects it.]

"equilateral and isosceles triangle."



Using Pythagoras theorem, in Δ ABM.

$$AB^2 = AM^2 + BM^2$$

$$AM^2 = AB^2 - BM^2$$

$$AM^2 = 5^2 - 3^2$$

$$AM^2 = 25 - 9$$

$$AM^2 = 16$$

$$AM = \sqrt{16} = 4\text{ cm}$$

$$\text{area} = \frac{1}{2} \times \text{base} \times \text{height}$$

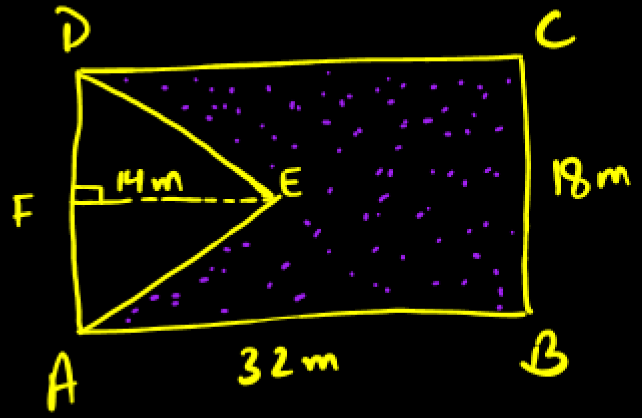
$$= \frac{1}{2} \times 6 \times 4$$

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

Q. The base of an isosceles triangle is 12 cm. and its perimeter is 32 cm. Find the area.

$$\text{Area} = 48 \text{ cm}^2$$

Find the area of shaded region. [ABCD is a rectangle]



Area of triangle $= \frac{1}{2} \times 18 \times 14 \ cm^2$

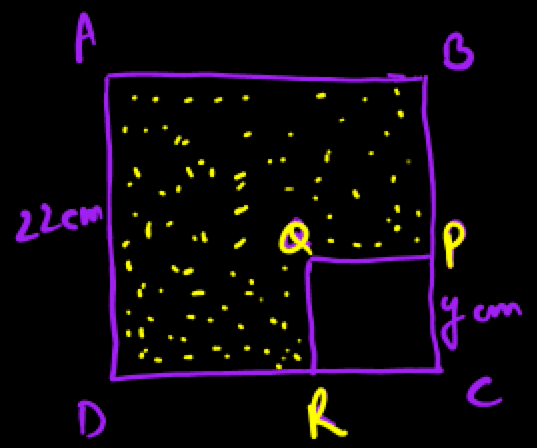
Area of shaded region $= 450 \ cm^2$

ABCD ~~are~~ and PQRC are squares.

~~Area of~~

Area of shaded region is $403 cm^2$

Find y.



$$\text{Area of } PQRC = (22 \times 22) - 403$$
$$= 81\ cm^2$$

$$y^2 = 81$$

$$\boxed{y = 9\ cm}$$

End of the chapter