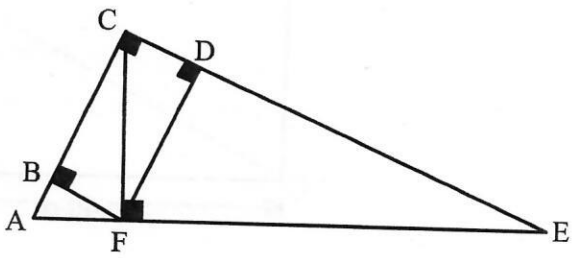
Metric Relations Practice Name : 4SN Solutions

1 To construct the roof of a house, an architect must determine the measures of the support beams of the roof.

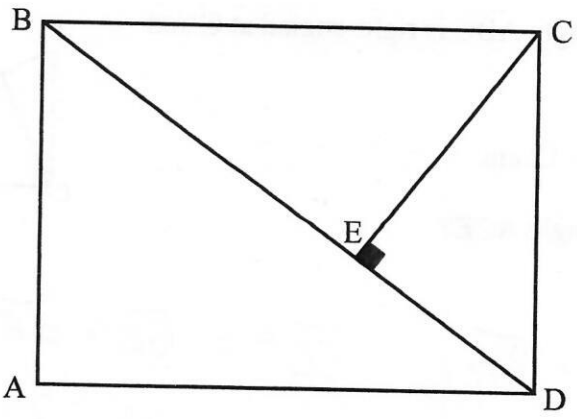
m $\overline{AC}$ = 6 m
m $\overline{CE}$ = 8 m
m $\overline{AE}$ = 10 m



What is the length of segment AF?

$\overline{AC}^2 = \overline{AF} \cdot \overline{AE}$
$6^2 = \overline{AF} \cdot 10$
$3.6\text{ m} = \overline{AF}$

In rectangle ABCD shown below, line segment CE is perpendicular to diagonal BD. In addition, m $\overline{ED}$ = 9 cm and m $\overline{CD}$ = 15 cm.

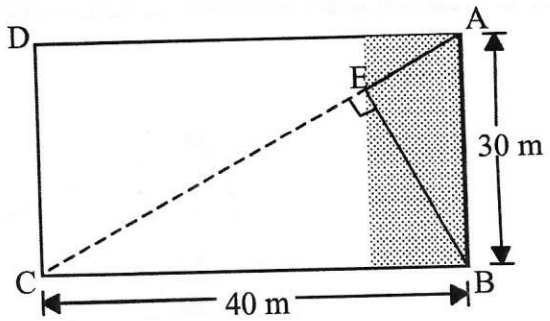


$\overline{CD}^2 = \overline{ED} \cdot \overline{BD}$
$15^2 = 9 \cdot \overline{BD}$
$25 = \overline{BD}$

What is the length of diagonal BD?

The length of diagonal BD is 25 cm.

3 Louise wants to buy the piece of land corresponding to triangle BAE shown in the rectangle below.



What is the area of this piece of land?

Show your work.

$\overline{AC} = 50$ m (pythag)

$\overline{BE} \cdot \overline{AC} = \overline{AB} \cdot \overline{BC}$

$\overline{BE} \cdot 50 = 30(40)$

$\overline{BE} = 24$ m.

$\overline{AB}^2 = \overline{AE} \cdot \overline{AC}$

$30^2 = \overline{AE} \cdot 50$

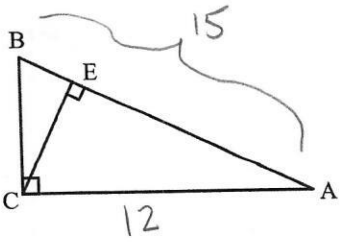
$18\text{m} = \overline{AE}$

Area $\triangle BAE = \frac{18(24)}{2}$

$= 216\ m^2$

4 In the figure to the right, triangle ABC is right-angled at C and $\overline{CE}$ is an altitude.

m $\overline{AB}$ = 15 cm and m $\overline{AC}$ = 12 cm.



What is the perimeter of triangle ACE?

Show your work.

$\overline{AC}^2 = \overline{AE} \cdot \overline{AB}$

$12^2 = \overline{AE} \cdot 15$

$\frac{12 \cdot 12^4}{15_5} = \overline{AE}$

$\frac{48}{5} = \overline{AE}$

$\overline{BE} = 15 - \frac{48}{5}$

$= \frac{75 - 48}{5}$

$= \frac{27}{5}$

$\overline{EC}^2 = \overline{BE} \cdot \overline{EA}$

$= \frac{48}{5} \cdot \frac{27}{5}$

$= \frac{16 \cdot 3 \cdot 3 \cdot 9}{5 \cdot 5}$

$\overline{EC} = \frac{36}{5}$

Perimeter of $\triangle ACE = \frac{48}{5} + \frac{36}{5} + 12$

$= \frac{48 + 36 + 60}{5}$

$= \frac{144}{5}$ cm.

OR $= 9.6 + 7.2 + 12$

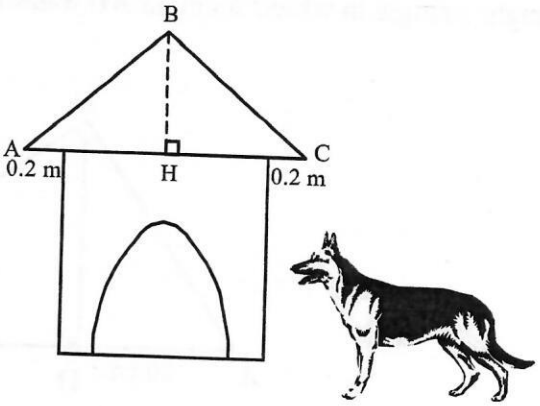
$= 28.8$ cm

A kennel is the shape of a **square** topped by an **isosceles right triangle**, as shown in the adjacent sketch.

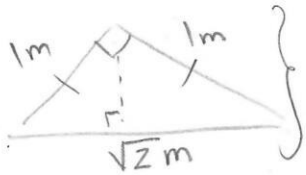
Each congruent side of the triangular roof measures 1 metre. The roof extends 0.2 metres over each side of the kennel.

What is the full height of the kennel?

Show your work.



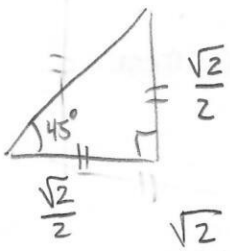
Work



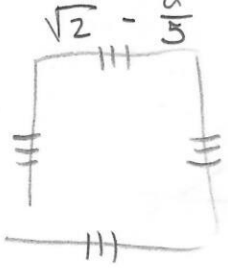
NOTE: 0.2m = $\frac{1}{5}$ m.

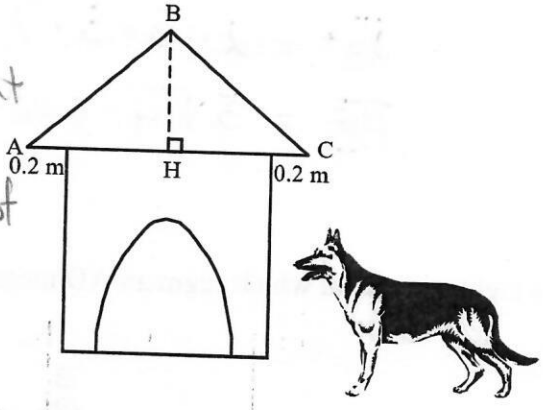
Cut in $\frac{1}{2}$ is also isosceles right △

So height of roof is $\frac{\sqrt{2}}{2}$



Square





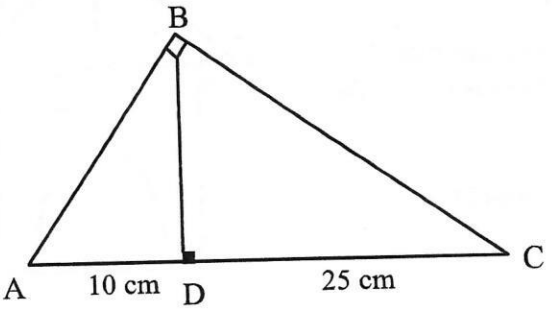
Total Height $= \frac{\sqrt{2}}{2} + \sqrt{2} - \frac{2}{5}$

$= \frac{5\sqrt{2}}{10} + \frac{10\sqrt{2}}{10} - \frac{4}{10}$

$= \frac{15\sqrt{2} - 4}{10}$ m

Answer : The full height of the kennel is $\frac{15\sqrt{2} - 4}{10}$ m.

6 ABC is a right triangle in which segment AD measures 10 cm and segment DC, 25 cm.



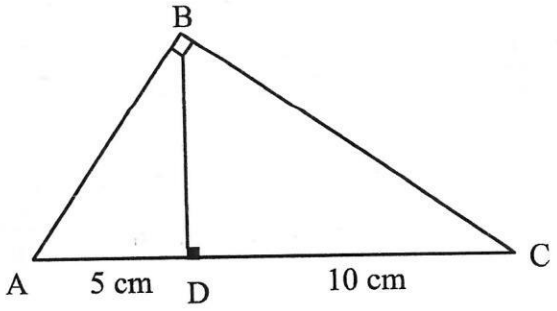
What is the measure of segment AB, to the ~~nearest tenth~~?

$\overline{AB}^2 = 10(35)$

$\overline{AB}^2 = 2 \cdot 5 \cdot 5 \cdot 7$

$\overline{AB} = 5\sqrt{14}$ cm

7 ABC is a right triangle in which segment AD measures 5 cm and segment DC, 10 cm.

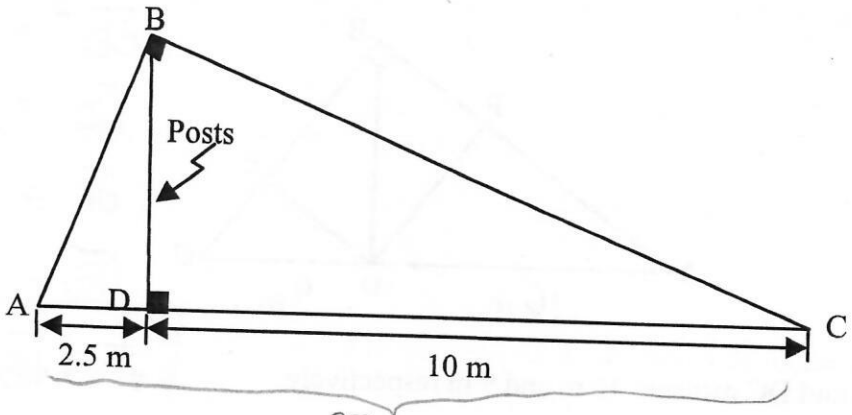


What is the measure of segment BD, to the ~~nearest tenth~~?

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

$\overline{BD} = 5\sqrt{2}$ cm.

A two-sided shelter is supported by vertical posts. The diagram below represents one end of this shelter.



$25/2$ m

Using the information given in the diagram, calculate the length of side BC.

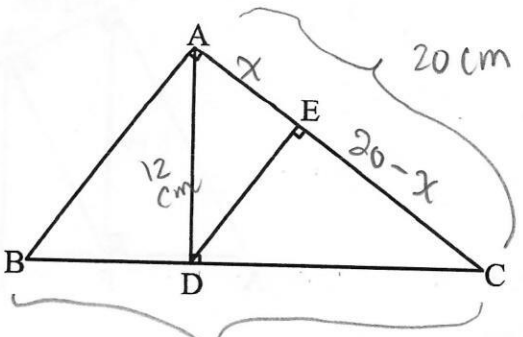
$\overline{BC}^2 = \overline{DC} \cdot \overline{AC}$

$= 10\left(\frac{25}{2}\right)$

$= 5 \cdot 25$

$\overline{BC} = 5\sqrt{5}$ m.

9 Given triangle ABC with a right angle at A. AD is drawn perpendicular to BC at D and DE is drawn perpendicular to AC at E. The height AD measures 12 cm, hypotenuse BC measures 25 cm and side AC measures 20 cm.



25 cm.

Find the measure of DE.

$\overline{AD}^2 = \overline{AE} \cdot \overline{AC}$

$12^2 = x(20)$

$\frac{144}{20} = x$

$\frac{36}{5} = x$ ($\overline{AE}$)

$\overline{EC} = 20 - \frac{36}{5}$

$= \frac{100 - 36}{5}$

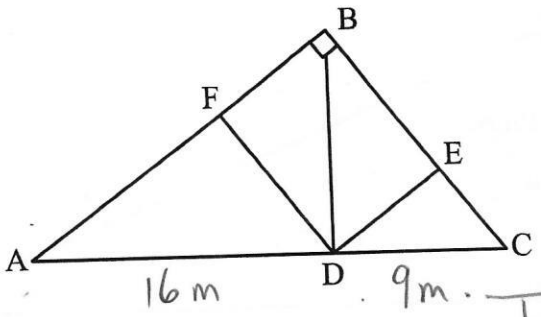
$= 64/5$

$\overline{DE}^2 = \overline{AE} \cdot \overline{EC}$

$= \frac{36}{5} \cdot \frac{64}{5}$

$\overline{DE} = \frac{48}{5}$ cm.

10 In right-angled triangle ABC below, altitude BD coincides with a diagonal of rectangle FBED.



$\overline{BD}^2 = 9(16)$

$\overline{BD} = 12$ m.

$\overline{BC} = 15$ m (pythag)

$\overline{AB} = 20$ m (pythag)

$\overline{FD} \cdot \overline{AB} = \overline{BD} \cdot \overline{AD}$

$\overline{FD} \cdot 20 = 12(16)$

$\overline{FD} = \frac{12(16)}{20_5}$

$= \frac{48}{5}$

Line segments AD and DC measure 16 m and 9 m respectively.

~~Rounded to the nearest tenth,~~ what is the perimeter of rectangle FBED?

Show your work.

$\overline{DE} \cdot \overline{BC} = \overline{BD} \cdot \overline{DC}$

$\overline{DE} \cdot 15 = 12(9)$

$\overline{DE} = \frac{36}{5}$

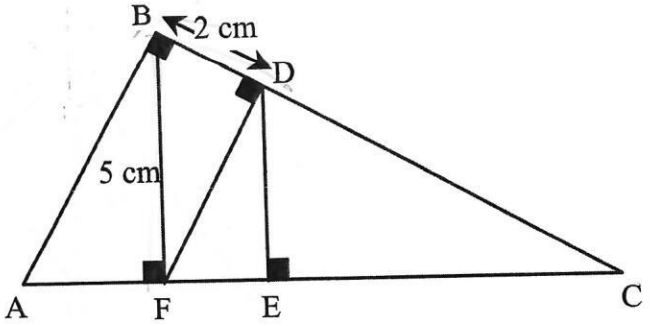
Perimeter $= 2\overline{DE} + 2\overline{FD}$

$= \frac{72}{5} + \frac{96}{5}$

Perimeter $= \frac{168}{5}$ m

11 In the following figure, ABC is a right triangle.

m $\overline{BF}$ = 5 cm
m $\overline{BD}$ = 2 cm
$\overline{BF} \perp \overline{AC}$
$\overline{DE} \perp \overline{AC}$
$\overline{FD} \perp \overline{BC}$



What is the area of triangle FDC?

Show all your work.

$\overline{BF}^2 = \overline{BD} \cdot \overline{BC}$

$5^2 = 2 \cdot \overline{BC}$

$\frac{25}{2} = \overline{BC}$

$\overline{DC} = \frac{25}{2} - 2$

$= \frac{21}{2}$

$\overline{FD}^2 = 2 \cdot \frac{21}{2}$

$\overline{FD} = \sqrt{21}$

Area $\triangle FDC = \frac{\overline{FD} \cdot \overline{DC}}{2}$

$= \frac{\sqrt{21}\,(21/2)}{2}$

$= \frac{21\sqrt{21}}{4}$ cm^2