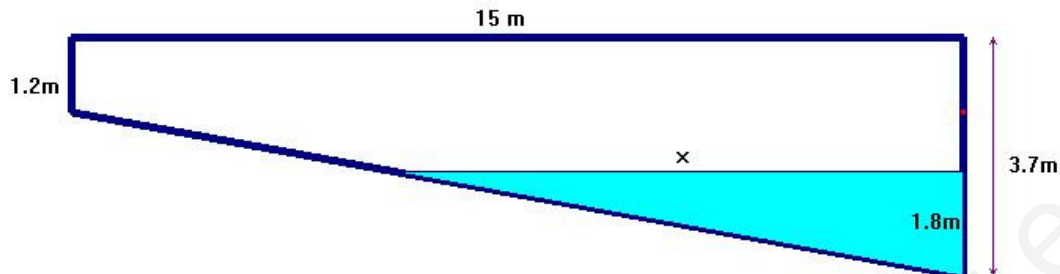
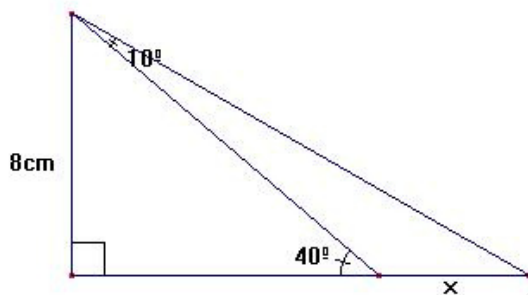


EXAM 3_1 (Geometry-Trigonometry)

1. The diagram shows the side view of a swimming pool being filled with water. Calculate the length x . (1.5 points)

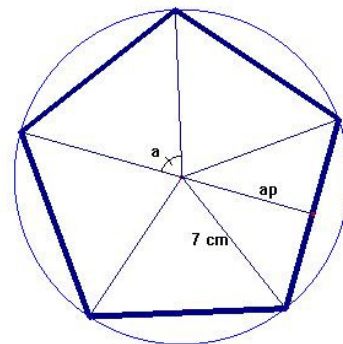


2. In the following diagram, find the length x . (2 points)



3. A regular pentagon is inscribed in a circle of radius 7 cm. (2.5 points)

- Find the angle a .
- Find the length of the side of the pentagon.
- Calculate the area of the pentagon.



4. Find the height of a rectangular box of length 8 cm, width 6 cm and where the length of the diagonal is 11 cm. (1.5 points)

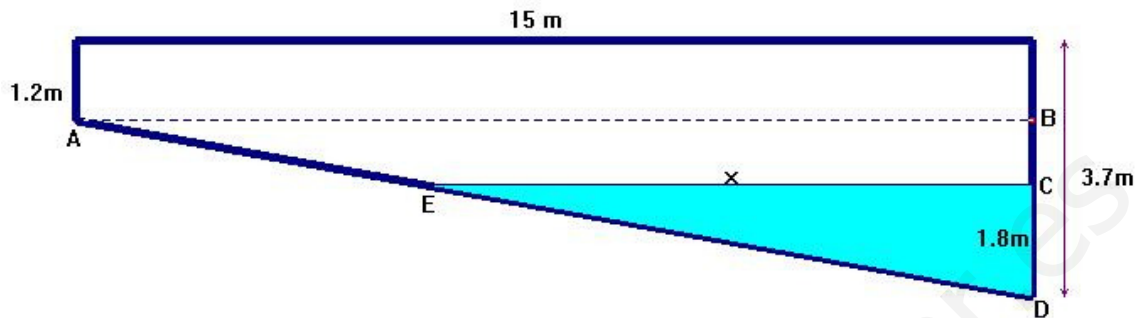
5. Solve: (2.5 points)

a) $\frac{(x+1)^2}{16} - \frac{1+x}{2} = \frac{(x-1)^2}{16} - \frac{2+x}{4}$

b) $\sqrt{2x} + \sqrt{5x-6} = 4$

SOLUTION

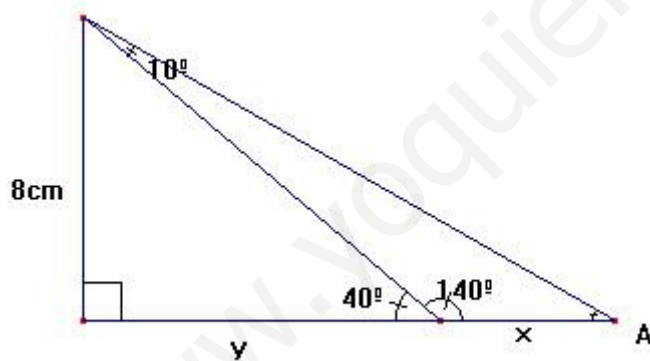
1. The diagram shows the side view of a swimming pool being filled with water. Calculate the length x .



Triangles ABD and CDE are similar, they have congruent angles.

$$\frac{BD}{CD} = \frac{15}{CE} \rightarrow \frac{2.5}{1.8} = \frac{15}{x} \rightarrow 2.5x = 15 \cdot 1.8 \rightarrow x = 10.8 \text{ m}$$

2. In the following diagram, find the length x .



$$\text{Angle } A = 180 - 150 = 30^\circ$$

$$\tan 40 = \frac{8}{y} \rightarrow y = \frac{8}{\tan 40} = 9.53$$

$$\tan 30 = \frac{8}{x+y} \rightarrow x + 9.53 = \frac{8}{\tan 30} \rightarrow x + 9.53 = 13.86 \rightarrow x = 4.33 \text{ cm}$$

The length of x is 4.33 cm

3. A regular pentagon is inscribed in a circle of radius 7 cm.

a) Find the angle a .

$$\text{Angle } a: 360:5 = 72^\circ$$

b) Find the length of the side x .

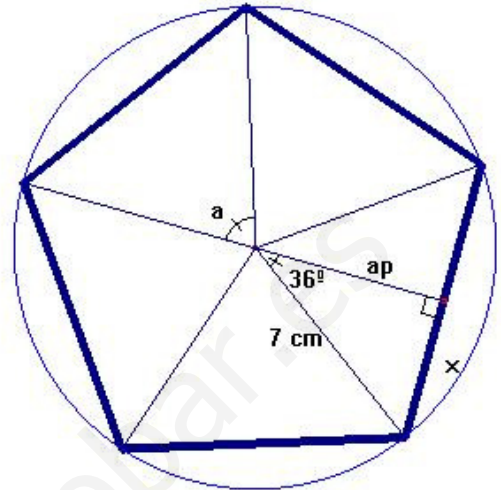
$$\sin 36 = \frac{x}{7} \rightarrow x = 7 \cdot \sin 36 = 4.11$$

$$\text{Side of pentagon: } 2 \cdot 4.11 = 8.22 \text{ cm}$$

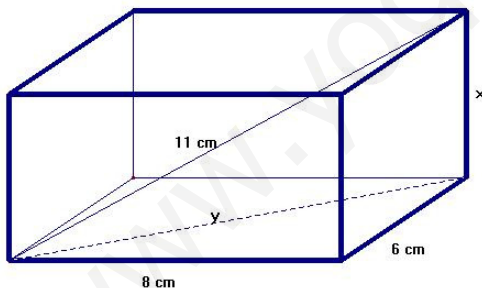
c) Calculate the area of the pentagon.

$$A = \frac{P \cdot ap}{2}; \text{ Perimeter } P = 5 \cdot 8.22 = 41.11 \text{ cm}$$

$$ap \rightarrow \cos 36 = \frac{ap}{7} \rightarrow ap = 7 \cdot \cos 36 = 5.66 \text{ cm}; A = \frac{P \cdot ap}{2} = \frac{41.11 \cdot 5.66}{2} = 116.34 \text{ cm}^2$$



4. Find the height of a rectangular box of length 8 cm, width 6 cm and where the length of the diagonal is 11 cm.



Pythagorean Theorem:

$$y^2 = 8^2 + 6^2 = 100 \rightarrow y = 10 \text{ cm}$$

$$x^2 = 11^2 - y^2 = 121 - 100 = 21 \rightarrow x = 4.58 \text{ cm}$$

The height of the box is 4.58 cm

5. Solve:

$$a) \frac{(x+1)^2}{16} - \frac{1+x}{2} = \frac{(x-1)^2}{16} - \frac{2+x}{4} \rightarrow x^2 + 2x + 1 - 8 - 8x = x^2 - 2x + 1 - 8 - 4x$$

$$2x + 1 - 8 - 8x = -2x + 1 - 8 - 4x \rightarrow 2x - 8x + 2x + 4x = 1 - 8 - 1 + 8 \rightarrow 0x = 0$$

Solution: all real numbers

$$b) \sqrt{2x} + \sqrt{5x-6} = 4 \rightarrow \sqrt{5x-6} = 4 - \sqrt{2x} \rightarrow (\sqrt{5x-6})^2 = (4 - \sqrt{2x})^2$$

$$5x - 6 = 16 - 8\sqrt{2x} + 2x \rightarrow 5x - 6 - 16 - 2x = -8\sqrt{2x} \rightarrow 3x - 22 = -8\sqrt{2x}$$

$$(3x - 22)^2 = (-8\sqrt{2x})^2 \rightarrow 9x^2 - 132x + 484 = 64 \cdot 2x \rightarrow 9x^2 - 260x + 484 = 0$$

$$x = \frac{260 \pm \sqrt{260^2 - 4 \cdot 9 \cdot 484}}{18} = \frac{260 \pm 224}{18} = \left\{ \begin{array}{l} \frac{242}{9} \\ 2 \end{array} \right.$$

Checking:

$$\sqrt{2x} + \sqrt{5x-6} = 4 \rightarrow \sqrt{2 \cdot \frac{242}{9}} + \sqrt{5 \cdot \frac{242}{9} - 6} = 4 \rightarrow \frac{22}{3} + \frac{34}{3} = 4 \rightarrow \frac{56}{3} = 4 \quad \text{NO!}$$

$$\sqrt{2x} + \sqrt{5x-6} = 4 \rightarrow \sqrt{2 \cdot 2} + \sqrt{5 \cdot 2 - 6} = 4 \rightarrow 2 + 2 = 4 \rightarrow 4 = 4 \quad \text{YES!}$$

Solution: $x = 2$