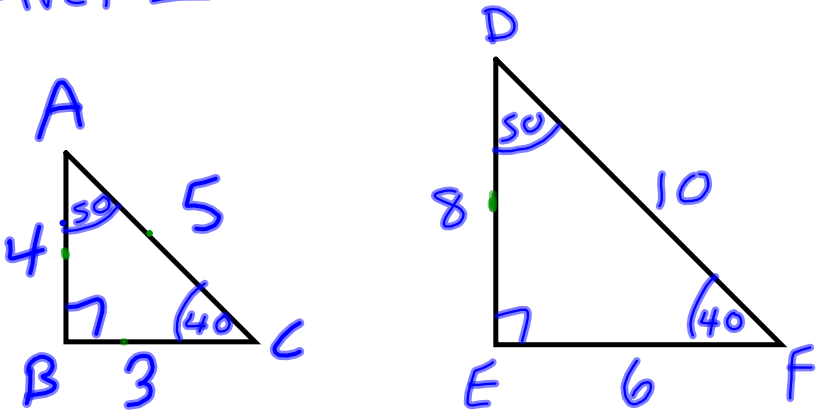
# Section 7.4 : Similar Triangles

Given $\triangle ABC$ and $\triangle DEF$ as follows:




* $\triangle ABC \sim \triangle DEF$ ← Similarity Relation

① Corresponding Angles are equal:

$\angle A = \angle D$

$\angle B = \angle E$

$\angle C = \angle F$

② Corresponding Sides are proportional:

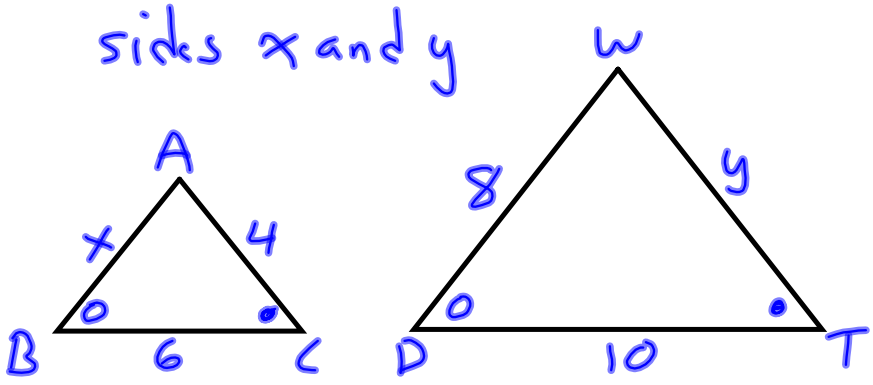
$$\frac{AB}{DE} = \frac{4}{8} = 0.5$$

$$\frac{BC}{EF} = \frac{3}{6} = 0.5$$

$$\frac{AC}{DF} = \frac{5}{10} = 0.5$$

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$$

Example #1: Find the value of the 2 missing sides x and y




(ANS) $\triangle ABC \sim \triangle WDT$

$$\frac{AB}{WD} = \frac{BC}{DT} = \frac{AC}{WT}$$

→ $\frac{6}{10} = \frac{4}{y}$

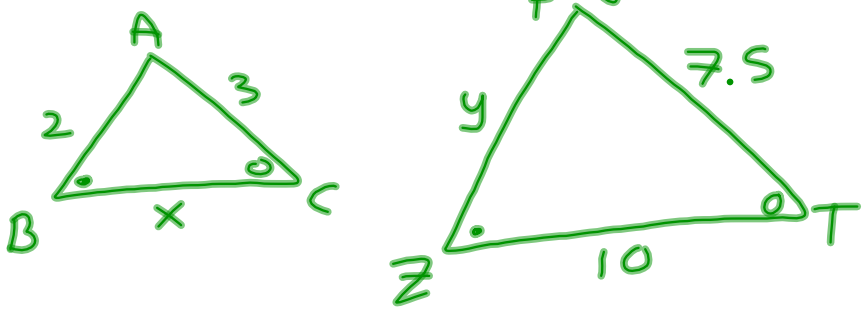
(A) Solve for x: $\frac{x}{8} = \frac{6}{10}$ → $\frac{10x}{10} = \frac{48}{10}$

$x = 4.8$

(B) Solve for y: $\frac{6}{10} = \frac{4}{y}$ → $\frac{6y}{6} = \frac{40}{6}$

$\therefore y = 6.6\overline{6}$

Practice: Solve for x and y:




(Ans) $\triangle ABC \sim \triangle PZT$

$$\frac{AB}{PZ} = \frac{BC}{ZT} = \frac{AC}{PT}$$

$$\frac{2}{y} = \frac{x}{10} = \frac{3}{7.5}$$

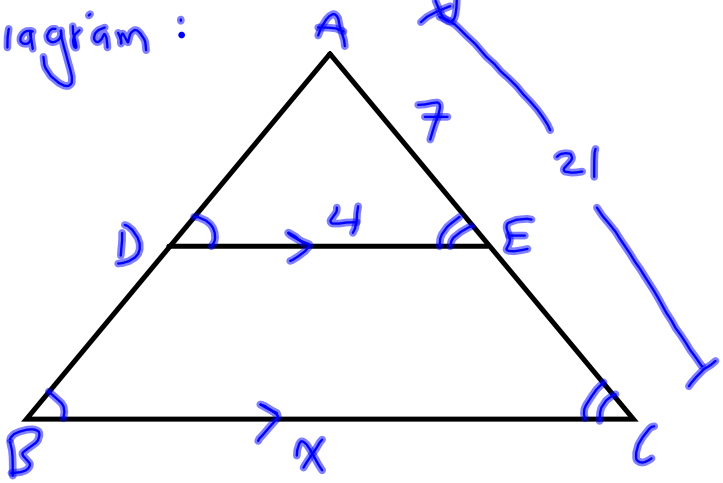
Solve for x: $\frac{x}{10} = \frac{3}{7.5} \rightarrow \frac{7.5x}{7.5} = \frac{30}{7.5}$

$\therefore x = 4$

Solve for y: $\frac{2}{y} = \frac{3}{7.5} \rightarrow \frac{3y}{3} = \frac{15}{3}$

$\therefore y = 5$

Example #2: Find the length of BC in the following diagram:




(ANS) $\triangle ADE \sim \triangle ABC$

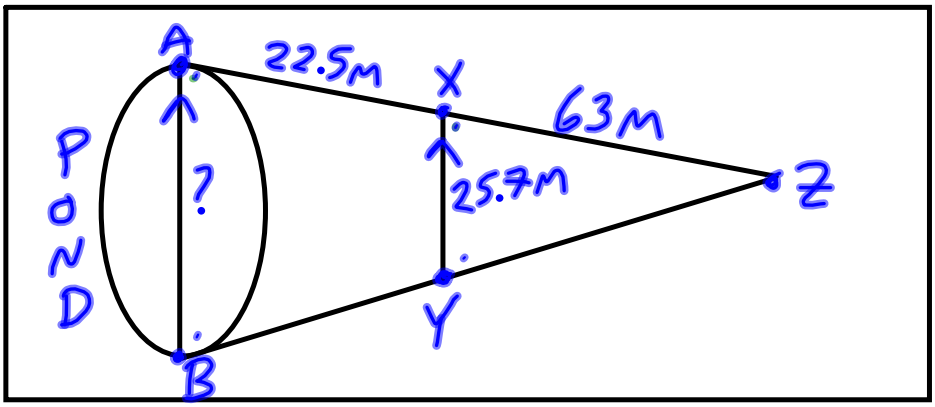
$$\frac{AD}{AB} = \frac{DE}{BC} = \frac{AE}{AC}$$

$$\frac{AD}{AB} = \frac{4}{x} = \frac{7}{21}$$

$$\therefore \frac{7x}{7} = \frac{84}{7}$$

$$\therefore x = 12$$

Example #3: To find the distance AB, across a pond, surveyors measured the distance shown below. Calculate the distance AB.




$AZ = 22.5 + 63 = 85.5$

(ANS) $\triangle XYZ \sim \triangle ABZ$

$\therefore \frac{XY}{AB} = \frac{YZ}{BZ} = \frac{XZ}{AZ}$

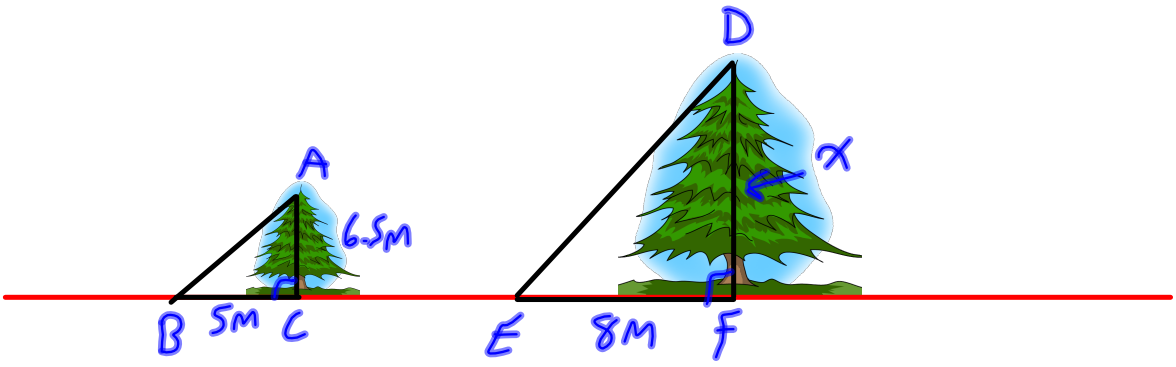
$\frac{25.7}{AB} = \frac{YZ}{BZ} = \frac{63}{85.5}$

$\therefore \frac{25.7}{AB} = \frac{63}{85.5}$

$\frac{63\,AB}{63} = \frac{2197.35}{63}$

$\therefore AB = 34.9\,M$

Example #4: Two trees cast shadows as shown below. How tall is the second tree?




ANS) $\triangle ABC \sim \triangle DEF$

$$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF} \Rightarrow \frac{5}{8} = \frac{6.5}{x}$$

$$\Rightarrow \frac{5x}{5} = \frac{52}{5}$$

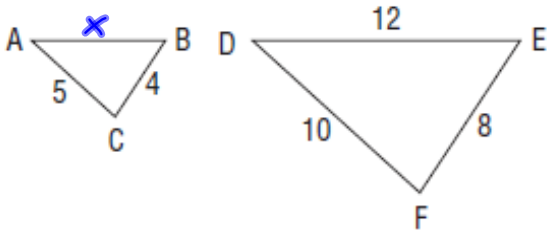
$$\therefore x = 10.4\text{m}$$

Homework:

p349-351
# 6, 9, 15

**6.** Determine the length of AB in each pair of similar triangles.

**a)**




$\triangle ABC \sim \triangle DEF$

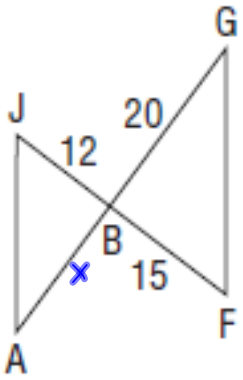
$\frac{AB}{DE} = \frac{BC}{EF} = \frac{AC}{DF}$

$\frac{x}{12} = \frac{4}{8} = \frac{5}{10}$

$8x = 48 \quad \therefore x = 6$

$8 \quad 8$

**b)**




(Aws) $\triangle ABJ \sim \triangle GBF$

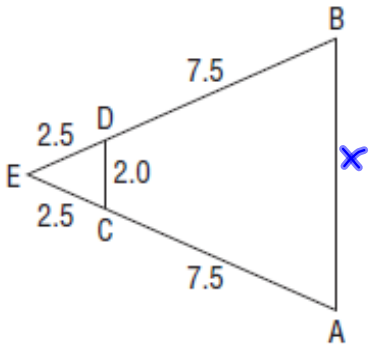
$\frac{AB}{GB} = \frac{BJ}{BF} = \frac{AJ}{GF}$

$\frac{x}{20} = \frac{12}{15} = \frac{AJ}{GF}$

$\therefore \quad 15x = 240 \quad \therefore x = 16$

$15 \quad 15$

c)



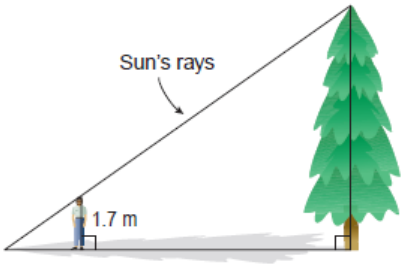

$\triangle CDE \sim \triangle ABE$

$\frac{CD}{AB} = \frac{DE}{EB} = \frac{CE}{AE}$

$\frac{2}{x} = \frac{2.5}{10} = \frac{2.5}{10}$

$\frac{2.5x}{2.5} = \frac{20}{2.5}$ $\therefore x = 8$

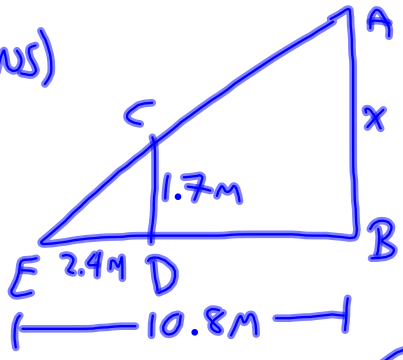
**9.** Tina wants to estimate the heights of two trees. For each tree, she stands so that one end of her shadow coincides with one end of the shadow of the tree. Tina's friend measures the lengths of her shadow and the tree's shadow. Tina is 1.7 m tall.




a) Tina's shadow is 2.4 m and the first tree's shadow is 10.8 m. What is the height of the tree?

b) Tina's shadow is 0.8 m and the second tree's shadow is 12.8 m. What is the height of the tree?

Ans)



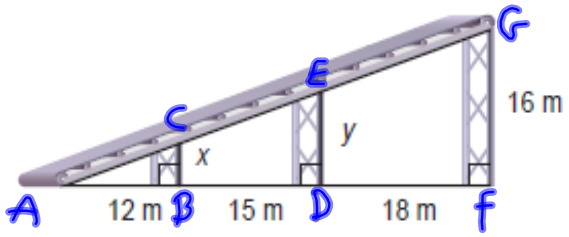

$\triangle CDE \sim \triangle ABE$

$\frac{CD}{AB} = \frac{DE}{BE} = \frac{CE}{AE}$

$\frac{1.7}{x} = \frac{2.4}{10.8} = \frac{CE}{AE}$

$\frac{2.4x}{2.4} = \frac{18.36}{2.4}$ $\therefore x = 7.65M$

**15.** In the diagram below, how high are the two supports $x$ and $y$ for the conveyor belt?




Note: To solve for x, compare $\triangle ABC$ & $\triangle AFG$. To solve for y, compare $\triangle ADE$ to $\triangle AFG$

Ans) $\triangle ABC \sim \triangle AFG$

$$\frac{AB}{AF} = \frac{BC}{FG} = \frac{AC}{AG}$$

$$\frac{12}{45} = \frac{x}{16} = \frac{AC}{AG}$$

$$\frac{45x}{45} = \frac{192}{45}$$

$$\therefore x = 4.2\overline{6}\ m$$

$\triangle ADE \sim \triangle AFG$

$$\frac{AD}{AF} = \frac{DE}{FG} = \frac{AE}{AG}$$

$$\frac{27}{45} = \frac{y}{16} = \frac{AE}{AG}$$

$$\frac{45y}{45} = \frac{432}{45}$$

$$\therefore y = 9.6\ m$$