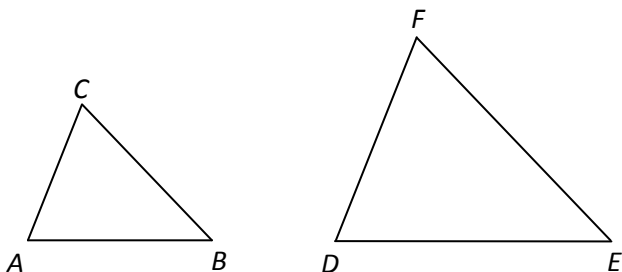


Lesson 4: Similar Triangles

- Two triangles are called **similar** if they have the same shape but different sizes.
- For example, if you draw a triangle and then photocopy it with a magnification factor of say 150% then the larger triangle and smaller triangle will be similar.
- Two triangles are similar if and only if they have the same three angle measures.
- If $\angle A = \angle D$, $\angle B = \angle E$, and $\angle C = \angle F$, then triangle ABC is similar to triangle DEF .



- The sides of similar triangles are proportional. This means the ratio of any two sides in one triangle equals the ratio of corresponding sides in the similar triangle. In the similar triangles above:

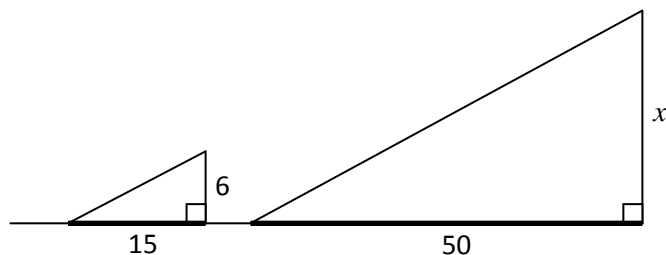
$$\frac{AB}{AC} = \frac{DE}{DF}, \quad \frac{AB}{BC} = \frac{DE}{EF}, \quad \frac{BC}{AC} = \frac{EF}{DF}, \text{ etc.}$$

Example

A 6 foot tall man measures his shadow to be 15 feet long. He measures the shadow of a nearby tree to be 50 feet long. How tall is the tree?

Solution

We have similar triangles as in the diagram below.



We now have equal ratios:

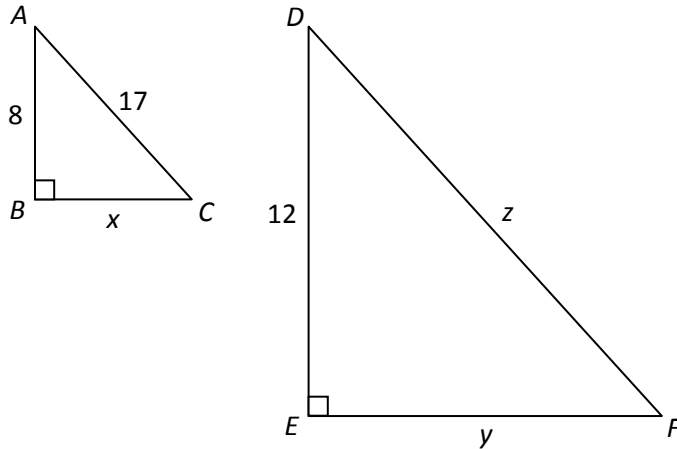
$$\frac{6}{15} = \frac{x}{50}$$

$$15x = 300$$

$$x = 20$$

The tree is 20 feet tall.

Example Given that angles A and D are equal find x , y , and z in the triangles below.



Solution

First, we find x using the Pythagorean Theorem (or simply use a Pythagorean triple): We get $x = 15$.

Since angles A and D are equal and angles B and E are equal, the remaining pair C and F are equal too (since the three angles of a triangle sum to 180 degrees). So, these triangles are similar. So,

$$\begin{aligned} \frac{y}{12} &= \frac{15}{8} & \frac{z}{17} &= \frac{17}{8} \\ 8y &= 180 & 8z &= 204 \\ y &= 22.5 & z &= 25.5 \end{aligned}$$