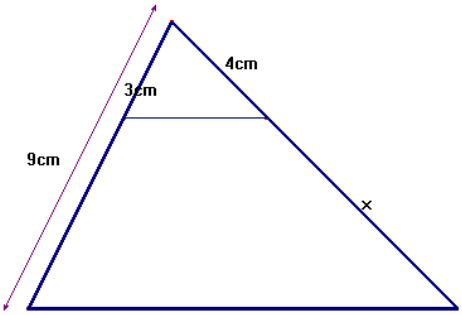
GEOMETRY 1 (SIMILAR TRIANGLES)

1. A flag pole casts a shadow 3 metres long. A woman near the pole casts a shadow 0.75 metres long. She is 1.5 metres tall. How tall is the flag pole?

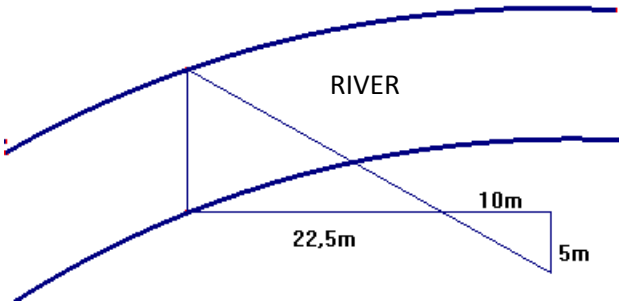
2. Most TV screens have similar shapes. The measure of the diagonal is used to give screen size. Suppose the dimensions of a 9-inch screen are 5 inches by 7.5 inches. Find the dimensions of an 18-inch TV and a 36-inch TV.

3. The legs of a right triangle measure 12 m and 5 m. What is the length of the legs of a similar triangle to this one whose hypotenuse is 52 m?

4. In the triangle, work out the length of x:



5. Calculate the width of the river:



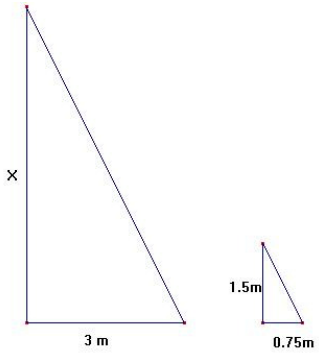
6. The area of a square is 27cm^2. What is the area of another square with the sides twice as long as the sides of the first square? And if the sides are the half?

7. Andy wants to find the height of the tallest building in the city. He stands 425 m from the building. There is a tree 38 m in front of him, which he knows is 21 m tall. How tall is the building in metres?

8. Find the ratio of the area of two similar triangles if one pair of their corresponding sides are 3 cm and 9 cm.

SOLUTION

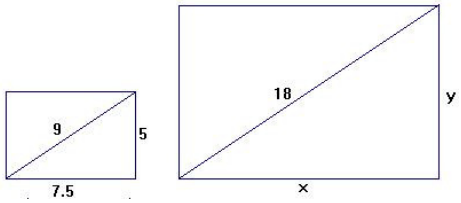
1. A flag pole casts a shadow 3 metres long. A woman near the pole casts a shadow 0.75 metres long. She is 1.5 metres tall. How tall is the flag pole?



Similar triangles, so $\frac{3}{0.75} = \frac{x}{1.5} \rightarrow x = \frac{3 \cdot 1.5}{0.75} = 6$

The flag pole is 6 metres long

2. Most TV screens have similar shapes. The measure of the diagonal is used to give screen size. Suppose the dimensions of a 9-inch screen are 5 inches by 7.5 inches. Find the dimensions of an 18-inch TV and a 36-inch TV.



Similar polygons, similar triangles, so

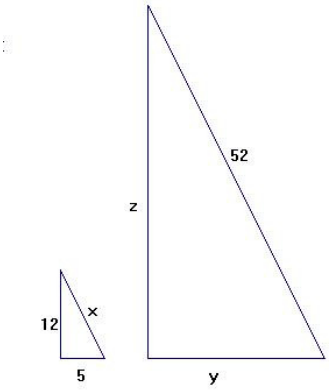
$\frac{9}{7.5} = \frac{18}{x} \rightarrow x = 15$ inches

$\frac{9}{5} = \frac{18}{y} \rightarrow y = 10$ inches

For the 36-inch TV, it is the same: $\frac{9}{7.5} = \frac{36}{x} \rightarrow x = 30$ inches

$\frac{9}{5} = \frac{36}{y} \rightarrow y = 20$ inches

3. The legs of a right triangle measure 12 m and 5 m. What is the length of the legs of a similar triangle to this one whose hypotenuse is 52 m?



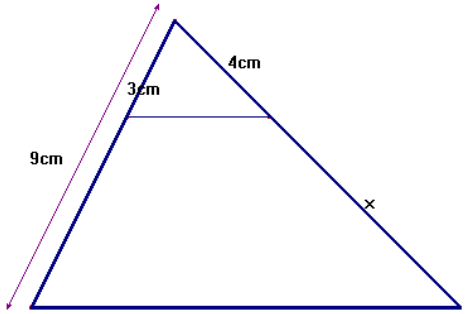
First we work out the hypotenuse in the little triangle: $x^2 = 5^2 + 12^2 = 169 \rightarrow x = 13$ m

Similar triangles:

$\frac{5}{13} = \frac{y}{52} \rightarrow y = \frac{5 \cdot 52}{13} = 20$ m

$\frac{12}{13} = \frac{z}{52} \rightarrow z = \frac{12 \cdot 52}{13} = 48$ m

4. In the triangle, work out the length of x:



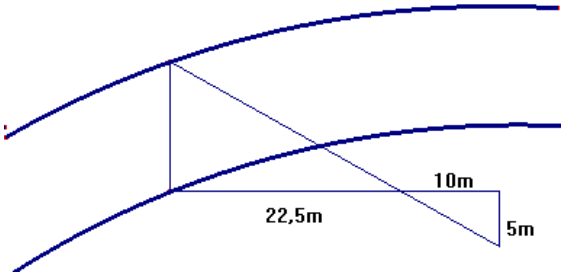
$\frac{9}{3} = \frac{4+x}{4} \rightarrow 4 + x = \frac{4 \cdot 9}{3} = 12$ cm

5. Calculate the width of the river:

They are similar triangles, (AAA), so:

$$\frac{22.5}{10}=\frac{x}{5}\rightarrow x=\frac{5\cdot 22.5}{10}=11.25$$

The river is 11.25 m width



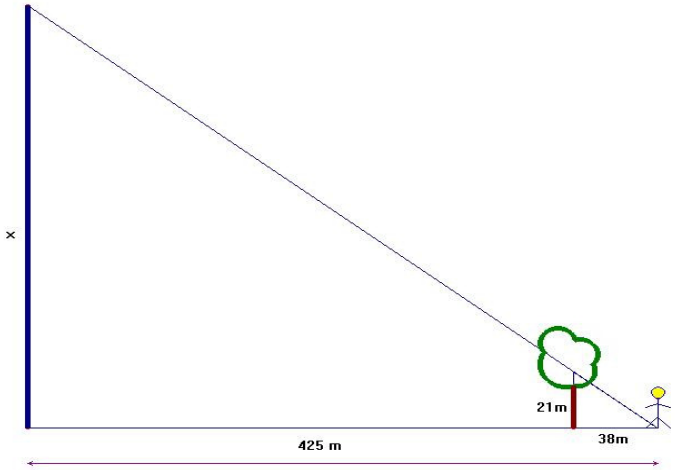
6. The area of a square is $27cm^2$. What is the area of another square with the sides twice larger than the sides of the first square? And if the sides are the half?

   Sides of the first square – $x \rightarrow A=x^2=27\,cm^2$

   Sides of the second square – $2x \rightarrow A'=(2x)^2=4x^2=4\cdot 27=108\,cm^2$

   Sides of the third square – $x/2 \rightarrow A''=\left(\frac{x}{2}\right)^2=\frac{x^2}{4}=\frac{27}{4}cm^2$

7. Andy wants to find the height of the tallest building in the city. He stands 425 metre from the building. There is a tree 38 m in front of him, which he knows is 21 m tall. How tall is the building in metres?



Similar triangles:

$$\frac{425}{38}=\frac{x}{21}$$

$$x=\frac{425\cdot 21}{38}$$

$$x=234.87$$

Answer: the building is 234.87 metres tall.

8. Find the ratio of the area of two similar triangles if one pair of their corresponding sides are 3 cm and 9 cm.

   The ratio is $\frac{9}{3}=3$, so the ratio of the area is $3^2=9$