You have a boat with a motor that propels it at vboat = 4.5 m/s relative to the water. You point it directly across the river and find that when you reach the other side, you have traveled a total distance of 27 m (indicated by the dotted line in the diagram) and wound up 14 m downstream. What is the speed of the current?

Solution:

$\mathrm{L} = 27\mathrm{m} -$ total distance;

$\mathrm{d} = 14\mathrm{m} -$ distance that boat wound up downstream;

$\mathrm{V_{boat}} = 4.5\frac{\mathrm{m}}{\mathrm{s}} -$ velocity of the boat reative to the water;

$\mathrm{V_{current}} -$ velocity of the current;

First, we can find the width of the current from the right triangle ABC:

$$\mathrm{h} = \sqrt{\mathrm{L}^2 - \mathrm{d}^2}$$

Triangles ABC and BDE are similar:

$$\mathrm{ABC} \sim \mathrm{BDE}: \frac{\mathrm{V_{boat}}}{\mathrm{V_{current}}} = \frac{\mathrm{h}}{\mathrm{d}}$$

$$\frac{\mathrm{V_{boat}}}{\mathrm{V_{current}}} = \frac{\sqrt{\mathrm{L}^2 - \mathrm{d}^2}}{\mathrm{d}}$$

$$\mathrm{V_{current}} = \frac{\mathrm{d} \cdot \mathrm{V_{boat}}}{\sqrt{\mathrm{L}^2 - \mathrm{d}^2}} = \frac{14\mathrm{m} \cdot 4.5\frac{\mathrm{m}}{\mathrm{s}}}{\sqrt{(27\mathrm{m})^2 - (14\mathrm{m})^2}} = 2.7\frac{\mathrm{m}}{\mathrm{s}}$$

Answer: speed of the current is $2.7\frac{\mathrm{m}}{\mathrm{s}}$.