A river flows toward the east. Because of your knowledge of physics, you head your boat 56° west of north and have a velocity of 4.0 m/s due north relative to the shore.

(a) What is the velocity of the current?

m/s

(b) What is your speed relative to the water?

m/s

Solution:

$\alpha = 56° -$ west of north angle;

$V_b = 4\frac{m}{s} -$ velocity of the boat relative to the shore;

$V_c -$ velocity of the current;

$V_{b,c} -$ velocity of the boat relative to the water;

From the right triangle ABC:

$$\sin\alpha = \frac{V_b}{V_{b,c}} \Longrightarrow V_{b,c} = \frac{V_b}{\sin\alpha} = \frac{4\frac{m}{s}}{\sin 56°} = 4.8\frac{m}{s}$$

$$\cos\alpha = \frac{V_c}{V_{b,c}} \Longrightarrow V_c = V_{b,c}\cos\alpha = 4.8\frac{m}{s}\cdot\cos 56° = 2.7\frac{m}{s}$$

Answer: a) $4.8\frac{m}{s}$

b) $2.7\frac{m}{s}$