Physics 200

Name: _____

The Classic <u>River</u> Problem

Bob and Jane went camping. They put their canoe into a 80.0 meter wide river directly across from the perfect campsite. Avid hikers and paddlers, they are able to walk with a speed of 4.0 m/s and paddle their canoe with a speed of 3.0 m/s. The river flows South with a speed of 2.0 m/s.

Jane suggests that they angle the nose of their canoe into the current so that they travel in a line perpendicular to the current and make a landing at the campsite. She also offers to calculate (she never leaves home without her calculator) the correct angle that the compass should read as they paddle.

Bob declares that the fastest way to get across the river is to point the canoe directly across the river. Of course they will get washed downstream, but no matter says Bob, they can simply walk back to the campsite along the river.

1. Sketch both methods of travel. Label the component velocity vectors and the resultant velocity vectors with their correct magnitude. Proportions of vector magnitudes do not have to be perfect.

2. How long does Jane's method take? *Jane's way is faster!*

3. How long does Bob's method take?

Total Bob time
$= 26.7s$
$+$
$13.3s$
$= 40.3s$

Jane

2m/s current
80m

$3 m/s$ $2 m/s$

Start • • Finish

$\sqrt{3^2 - 2^2} = \sqrt{5}$
$= 2.24 m/s$

$V = \frac{d}{t}$ $2.24 m/s = \frac{80m}{t}$

$t \approx 35.7s$

Bob

2m/s current
80m

$3 m/s$

Start • • Finish $2 m/s$

Don't bother with this,
x + y are independent!!

$V_x = \frac{d_x}{t}$ $3 m/s = \frac{80m}{t}$

Cross time $\rightarrow t = 26.7s$

$V_y = \frac{d_y}{t}$
$2 m/s = \frac{d_y}{26.7s}$
$d_y = 53.3 m$
to walk

$V_{walk} = \frac{d_{walk}}{t_{walk}}$
$4 m/s = \frac{53.3m}{t}$
$t = 13.3s$