## Section 5: Velocity Vectors in Two Dimensions

1 A swimmer jumps into a river and swims for the opposite shore. Her velocity in still water is $4.0 \mathrm{~km} / \mathrm{h}[\mathrm{N}]$. The current in the river is $3.0 \mathrm{~km} / \mathrm{h}$ [E]. Find the swimmer's velocity relative to the shore.

2 The velocity of the current in a river is $10.0 \mathrm{~m} / \mathrm{s}$ [ E ] and a boat on the river has a velocity of $7.0 \mathrm{~m} / \mathrm{s}[\mathrm{N}]$. On the boat there is a cart that has a velocity of $4.0 \mathrm{~m} / \mathrm{s}$ [W]. A turtle is moving on the cart at $3.0 \mathrm{~m} / \mathrm{s}[\mathrm{E}]$ and an ant is moving at $1.0 \mathrm{~m} / \mathrm{s}[\mathrm{S}]$ on the turtle's back. Find the velocity of the ant with respect to the:
A) boat
B) water

3 A swimmer can swim at a speed of $1.80 \mathrm{~m} / \mathrm{s}$ in still water. If the current in a river 200.0 m wide is $1.00 \mathrm{~m} / \mathrm{s}$ [ E$]$ and the swimmer starts on the south bank and swims so that she is always headed directly across the river, determine:
A) the swimmer's resultant velocity.
B) how long she will take to reach the far shore.
C) how far downstream she will land.

A swimmer on the south shore of a river wishes to swim to a dock due north of his starting point. His speed in still water is $4.0 \mathrm{~km} / \mathrm{h}$ and there is a current in the river flowing at $2.5 \mathrm{~km} / \mathrm{h}$ to the West.
A) In what direction must he swim to get directly across the river?
B) If the river is 2.0 km wide, how long does it take him to make the crossing?
5. A man attempts to swim at $5.8 \mathrm{~m} / \mathrm{s}$ due west across a river which flows south with a $2.3 \mathrm{~m} / \mathrm{s}$ current.
A. i. What will be his resultant velocity?
ii. How long does it take him to cross the river, if the river is 1500 m wide?
iii. How far down stream does he land?
B. i. In what direction must he swim at his $5.8 \mathrm{~m} / \mathrm{s}$ speed to get directly across the river?
ii. If he does get directly across the river, what was his resultant velocity in crossing the river?
iii. If the river is 1500 m wide, how long will it take him to cross the river?

