## Physics 20 Navigation Worksheet

Name: $\qquad$
Date: $\qquad$

1. A pilot heads her plane with a velocity of $250 \mathrm{~km} / \mathrm{h}$ north. There is a wind of $100 \mathrm{~km} / \mathrm{h}$ blowing west. What is the velocity of the airplane relative to the ground?
2. The airspeed of airplane headed north is $40 \mathrm{~m} / \mathrm{s}$. A wind of $15 \mathrm{~km} / \mathrm{s}$ is blowing to the west. What is the velocity of the airplane relative to the ground?
3. A boat whose speed in still water is $2.5 \mathrm{~m} / \mathrm{s}$ is in a river that is flowing at $1.2 \mathrm{~m} / \mathrm{s}$ south. What is the velocity of the boat relative to the shore when
a. the boat is headed south?
b. the boat is headed north?
c. the boat is headed west?
4. An airplane is travelling east at an airspeed of $150 \mathrm{~m} / \mathrm{s}$. A $30 \mathrm{~m} / \mathrm{s}$ wind is blowing north. What is the velocity of the plane relative to the ground?
5. The captain of a ship aims his ship with a velocity of $25 \mathrm{~m} / \mathrm{s}$ directly north across a river whose current flows at $8.0 \mathrm{~m} / \mathrm{s}$ east. The river is 850 m wide. Calculate:
a. the velocity of the ship relative to the shore.
b. the time that it takes the ship to cross the river.
c. how far downstream the ship ends up when it reaches the other side.
6. The captain of a ship wants to go directly South across a river at $15 \mathrm{~m} / \mathrm{s}$ but there is a current in the river of $5.0 \mathrm{~m} / \mathrm{s}$ East. With what velocity (including direction) must the captain aim the ship?
7. The pilot of an airplane wants to go directly South at $130 \mathrm{~m} / \mathrm{s}$, however a wind is blowing to the West at $20 \mathrm{~m} / \mathrm{s}$. With what velocity (including direction) does the pilot need to aim the airplane?
8. The captain of a ship wants to go directly North at a speed of $35 \mathrm{~m} / \mathrm{s}$, but there is a current to the East. The speed of the boat without the current would be $50 \mathrm{~m} / \mathrm{s}$. What is the speed of the wind?
9. A pilot of an airplane wants to directly west to Vancouver. There is a wind blowing to the South of $25 \mathrm{~m} / \mathrm{s}$. If the airspeed of the airplane is $100 \mathrm{~m} / \mathrm{s}$, with what speed does the plane actually travel?
