Assignment 7
Relative Velocity

Name:_____

Multiple Choice: Please show ALL workings for Multiple Choice.

1. While travelling on a train, two boys play catch in the aisle. The train is moving north at 30.0 m/s. The ball is tossed front to back at 5.0 m/s relative to the boys. A bystander on the highway observes the ball being tossed toward the back. To the bystander, what is the relative speed of the ball?
   (A) 5.0 m/s [N]
   (B) 25 m/s [N]
   (C) 35 m/s [N]
   (D) 35 m/s [S]

2. A boat attempts to move due East across a river at 9.0 km/hr. If the river runs South at 12 km/hr, what will be the boat's resultant velocity?
   (A) 15 km/hr at 37° SE
   (B) 15 km/hr at 53° SE
   (C) 15 km/hr at 37°
   (D) 15 km/hr at 53°

3. A bus is moving East at 20.0 m/s, while a car moves toward it at 20.0 m/s. If a man walks from the back to the front of the bus at 5.0 m/s, what is the velocity of the man relative to the car?
   (A) 35 m/s [E]
   (B) 35 m/s [W]
   (C) 45 m/s [E]
   (D) 45 m/s [W]

4. A pilot wants to travel East in an airplane with an air speed of 350 km/h. The wind is blowing from the South at 20 km/h. What should be the plane's heading?
   (A) Directly East
   (B) Slightly East of South
   (C) Slightly North of East
   (D) Slightly South of East

5. A slug traveling through a cabbage patch travels 7.0 cm [E], 5.0 cm [W], then 2.0 cm [S]. How far and in what direction did it end up with reference to its original position?
   (A) 2.8 cm [E 45 N]
   (B) 2.8 cm [N 45 W]
   (C) 2.8 cm [S 45° E]
   (D) 2.8 cm [S 45° W]

6. What is the opposite of the following vector: 20 km [N 30° E]?
   (A) 20 km [E 30 N]
   (B) 20 km [S 30 W]
   (C) 20 km [E 60° N]
   (D) 20 km [S 60° W]

7. Which of the following vectors is the same as 26 m/s [W 78° S]?
   (A) 26 m/s [E 78 N]
   (B) 26 m/s [S 12 W]
   (C) 26 m/s [S 78 W]
   (D) 26 m/s [W 12 S]

8. Truck X is traveling North at 50 km/h while directly behind it truck Y is traveling South at 30 km/h. What is the velocity of Y relative to X?
   (A) 20 km/h [N]
   (B) 20 km/h [S]
   (C) 80 km/h [N]
   (D) 80 km/h [S]

9. Three identical boats set out to cross a river that has a current. Boat A points directly across the river, boat B points 20º downstream from a point straight across the river, and boat C points 20º upstream from a point straight across the river. Which boat will arrive on the opposite shore first?
   (A) all three boats will arrive at the same time
   (B) boat A
   (C) boat B
   (D) boat C

10. The current in a river moves at 2.4 m/s [S]. How fast and in what direction must a swimmer move through the water in order to have a resultant velocity relative to the river bank of:

    A) 5.6 m/s [S] {2 marks}

    B) 5.6 m/s [N] {2 marks}

11. A motorboat heads due east at 16 m/s across a river that flows due north at 9.0 m/s.

    A) What is the resultant velocity of the boat?

    B) If the river is 136 m wide, how long does it take the motorboat to reach the other side?

    C) How far downstream is the boat when it reaches the other side of the river?

12. Andrew wants to swim across a river. To do this, he needs to swim 2.7 km [N] of his current position. When he starts, however, he forgets to consider the velocity of the current. In calm water, he can swim with a velocity of 1.2 m/s. The current has a velocity of 0.57 m/s [E].
    A) Determine Andrew's velocity relative to the shore.

B) How long will it take him to cross the river?

C) How far down the river will he land?

13. A canoeist wants to travel directly north to the opposite side of a river. The canoeist can paddle with an average speed of 4.3 m/s. The river has a current of 0.75 m/s [W].
    A) In what direction should the canoeist paddle to get directly across the river?

    B) What is the canoeist resultant velocity?

    C) How long will it take him to cross the river if the river is 450 m wide?

14. Rivka is on the east side of a river. She wants to swim to a campsite that is on the west side of the river, directly across from her current position. Rivka can swim 1.56 m/s in calm water. She notices, however, that there is a current in the water and that a flutter board travels 3.80 m [N] in 3.50 s.
    A) What direction does Rivka have to swim in order to arrive at the campsite?

    B) Calculate her velocity relative to the shore.

C) If the river is 1.85 km wide, how long does Rivka take to swim to the campsite?

15. A small aircraft heads North from Southern Hr. to Clarenville, a distance of approximately 45 km, with an air speed of 180 km/hr. The pilot does not adjust for a Westerly wind which is blowing at 60 km/hr. Determine

A) the resultant speed of the plane.

B) how much (in degrees) the plane will be blown off course.

C) how many kilometers the pilot will be away from Clarenville if she lands directly East of the community.

16. A pilot in a solar powered air plane has an air speed of 108 km/h. The pilot wants to fly directly North from Corner Brook to St. Anthony, a distance of 325 km. When she takes off, the wind is blowing from the East with a speed of 54 km/h.

A) In what direction should the pilot fly in order to seek her destination?

B) What is her velocity with respect to the ground?

C) How long did it take the pilot to fly to St. Anthony?