

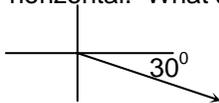
The following questions should be solved using proper vector notation

- 1) The current in a river moves at 2.0m/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 band of
- 3.6 m/s [S]? [ku:2]
 - 3.6 m/s [N]? [ku:2]
 - 3.6 m/s [E]? [ku:2]

- 2) A boat sails 8.0km [S10°E] through still water. What are the components of its displacement in each of the following directions?
- [S] [ku:2]
 - [E] [ku:2]
 - [S10°E] [ku:1]
 - [E10°N] [ku:2]

- 3) A helicopter rises with a uniform speed of 30 m/s at an angle of 50° degrees to the horizontal
- What are the vertical and horizontal components of its velocity? [ku:3]
 - How long will it take to reach an altitude of 1.00km? [ku:2]
 - What horizontal distance will it have covered by that time? [ku:2]

- 4) A ball is thrown from the top of a building with a speed of 20m/s and at a downward angle of 30° to the horizontal. What are the horizontal and vertical components of the ball's initial velocity? [ku:3]



- 5) A dog walks at 1.6 m/s on the deck of a boat that is traveling north at 7.6 m/s with respect to the water.
- What is the velocity of the dog with respect to the water if it walks toward the bow? [ku:2]
 - What is the velocity of the dog with respect to the water if it walks towards the stern? [ku:2]
 - What is the velocity of the dog with respect to the water if it walks towards the east rail, at right angles to the boat's keel? [ku:3]
- 6) An airplane maintains a heading due west at an air speed of 900km/h. It is flying through a hurricane with winds of 300 km/h, from the northeast
- In which direction is the plane moving relative to the ground? [ku:2]
 - What is the plane's ground speed? [ku:2]
 - How long would it take the plane to fly from one city to another 500km away, along the path in a) [ku:2]
- 7) A newspaper boy throws papers sideways onto the porches of his customers while riding his bicycle along the sidewalk. The sidewalk is 15m in front of the porches. The boy throws the papers at a horizontal speed of 6.0 m/s relative to himself, and rides the bicycle at a speed of 4.0 m/s relative to the sidewalk.
- With what horizontal speed do the papers actually travel relative to the ground? [ku:2]
 - How far in advance of a porch should the boy throw a paper so that it lands on target? [ku:2]
 - If he waits until he is directly opposite a porch, at what horizontal angle with respect to the sidewalk will he have to throw the paper, to hit the porch? [ku:2]
- 8) A train has a speed of 20km/h. Raindrops falling against its side windows make traces inclined at 30° to the vertical. We ignore air turbulence and there is no wind.
- What is the horizontal component of a raindrop's velocity with respect to the earth? With respect to the train? [ku:2]
 - What is the velocity of a raindrop with respect to the Earth? With respect to the train? [ku:2]
- 9) A batter strikes a baseball moving horizontally towards him at 15m/s. The ball leaves the bat horizontally at 24m/s, 40° to the left of a line from the plate to the pitcher. The ball is in contact with the bat for 0.01s. Determine
- The change in velocity of the ball. [ku:3]
 - Its average acceleration while being hit by the bat [ku:2]