

## Physics 12 – Unit 1 Practice Test

Express all final answers to 2 or 3 significant figures.

1. An aircraft is climbing with a steady speed of 240m/s at an angle of  $25^\circ$  to the horizontal. What are the horizontal and vertical components of its velocity?
2. An airplane, whose speed in still air is 200km/h, is flying with its nose pointed  $34^\circ$  [N of E]. If there is a wind blowing 50km/h towards the west, what is the ground speed of the airplane?
3. Bob is a soccer player who has just scored the winning goal in the game. Bob, who is also an observant physics student, noticed that when he received the pass, the soccer ball was moving 4.8 m/s  $8^\circ$  N of E and that after he kicked the ball it was moving at 25 m/s  $41^\circ$  E of S. What is the ball's change in velocity?
4. A cannon ball is fired horizontally at a speed of 125m/s from a height of 175m.
  - a) How long does it take to hit the ground?
  - b) Where does it land?
  - c) What is its impact velocity?
5. A golfer hits a ball at an angle of  $41^\circ$  from the ground. The ball reaches a maximum height of 22m. What horizontal distance did the ball travel?
6. A soccer ball player kicks a ball off of a level field at 25m/s at exactly  $36.9^\circ$  above the horizontal. The ball strikes the top corner of a goal post, which is 3m above the level of the field. What is the horizontal distance from the point where the ball was kicked to the corner of the goal post?  
(Note: there are 2 possible answers)
7. A car traveling at a constant speed of 30m/s passes a highway patrol car, which is at rest. The police officer accelerates at a constant rate of  $3.0 \text{ m/s}^2$  and maintains this rate of acceleration until he pulls next to the speeding car. Assume that the police car starts to move at the moment the speeder passes his car.  
Determine:
  - a) the time required for the police officer to catch the speeder
  - b) the distance traveled during the chase
8. A boat whose speed in still water is 4.1m/s must aim upstream at an angle of  $41^\circ$  with respect to the shore in order to travel directly across the stream.
  - a) What is the speed of the current?
  - b) What is the resultant velocity of the boat with respect to the shore?
9. Use your knowledge of **components** to explain, **in words**, why the speed with which a projectile is launched is the same as the speed just before it strikes the ground, assuming the launch takes place on flat ground.

**BONUS:** Joe is trying to punt a football onto the roof of his house (don't ask why) which is 11m high. If he makes contact with the ball 1m above the ground and is standing 20m from his house, what is the minimum velocity with which he must kick the ball, if its path initially made an angle of  $51^\circ$  with the ground?