

**Quiz 3**  
**Physics 220**  
**Fall 2013**

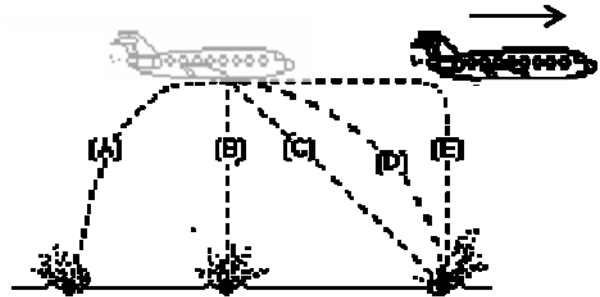
Name: \_\_\_\_\_ Group #: \_\_\_\_\_ 5 digit #: \_\_\_\_\_

1. Two metal balls are the same size but one weighs twice as much as the other. These balls are rolled off a horizontal table with the same speed. In this situation:
  - a) both balls hit the floor at approximately the same horizontal distance from the base of the table.
  - b) the heavier ball hits the floor at about half the horizontal distance from the base of the table than does the lighter ball.
  - c) the lighter ball hits the floor at about half the horizontal distance from the base of the table than does the heavier ball.
  - d) the heavier ball hits the floor considerably closer to the base of the table than the lighter ball, but not necessarily at half the horizontal distance.
  - e) the lighter ball hits the floor considerably closer to the base of the table than the heavier ball, but not necessarily at half the horizontal distance.

**Explain Why:**

2. A bowling ball accidentally falls out of the cargo bay of an airliner as it flies along in a horizontal direction.

Which path would the bowling ball most closely follow after leaving the airplane?



3. A projectile is launched with an initial speed of 30.0 m/s at an angle of  $20^\circ$  above the horizontal. The landscape is rolling hills and the projectile lands 3.00 seconds later. Neglect air resistance and use  $-9.8 \text{ m/s}^2$  for the acceleration due to Earth's gravity.
  - a. What is its velocity just before it hits the ground?

b. How far above or below the launch point must the landing site be?

4. A bus is moving at 15.0 m/s relative to the Earth. A passenger sitting in the front row throws a football to his friend in the back row. If the football is thrown with a horizontal velocity of -5.0 meters per second relative to the Earth, what is its velocity relative to the passengers in the bus? You must use relative motion notation in your work for full credit.

$$x_f = x_i + v_{xi}\Delta t + \frac{1}{2} a_x(\Delta t)^2$$

$$v_{xf} = v_{xi} + a_x\Delta t$$

$$v_{xf}^2 = v_{xi}^2 + 2a_x(\Delta x)$$

$$\sin \theta = \text{opp/hyp}$$

$$\cos \theta = \text{adj/hyp}$$

$$\tan \theta = \text{opp/adj}$$

$$a^2 + b^2 = c^2$$