# PreAP Two Dimensions 4

Realizing that many of you struggled on the quiz (even with the basic questions), I want you to do the Regular Physics homework: "Two Dimensions 2".   You have to know that information perfectly AND quickly.
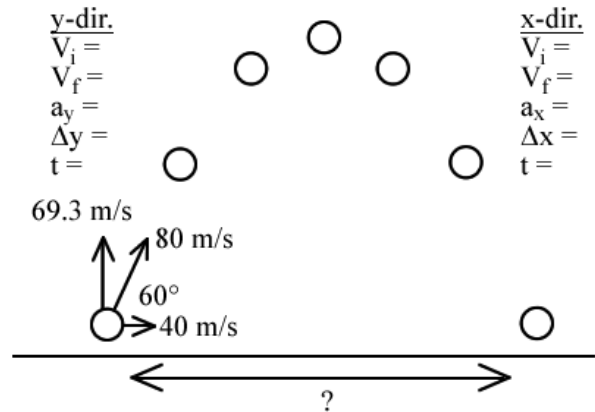
1.   A person walks 5 m east, then 10 m south, then 12 m west, then 3 m north. What is their total displacement and direction?

2.   A projectile is shot going 145 m/s at an angle of 35º, what is the projectile's initial x and y velocities?

3.   A plane flies 200 mph for 2 hours going 20º. Then it flies 250 mph for 1.5 hours going 120º. Calculate the planes total displacement (magnitude and direction, please).

4.   Imagine you are in a plane. Let's make it a cargo plane where most of the seats have been removed so you can walk freely around the plane. Let's first imagine that the plane is at rest on the ground.
   A.   If the front of the plane is 12 m away from your seat and you can walk 2 m/s, how long does it take for you to get to the front of the plane?

   B.   Now let's imagine that the plane is in the air. Let's also imagine that the plane is flying level and with no turbulence, so it is very smooth.   How long does it take for you to walk to the front of the plane?

   C.   If the plane is 6 m wide, how long does it take for you to walk the width of the plane (side to side) if it is at rest?
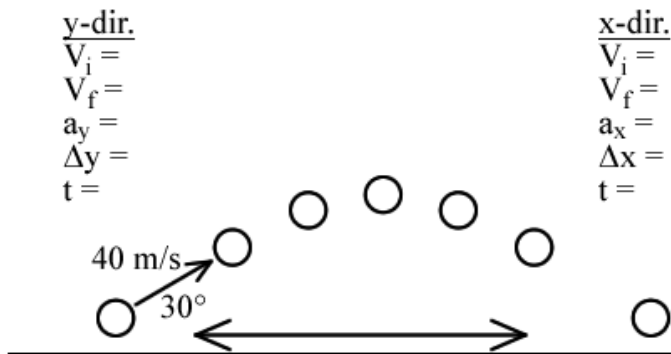   D.   How long does it take for you to walk side to side if it is flying?

$V_{Wind} = 20$ m/s
$V_{Plane} = 80$ m/s
45º

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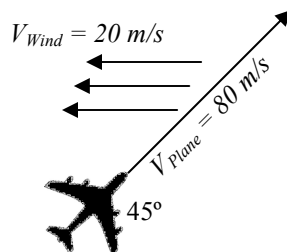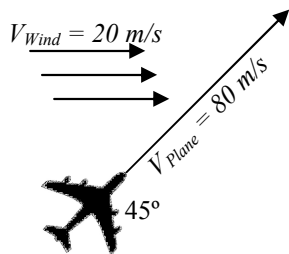
5.   A plane has a speed of 80 m/s when there is no wind.
   A.   In which of the situations shown is the wind helping the plane go faster?
   B.   In which case is the wind increasing the plane's x-velocity?
   C.   In which case is the wind decreasing the plane's y-velocity?
   D.   Find the left plane's total velocity. (Add the velocity of the plane with the velocity of the wind. Just add the vectors together.)

6. Answer the following projectile questions:
   A. What is a projectile's acceleration in the y-direction?
   B. What is the shape of a projectile's path?
   C. What is a projectile's acceleration in the x-direction?
   D. What equation can we always use in the x-direction?
   E. Given the velocity and angle of a projectile, how do we find its initial y-velocity?

   F. Given the velocity and angle of a projectile, how do we find its initial x-velocity?

7. On the diagram below, 69.3 m/s is the initial y-velocity of the projectile. 40 m/s is Vxi. The projectile is being shot from the ground to the ground.
   A. Assign variables in both directions.
   B. Write the equation you will use in the x-direction.
   C. Calculate time in the y-direction.

   y-dir.
   $V_i =$
   $V_f =$
   $a_y =$
   $\Delta y =$
   $t =$
   69.3 m/s

   80 m/s

   60°

   40 m/s

   x-dir.
   $V_i =$
   $V_f =$
   $a_x =$
   $\Delta x =$
   $t =$

   ?

   D. Calculate Δx (known as the "range"), using t from the y-direction.

   y-dir.
   $V_i =$
   $V_f =$
   $a_y =$
   $\Delta y =$
   $t =$

   40 m/s

   30°

   x-dir.
   $V_i =$
   $V_f =$
   $a_x =$
   $\Delta x =$
   $t =$

8. An object (like, say, a pudding cup) is launched from the ground at an angle of 30° and a velocity of 40 m/s. If it lands back on the ground, calculate its range.
   A. Use trig to find the initial x and y velocities.
   B. Write out the x and y variables.
   C. Solve for t in the y-direction.

   D. Use this t to find Δx.

9. Using what you have learned in the previous problems,
    A. Fill in the variables.
    B. Calculate time in the y-direction.

    C. Calculate the range.

y-dir.
$V_i =$
$V_f =$
$a_y =$
$\Delta y =$
$t =$

x-dir.
$V_i =$
$V_f =$
$a_x =$
$\Delta x =$
$t =$

12 m/s

5 m