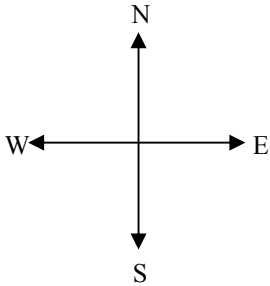# 2010-11 PreAP Two Dimensions 1

4m

θ

12m

14m

25°
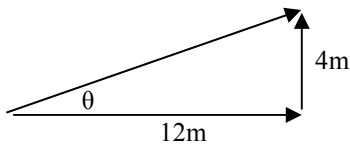
1. Solve for the length of the hypotenuse and the angle.
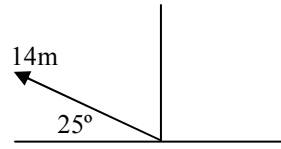
2. Calculate the x and y components of the 14 m arrow.

N

W◄————————► E

S

*Don't out think the following questions. Notice the compass directions at the left if you are con-*

3. Positive or Negative?
   A. ____ Walking east?
   B. ____ Walking north?
   C. ____ Walking south?
   D. ____ Walking west?

4. Δx or Δy?
   A. ____ Walking east?
   B. ____ Walking north?
   C. ____ Walking south?
   D. ____ Walking west?

5. A person walks 4 m north, then 8 m south, then, totally confused, walks another 10 m north. Find their displacement. (If they started at the origin, where did they end up?) *Write each individual displacements, keeping track of + and -, then solve.*

6. Another confused person walks 15 m east, then 20 m west, then 2 m east. What is their displacement?

7. A third, VERY confused person walks 30 m west, then 10 m north, then 5 m south, then 40 m east, then another 6 m north.
   A) Find Δx.   B) Find Δy.

   C) Using the Pythagorean theorem, find their total displacement (*use "$A^2 + B^2 = C^2$" Δy and Δx are A and B [doesn't matter which], C is the magnitude of their total displacement, which is always positive*).

   D) Using $\tan \theta = $ opp/adj = y/x, find their direction.

8. (*As you did before.*) A FOURTH ***PHENOMENALLY*** confused person walks 50 m north, 12 m east, 60 m west, 10 m south, and another 5 m south. Find the person's total displacement.


18 m

22 m
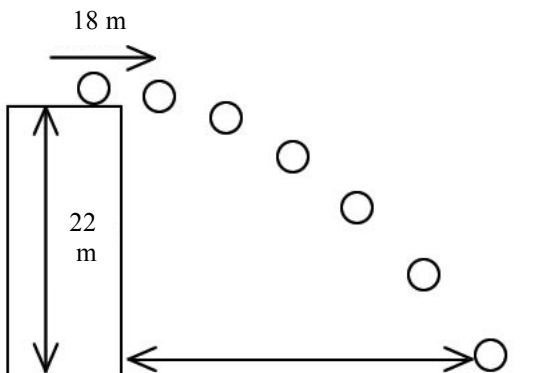
Try this on your own. See "Linear Motion 8" if you need more help.
9. An object is thrown horizontally from the top of a 22 m tall ledge.
   A. How much of horizontal is vertical?
   B. So, what is its initial y-velocity? $V_{yi} =$
   C. What is its y-direction acceleration? $a_y =$
   D. $\Delta y =$
   E. Calculate the time to the ground.

   F. $a_x =$ G. $V_x =$ H. $t_x =$
   I. Calculate how far away it lands in the x-direction.

Let me explain the grid. The non-arrow black lines are the x and y axis. The arrows represent motion (vectors). Each vector starts at the origin (0,0) and ends at the end of the arrow (the circle).   (I assume you know which is the x and y axis and which directions are positive and negative.)   To simplify things, let's make each square equal to 1 meter. When I ask for Δx or Δy I am asking for how far the object moves in the x direction and y direction from its start to its end. Since each arrow starts at the origin, the displacements are the x and y coordinates of the final position (since initial positions are 0,0). ALSO—Some displacements can be negative!!!!!

10. Which arrows have negative y coordinates?

11. Which arrows have negative x coordinates?

12. For Arrow B:

   A)   Δx = _____; Δy = _____.

   B)   Using Δx and Δy as A and B, find the total displacement of Arrow B (find "hypotenuse").

13. For Arrow A: (*notice negatives*)

   A)   Δx = _____; Δy = _____.

   B)   Find the total displacement of Arrow A.

14. Find the total displacement of Arrow C.

15. Find the total displacement of Arrow D.
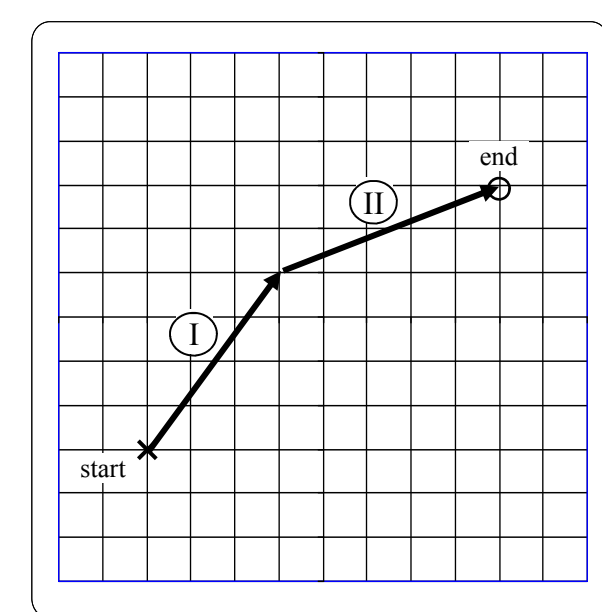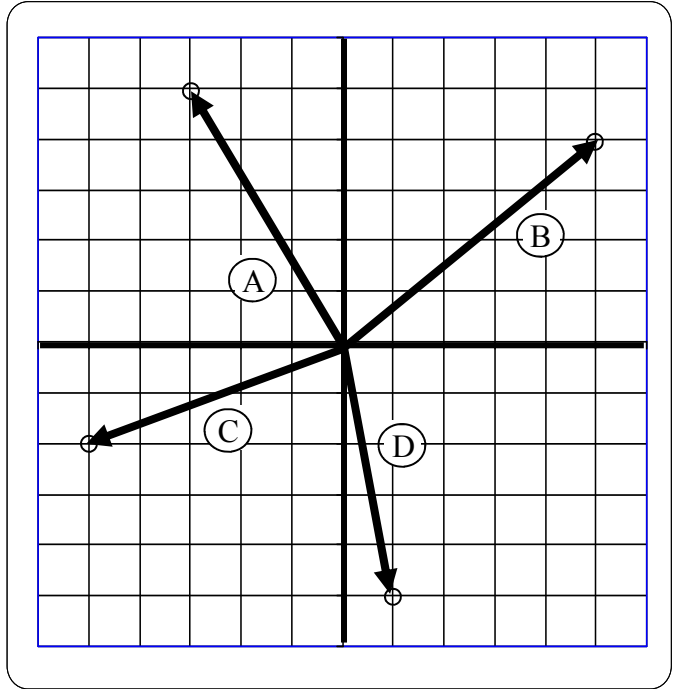
16. A similar grid (where each square is 1 m) shows the motion of a person. They walk the direction and distance of I, then II, ending up at the circle.
   A.   For I: Δx = _____ Δy = _____.
   B.   For II: Δx = _____ Δy = _____.
   C.   Totals: x_{total} = _____ y_{total} = _____.
   D.   Draw a straight line arrow from the start to the finish.
   E.   Make a triangle from your arrow:
      i.   From the end of your arrow (the circle), draw a vertical line down.
      ii. From the start of your arrow (the x), draw a horizontal line to the right that connects with your vertical line.
   F.   Using your x_{total} and y_{total} calculate the magnitude of your arrow.

   G.   Using tangent, calculate the direction of your arrow.