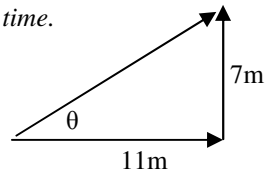
Due Fri., Sept 21

2012 PreAP Two Dimensions 1

1. Algebra works by inverse functions. So, you have to know what the inverse of each function is.
   A. The inverse of multiplication is *division*.
   B. The inverse of subtraction is _____.
   C. * The inverse of a square root is _____.
   D. * The inverse of cosine is _____.

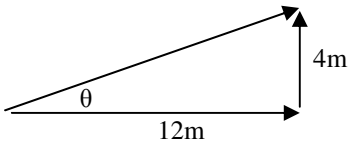
So, let me show you how to perform inverse trig functions one more time. Follow along with your calculator. Do both examples:

Ex. 1: Sin 30° = 0.5 (Push sin, then 30, then =, gives 0.5)
So, $Sin^{-1}(0.5) = 30°$ (Push Inv, then 0.5, then =, gives 30°)

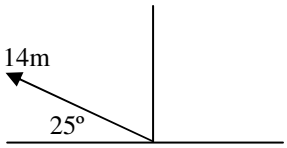


$$Tan\theta = \frac{opp}{adj} = \frac{7}{11}$$

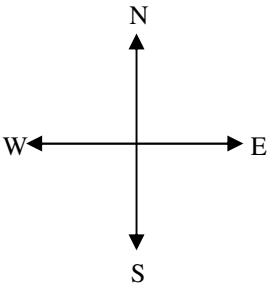
$$\theta = \tan^{-1}\left(\frac{7}{11}\right) = 32.5°$$



2. * Solve for the angle using tangent and the hypotenuse using Pythagorean theorem. (*DO NOT use the hypotenuse to find the angle.)*



3. * Calculate the x and y components of the 14 m arrow. You should know how to find the correct direction, too.



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

4. Positive or Negative?
   A. ___ Walking east?
   B. ___ Walking north?
   C. ___ Walking south?
   D. ___ Walking west?

5. Δx or Δy?
   A. ___ Walking east?
   B. ___ Walking north?
   C. ___ Walking south?
   D. ___ Walking west?

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

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

8. 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 θ = opp/adj = y/x, find their direction.

9. * (*As you did before*.) A FOURTH ***PHENOMENALLY*** confused person walks 72 m east, 30 m north, , 60 m west, 45 m south, and another 5 m south. Find the person's total displacement: magnitude and direction (*pyth and tan*).

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").

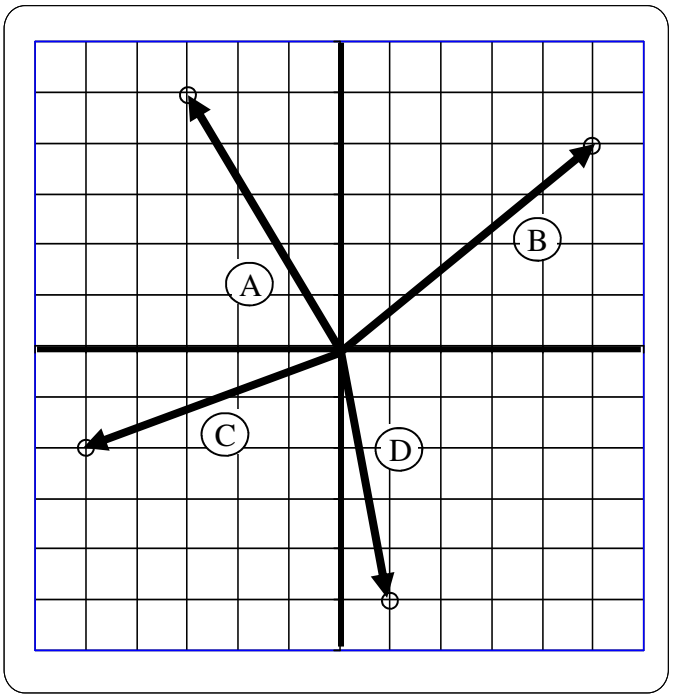
13. For Arrow A: (*notice negatives*)

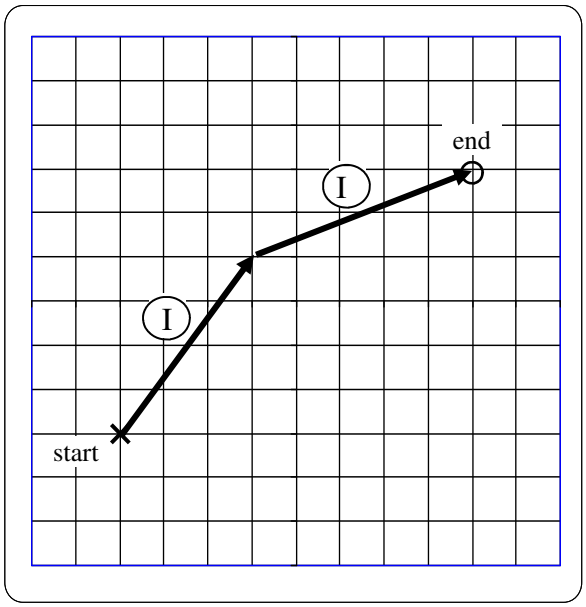
    A) Δx = _____; Δy = _____.

    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.

1C) squaring; 1D) inv cos or $\cos^{-1}$ 2) $\theta = \tan^{-1}(4/12) = 18.4°$ | Hyp = 12.6 m 3) Use 155°, so x = −12.7 m; y = 5.92 m
6) Δy = 6 m 9) Δx = +12 m; Δy = −15 m; D_{total} = 19.2 m; $\theta = \tan^{-1}(-15/12) = -51.3°$ 12A) Δx = 5; Δy = 4; H = 6.4m
14) 5.4 m 16C) x total = 8m; y total = 6m; 16G) $\theta = \tan^{-1}(6/8) = 36.9°$