Due Mon., Oct 15

2012 PreAP Two Dimensions 16

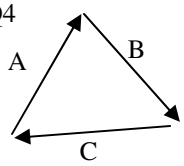
1. (Hint*) Person A walks 55 m at 38°. Then the person turns and walks 20 m directly north. A Person B starts at the same place as Person A. What direction and distance does Person B have to walk to walk straight to Person A's final position (*and what is Person B' s name*)?

Remember: the magnitude of a vector is how long the arrow is. Magnitude can never be negative (but it can be zero). The direction can be anything between 0° and 360°. Given 25 m/s at 15°, 25 m/s is the magnitude and 15° is the direction taken from the + x axis.

2. If two vectors (arrows) have unequal magnitudes (*length of A ≠ length of B*), can their sum (*addition*) ever be zero?

3. If vector A is added to vector B, how is it possible for their sum to = exactly A + B?

Q4



4. Three vectors, A, B, and C, are added together head to tail and form a closed loop, as shown. What is the total displacement of the three vectors?

Remember that a "component" is the x or y part of the triangle.

5. How can a vector have a component (*x or y*) equal to zero, but not have a nonzero magnitude (*the arrow does not equal zero*)?

6. A cannon can be shot at various angles, but has the same velocity: 42 m/s. Assume it is shot from the ground to the ground.

   A. * Calculate its range and hang time (*time in the air*) if it is shot at 20°.

   B. * Calculate its range and hang time, if it is shot at 45°.

   C. Calculate its range and hang time, if it is shot at 70°.

   D. 20°; 45°; 70°; none; or all?

   i. _____ * Has the fastest initial velocity (*total*).
   j. _____ Has the greatest vertical acceleration.
   k. _____ Has the greatest range.
   l. _____ Stays in the air the longest.
   m._____ Moves downrange fastest (*greatest Vx*).
   n. _____ Has the smallest initial Vy.

   E. (*Still working with the same information*) Why is 45° the greatest range for a projectile shot ground to ground?

   F. When the cannon is shot at 20°, what is its final x-velocity?

   G. When the cannon is shot at 45°, what is the projectile's velocity at the very top of its path?

Q1 Hint: just add vectors: (sin, cos, etc). When it says "*directly north*" the angle is 90°.
Q6A: Vyi = 14.365 m/s; Vxi = 39.467 m/s; t = 2.93 sec; range = 115.7 m.
Q6B: 180 m
Q6Di—same V = 42 m/s for all angles.