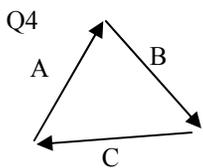


PreAP Two Dimensions 16

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 \neq 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?



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*). l. _____ Stays in the air the longest.
- j. _____ Has the greatest vertical acceleration. m. _____ Moves downrange fastest (*greatest Vx*).
- k. _____ Has the greatest range. 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: $V_{yi} = 14.365$ m/s; $V_{xi} = 39.467$ m/s; $t = 2.93$ sec; range = 115.7 m.

Q6B: 180 m

Q6Di—same $V = 42$ m/s for all angles.