

Halliday/Resnick/Walker
Fundamentals of Physics 8th edition

Classroom Response System Questions

Chapter 3 Vectors

Interactive Lecture Questions

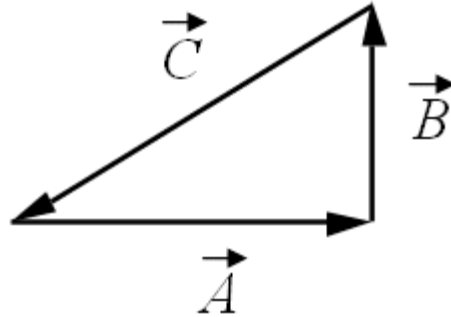
3.2.1. Which one of the following statements is true concerning scalar quantities?

- a) Scalar quantities must be represented by base units.
- b) Scalar quantities have both magnitude and direction.
- c) Scalar quantities can be added to vector quantities using rules of trigonometry.
- d) Scalar quantities can be added to other scalar quantities using rules of trigonometry.
- e) Scalar quantities can be added to other scalar quantities using rules of ordinary addition.

3.2.2. Which one of the following situations involves a vector?

- a) The submarine followed the coastline for 35 kilometers.
- b) The air temperature in Northern Minnesota dropped to $-4\text{ }^{\circ}\text{C}$.
- c) The Hubble Telescope orbits 598 km above the surface of the earth.
- d) The baseball flew into the dirt near home plate at 44 m/s.
- e) The flock of Canadian Geese was spotted flying due south at 5 m/s.

3.3.1. Which expression is *false* concerning the vectors shown in the sketch?



a) $\vec{C} + \vec{A} = -\vec{B}$

b) $\vec{C} = \vec{A} + \vec{B}$

c) $\vec{A} + \vec{B} + \vec{C} = 0$

d) $C < A + B$

e) $A^2 + B^2 = C^2$

3.3.2. Three vectors \vec{A} , \vec{B} , and \vec{C} add together to yield zero: $\vec{A} + \vec{B} + \vec{C} = 0$. The vectors \vec{A} and \vec{C} point in *opposite* directions and their magnitudes are related by the expression: $A = 2C$. Which one of the following conclusions is correct?

- a) \vec{B} and \vec{C} point in the same direction, but \vec{C} has twice the magnitude of \vec{B} .
- b) \vec{B} and \vec{C} have equal magnitudes and point in opposite directions.
- c) \vec{A} and \vec{B} point in the same direction, but \vec{A} has twice the magnitude of \vec{B} .
- d) \vec{A} and \vec{B} have equal magnitudes and point in opposite directions.
- e) \vec{B} and \vec{C} have equal magnitudes and point in the same direction.

3.3.4. Two vectors \vec{a} and \vec{b} are added together to form a vector \vec{c} . The relationship between the magnitudes of the vectors is given by $a^2 + b^2 = c^2$. Which one of the following statements concerning these vectors is true?

- a) \vec{a} and \vec{b} must be parallel.
- b) \vec{a} and \vec{b} could have any orientation relative to each other.
- c) \vec{a} and \vec{b} must be at right angles to each other.
- d) \vec{a} and \vec{b} must point in opposite directions.
- e) \vec{a} and \vec{b} must have equal lengths.

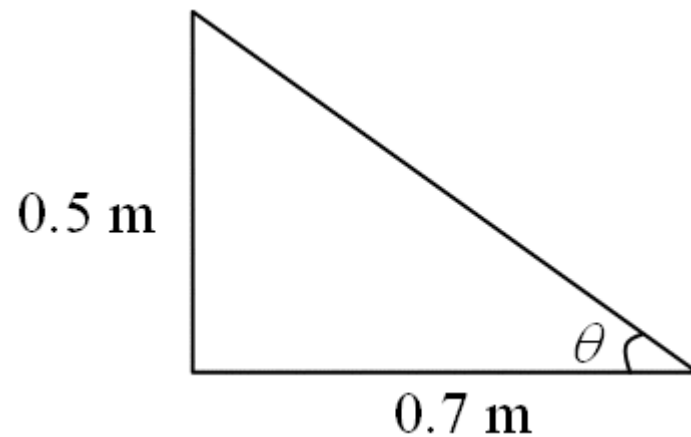
3.3.7. A physics student adds two displacement vectors with magnitudes of 8.0 km and 6.0 km. Which one of the following statements is true concerning the magnitude of the resultant displacement?

- a) The magnitude must be 14.0 km.
- b) The magnitude must be 10.0 km.
- c) The magnitude could be equal to zero kilometers, depending on how the vectors are oriented.
- d) The magnitude could have any value between 2.0 km and 14.0 km, depending on how the vectors are oriented.
- e) No conclusion can be reached without knowing the directions of the vectors.

3.4.1. During the execution of a play, a football player carries the ball for a distance of 33 m in the direction 76° north of east. To determine the number of meters gained on the play, find the northward component of the ball's displacement.

- a) 8.0 m
- b) 16 m
- c) 24 m
- d) 28 m
- e) 32 m

3.4.3. Determine the angle θ in the right triangle shown.

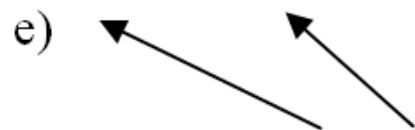
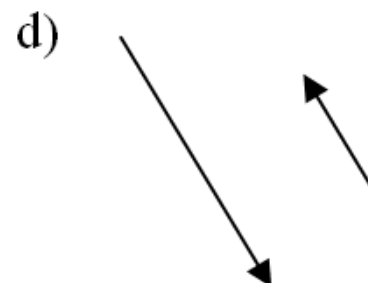
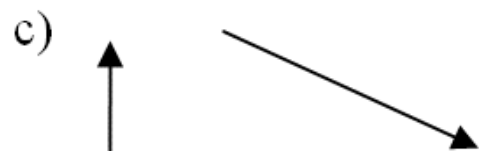
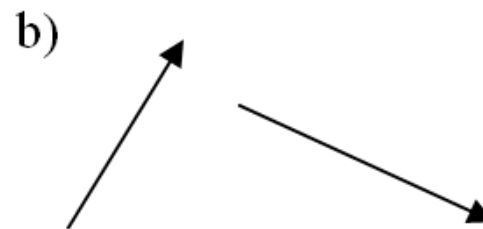
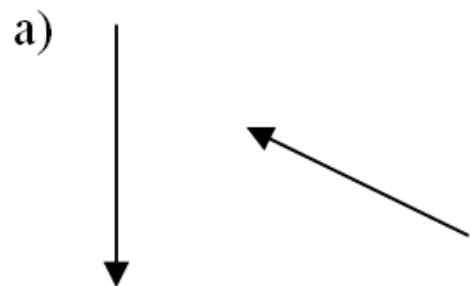


- a) 54.5°
- b) 62.0°
- c) 35.5°
- d) 28.0°
- e) 41.3°

3.4.9. An escaped convict runs 1.70 km due east of the prison. He then runs due north to a friend's house. If the magnitude of the convict's total displacement vector is 2.50 km, what is the direction of his total displacement vector with respect to due east?

- a) 43° south of east
- b) 47° north of east
- c) 56° north of east
- d) 34° south of east
- e) 34° north of east

3.8.1. Consider the various vectors given in the choices below. The cross product of which pair of vectors is equal to zero?



3.8.2. What is the scalar product, $\vec{A} \bullet \vec{B}$, if $\vec{A} = 1.1\hat{i} + 2.0\hat{j}$ and $\vec{B} = 1.0\hat{i} - 1.0\hat{j}$?

a) zero

b) -0.9

c) $1.1\hat{i} - 2.0\hat{j}$

d) 3.1

e) $0.1\hat{i} + 1.0\hat{j}$

3.8.3. What is the vector product, $\vec{A} \times \vec{B}$, if

$$\vec{A} = 2.2\hat{i} + 3.4\hat{j} \text{ and } \vec{B} = 4.4\hat{i} + 2.0\hat{j}?$$

a) zero

b) $-10.6\hat{k}$

c) $4.4\hat{i} - 15.0\hat{j}$

d) $19.4\hat{k}$

e) 8.3

3.8.4. The scalar product of two vectors, $\vec{A} \bullet \vec{B}$, can be determined in a variety of ways. Which one of the following choices is false?

- a) $\vec{A} \bullet \vec{B} = AB \cos \theta$, where θ is the smallest angle between the two vectors.
- b) The scalar product is the product of B and the component of \vec{A} in the direction of \vec{B} .
- c) The scalar product of these two vectors could be equal to zero.
- d) The scalar product is the product of A and the component of \vec{B} in the direction of \vec{A} .
- e) The scalar product is equal to the product of the magnitudes of the two vectors and the sine of the smallest angle between the two vectors.

3.8.5. The vector product of two vectors is equal to zero, but the magnitudes of the two vectors are not equal to zero. Which one of the following statements is true?

- a) Based on the definition of the vector product, this situation can never occur.
- b) The two vectors must be perpendicular to each other.
- c) The two vectors must be parallel to each other.
- d) The two vectors must be unit vectors.
- e) This can only be true if the scalar product is also equal to zero.

3.8.6. Which of the following vector operations produces a vector as the result, if the magnitudes of all of the vectors are not equal to zero?

a) $\vec{A} \bullet (\vec{B} \times \vec{C})$

b) $\vec{A} \bullet \vec{B}$

c) $(\vec{C} - \vec{B}) \bullet \vec{D}$

d) $(\vec{A} \bullet \vec{B})\vec{C}$

e) $(\vec{A} \times \vec{B}) \bullet (\vec{C} \times \vec{D})$