

## AP Physics C

### Practice Problems: "Vectors"

#### Multiple Choice Questions

1. The components of vector  $\vec{A}$  are given as follows:

$$A_x = 10.5 \quad A_y = 15.2$$

What is the magnitude of the vector?

- A. 10.5      B. 15.2      C. 18.5      D. 25.7      E. 4.7

2. The components of vector  $\vec{A}$  are given as follows:

$$A_x = 5.6 \quad A_y = -4.7$$

What is the angle between vector  $\vec{A}$  and positive direction of x – axis?

- A.  $320^\circ$       B.  $180^\circ$       C.  $90^\circ$       D.  $127^\circ$       E.  $230^\circ$

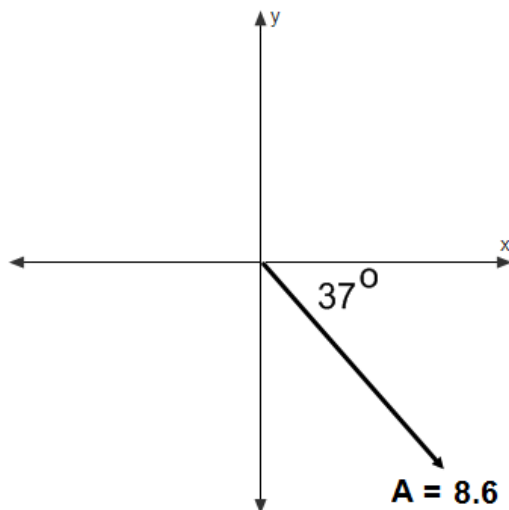
3. The components of vectors  $\vec{A}$  and  $\vec{B}$  are given as follows:

$$A_x = 5.1 \quad B_x = -2.6$$

$$A_y = -5 \quad B_y = -4.3$$

What is the magnitude of vector sum  $\vec{A} + \vec{B}$

- A. 5.1      B. 2.5      C. -9.3      D. 9.6      E. -3.8



4. The magnitude of vector  $\vec{A}$  is 8.6. Vector lies in the fourth quadrant and forms an angle of  $37^\circ$  with the x-axis. What are the components of vector  $\vec{A}$ ?

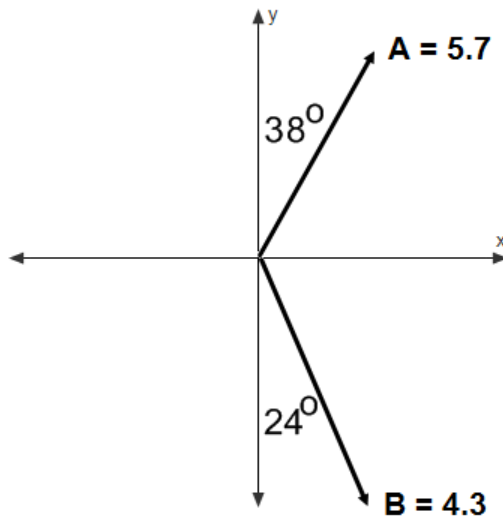
A.  $A_x = 8.6$        $A_y = -8.6$

B.  $A_x = -6.9$        $A_y = 5.2$

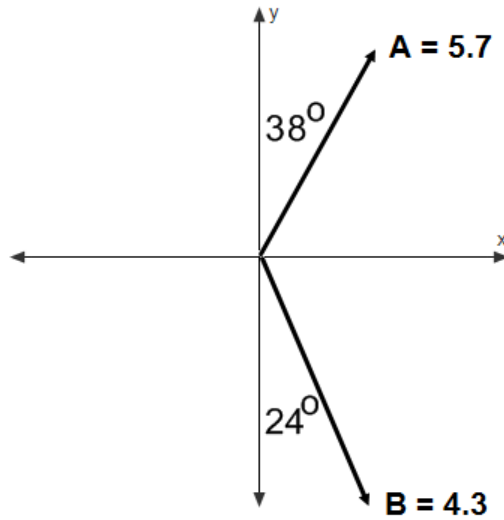
C.  $A_x = -6.9$        $A_y = -5.2$

D.  $A_x = 6.9$        $A_y = 5.2$

E.  $A_x = 6.9$        $A_y = -5.2$



5. Find the magnitude of vector  $\vec{C} = \vec{A} - \vec{B}$ . Use all the information presented by the graph.
- A. 5.7      B. 6.9      C. 7.4      D. 8.6      E. 9.7



6. Find the dot product of two vectors  $\vec{A} \cdot \vec{B}$ . Use all the information presented by the graph.
- A. 8.6      B. 3.5      C. -11.6      D. -17.5      E. 9.4

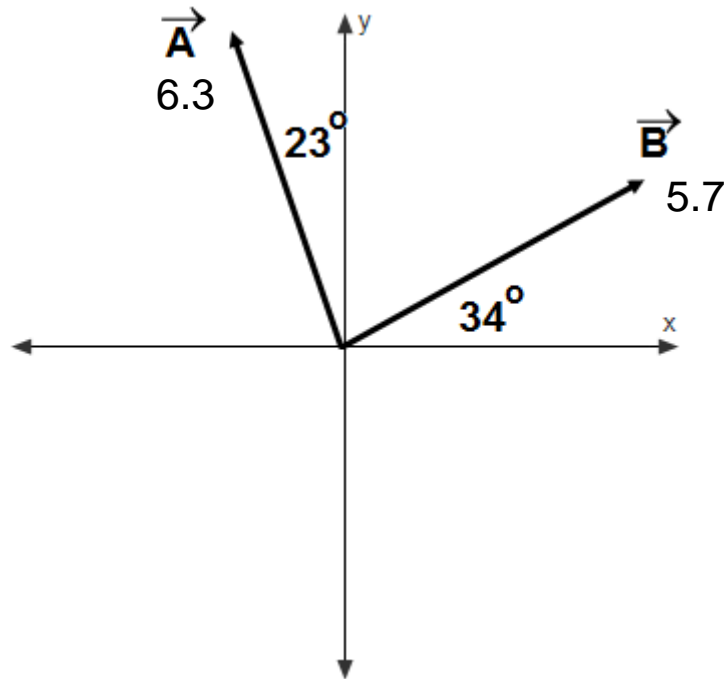
7. Two vectors are given as follows:

$$\vec{A} = -2\mathbf{i} - 5\mathbf{j} + 2\mathbf{k} \quad \vec{B} = -4\mathbf{i} - 2\mathbf{j} - 3\mathbf{k}$$

What is the angle between the vectors?

- A.  $114^\circ$       B.  $67^\circ$       C.  $41^\circ$       D.  $132^\circ$       E.  $94^\circ$

Vectors  $\vec{A}$  and  $\vec{B}$  are shown. Vector  $\vec{C}$  is given by  $\vec{C} = \vec{B} - \vec{A}$ . Please refer to this figure for problems 8-9.



8. The magnitude of  $\vec{C}$  is closest to  
 a) 3.9      b) 5.9      c) 6.8      d) 7.7      e) 8.4
9. The angle, measured from the x-axis to vector  $\vec{C}$ , in degrees, is closest to:  
 a) 20°      b) 34°      c) 67°      d) 70°      e) 82°

10. The components of vector  $\vec{Z}$  are given as follows:

$$Z_x = 10.7 \quad Z_y = 8.3$$

What is the magnitude of the vector?

- a) 7.8      b) 9.5      c) 14.2      d) 16      e) 13.6
11. The components of vector  $\vec{Q}$  are given as follow:  
 $Q_x = 23.5 \quad Q_y = 18.6$   
 What is the measure of the angle, in degrees, that the resultant vector makes with the x-axis?  
 a) 38.4°      b) 47.9°      c) 56.3°      d) 62°      e) 74.7°

12. The components of vectors  $\vec{U}$  and  $\vec{V}$  are given as follow:

$$U_x = -8.6 \quad V_x = 10.7$$

$$U_y = 9.4 \quad V_y = 4.1$$

What is the magnitude of the vector sum  $\vec{U} + \vec{V}$ ?

- a) 9.8      b) 13.7      c) 14.6      d) 15.3      e) 16.9

13. Which of the following statements is true?

- a) A scalar quantity can be added to a vector  
b) It is possible for the magnitude of a vector to equal zero even though one of its components is non-zero  
c) Scalar quantities are path dependent, while vectors are not.  
d) Scalar quantities and vector quantities can both be added algebraically  
e) A scalar contains magnitude and direction while a vector does not.

Questions 14-16:

Two vectors are given as follows:

$$\vec{A} = -3\vec{i} + 6\vec{j} - 5\vec{k}$$

$$\vec{B} = -2\vec{i} + 3\vec{j} + \vec{k}$$

14. The vector dot product  $\vec{A} \cdot \vec{B}$  equals:

- a) -12      b) 10      c) 14      d) 19      e) 20

15. The difference between vectors  $\vec{A}$  and  $\vec{B}$  is:

a)  $-\vec{i} + 9\vec{j} - 4\vec{k}$

b)  $-\vec{i} + 3\vec{j} - 6\vec{k}$

c)  $-3\vec{i} + 3\vec{j} - 6\vec{k}$

c)  $-5\vec{i} + 9\vec{j} - 4\vec{k}$

d)  $-6\vec{i} + 18\vec{j} - 5\vec{k}$

16. The magnitude of the sum of the vectors  $\vec{A}$  and  $\vec{B}$  is most nearly:

- a) 6.8      b) 7.4      c) 9.0      d) 10.4      e) 11

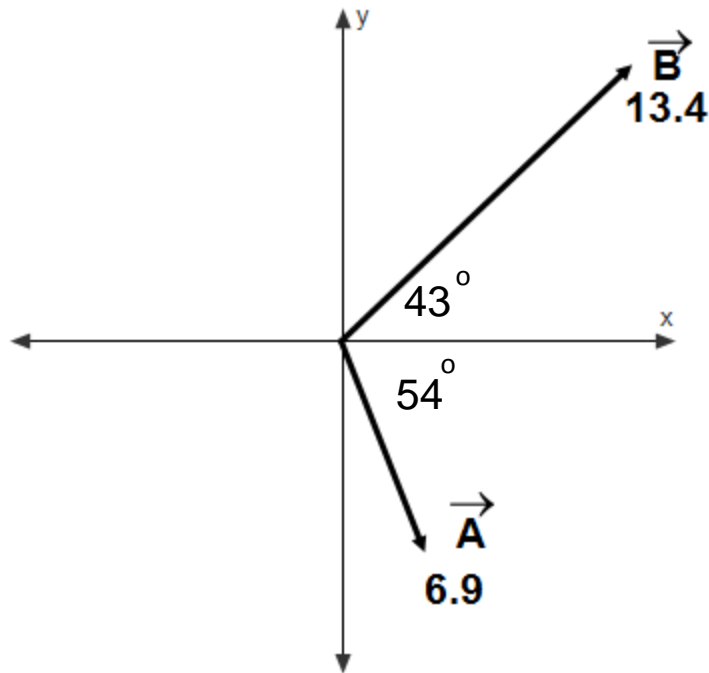
17. The components of vector  $\vec{E}$  are as follows:

$$E_x = -34.8 \quad E_y = -23.6$$

What is the measure of the angle, in degrees, formed by vector  $\vec{E}$  and +x-axis?

- a) -145.9      b) 214.1      c) 34.1      d) 145.9      e) 195.7

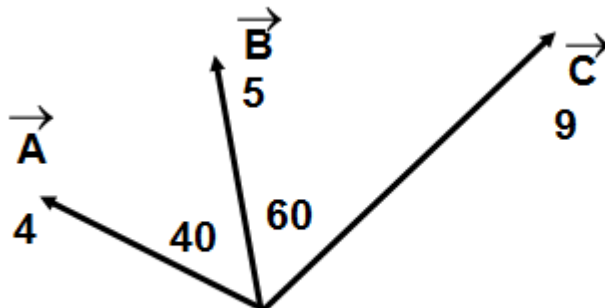
Vectors  $\vec{A}$  and  $\vec{B}$  are shown. Vector  $\vec{C}$  is given by  $\vec{C} = \vec{A} + \vec{B}$ . Refer to this figure for problems 18-19.



18. What is the magnitude of vector  $\vec{C}$ ?

- a) 4.7      b) 11.9      c) 14.3      d) 16.7      e) 17.2

Three Vectors are given as shown. Refer to this figure for numbers 19-21.



19. In the figure above, the magnitude and direction of the vector product  $\vec{A} \times \vec{B}$  are closest to:

- a) 20, directed out of the plane.
- b) 20, directed into the plane.
- c) 13, directed out of the plane.
- d) 13, directed into the plane.
- e) 13, directed on the plane.

20. The magnitude and direction of the vector product  $\vec{C} \times \vec{B}$  are closest to

- a) 23, directed into the page.
- b) 23, directed out of the page.
- c) 23, directed on the plane.
- d) 39, directed into the page.
- e) 39, directed out of the page.

21. The scalar dot product of  $\vec{A} \cdot \vec{B}$  is closest to:

- a) 15                  b) 10                  c) 17                  d) 21                  e) 25

22. Two vectors are given as follows:

$$\vec{A} = -2\mathbf{i} - 5\mathbf{j} + 2\mathbf{k} \quad \vec{B} = -5\mathbf{i} - 2\mathbf{j} - 3\mathbf{k}$$

Find the magnitude of the following vector:  $\vec{A} \times \vec{B}$ .

- A. 12                  B. 43                  C. 18                  D. 26                  E. 31

Answer Key.

1. C
2. A
3. D
4. E
5. D
6. C
7. B
8. D
9. A
10. E
11. A
12. B
13. C
14. D
15. B
16. E
17. A
18. C
19. D
20. E
21. A
22. E