

Chapter (3): VECTORS

Choose the correct answer:

1. A vector has two components ($\mathbf{A}_x = 3 \text{ cm}$ and $\mathbf{A}_y = -4 \text{ cm}$). What is the **magnitude of $\vec{A}$** ?

- (a) 4 cm (b) 5 cm (c) 1 cm (d) 7 cm

2. In question 2, What is the **direction of $\vec{A}$** ?

- (a) -53.1° (b) -25.3° (c) -17.9° (d) -36.9°

3. Given the two vectors $\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 3\hat{k}$, Find $\vec{c}$ where $\vec{c} = \vec{a} + \vec{b}$?

- (a) $\vec{c} = 3\hat{i} + 5\hat{j} + 7\hat{k}$ (b) $\vec{c} = 3\hat{i} + \hat{j} + 7\hat{k}$ (c) $\vec{c} = \hat{i} + \hat{j} + 7\hat{k}$ (d) $\vec{c} = \hat{i} + 5\hat{j} + \hat{k}$

4. In question 3, Find $\vec{a} \cdot \vec{b}$?

- (a) 5 (b) 15 (c) 20 (d) 8

5. Vectors $\vec{C}$ and $\vec{D}$ have magnitudes of **3 units** and **4 units** respectively. What is the **angle between the directions of $\vec{C}$ and $\vec{D}$ if $\vec{C} \times \vec{D} = 12$**

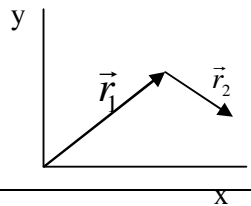
- (a) 90° (b) 180° (c) 270° (d) 0°

6. A vectors $\vec{a}$ has two component, $a_x = 2.6 \text{ m}$, $a_y = -2.3 \text{ m}$, what is the **direction of $\vec{a}$** ?

- (a) -48.5° (b) 48.5° (c) -41.3° (d) 41.3°

7. In the figure **what are the signs of the x and y component of $\vec{r}_1 + \vec{r}_2$** ?

- (a) $(+, +)$ (b) $(-, -)$ (c) $(+, -)$ (d) $(-, +)$

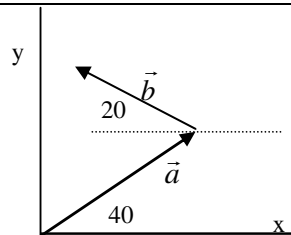


8. If $\vec{a} \times \vec{b} = \vec{c}$ then **the value of c_y** equals:

- (a) $a_z b_x - b_z a_x$ (b) $a_x b_y - b_x a_y$ (c) $a_y b_z - b_y a_z$ (d) $a_y b_x - b_y a_x$

9. Two vectors $\vec{a}$ and $\vec{b}$, $\vec{a}$ has a magnitude of **12 m** and has an **angle of 40°** from the +x direction, and $\vec{b}$ has a magnitude of **9 m** in the **direction shown**. Find the **x component of their vector sum**?

- (a) 17.65 m (b) 10.79 m (c) 0.73 m (d) 3.21 m



10. Two vectors $\vec{a} = (4m)\hat{i} - (3m)\hat{j}$ and $\vec{b} = (6m)\hat{i} + (8m)\hat{j}$, What is **the magnitude** of $\vec{a}$?

- (a) 1 m (b) 4 m (c) 5 m (d) 7 m

11. In **question 10**, find $\vec{a} + \vec{b}$?

- (a) $10\hat{i} + 5\hat{j}$ (b) $2\hat{i} + 11\hat{j}$ (c) $10\hat{i} + 11\hat{j}$ (d) $9\hat{i} + 12\hat{j}$

12. In **question 10**, Find $\vec{a} \cdot \vec{b}$?

- (a) 1 (b) 24 (c) 48 (d) zero

13. In **question 10**, Find $\frac{\vec{b}}{2}$?

- (a) $3\hat{i} + 4\hat{j}$ (b) $-3\hat{i} - 4\hat{j}$ (c) $12\hat{i} + 16\hat{j}$ (d) $-12\hat{i} - 16\hat{j}$

14. Given the two vectors $\vec{a} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{b} = \hat{i} - 2\hat{j} + 3\hat{k}$, Find $\vec{c}$ where $\vec{c} = \vec{a} + \vec{b}$?

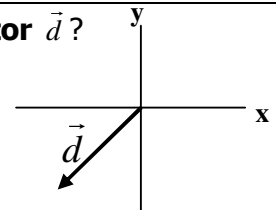
- (a) $\vec{c} = 3\hat{i} + 5\hat{j} + 7\hat{k}$ (b) $\vec{c} = 3\hat{i} + \hat{j} + 7\hat{k}$ (c) $\vec{c} = \hat{i} + \hat{j} + 7\hat{k}$ (d) $\vec{c} = \hat{i} + 5\hat{j} + \hat{k}$

15. Vector $\vec{A}$ has a **magnitude of 6 units** and is in the **direction of positive x-axis**, vector $\vec{B}$ has a **magnitude of 4 units** and making an angle of **30° with the positive x-axis**. What is the **magnitude of $\vec{A} \times \vec{B}$** ?

- (a) 12 units (b) 24 units (c) 20.8 units (d) 28 units

16. In the figure, what is the **signs of the x and y components of vector $\vec{d}$** ?

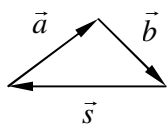
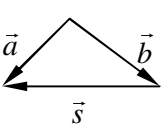
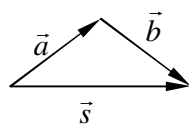
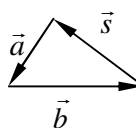
- (a) (+ , +) (b) (+ , -) (c) (- , -) (d) (- , +)



17. Two vectors : $\vec{A} = 2\hat{i} + 3\hat{j} + 4\hat{k}$ and $\vec{B} = \hat{i} - 2\hat{j} + 3\hat{k}$. Find $\vec{A} \cdot \vec{B}$?

- (a) 5 (b) 15 (c) 20 (d) 8

18. Which figure of the following represent the relation $\vec{s} = \vec{a} + \vec{b}$:

- (a)  (b)  (c)  (d) 

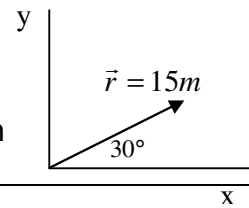
19. from the figure, the **y component** of the vector $\vec{r}$ equals:

(a) 13 m

(b) 7.5 m

(c) 8.7 m

(d) 7.8 m



20. Which one of the following is the **scalar quantity**?

(a) Displacement

(b) Length

(c) Velocity

(d) acceleration

21. Vector $\vec{A}$ has two components, $A_x = -25 \text{ m}$, $A_y = 40 \text{ m}$, what is the direction of $\vec{A}$?

(a) 32°

(b) -32°

(c) 58°

(d) -58°

22. If the **x component** of vector $\vec{r}$ is **2.6 m** and the **y component** is **-2.3 m** then $\vec{r}$ in **unit-vector notation** is:

(a) $2.6 \hat{i} - 2.3 \hat{j}$

(b) $-2.3 \hat{i} + 2.6 \hat{j}$

(c) $2.6 \hat{i} - (-2.3) \hat{j}$

(d) $2.6 \hat{i} - 2.3 \hat{j} + \hat{k}$

23. Vector $\vec{c}$ has the **magnitude of 36**, what is the magnitude of $\frac{\vec{c}}{4} - 9$?

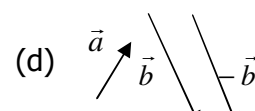
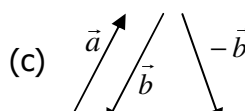
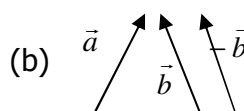
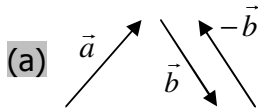
(a) zero

(b) 6

(c) 9

(d) 27

24. Which one of the following figures **shows the three vectors** $\vec{a}$, $\vec{b}$ **and** $-\vec{b}$:



25. Two vectors are given by: $\vec{a} = 4\hat{i} - 3\hat{j} + \hat{k}$ **and** $\vec{b} = 6\hat{i} + 8\hat{j} + 4\hat{k}$

Find $\vec{c}$ **where** $\vec{a} - \vec{b} + \vec{c} = 0$

(a) $4\hat{i} - 3\hat{j} + \hat{k}$

(b) $2\hat{i} + 11\hat{j} + 3\hat{k}$

(c) $-2\hat{i} - 5\hat{j} + \hat{k}$

(d) $\hat{i} + 3\hat{j} + 11\hat{k}$

26. If **the angle between** $\vec{A}$ **and** $\vec{B}$ **is** 60° , and **A = 5 units, B = 6 units**, then **the magnitude** of the **vector product** $\vec{A} \times \vec{B}$ is:

(a) 30

(b) 20.89

(c) 15

(d) 25.98

27. For the following two vectors: $\vec{A} = 2\hat{i} + 3\hat{j} - 4\hat{k}$, $\vec{B} = -3\hat{i} + 4\hat{j} + 2\hat{k}$. **Find** $\vec{A} \cdot \vec{B}$

(a) -4

(b) -2

(c) -8

(d) -10

28. In question 27, the **magnitude** of vector $\vec{A}$ equals:

(a) 5.4

(b) 3

(c) 1.7

(d) 4.2

29. If $\vec{a} \times \vec{b} = \vec{c}$ then **the value of** c_x equals:

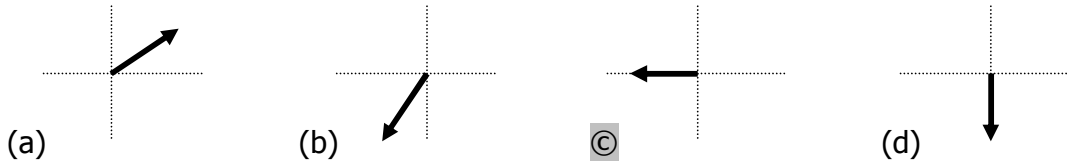
(a) $a_z b_x - b_z a_x$

(b) $a_x b_y - b_x a_y$

(c) $a_y b_z - a_z b_y$

(d) $a_y b_x - b_y a_x$

30. Which **vector** of the following has the **y-component equals zero**:

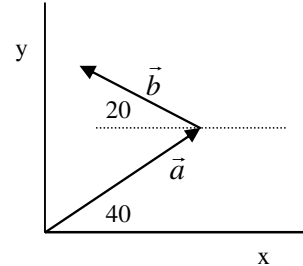


31. Vectors $\vec{C}$ and $\vec{D}$ have magnitudes of **3 units** and **4 units** respectively. What is the **angle between the directions of $\vec{C}$ and $\vec{D}$ if $\vec{C} \cdot \vec{D} = 12$ units?**

- (a) 90° (b) 180° (c) 270° (d) 0°

32. Two vectors $\vec{a}$ and $\vec{b}$ shown in the figure, if $\vec{r} = \vec{a} + \vec{b}$ then :

- (a) $r_x = a \cos 40 + b \cos 20$
 (b) $r_x = a \cos 40 + b \cos 160$
 (c) $r_x = a \sin 40 + b \sin 20$
 (d) $r_x = a \sin 40 + b \sin 160$

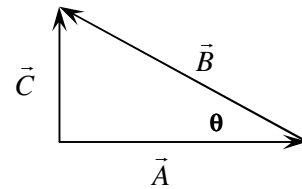


33. If $\vec{A} = 3\hat{i} - 3\hat{j}$ and $\vec{B} = \hat{i} - 2\hat{j}$, then $\vec{A} - 2\vec{B} =$

- (a) $\hat{i} + \hat{j}$ (b) $2\hat{i} - \hat{j}$ (c) $5\hat{i} - 7\hat{j}$ (d) $4\hat{i} - 5\hat{j}$

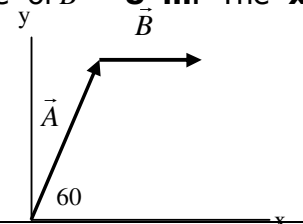
34. The vector $\vec{B}$ in the diagram is equal to:

- (a) $\vec{B} = \vec{A} - \vec{C}$
 (b) $\vec{B} = \vec{A} + \vec{C}$
 (c) $\vec{B} = \vec{C} - \vec{A}$
 (d) $\vec{B} = -\vec{A} - \vec{C}$



35. In the diagram, the magnitude of $\vec{A} = 12$ m and the magnitude of $\vec{B} = 8$ m. The **x component** of $\vec{A} + \vec{B} =$

- (a) 14 m (b) 10 m (c) 6 m (d) 18.4 m



36. Vectors $\vec{A}$ and $\vec{B}$ each has **magnitude 4** and the angle between them is **30°** . The value of $\vec{A} \cdot \vec{B} =$

- (a) 3.46 (b) 13.86 (c) 16 (d) 8

37. Let $\vec{C} = \vec{A} \times \vec{B}$ and ϕ is the angle between $\vec{A}$ and $\vec{B}$, which of the following is **true**?

- (a) The magnitude of $\vec{C} = AB \cos \phi$ (c) $-\vec{C} = \vec{B} \times \vec{A}$
 (b) $\vec{A} \times \vec{B} = \vec{B} \times \vec{A}$ (d) The angle between $\vec{C}$ and $\vec{A} = 0^\circ$

38. Vectors $\vec{a}$ and $\vec{b}$ have magnitudes **5 units** and **2 units**, respectively. If $\vec{a} \times \vec{b} = 5$ units, then the **angle ϕ** between $\vec{a}$ and $\vec{b}$ equals:

- (a) 0° (b) 30° (c) 60° (d) 90°

39. If vector $\vec{A} = 6\hat{i} - 8\hat{j}$ then $4\vec{A}$ has a **magnitude** :

- (a) 10 (b) 20 (c) 30 (d) 40

40. A vector $\vec{a}$ has a **magnitude of 25 m** and an **$a_x = 12$ m**. The **angle** it makes with the positive x axis is:

- (a) 26° (b) 29° (c) 61° (d) 64°

41. Let $\vec{A} = 2\hat{i} + 6\hat{j} - 3\hat{k}$ and $\vec{B} = 4\hat{i} + 2\hat{j} + \hat{k}$. The **vector sum** $\vec{S} = \vec{A} + \vec{B}$ is:

- (a) $6\hat{i} + 8\hat{j} - 2\hat{k}$ (b) $-2\hat{i} + 4\hat{j} - 4\hat{k}$ (c) $2\hat{i} - 4\hat{j} + 4\hat{k}$ (d) $8\hat{i} + 12\hat{j} - 3\hat{k}$

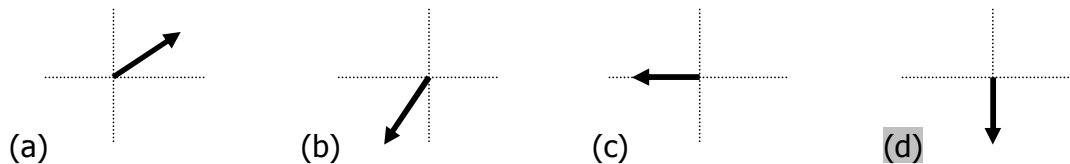
42. Let $\vec{A} = 2\hat{i} + 6\hat{j} - 3\hat{k}$ and $\vec{B} = 4\hat{i} + 2\hat{j} + \hat{k}$. Then $\vec{A} \cdot \vec{B} =$

- (a) $8\hat{i} + 12\hat{j} - 3\hat{k}$ (b) $12\hat{i} - 14\hat{j} - 20\hat{k}$ (c) 23 (d) 17

43. Vectors $\vec{A}$ and $\vec{B}$ each have **magnitude L**. When the angle between them is **60°** . The **magnitude** of $\vec{A} \times \vec{B}$ is:

- (a) $0.5 L^2$ (b) L^2 (c) $0.866 L^2$ (d) $2 L^2$

44. Which **vector** of the following has the **x-component equals zero**:



45. The **angle between** $\vec{A} = -25\hat{i} + 45\hat{j}$ and the x axis is

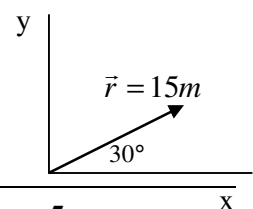
- (a) -29° (b) 29° (c) -60.9° (d) 60.9°

46. Let $\vec{V} = 2\hat{i} + 6\hat{j} - 3\hat{k}$. The **magnitude of** $\vec{V}$ is

- (a) 5 (b) 5.57 (c) 7 (d) 7.42

47. from the figure, the **y component** of the vector $\vec{r}$ equals:

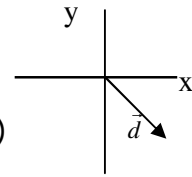
- (a) 13 m (b) 7.5 m (c) 8.7 m (d) 7.8 m



48. In the figure, what is **the signs of the x and y components**

Of the vector $\vec{d}$:

- (a) (+ , +) (b) (- , -) (c) (+ , -) (d) (- , +)



49. Two vectors are given by: $\vec{a} = 4\hat{i} - 3\hat{j} + \hat{k}$ and $\vec{b} = 6\hat{i} + 8\hat{j} + 4\hat{k}$

Find $\vec{c}$ where $\vec{a} - \vec{b} + \vec{c} = 0$

- (a) $4\hat{i} - 3\hat{j} + \hat{k}$ (b) $2\hat{i} + 11\hat{j} + 3\hat{k}$ (c) $-2\hat{i} - 5\hat{j} + \hat{k}$ (d) $\hat{i} + 3\hat{j} + 11\hat{k}$

50. For the following two vectors: $\vec{A} = 2\hat{i} + 3\hat{j} - 4\hat{k}$, $\vec{B} = -3\hat{i} + 4\hat{j} + 2\hat{k}$

Find $\vec{A} \cdot \vec{B}$

- (a) - 4 (b) - 2 (c) - 8 (d) - 10

51. Vector $\vec{a}$ has three components, $a_x = 10 \text{ m}$, $a_y = 10 \text{ m}$, and $a_z = 5 \text{ m}$. Its magnitude is:

- (a) 225 m (b) 25 m (c) 20 m (d) 15 m

52. If $\vec{A} = 2\hat{i} + 6\hat{j} - 3\hat{k}$ and $\vec{B} = 4\hat{i} + 2\hat{j} + \hat{k}$. Then $\vec{A} - \vec{B} =$

- (a) $6\hat{i} + 8\hat{j} - 2\hat{k}$ (b) $-2\hat{i} + 4\hat{j} - 4\hat{k}$ (c) $2\hat{i} - 4\hat{j} + 4\hat{k}$ (d) $8\hat{i} + 12\hat{j} - 3\hat{k}$

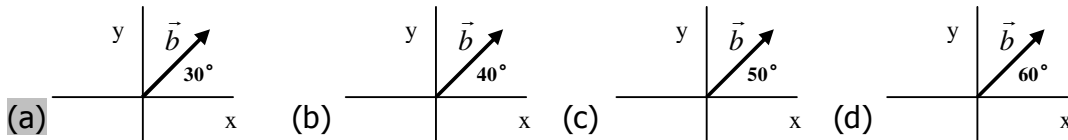
53. Vectors $\vec{C}$ and $\vec{D}$ have magnitudes of **3 units** and **4 units** respectively. What is the **angle between the directions of $\vec{C}$ and $\vec{D}$ if $\vec{C} \cdot \vec{D} = 12 \text{ units}$?**

- (a) 90° (b) 180° (c) 270° (d) 0°

54. The vector $-\vec{b}$ has the same **magnitude** as the vector $\vec{b}$ but

- (a) perpendicular to $\vec{b}$ (c) the opposite direction of $\vec{b}$
(b) parallel to $\vec{b}$ (d) the same direction of $\vec{b}$

55. In which figure of the following $b_x = 8.7 \text{ m}$? ($b = 10 \text{ m}$)



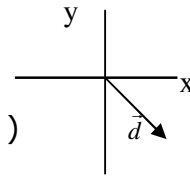
56. The components of $\vec{a}$ are: $a_x = 3 \text{ m}$, and $a_y = 4 \text{ m}$, the **direction** of $\vec{a}$ is:

- (a) 66.8° (b) 63.4° (c) 59° (d) 53.13°

57. In question 59, the magnitude of $\vec{a}$ is:

- (a) 6.71 m (b) 5.83 m (c) 7.62 m (d) 5 m

58. In the figure, the signs of the x and y components of the vector $\vec{d}$ are:



- (a) (+ , +) (b) (- , -) (c) (+ , -) (d) (- , +)

59. The vector product $\hat{j} \times \hat{k}$ is equal to:

- (a) 0 (b) 1 (c) $\hat{i}$ (d) $-\hat{i}$

60. If $\vec{a} = 4\hat{i} - 3\hat{j}$ and $\vec{b} = 6\hat{i} + 8\hat{j}$, then $\vec{b} - \vec{a} =$

- (a) $4\hat{i} - 3\hat{j}$ (b) $2\hat{i} + 11\hat{j}$ (c) $-2\hat{i} - 5\hat{j}$ (d) $\hat{i} + 3\hat{j}$

61. If $A = 4$ units, $B = 6$ units, and the angle $\phi = 60^\circ$, then the magnitude of the vector product $\vec{A} \times \vec{B}$ is:

- (a) 31.2 units (b) 20.78 units (c) 15.6 units (d) 25.98 units

62. For the following two vectors: $\vec{A} = 2\hat{i} + 3\hat{j} - 4\hat{k}$, $\vec{B} = -3\hat{i} + 2\hat{j} + 2\hat{k}$. Find $\vec{A} \cdot \vec{B}$

- (a) -5 (b) -2 (c) -8 (d) -11

63. If $C = 3$ units, $D = 4$ units and $\vec{C} \cdot \vec{D} = -12$ units then the angle between the directions of $\vec{C}$ and $\vec{D}$ is:

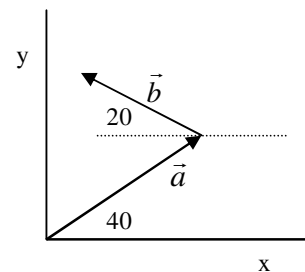
- (a) 90° (b) 180° (c) 270° (d) 0°

64. If $\vec{D} = 5\hat{i} + 25\hat{j}$, then $\frac{\vec{D}}{5}$ equals:

- (a) $5\hat{i} + \hat{j}$ (b) $\hat{i} + 5\hat{j}$ (c) $5\hat{i} - \hat{j}$ (d) $\hat{i} - 5\hat{j}$

65. Two vectors $\vec{a}$ and $\vec{b}$ shown in the figure, if $\vec{r} = \vec{a} + \vec{b}$ then :

- (a) $r_x = a \cos 40 + b \cos 20$
(b) $r_x = a \cos 40 + b \cos 160$
(c) $r_x = a \sin 40 + b \sin 20$
(d) $r_x = a \sin 40 + b \sin 160$



Are the following statements (True ✓) or (False ✗) ?

66. The component of a vector is the projection of the vector (مسقط المتجه) on an axis.

- (a) True (b) False

67. The magnitude of $\vec{A} \cdot \vec{B}$ is maximum when the angle between $\vec{A}$ and $\vec{B}$ is 90° .

(a) True (b) False

68. The value of $\hat{i} \cdot (\hat{j} \times \hat{k})$ is zero.

(a) True (b) False

69. a_x and a_y are vector components of $\vec{a}$.

(a) True (b) False

70. The magnitude of the unit vector equals 1.

(a) True (b) False