MahaManthan ASSIGNMENT

Vector

Assignment-01
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1. The magnitude of a vector is always a positive value. **True/False**

2. A scalar quantity has both magnitude and direction. **True/False**

3. Two vectors are equal only if they have the same magnitude and the same direction. **True/False**

4. If A and B are two vectors, then A + B has the same magnitude as B + A. **True/False**

5. Adding a vector to a scalar quantity is a valid mathematical operation. **True/False**

6. If a vector is multiplied by a positive scalar, its direction changes. **True/False**

7. If A and B are perpendicular vectors, then their dot product (A . B) is zero. **True/False**

8. The cross product of two parallel vectors is a vector pointing perpendicular to both. **True/False**

9. The magnitude of the cross product of two vectors A and B is given by AB sin θ, where θ is the angle between them. **True/False**

10. A unit vector has a magnitude of one and indicates the direction of a vector. **True/False**

11. The resultant of two vectors is always greater than or equal to the magnitude of either individual vector. **True/False**

12. If a vector is resolved into its rectangular components, the sum of the magnitudes of the components is equal to the magnitude of the original vector. **True/False**

13. Torque is a scalar quantity because it is the result of a force acting at a distance. **True/False**

14. The area of a parallelogram formed by two vectors A and B is equal to the magnitude of their cross product, $|A \times B|$. **True/False**

15. If the scalar product of two vectors is equal to the magnitude of their vector product, then the angle between them is 45°. **True/False**

16. If a vector A makes an angle θ with the positive x-axis, its x component is always $|A| \cos \theta$, regardless of the quadrant. **True/False**

17. Parallel vectors have the same magnitude but not necessarily the same direction. **True/False**

18. Equivalent vectors have the same magnitude and direction. **True/False**

19. Opposite vectors have a negative magnitude. **True/False**

20. The resultant vector is the vector formed by adding two vectors. **True/False**

21. To subtract a vector from a given vector, add the opposite vector to the given vector. **True/False**

22. To multiply two vectors, multiply their magnitudes and add their direction angles. **True/False**

23. The scalar multiplication of a vector results in another vector having the same direction. **True/False**

24. A child pulling a wagon with a force of 100 N at 30° to the horizontal is an example of a vector. **True/False**

25. A single vector can be replaced by two vectors in the X and Y directions. These X and Y vectors are called the resultant of the original vector.

True/False

26. Wind velocity can be represented as a vector quantity. **True/False**

27. Is a vector necessarily changed if it is rotated through an angle?

28. Is it possible to add two vectors of unequal magnitudes and get zero? Is it possible to add three vectors of equal magnitudes and get zero?

29. Can you add three unit vectors to get a unit vector? Does your answer change if two unit vectors are along the coordinate axes?

30. Can we have physical quantities having magnitude and direction which are not vectors?

31. Which of the following two statements is more appropriate?

(a) Two forces are added using triangle rule because force is a vector quantity.

(b) Force is a vector quantity because two forces are added using triangle rule.

32. Can you add two vectors representing physical quantities having different dimensions? Can you multiply two vectors representing physical quantities having different dimensions?

33. Can a vector have zero component along a line and still have nonzero magnitude?

34. Is the vector sum of the unit vectors $\hat{i}$ and $\hat{j}$ a unit vector? If no, can you multiply this sum by a scalar number to get a unit vector?

35. Let $\vec{A} = 3\hat{i} + 4\hat{j}$. Write vector $\vec{B}$ such that $\vec{A} \neq \vec{B}$ but $A = B$.

36. Can you have $\vec{A} \times \vec{B} = \vec{A} \cdot \vec{B}$ with $A \neq 0$ and $B \neq 0$? What if one of the two vectors is zero?

37. If $\vec{A} \times \vec{B} = 0$, can you say that (a) $\vec{A} = \vec{B}$, (b) $\vec{A} \neq \vec{B}$?

38. Let $\vec{A} = 5\hat{i} - 4\hat{j}$ and $\vec{B} = -7.5\hat{i} + 6\hat{j}$. Do we have $\vec{B} = k\vec{A}$? Can we say $\frac{\vec{B}}{\vec{A}} = k$?

39. A vector is not changed if

(1) it is rotated through an arbitrary angle

(2) it is multiplied by an arbitrary scalar

(3) it is cross multiplied by a unit vector

(4) it is slid parallel to itself.

40. Which of the sets given below may represent the magnitudes of three vectors adding to zero?

(1) 2, 4, 8

(2) 4, 8, 16

(3) 1, 2, 1

(4) 0.5, 1, 2

41. The resultant of $\vec{A}$ and $\vec{B}$ makes an angle α with $\vec{A}$ and β with $\vec{B}$,

(1) $\alpha < \beta$

(2) $\alpha < \beta$ if $A < B$

(3) $\alpha < \beta$ if $A > B$

(4) $\alpha < \beta$ if $A = B$

42. The component of a vector is

(1) always less than its magnitude

(2) always greater than its magnitude

(3) always equal to its magnitude

(4) none of these

43. A vector $\vec{A}$ points vertically upward and $\vec{B}$ points towards north. The vector product $\vec{A} \times \vec{B}$ is

(1) along west

(2) along east

(3) zero

(4) vertically downward

44. A situation may be described by using different sets of coordinate axes having different orientations. Which of the following do not depend on the orientation of the axes?

(1) the value of a scalar

(2) component of a vector

(3) a vector

(4) the magnitude of a vector

45. Let $\vec{C} = \vec{A} + \vec{B}$.

(1) $|\vec{C}|$ is always greater than $|\vec{A}|$

(2) It is possible to have $|\vec{C}| < |\vec{A}|$ and $|\vec{C}| < |\vec{B}|$

(3) C is always equal to $A + B$

(4) C is never equal to $A + B$

46. Let the angle between two nonzero vectors $\vec{A}$ and $\vec{B}$ be 120° and its resultant be $\vec{C}$.

(1) C must be equal to $|A - B|$

(2) C must be less than $|A - B|$

(3) C must be greater than $|A - B|$

(4) C may be equal to $|A - B|$

47. The x-component of the resultant of several vectors

(1) is equal to the sum of the x-components of the vectors

(2) may be smaller than the sum of the magnitudes of the vectors

(3) may be greater than the sum of the magnitudes of the vectors

(4) may be equal to the sum of the magnitudes of the vectors

48. The magnitude of the vector product of two vectors $|\vec{A}|$ and $|\vec{B}|$ may be

(1) greater than AB (2) equal to AB

(3) less than AB (4) equal to zero

ANSWER KEY

1. [True]
2. [False]
3. [True]
4. [True]
5. [False]
6. [False]
7. [True]
8. [False]
9. [True]
10. [True]
11. [False]
12. [False]
13. [False]
14. [False]
15. [True]
16. [True]
17. [False]
18. [True]
19. [False]
20. [True]
21. [True]
22. [False]
23. [False]
24. [True]
25. [False]
26. [True]
27. [No]
28. [No, Yes]
29. [Yes]
30. [Yes → Yes, Current]
31. [b]
32. [No, Yes]
33. [Yes]
34. [No, Yes]
35. [$\vec{B} = 4\hat{i} + 3\hat{j}$]
36. [No, No]
37. [(a) Yes, (b) Yes]
38. [Yes, No]
39. [4]
40. [3]
41. [3]
42. [4]
43. [1]
44. [1, 3, 4]
45. [2]
46. [3]
47. [1, 2, 4]
48. [2, 3, 4]