CBSE

MOTION IN A PLANE WS 6

Class 11 - Physics

Section A

1. What is the maximum number of rectangular components into which a vector can be split in space? **[1]**

   a) 4 b) 2

   c) 3 d) Infinite

2. **Assertion (A):** The projection of $(3\hat{i} - 4\hat{k})$ on the y-axis is 3 units. **[1]**

   Reason (R): The projection of $\vec{A}$ along y-axis is $\vec{A} \cdot \hat{j}$.

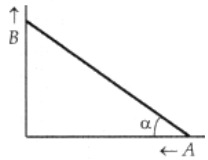
   a) Both A and R are true and R is the correct explanation of A. b) Both A and R are true but R is not the correct explanation of A.

   c) A is true but R is false. d) A is false but R is true.

3. **State True or False:** **[1]**

   (a) The walking on a road is an example of resolution of vectors. **[1]**

4. Two particles A and B are connected by a rigid rod AB. The rod slides along perpendicular rails as shown here. **[1]**

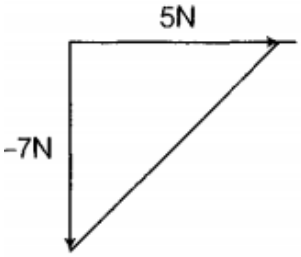


   The velocity of A to the left is 10 m/s. What is the velocity of B when angle α = 60°?

   a) 9.8 m/s b) 10 m/s

   c) 5.8 m/s d) 17.3 m/s

5. Two forces of 5 N towards East and -7 N towards South acts on a particle. Find the resultant force. **[1]**



6. Determine the angles which the vector $\vec{A} = 5\hat{i} + 0\hat{j} + 5\hat{k}$, makes with X-, Y- and Z-axes. **[1]**
7. A force is inclined at 50° to the horizontal. If its rectangular component in the horizontal direction be 50 N, find the magnitude of the force and its vertical component. **[1]**
8. Is walking on a road be an example of resolution of vectors? **[1]**
9. Find with the help of vectors, the area of the triangle with vertices A (3, -1, 2), B (1, -1, -3) and C (4, -3, 1). **[1]**

Section B

10. Suppose you have two forces $\vec{F}$ and $\vec{F}$. How would you combine them in order to have resultant force of magnitudes? **[2]**

i. Zero

ii. $2\vec{F}$

iii. $\vec{F}$

11. Find the magnitude and direction of the resultant of two vectors **A** and **B** in terms of their magnitudes and angle θ between them. **[2]**

12. An accelerating train is passing over a high bridge. A stone is dropped from the train at an instant when its speed is 10 ms^{-1} and acceleration is 1 ms^{-2}. Find the horizontal and vertical components of the velocity and acceleration of the stone one second after it is dropped. Take g = 10 ms^{-2}. **[2]**

13. A child pulls a rope attached to a stone with a force of 60 N. The rope makes an angle of 40° to the ground. **[2]**

i. Calculate the effective value of the pull tending to move the stone along the ground.

ii. Calculate the force tending to lift the stone.

Section C

14. The greatest and the least resultant of two forces acting at a point are 29 N and 5 N, respectively. If each force is increased by 3 N. Find the resultant of two new forces acting at a right angle to each other. **[3]**

15. In any ΔABC, prove that **[3]**

$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

16. Can a flight of a bird, an example of composition of vectors. Why? **[3]**

17. Find the angle between the vectors **[3]**

$\vec{A} = \hat{i} - 2\hat{j} - \hat{k}$ and $\vec{B} = -\hat{i} + \hat{j} - 2\hat{k}$

Section D

18. $\hat{i}$ and $\hat{j}$ are unit vectors along x and y-axes respectively. What is the magnitude and direction of vectors $\hat{i} + \hat{j}$ and $\hat{i} - \hat{j}$? What are the components of a vector A = $2\hat{\mathbf{i}} + 3\hat{\mathbf{j}}$ along the direction $\hat{i} + \hat{j}$ and $\hat{i} - \hat{j}$? **[5]**

19. **[5]**

i. Pick out only the vector quantities from the following: Temperature, pressure, impulse, time, power, charge.

ii. Show by drawing a neat diagram that the flight of a bird is an example of composition of vectors.

iii. A man is travelling at 10.8 km h^{-1} in a topless car on a rainy day. He holds his umbrella at an angle 37° to the vertical to protect himself from the rain which is falling vertically downwards. What is the velocity of the rain?

[Given cos 37°= $\frac{4}{5}$]