Class 11 Physics · Chapter 3: Motion in a Plane

Worksheet · 20 marks · about 40 minutes · based on NCERT

Name _____ Class and section _____ Date _____

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1. For an object moving in a plane, the angle between its velocity and its acceleration [1]

(a) can only be 0° or 180°
(b) must always be 90°
(c) can have any value from 0° to 180°
(d) must always be less than 90°

2. A cyclist rides round a circular track at a steady speed. Her acceleration is [1]

(a) of constant magnitude, always directed towards the centre, so it is not a constant vector
(b) zero, because her speed does not change
(c) a constant vector directed towards the centre
(d) directed along the tangent to the track

3. A disc rotates about its axis with constant angular speed. Points A and B are 5 cm and 15 cm from the axis. The ratio of their linear speeds $v_A : v_B$ is [1]

(a) 3 : 1
(b) 1 : 9
(c) 1 : 1
(d) 1 : 3

4. If $A = 2\hat{i} + 3\hat{j}$ and $B = -5\hat{i} + \hat{j}$, the magnitude of A + B is [1]

(a) 7
(b) $\sqrt{53}$
(c) 5
(d) $\sqrt{17}$

5. Vector P has magnitude 5 units and points due north. Vector Q has magnitude 5 units and points north-east. Which statement is correct? [1]

(a) P = Q, since their magnitudes are equal
(b) P ≠ Q, since their directions differ
(c) P = Q, provided both are drawn from the same origin
(d) P and Q cannot be compared, since they act at different points

6. The hour hand of a wall clock is 4 cm long and its minute hand is 6 cm long. Find the ratio of the angular speeds, and of the linear speeds of their tips (minute hand : hour hand). [2]

7. A student uses $r = r_0 + v_0 t + \frac{1}{2}at^2$ to find where a stone whirled in a horizontal circle at constant speed will be after 3 s. Explain why the method fails. [2]

8. A scooter moves with a constant velocity of 5 m s^{-1} due north. This velocity vector is multiplied by a time interval of 4 s. State the magnitude, the direction and the physical quantity of the new vector. [2]

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9. A toy boat on a pond starts from the origin with velocity $3\hat{j}$ m s^{-1}, and a steady breeze gives it a constant acceleration $2\hat{i}$ m s^{-2}. Find the equation of its path, name the curve, and find its speed at t = 2 s. [3]

10. The resultant of two forces P and Q is 17 N when they act in the same direction and 13 N when they act at right angles. Find P and Q, and the resultant when the angle between them is 60°. [3]

11. Three forces act on a ring that stays at rest. Two of them are $F_1 = (3\hat{i} + 4\hat{j})$ N and $F_2 = (-5\hat{i} + 2\hat{j})$ N. Find the third force F_3, its magnitude, and the angle it makes with the +x-axis. [3]

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