DPP No: 03

Maximum Time
50 Min

PHYSICS

TARGET
JEE-MAINS

SYLLABUS : KINEMATICS

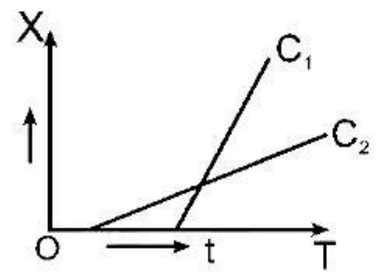
1. A stone is thrown upwards from a tower with a velocity 50 ms^{-1}. Another stone is simultaneously thrown downwards from the same location with a velocity 50 ms^{-1}. When the first stone is at the highest point, the relative velocity of the second stone with respect to the first stone is (assume that second stone has not yet reached the ground) :

(A) Zero (B) 50 ms^{-1} (C) 100 ms^{-1} (D) 150 ms^{-1}

2. A thief is running away on a straight road with a speed of 9 m s^{-1}. A police man chases him on a jeep moving at a speed of 10 m s^{-1}. If the instantaneous separation of the jeep from the motorcycle is 100m, how long will it take for the police man to catch the thief?

(A) 1s (B) 19s (C) 90s (D) 100s

3. Shown in the figure are the position time graph for two children going home from the school. Which of the following statements about their relative motion is true after both of them started moving. Their relative velocity : (consider 1-D motion)



(A) first increases and then decreases (B) first decreases and then increases

(C) is zero (D) is non zero constant.

4. Two cars get closer by 9 m every second while travelling in the opposite directions. They get closer by 1 m every second while travelling in the same directions. What are the speeds of the cars?

(A) 5 ms^{-1} and 4 ms^{-1} (B) 4 ms^{-1} and 3 ms^{-1}

(C) 6 ms^{-1} and 3 ms^{-1} (D) 6 ms^{-1} and 5 ms^{-1}

5. The driver of a train A running at 25 m s^{-1} sights a train B moving in the same direction on the same track with 15 ms^{-1}. The driver of train A applies brakes to produce a deceleration of 1.0 ms^{-2}. what should be the minimum distance between the trains to avoid the accident .

(A) 10m (B) 20m (C) 30m (D) 50m

6. Man A is sitting in a car moving with a speed of 54 km/hr observes a man B in front of the car crossing perpendicularly a road of width 15 m in three seconds. Then the velocity of man B (in m/s) will be:

(A) $5\sqrt{10}$ towards the car at some angle (B) $5\sqrt{10}$ away from the car at some angle

(C) 5 perpendicular to the road (D) 15 along the road

7. A helicopter is flying south with a speed of 50 kmh^{-1}. A train is moving with the same speed towards east. The relative velocity of the helicopter as seen by the passengers in the train will be towards.

(A) north east (B) south east (C) north west (D) south west

8. A train is standing on a platform , a man inside a compartment of a train drops a stone . At the same instant train starts to move with constant acceleration . The path of the particle as seen by the person who drops the stone is :

(A) parabola

(B) straight line for sometime & parabola for the remaining time

(C) straight line

(D) variable path that cannot be defined

9. Two billiard balls are rolling on a flat table. One has velocity components v_x = 1m/s, v_y = $\sqrt{3}$ m/s and the other has components v_x = 2m/s and v_y = 2 m/s. If both the balls start moving from the same point, the angle between their path is -

(A) 60° (B) 45° (C) 22.5° (D) 15°

10. A man is swimming in a lake in a direction of 30° East of North with a speed of 5 km/h and a cyclist is going on a road along the lake shore towards East at a speed of 10 km/h. In what direction and with what speed would the man appear to swim to the cyclist.

(A) $5\sqrt{2}$ km/hr (B) $2\sqrt{3}$ km/hr (C) $5\sqrt{3}$ km/hr (D) $3\sqrt{5}$ km/hr

11. A man who can swim at the rate of 2 km/hr (in still river) crosses a river to a point exactly opposite on the other bank by swimming in a direction of 120^0 to the flow of the water in the river. The velocity of the water current in km/hr is

(A) 1 (B) 2 (C) 1/2. (D) 3/2

12. A boat, which has a speed of 5 km/h in still water, crosses a river of width 1 km along the shortest possible path in 15 minutes. The velocity of the river water in km/h is -

(A) 1 (B) 3 (C) 4 (D) $\sqrt{41}$

13. A boat which can move with a speed of 5 m/s relative to water crosses a river of width 480 m flowing with a constant speed of 4 m/s. What is the time taken by the boat to cross the river along the shortest path.

(A) 80 s (B) 160 s (C) 240 s (D) 320 s

14. An airplane pilot sets a compass course due west and maintains an air speed of 240 km/h. After flying for $\frac{1}{2}$ h, he finds himself over a town that is 150 km west and 40 km south of his starting point. The wind velocity (with respect to ground).

(A) 100 km/h, 37° W of S (B) 100 km/h, 37° S of W

(C) 120 km/h, 37° W of S (D) 120 km/h, 37° S of W

15. A swimmer's speed in the direction of flow of river is 16 km h^{-1}. Swimmer's speed against the direction of flow of river is 8 km h^{-1}. Calculate the swimmer's speed in still water and the velocity of flow of the river.

(A) 2 km/hr (B) 4 km/hr (C) 6 km/hr (D) 8 km/hr

16. A standing man observes rain falling with speed 20 m/s at an angle 30° with vertical, with what velocity man should run so that rain appears to fall vertically :

(A) 10 m/s (B) $10\sqrt{3}$ m/s (C) 5 m/s (D) 20 m/s

17. It is raining vertically downwards with a velocity of 3 km h^{-1} . A man walks in the rain with a velocity of 4 kmh^{-1}. The rain drops will fall on the man with a relative velocity of ;

(A) 1 kmh^{-1} (B) 3 kmh^{-1} (C) 4 kmh^{-1} (D) 5 kmh^{-1}

18. Raindrops are falling vertically with a velocity of 10 m/s. To a cyclist moving on a straight road the raindrops appear to be coming with a velocity of 20 m/s. The velocity of cyclist is

(A) 10 m/s (B) $10\sqrt{3}$ m/s (C) 20 m/s (D) $20\sqrt{3}$ m/s

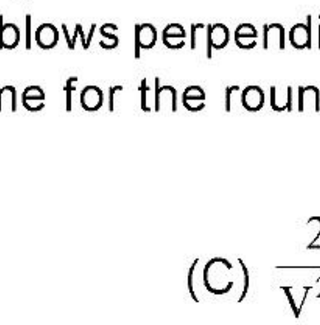
19. An aeroplane has to go along straight line from A to B, and back again. The relative speed with respect to wind is V. The wind blows perpendicular to line AB with speed v. The distance between A and B is ℓ. The total time for the round trip is:

(A) $\frac{2\ell}{\sqrt{V^2 - v^2}}$ (B) $\frac{2\,v\ell}{V^2 - v^2}$ (C) $\frac{2\,V\,\ell}{V^2 - v^2}$ (D) $\frac{2\ell}{\sqrt{V^2 + v^2}}$

20. A person standing on the escalator takes time t_1 to reach the top of a tower when the escalator is moving. He takes time t_2 to reach the top of the tower when the escalator is standing. How long will he take if he walks up on a moving escalator?

(A) $t_2 - t_1$ (B) $t_1 + t_2$ (C) $t_1 t_2/(t_1 - t_2)$ (D) $t_1 t_2/(t_1 + t_2)$

21. Two men P & Q are standing at corners A & B of square ABCD of side 8 m. They start moving along the track with constant speed 2 m/s and 10 m/s respectively. Find the time when they will meet for the first time.

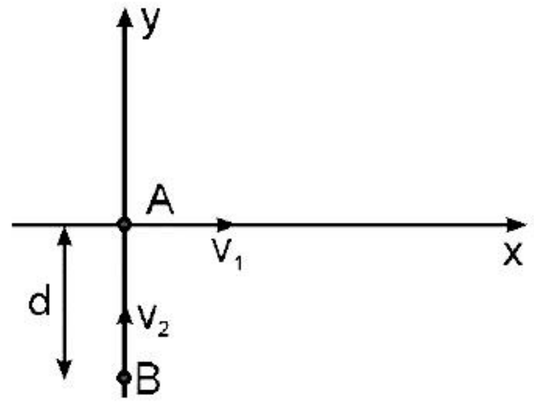


(A) 2 sec (B) 3 sec (C) 1 sec (D) 6 sec

22. For two particles A and B, given that $\vec{r}_A = 2\hat{i} + 3\hat{j}$, $\vec{r}_B = 6\hat{i} + 7\hat{j}$, $\vec{v}_A = 3\hat{i} - \hat{j}$ and $\vec{v}_B = x\hat{i} - 5\hat{j}$. What is the value of x if they collide.

(A) 1 (B) – 1 (C) 2 (D) –2

23. Two particles A and B move with velocities v_1 and v_2 respectively along the x & y axis. The initial separation between them is ' d ' as shown in the figure. Find the least distance between them during their motion.

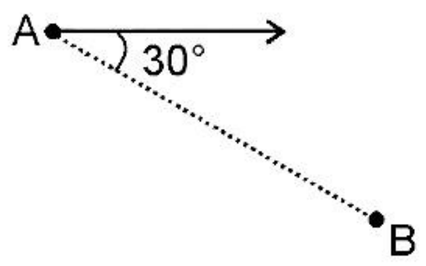


(A) $\frac{d.v_1^2}{v_1^2 + v_2^2}$ (B) $\frac{d.v_2^2}{v_1^2 + v_2^2}$ (C) $\frac{d.v_1}{\sqrt{v_1^2 + v_2^2}}$ (D) $\frac{d.v_2}{\sqrt{v_1^2 + v_2^2}}$

24. A particle is kept at rest at origin. Another particle starts from (5, 0) with a velocity of $-4\hat{i} + 3\hat{j}$. Find their closest distance of approach.

(A) 3m (B) 3m (C) 3m (D) 4m

25. A particle A is moving with a constant velocity of 10 m/sec. Another particle B is moving with a constant but unknown velocity. At an instant, the line joining A and B makes an angle of 30° with velocity of A. Find the minimum possible magnitude of velocity of B, if they collide after some time. (see figure)



(A) 1 m/s. (B) 3 m/s. (C) 5 m/s. (D) 15 m/s.

ANSWER KEY

1.	(C)	**2.**	(D)	**3.**	(D)	**4.**	(A)	**5.**	(D)
6.	(B)	**7.**	(D)	**8.**	(C)	**9.**	(D)	**10.**	(C)
11.	(A)	**12.**	(B)	**13.**	(B)	**14.**	(A)	**15.**	(B)
16.	(A)	**17.**	(D)	**18.**	(B)	**19.**	(A)	**20.**	(D)
21.	(B)	**22.**	(B)	**23.**	(C)	**24.**	(C)	**25.**	(C)