1. A car A is going north-east at 80km/hr. and another car B is going south-east at 60 km/hr. Then the direction of the velocity of A relative to B makes with the north an angle α such that $\tan\alpha$ is

(A) 1/7 (B) 3/4 (C) 4/3 (D) 3/5

2. A boat man could row his boat with a speed 10m/sec. He wants to take his boat from P to a point Q just opposite on the other bank of the river flowing at a speed 4m/sec. He should row his boat

(A) at right angle to the stream

(B) at an angle of $\sin^{-1}(2/5)$ with PQ up the stream

(C) at an angle of $\sin^{-1}(2/5)$ with PQ down the stream

(D) at an angle $\cos^{-1}(2/5)$ with PQ down the stream

3. A boat moves relative to water with a velocity which is 1/n times the river flow velocity. At what angle to the stream direction must be boat move to minimize drifting ?

(A) $\pi/2$ (B) $\sin^{-1}(1/n)$ (C) $\frac{\pi}{2} + \sin^{-1}(1/n)$ (D) $\frac{\pi}{2} - \sin^{-1}(1/n)$

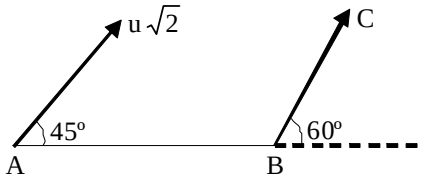
4. A man standing on a road has to hold his umbrella at 30º with the vertical to keep the rain away. He thrown the umbrella and starts running at 10 km/h. He finds that rain drop are hitting his head vertically. Find the speed of rain w.r.t. road

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

5. A boat which has a speed of 5 km/hr 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/hr is

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

6. A particle is projected from a point A with velocity $u\sqrt{2}$ at an angle of 45º with horizontal as shown in figure. It strikes the plane BC at right angles. The velocity of the particle at the time of collision is



(A) $\frac{\sqrt{3}u}{2}$ (B) $\frac{u}{2}$ (C) $\frac{2u}{\sqrt{3}}$ (D) u

7. A man who can swim at a speed v relative to the water wants to cross a river of width d flowing with a speed u. The point opposite him across the river is A.

(A) He can reach the point A in time d/v

(B) He can reach the point A is time $\frac{d}{\sqrt{v^2 - u^2}}$

(C) The minimum time in which he can cross river is $\frac{d}{v}$

(D) He can not reach A if $u > v$

8. An aero plane flies along straight line from A to B with speed v (relative to wind) and back again with the same speed. There is a steady wind speed w. The distance between A and B is d. Total time for the round trip

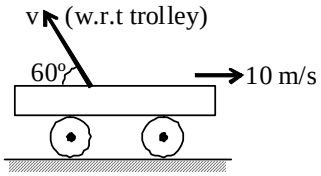
(A) is $\frac{2vd}{v^2 - w^2}$ if the wind blows along the line AB.

(B) is $\frac{2d}{\sqrt{v^2 - w^2}}$ if the wind blows perpendicular to the line AB

(C) is always increased by the presence of wind.

(D) depend on the direction of wind.

9. For an observer on trolley direction of projection of particle is shown in figure, while for observer on ground ball rises vertically. Maximum height (in meter) reached by ball minus 10 m is

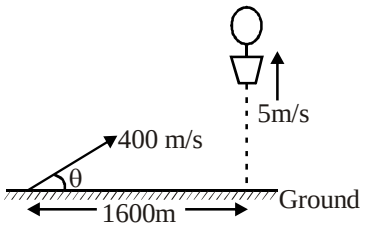


10. A man running on a horizontal road at 8 km/h finds the rain falling vertically. He increases his speed to 12 km/h and find that the drops are making 30º with vertical. Find the speed and direction of the rain with respect to the road.

11. Two cars A and B having velocities of 72 km/h and 18 km/h are running in the same direction, the car B being ahead of the A. The distance between the cars is 150 m. If the car A now starts retarding at a uniform rate of 1 m/s^2 while the car B moves along at a uniform velocity, will the car A overtake the car B ?

Paragraph for question nos. 12 to 14

An observer having a gun observes a remotely controlled balloon. When he first noticed the balloon, it was at an altitude of 800 m and moving vertically upward at a constant velocity of 5 m/s. The horizontal displacement of balloon from the observer is 1600 m. Shells fired from the gun have an initial velocity of 400 m/s at a fixed angle θ ($\sin\theta = 3/5$ and $\cos\theta = 4/5$). The observer having gun waits (for some time after observing balloon) and fires so as to destroy the balloon. Assume $g = 10\ m/s^2$. Neglect air resistance.



12. The flight time of the shell before it strikes the balloon is

(A) 2 sec (B) 5 sec (C) 10 sec (D) 15 sec

13. The altitude of the collision above ground level is

(A) 1075 m (B) 1200 m (C) 1250 m (D) 1325 m

14. After noticing the balloon, the time for which observer having gun waits before firing the shell is

(A) 45 sec (B) 50 sec (C) 55 sec (D) 60 sec

Answers

RACE # 15

1. (A) **2.** (B) **3.** (C) **4.** (B) **5.** (B) **6.** (C) **7.** (BCD) **8.** (ABCD)
9. 5 **10.** $\sqrt{3}/2$ **11.** Car A can not overtake Car B **12.** (B) **13.** (A) **14.** (B)