Kinematics worksheet 2

1. A railway train 400m long is going from New Delhi railway station to Kanpur. Can we consider railway train as a point object 1

Ans. Yes because the train travels a very large distance as compared to its length.

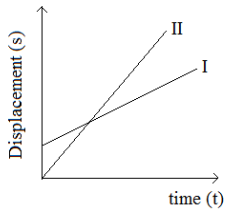
2. Shipra went from her home to school 2.5km away. On finding her home closed she returned to her home immediately. What is her net displacement? What is the total distance covered by her? 1

Ans. Distance =5km, displacement =0km

3. Can speed of an object be negative? Justify 1

Ans. No because distance can't be negative

4. Figure. Shows displacement – time curves I and II. What conclusions do you draw from these graphs? 2



Ans. velocity of II is more than the velocity of I because slope of curve (II) is greater.

5. Displacement of a particle is given by the expression $x = 3t^2 + 7t - 9$, where x is in meter and t is in seconds. What is acceleration? 2

Ans. $x = 3t^2 + 7t - 9$

$$v = \frac{dx}{dt} = \frac{d}{dt}\left(3t^2 + 7t - 9\right) = 6t + 7$$

$$a = \frac{dx}{dt} = \frac{d}{dt}(6t + 7) = 6ms^{-2}$$

6. A police jeep on a petrol duty on national highway was moving with a speed of 54km/hr. in the same direction. It finds a thief rushing up in a car at a rate of 126km/hr in the same direction. Police sub – inspector fired at the car of the thief with his service revolver with a muzzle speed of 100m/s. with what speed will the bullet hit the car of thief? 2

Ans. $Velocity\ of\ police\ jeep,\ v_J = 54kmhr^{=1} = 54 \times \frac{5}{18} = 15ms^{-1}$

$Velocity\ of\ thief\ car,\quad v_T = 126kmhr^{=1} = 126 \times \frac{5}{18} = 35ms^{-1}$

$Velocity\ of\ bullet\ car,\quad v_B = 100ms^{-1}$

Relative velocity of thief w.r.t police, $v_{TJ} = v_T - v_J = 35 - 15 = 20ms^{-1}$

Relative velocity of bullet w.r.t thief, $v_{BT} = v_B - v_{TJ} = 100 - 20 = 80ms^{-1}$

7. Establish the relation $S_{n^{th}} = u + \frac{a}{2}(2n-1)$ where the letters have their usual meanings. 3

Ans.

8 A stone is dropped from the top of a cliff and is found to ravel 44.1m diving the last second before it reaches the ground. What is the height of the cliff? g = 9.8m/s^2 3

Ans. $S_{n^{th}} = u + \frac{a}{2}(2n-1)$

$44.1 = 0 + \frac{9.8}{2}(2n-1)$

$2n - 1 = 9$

$n = 5$

$So,\ t = 5s$

$\therefore s = ut + \frac{1}{2}at^2 = 0(5) + \frac{1}{2} \times 9.8 \times 25 = 122.5m$