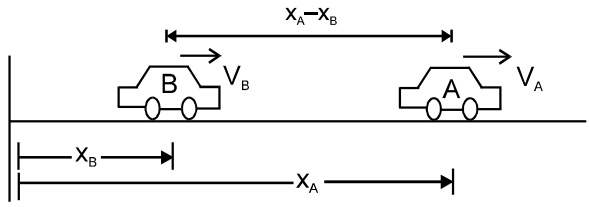
HW-1

1. Two cars A and B are racing along straight line. Car A is leading, such that their relative velocity is directly proportional to the distance between the two cars. When the lead of car A is l_1 = 10 m, its running 10 m/s faster than car B. Determine the time car A will take to increase its lead to l_2 = 20 m from car B.



2. The driver in a running car is at _____with respect to the person in the back seat of the car but is in _____with respect to a pedestrian on the road.

3. There are three particles A, B & C are lying in a horizontal plane. The particle B is situated 5 m due North from A and particle C is situated 30º East of North at a distance of $2\sqrt{3}$ m from A. These three particles start moving simultaneously along straight lines and collide after 2 seconds of their start. Particle A moves with constant velocity 5 m/s due 30º South of East. Find out the velocity vectors (constant) of the particles B & C. Assume unit vector $\hat{i}$ in the east and $\hat{j}$ in the north.

4. 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

5. A coin is released inside a lift at a height of 2 m from the floor of the lift. The height of the lift is 10 m. The lift is moving with an acceleration of 9 m/s^2 downwards. The time after which the coin will strike with the lift is : (g = 10 m/s^2)

(A) 4 s (B) 2 s (C) $\frac{4}{\sqrt{21}}$ s (D) $\frac{2}{\sqrt{11}}$ s

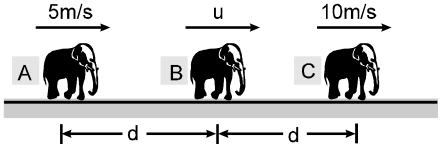
6. A man in a balloon, throws a stone downwards with a speed of 5 m/s with respect to balloon . The balloon is moving upwards with a constant acceleration of 5 m/s^2. Then velocity of the stone relative to the man after 2 second is :

(A) 10 m/s (B) 30 m/s (C) 15 m/s (D) 35 m/s

7. A man is sitting inside a moving train and observes the objects outside of the train. Then choose the single correct choice from the following statements -
(A) all stationary objects outside the train will move with same velocity in opposite direction of the train with respect to the man.
(B) stationary objects near the train will move with greater velocity & object far from train will move with lesser velocity with respect to the man.
(C) large objects like moon or mountains will move with same velocity as that of the train.
(D) all of these.

8. A monkey is sitting on the branch of a tree at height 10 m. From the ground a man throws a stone with speed 10 m/s towards monkey to hit the monkey. At the instant stone is thrown monkey jumped off the tree with negligible velocity. Distance between man & monkey is 20 m. Which of the following is true -
(A) stone will not hit the monkey
(B) stone will hit the monkey after three second
(C) stone will hit the monkey after two seconds
(D) cannot be determined some more data is required

9. Three elephants A, B and C are moving along a straight line with constant speed in same direction as shown in figure. Speed of A is 5 m/s and speed of C is 10 m/s. Initially separation between A & B is 'd' and between B & C is also d. When 'B' catches 'C' separation between A & C becomes 3d. Then the speed of B will be -



(A) 7.5 m/s (B) 15 m/s (C) 20 m/s (D) 5 m/s

10. When two bodies move uniformly towards each other, the distance between them diminishes by 16 m every 10 s. If bodies move with velocities of the same magnitude and in the same direction as before the distance between then will decrease 3 m every 5 s. Calculate the velocity of each body.