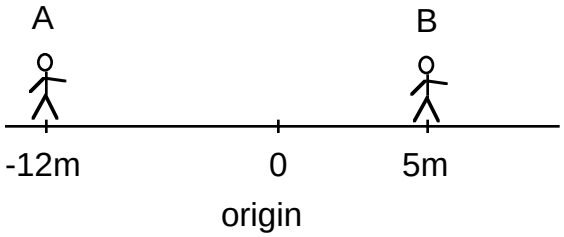
Introduction to Physics : Notes/W.S.-10

Physics is a mathematical description of our world. It involves measurements of time, distance, displacement, speed, velocity, acceleration, mass, weight, force, and other physical quantities.

Distance and Displacement

The **distance** between two points is measured in meters. It is a positive quantity. The **displacement** of an object is the distance relative to some origin. It may be positive or negative. Displacements to the left are negative. The units for distance and displacement are in meters.



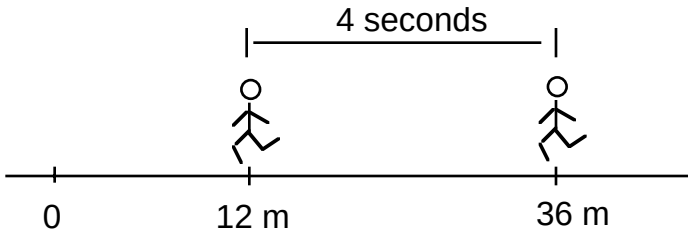
In the diagram above, the distance between A and B is 17 m. Person A has a displacement of -12 meters relative to the origin at 0. Person B has a displacement of +5 meters relative to the origin. The displacement of B relative to A is +17 m. The displacement of A relative to B is -17 m.

Speed and Velocity

The **speed** of an object equals the distance traveled divided by the time. It is always positive. The **velocity** is equal to the change in displacement divided by the time. It may be positive or negative. Velocities to the left are negative. The units for speed and velocity are in meters per second (m/s).

$$\text{speed} = \frac{\text{distance}}{\text{time}}$$

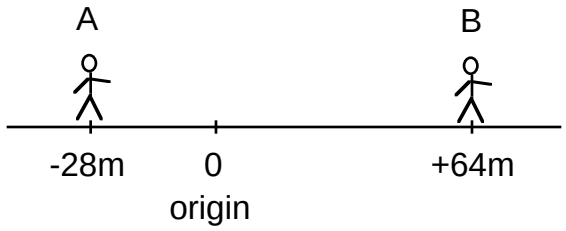
$$\text{velocity} = \frac{\text{displacement}}{\text{time}}$$



In the diagram above, the boy runs to the left. The distance traveled is 24 m. The change in displacement is -24 m. The speed is 6 meters per second. The velocity is -6 meters per second.

Problems:

1)



The displacement of person A is _____ . The displacement of person B is _____ . The distance between A and B is _____ . The displacement of A relative to B is _____ .

2) Give the approximate answer.

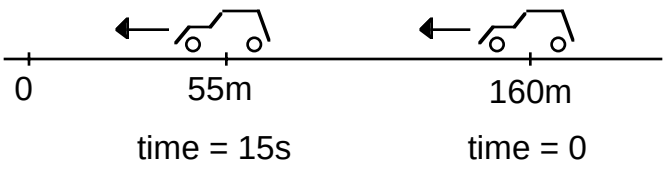
a) A car travels 37 m in 5.8 s. Find the speed.

b) If the car travels at this speed for 30 seconds, what distance does it travel?

c) If the car travels at this speed for 1.0 hours, what distance does it travel?

d) How many seconds does it take for the car to travel a distance of 1000 meters.

3)



A car travels to the left at a constant speed.

The speed is _____ . The velocity is _____ . The displacement at time t = 0 is _____ . The displacement at time t = 5 seconds is _____ . The displacement at time t = 25 seconds is _____ . The time that the displacement equals zero is _____ .

Answers: 1) -28 m, +64 m, +92 m, -92 m, 2)a) 6.4 m/s, b) 190 m, c) 23,000 m, d) 160 s, 3) 7.0 m/s, -7.0 m/s, 160 m, 125 m, -15 m, 23 s.