

Answer on Question #51069, Physics, Mechanics | Kinematics | Dynamics

A man leaves the garrage in his house and drives to a neighboring town which is twenty kilometers away from his house on sightseeing. He returns home to his garrage two hours after. What is his average velocity from home in km/h?

Solution:

Average velocity can be calculated as:

$$\bar{v} = \frac{\Delta \vec{x}}{\Delta t}$$

The average speed is equal to the arithmetic mean of the velocities of the body during movement only when the body is moving with these velocities regular intervals. (In case body moving with different speeds unequal intervals, the average velocity may be calculated as a weighted arithmetic mean of these velocities with weights equal to the corresponding time intervals.)

We can also note the average speed of the movement of the man, which is a vector equal to the relative movement of the time in which it was committed:

$$\bar{v} = \frac{\Delta \vec{x}}{\Delta t}$$

The average velocity, defined in this manner may be equal to zero even if the point (body) actually moved (but after the time period returned to the initial position). If displacement occurs in a straight line (and in the same direction), the average ground speed is equal to the average velocity of the module on the movement. Since we want to take the trip in a certain amount of time, average velocity tells us how fast, and in which direction we have to go if we want to go in a straight line between those points in that amount of time. That's why it's given by the displacement vector divided by the trip time.

In our case if man travel from his the garrage in his house to a neighboring town and then back home, then the average velocity will be equal to 0 m/sec.

If our start and end points are in the same spot, then we don't have to move at all to take the trip (displacement = 0) and our speed is obviously zero since we are not moving at all (average velocity = 0).

A man started at home and returned home, so his displacement is 0 km.

$$\Delta \vec{x} = 0 \text{ m}$$

A man travelled a total distance of 40 000 m (20 000 m out and 20 000 m back).

Distance = 40 000 m

It is also known that a man took two hours to walk out and to walk back.

Thus we can calculate his average speed.

$$v_{av} = \frac{D}{\Delta t} = \frac{40\,000\text{ m}}{7200\text{ sec}} = 5.56 \frac{\text{m}}{\text{sec}} \text{ or } 20\text{ km/h}$$

The average speed is equal to $5.56 \frac{\text{m}}{\text{sec}}$ or 20 km/h.

The average velocity is equal to 0 m/sec or 0 km/h.

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