1.5 a) Speed and Velocity
By

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P2.1A Calculate the average speed of an object using the change of position and elapsed time.

Items:

1. Scalar and Vector quantities.
2. Distance and Displacement.
3. Speed Using Distance and Time.
4. Velocity Using Displacement and Time.

Chapter 1. Simple Motion

1.4 Uniform Motion (P2.1A)

Uniform motion is motion at a constant velocity. Velocity if defined as the displacement of an object in a unit of time. Velocity shows how fast an object is moving to which direction.

1.5 Speed and Velocity

Velocity (v) is a vector quantity which may be found by using the following relationship if the velocity is uniform:

Uniform Velocity
Uniform velocity ($\vec{v}$) = displacement / time **or** $\vec{v} = \Delta\vec{dis.}/\Delta t$

where v is the velocity

$\vec{\Delta}$dis. is the displacement

Δt is the time interval (ellapsed time)

For example, when a car moved 50 km in 2 hours, the average velocity is 25.5 km/h because

$$V = \frac{50km}{2h} = 25.5km/h$$

What to do?

1. Study sample problem.

2. Do practice exercises numbers 1, 2, 3.

3. Show your work and submit.

4. Answers are shown below (in blue) to verify your work.

5. When submitting, write the section number, Example:

Section 1.5 (Speed and Velocity) Exercises numbers 1, 2, 3.

Sample problems

1. What is the velocity of a runner who runs 96 m[N] in 12 s?

$$\begin{aligned}\overrightarrow{\Delta d} &= 96 \text{ m[N]} \\ \Delta t &= 12 \text{ s} \\ \vec{v} &= ? \\ \vec{v} &= \frac{\overrightarrow{\Delta d}}{\Delta t} \\ &= \frac{96 \text{ m[N]}}{12 \text{ s}} \\ &= 8.0 \text{ m/s[N]}\end{aligned}$$

Therefore, the runner has a velocity of 8.0 m/s[N]

2. An air traffic controller notices that a distant aircraft has a velocity of 360 km/h[SW]. What displacement will the plane experience in the 25 s period before the controller checks its position again?

$$\begin{aligned}\vec{v} &= 360 \text{ km/h[SW]} \\ \Delta t &= 25 \text{ s} \\ \overrightarrow{\Delta d} &= ?\end{aligned}$$

Before calculating the displacement, convert the time to hours or the velocity to meters per second. A positive sign is used to indicate the direction [SW]

$$\vec{v} = \frac{+360\ \text{km}}{1.00\ \text{h}}$$
$$= \frac{360\ 000\ \text{m}}{3600\ \text{s}}$$
$$= \frac{+100\ \text{m}}{1\ \text{s}}, \text{ or } 100\ \text{m/s[SW]}$$

$$\overrightarrow{\Delta d} = \vec{v}\,\Delta t$$
$$= (+100\ \text{m/s})(25\ \text{s})$$
$$= +2500\ \text{m, or } 2.5\ \text{km[SW]}$$

Therefore, the plane's displacement is 2.5 km[SW]

Practice

1. What is the velocity of an airplane that experiences a displacement of 580 m[N] in 2.5 s?

2. A car has a velocity of 105 km/h[N]. What is its displacement if it travels at this velocity for 2.5 h?

3. What velocity is required for a truck moving along the highway to experience a displacement of 400 m[W] in a time of 20 s? Express you answer in meters per second and in kilometers per hour.

4. How long would it take a dolphin swimming a 8.0 m/s[E] to travel 208 m[E]?

Answers

1. 2.3×10^2 m/s [N]
2. 2.6×10^2 km[N]
3. 20 m/s[W], or 72 km/h[W]
4. 26 s.