Pracce Sheet 2

1. A boat travels 1.75 km in 0.52 hours.

a. What is the average speed of the boat in km/h?

$v = ?$
$d = 1.75\text{km}$
$t = 0.52\text{h}$

$v = \frac{d}{t} = \frac{1.75\text{km}}{0.52\text{h}} = 3.365\ldots\frac{\text{km}}{\text{h}} = \boxed{3.4\frac{\text{km}}{\text{h}}}$

b. What is his average speed in m/s?

$3.365\ldots\frac{\text{km}}{\text{h}} \times \frac{1000}{1\ \text{km}} \times \frac{1\text{h}}{60\text{min}} \times \frac{1\text{min}}{60\text{s}} = \boxed{0.93\text{m/s}}$

2. Husain Bolt ran the 100m dash in a world record me of 9.69 s.

a. What is his average speed in m/s?

$d = 100\text{m}$
$t = 9.69\text{s}$
$v = ?$

$v = \frac{d}{t} = \frac{100\text{m}}{9.69\text{s}} = 10.3199\ldots\frac{\text{m}}{\text{s}} = \boxed{10.3\frac{\text{m}}{\text{s}}}$

b. What is his average speed in km/h

$10.319\ldots\frac{\text{m}}{\text{s}} \times \frac{1\text{km}}{1000\text{m}} \times \frac{60\text{s}}{1\text{min}} \times \frac{60\text{min}}{\text{h}} = 37.151\ldots\text{km/h} = \boxed{37.2\text{km/h}}$

3. A student walks 10.0 m [E] in 7.00 s. Then he walks another 12.0 m [E] in 8.00 s.

a. Determine the distance travelled by the student.

$d = 10.0\text{m} + 12.0\text{m} = \boxed{22.0\text{m}}$

b. Determine the displacement of the student.

$\vec{d} = 10.0\text{m [E]} + 12.0\text{m [E]} = \boxed{22.0\text{m [E]}}$

c. Determine the average speed of the student.

$d = 22.0\text{m}$
$t = 15.00\text{s}$
$v = ?$

$v = \frac{d}{t} = \frac{22.0}{15.00\text{s}} = 1.466\ldots\frac{\text{m}}{\text{s}} = \boxed{1.47\frac{\text{m}}{\text{s}}}$

d. Determine the average velocity of the student.

$\vec{v} = \frac{\vec{d}}{t} = \frac{22.0\text{m [E]}}{15.00\text{s}} = 1.466\ldots\frac{\text{m}}{\text{s}}\text{ [E]} = \boxed{1.47\frac{\text{m}}{\text{s}}\text{ [E]}}$

4. A boat travels at a velocity of 8.00 m/s [N] for 14.0 s. What is the displacement of the boat?

$\vec{v} = 8.00\text{m/s [N]}$
$\vec{d} = ?$
$t = 14.0\text{s}$

$\vec{v} = \frac{\vec{d}}{t}$

$8.00\frac{\text{m}}{\text{s}}\text{ [N]} = \frac{\vec{d}}{14.0\text{s}}$

$\vec{d} = 112\text{m [N]}$

5. An airplane flying at a velocity of 900 km/h [W] travels 400 km west. How long will the flight take?

$\vec{v} = 900\text{km/h [W]}$
$\vec{d} = 400\text{km [W]}$
$t = ?$

$v = \frac{d}{t}$

$900\frac{\text{km}}{\text{h}}\text{ [W]} = \frac{400\text{km [W]}}{t}$

$t = 0.444\ldots\text{h}$
$= \boxed{0.444\text{h}}$

6. A ball rolls 10.0 m [S] in a me of 6.00 s, hits a wall, and rolls back a distance of 15.0 m [N] in a me of 10.00 s. Determine:

a. the distance travelled by the ball.

$d = 25.0\text{m}$

b. the displacement of the ball.

$\vec{d} = 5.0\text{m [N]}$

c. the average speed of the ball.

$v = \frac{d}{t} = \frac{25.0\text{m}}{16.00\text{s}} = 1.5625\frac{\text{m}}{\text{s}} = \boxed{1.56\text{m/s}}$

d. the average velocity of the ball.

$\vec{v} = \frac{\vec{d}}{t} = \frac{5.0\text{m [N]}}{16.00\text{s}} = 0.3125\text{m/s [N]} = \boxed{0.31\text{m/s [N]}}$

7. A person walks 15.0 m [S] in 5.00 s and then walks 12.0 m [N] in 10.00 s. What is the average speed of the person?

$v = ?$
$d = 27.0\text{m}$
$t = 15.00\text{s}$

$v = \frac{d}{t} = \frac{27.0\text{m}}{15.00\text{s}} = \boxed{1.80\text{m/s}}$

8. A baseball player throws a ball a distance of 45.0 m at a speed of 30.0 m/s. How long is the ball in flight?

$v = 30.0\text{m/s}$
$d = 45.0\text{m}$
$t = ?$

$v = \frac{d}{t}$

$30.0\frac{\text{m}}{\text{s}} = \frac{45.0\text{m}}{t} = \boxed{1.50\text{s}}$

Science 10 Physics

Velocity and Speed Problems

1. An archer shoots an arrow that has an average speed of 250 /sec for the enre arrow flight. How long will it take for the arrow to reach a target that is 50 yds away?

(1 yd = 3)

$v = 250\ ft/s$

$d = 150\ ft$

$t = ?$

$v = \frac{d}{t}$

$50\ yds \times \frac{3\ ft}{1\ yd} = 150\ ft$

$\frac{250\ ft}{s} = \frac{150\ ft}{t}$

$t = 0.60\ s$

2. A bird flies 100 m [N] and then 20 m [S] and then back 100 m [N]. It take the bird 45 seconds to do this.

a. What is the birds average speed in m/s and km/h?

$v = ?$

$d = 220\ m$

$t = 45\ s$

$v = \frac{d}{t} = \frac{220\ m}{45\ s} = 4.888\ldots \frac{m}{s} \times \frac{1\ km}{1000\ m} \times \frac{60\ s}{1\ min} \times \frac{60\ min}{1\ h}$

$= 4.9 \frac{m}{s}$

$= 17.6\ km/h$

$\approx 18\ km/h$

b. What is the birds average velocity in m/s?

$\vec{v} = ?$

$\vec{d} = 180\ m\ [N]$

$t = 45.0\ s$

$\vec{v} = \frac{\vec{d}}{t} = \frac{180\ m\ [N]}{45\ s} = 4.0 \frac{m}{s}\ [N]$

3. A car travels at an average speed of 97 km/h for 13 min. How far has the car travelled?

$v = 97\ km/h$

$t = 13\ min = 0.216\ldots h$

$d = ?$

$13\ min \times \frac{1\ h}{60\ min} = 0.216\ h$

$v = \frac{d}{t}$

$\frac{97\ km}{h} = \frac{d}{0.216\ldots h}$

$d = 21.016\ldots\ km$

$\approx 21\ km$

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Acceleration

- Acceleration - is the change in velocity over a period of time

- in simpler terms, acceleration is how fast a object speeds up or slows down

Example: A Porsche goes from rest to 100 km/h in 7.7 s

Mr. Gray's Kia Magentis goes from rest to 100 km/h in 14.5 s.

Which car has better acceleration?

Calculating Acceleration

Acceleration = change in velocity /speed
change in time

Formula for acceleration is:

$$a = \frac{v_f - v_i}{\Delta t}$$

Δ = change in

$a = \frac{\Delta v}{\Delta t}$

a = acceleration
v_f = final velocity (speed)
v_i = initial velocity (speed)
Δt = change in time

Example: A formula 1 racing car starts at rest and reaches a speed of 27 m/s in a time of 3 seconds. What is the acceleration of the car?

a = ?
v_f = 27 m/s
v_i = 0 m/s
Δt = 3 s

Δv = 27 m/s

$a = \frac{v_f - v_i}{\Delta t}$

$a = \frac{27 - 0 m/s}{3s} = 9 m/s/s$

Example: A car travelling 100 km/h accelerates at a rate of 2 km/hr/s. How long will it take the car to reach a speed of 115 km/h?

a = 2 km/h /s
v_i = 100 km/h
v_f = 115 km/h
Δt = ?

$a = \frac{v_f - v_i}{\Delta t}$

$2 \frac{km/h}{s} = \frac{(115 - 100 km/h)}{\Delta t} = 7.5s$

Δt = 8s

Pracce Sheet 3

$$a = \frac{V_f - V_i}{\Delta t}$$

1. A shule cra accelerates from rest to a velocity of 50 m/s [up] in 4.00 s. What is its acceleraon?

$a = ?$
$V_f = 50\ m/s\ [up]$
$V_i = 0\ m/s$
$\Delta t = 4.00\ s$

$$a = \frac{V_f - V_i}{\Delta t}$$
$$a = \frac{50\ m/s - 0\ m/s\ [up]}{4.00\ s} = 12.5\ m/s/s$$
$$= 13\ m/s^2\ [up]$$

2. A baseball thrown at 25.0 m/s strikes a catcher's mi and slows down to rest in 0.500 s. What is the magnitude of the ball's acceleraon?

$a = ?$
$V_i = 25.0\ m/s$
$V_f = 0\ m/s$
$\Delta t = 0.500\ s$

$$a = \frac{V_f - V_i}{\Delta t}$$
$$a = \frac{0 - 25.0\ m/s}{0.500\ s} = -50.0\ m/s/s$$

3. A car driver applies the brakes and slows down from 15.0 m/s [E] to 5.00 m/s [E] in 4.00 s. Determine the car's acceleraon.

$a = ?$
$V_f = 5.00\ m/s\ [E]$
$V_i = 15.0\ m/s\ [E]$
$\Delta t = 4.00\ s$

$$a = \frac{V_f - V_i}{\Delta t}$$
$$a = \frac{5.00\ m/s - 15.0\ m/s\ [E]}{4.00\ s} = -2.50\ m/s^2\ [E]$$

4. A race car driver accelerates his car from 25.0 m/s [W] to 40.0 m/s [W] in 4.00 s. What is the acceleraon of the car?

$a = ?$
$V_f = 40.0\ m/s\ [W]$
$V_i = 25.0\ m/s\ [W]$
$\Delta t = 4.00\ s$

$$a = \frac{V_f - V_i}{\Delta t}$$
$$= \frac{40.0 - 25.0\ m/s\ [W]}{4.00\ s}$$
$$= 3.75\ m/s/s\ [W]$$

5. A car has an inial speed of 30.5 m/s and accelerates at a rate of 14 m/s/min for 5.50 min. What is the cars final speed?

$a = 14\ m/s/min$
$V_f = ?$
$V_i = 30.5\ m/s$
$\Delta t = 5.50\ min$

$$a = \frac{V_f - V_i}{\Delta t}$$
$$77\ m/s = V_f$$
$$+ 30.5\ m/s$$
$$V_f = 107.5\ m/s$$
$$= 1.1 \times 10^2\ m/s$$