Section 1.2: Review of uniform motion in One-Dimension
Calculations of Distance, Displacement, Speed, and Velocity (Motion in one-dimension - Review)

1. A hiker travels 10.0 km [N] and then 6.0 km [S] in a time of 4.0 h. Find the distance travelled, his displacement, speed and velocity.

2. A hiker first hikes 10.0 km [N], then 6.0 km [S] and finally 2.0 km [N] in a time of 4.0 hr. Determine distance, displacement, average speed and average velocity.

$d_T = 18\ km$

$\vec{d}_T = 6.0\ km\ [N]$

$v_{AV} = \frac{d_T}{t_T} = \frac{18\ km}{4.0\ h} = 4.5\ km/h$

$\vec{v}_{AV} = \frac{\vec{d}_T}{t} = \frac{6.0\ km\ [N]}{4.0\ h} = 1.5\ km/h\ [N]$

3. How much time is required to cover a distance of 5.0 m at a constant speed of 50.0 km/h?

$d = 5.0\,m$

$V = 50.0\,km/h = 13.89\,m/s$

$t = ?$

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

$t = \frac{d}{V} = \frac{5.0\,m}{13.89\,m/s}$

$t = 0.36\,s$

Units $\left[m \div \frac{m}{s} \right]$

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

$\vec{V}$ $\vec{d} = ?$

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

$t = ?$

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

$\vec{d} = \vec{V}t$

$\vec{d} = (105\,km/h\,[N])(2.5\,h)$

$\left[\frac{km}{h} \times h \right]$

$\vec{d} = 262.5\,km\,[N]$

$\vec{d} = 260\,km\,[N]$

5. A marathon runner in training runs 22 km [N] and then 32 km [S]. Assuming the entire run takes 4.2 h, what is his average speed and average velocity?

$\vec{d}_1$ $\vec{d}_2$ t

$$v_{AV} = \frac{d_T}{t_T} = \frac{22\text{km} + 32\text{km}}{4.2\text{h}} = 12.85\frac{\text{km}}{\text{h}} = 13\frac{\text{km}}{\text{h}}$$

$$\vec{v}_{AV} = \frac{\vec{d}_T}{t_T} = \frac{22\text{km [N]} + 32\text{km [S]}}{4.2\text{h}} = \frac{10\text{km [S]}}{4.2\text{h}}$$
$$= 2.4\text{km/h [S]}$$

6. A driver travels by car at 100.0 km/h [E] during a 3.0 h period. He then drives for 2.0 h at 82 km/h [W]. Find the average speed and average velocity.

$\vec{v}_1 = 100\text{km/h [E]}$
$t_1 = 3.0\text{h}$
$\vec{v}_2 = 82\text{km/h [W]}$
$t_2 = 2.0\text{h}$

$\vec{d}_1 = \vec{v}_1 t_1$
$= (100\frac{\text{km}}{\text{h}}\text{ [E]})(3.0\text{h})$
$= 300\text{ km [E]}$

$\vec{d}_2 = \vec{v}_2 t_2$
$= (82\text{km/h [W]})(2.0\text{h})$
$= 164\text{ km [W]}$

$v_{AV} = \frac{d_T}{t_T}$
$= \frac{464\text{km}}{5.0\text{h}}$
$= 93\text{km/h}$

$\vec{v}_{AV} = \frac{\vec{d}_T}{t}$
$= \frac{136\text{km [E]}}{5.0\text{h}}$
$= 27\frac{\text{km}}{\text{h}}\text{ [E]}$

7. A person travels 85 km [E] at a velocity of 65 km/h [E] and then 108 km [W] at a velocity of 84 km/h [W]. What is his average velocity and average speed?

$\vec{d}_1 = 85\text{ km [E]}$
$\vec{v}_1 = 65\text{ km/h [E]}$
$\vec{d}_2 = 108\text{ km [W]}$
$v_2 = 84\text{ km/h [W]}$

$t_1 = \frac{d_1}{v_1} = \frac{85\text{ km}}{65\text{ km/h}} = 1.31\text{ h}$

$t_2 = \frac{108\text{ km}}{84\text{ km/h}} = 1.29\text{ h}$

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

$v_{AV} = \frac{d_T}{t_T} = \frac{193\text{ km}}{2.60\text{ h}} = 74\text{ km/h}$

$\vec{v}_{AV} = \frac{\vec{d}_T}{t_T} =$

1. 67km/h or 19m/s

2. 226m

3. 6.0×10^2 m

4. 170 s or 0.047 h

5. 0.82h or 2900 s

6. $V_{AV} = 3.0$ km/h $\quad \vec{V}_{AV} = 1.0$ km/h [E]

7. a) 893.0 km [S] $\quad$ c) 379 km/h [S]
   b) 1507.0 km $\quad$ 392 km/h [N]
   d) 381 km/h or 382 km/h $\quad$ 226 km/h [S]

8. 22m

9. a) 2.21 m/s $\quad$ b)

10. $V_{AV} = 7.0 \times 10^1$ km/h $\quad \vec{V}_{AV} = 1.0 \times 10^1$ km/h [N]

11. $V_{AV} = 42.4$ km/h $\quad \vec{V}_{AV} = 18.2$ km/h [N]

12. $V_{AV} = 5.5$ km/h $\quad \vec{V}_{AV} =$