# Warm-Up Question

If a person travels at a speed of 9.4m/s for 2.45hrs, how far will s/he travel?

$t \times S = \frac{d}{t} \times t$

$d = st$

$s = 9.4\ m/s$

$t = 2.45\ hr$

$2.45\ hr \times \frac{60\ min}{1\ hr} \times \frac{60\ s}{1\ min}$

$= 8820\ s$

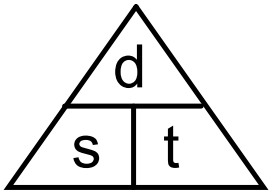
$d = st$

$= (9.4\ m/s)(8820\ s)$

$= 82,908\ m$

$= 83,000\ m$

$83\ km$



| yes | no |
| --- | --- |
| 6 | 9 |

# Acceleration (a)

Acceleration describes all situations where the speed (velocity) is changing.

Formula: $a = \frac{v_2 - v_1}{t_2 - t_1}$ $a = \frac{\Delta v}{\Delta t}$ $\frac{m/s}{s}$ $s = \frac{d_2 - d_1}{t_2 - t_1}$

During **constant acceleration (uniform)** the same change in speed occurs in each equal interval of time. The object accelerates at the same rate.

**Average acceleration** ($a_{av}$) occurs when acceleration changes over a period of time. The acceleration rate varies.

If an object is slowing down the acceleration is **negativ**

For ALL of *our* calculations acceleration is assumed to be constant.

If an object's acceleration is 2.0 m/s$^2$ that means the object is increasing its speed by 2.0 m/s for every second travelled.

$\frac{2.0\text{m}}{\text{s}^2} \times 1\text{s} = 2.0\text{m/s}$

At the end of the 1st second the speed is 2.0 m/s.
At the end of the 2nd second the speed is 4.0 m/s.

$\frac{2.0\text{m}}{\text{s}^2} \times 2\text{s} = 4.0\text{m/s}$

If a car started from rest, and accelerated at a rate of 4.5m/s$^2$, how fast would the car be going at the end of the 2nd second?

$\frac{4.5\text{m}}{\text{s}\cdot\text{s}} \times 2\text{s}$ 9.0m/s

# Sample Problem 1:

**You speed up a motorcycle from rest (0m/s) to 9.00 m/s in a time of 2.0 s. What is the acceleration of the motorcycle?**

$s_1 = 0\ m/s$

$s_2 = 9.00\ m/s$

$t_1 = 0\ s$

$t_2 = 2.0\ s$

$$a = \frac{\Delta s}{\Delta t} = \frac{9.00 - 0.00}{2.0 - 0.0}$$

$$= \frac{9.00\ m/s}{2.0\ s}$$

$$= 4.5\ m/s^2$$