Measuring Distance

Kinematics

The study of motion.

Distance

If I drive to Calgary, how can I figure out how far I went?

$\sim 300 \, Km$

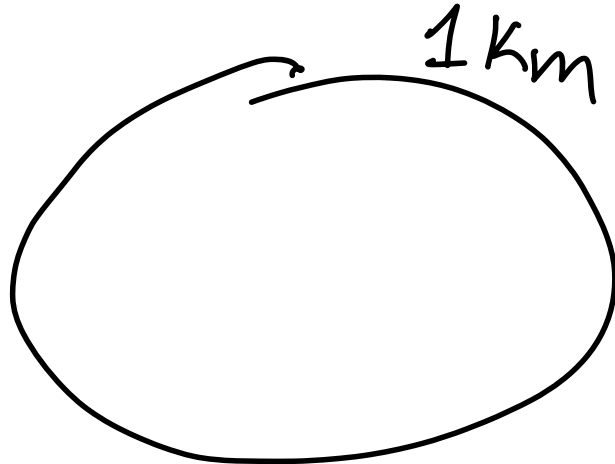# Distance

If I turn around and come back to ~~St. Albert~~ Fort Sask, how far have I gone?
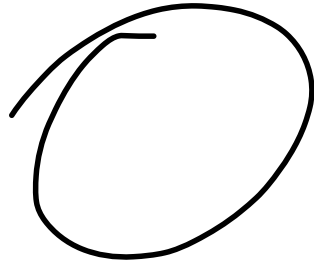What will the odometer in the car say?

~600 km

Distance

If I drive around a circular track with a ~~diameter~~ Circumference of 1 km, how far have I travelled?

1 km

Distance

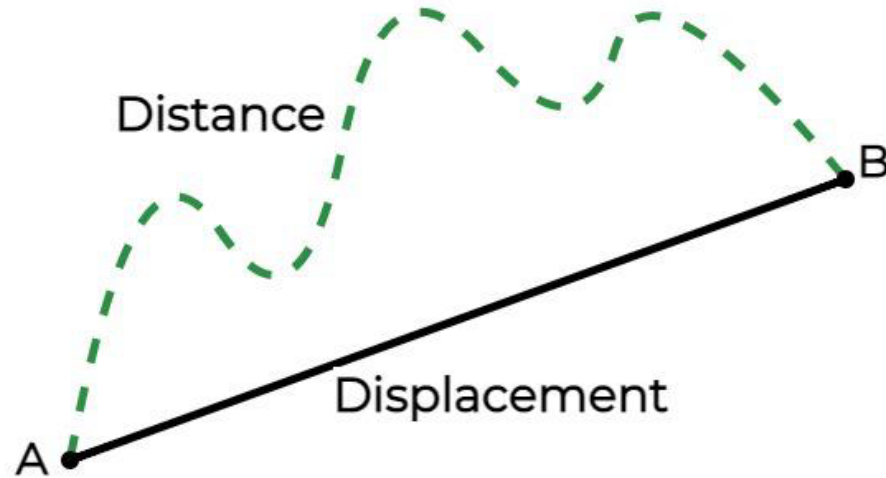After completing a lap on the circular track, how far am I from where I started?

Distance vs. Displacement

Distance The total length travelled

home → Calgary → home 600 km, d
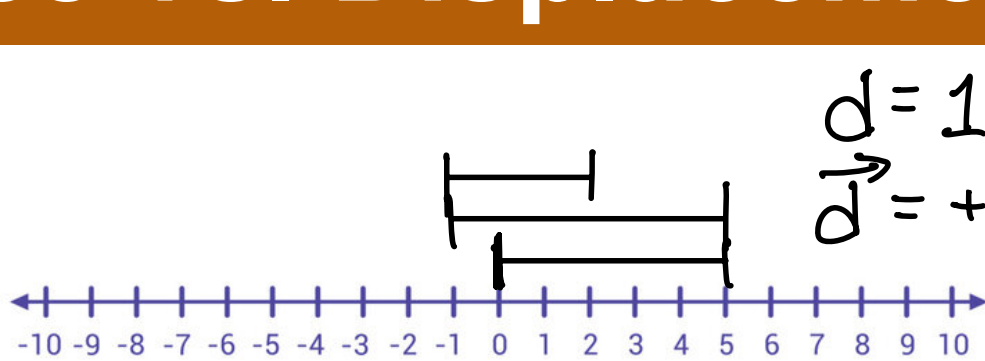
Displacement The length from a starting point.

home → Calgary → home 0 km.

requires a direction. $\vec{d}$
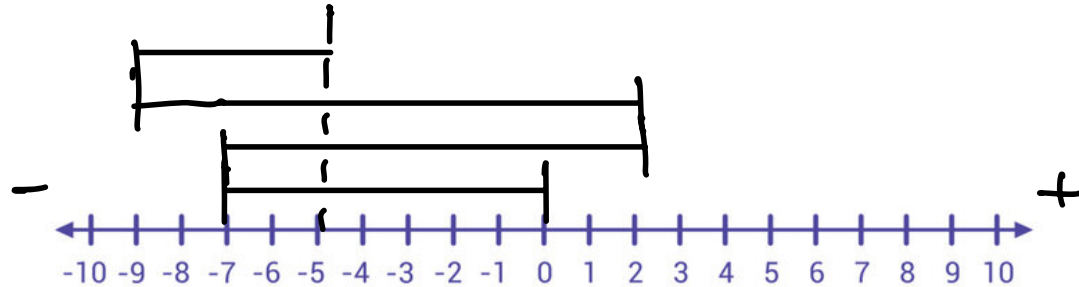
Distance vs. Displacement

Distance vs. Displacement

5m R

6m L

3m R

$d = 14m$

$\vec{d} = +2m,\ 2m\ R$

7m L

9m R

11m L

4m R

$d = 7m + 9m + 11m + 4m = 31m$

$\vec{d} = -7m + 9m - 11m + 4m = -5m$ or $5mL$

Kinematics and Dynamics

$$\Delta d_{Tot} = d_1 + d_2 + \ldots$$

$$\Delta = delta \text{ "change"}$$

$$\Delta \vec{d} = \vec{d_1} + \vec{d_2} + \ldots$$

Distance vs. Displacement

Discussion: Can distance ever be negative?

No

Speed

Speed

How do I know how fast I went on my trip to Calgary?

distance travelled

time it took

$d = 300 \text{ km}$

$\text{time} = t = 3 \text{ hr.}$

$$\frac{d}{t} = \frac{300 \text{ km}}{3 \text{ hr}} = 100 \text{ km/hr.}$$

Speed: distance travelled over a time period.

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

600 km in 11.0 hr. what was my average speed?

$d = 600 \text{ km}$
$t = 11.0 \text{ h}$

$$V = \frac{d}{t} = \frac{600 \text{ km}}{11.0 \text{ h}} = 54.5 \text{ km/h}$$

400 m in 65 s. what was my average speed?

$d = 400 \text{ m}$
$t = 65 \text{ s}$

$$V = \frac{d}{t} = \frac{400 \text{ m}}{65 \text{ s}} = 6.2 \text{ m/s}$$

3 m/s for 260 s. what was my
distance travelled.

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

$$v \times t = d = 3\,\text{m/s} \times 260\,\text{s} = 780\,\text{m}$$

$$v = 3\,\text{m/s}$$

$$8 \times 10^2\,\text{m}$$

$$t = 260\,\text{s}$$

I went 600 m. I ran at 4.5 m/s. How long
did it take me?

$$v = 4.5\,\text{m/s} \qquad t \times v = \frac{d}{\cancel{t}} \times \cancel{t}$$

$$d = 600\,\text{m}$$

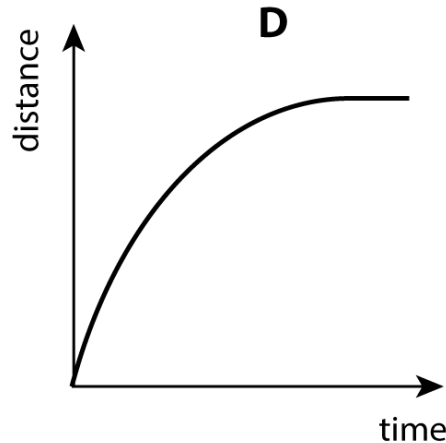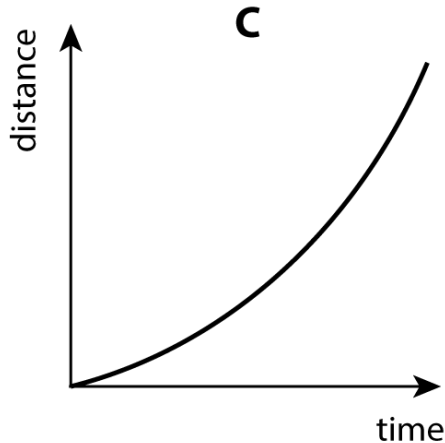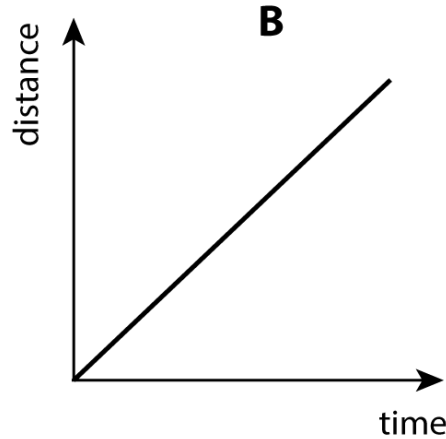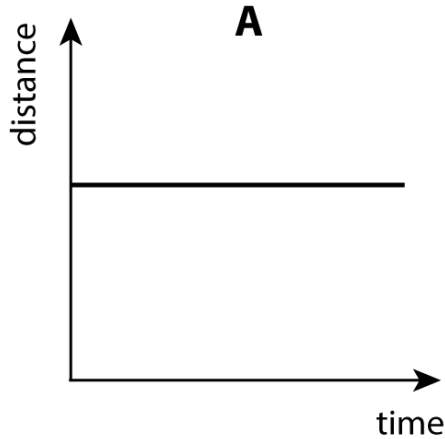$$t = ? \qquad \frac{t \times \cancel{v} = d}{\cancel{v} \quad v}$$

$$v \checkmark$$

$$t = \frac{d}{v} = \frac{600\,\text{m}}{4.5\,\text{m/s}}$$

$$= 133\,\text{s}$$

$$= 1.3 \times 10^2\,\text{s}$$

Graphing Distance

What type of motion does each graph show?

Is the object still, moving at a constant speed, getting faster, or getting slower?

Uniform Motion

Uniform Motion is:

In Science 10, we will deal with motion in straight lines, both uniform and accelerated. In Physics 20, you will see curved motion and changes in direction!