

## Key Motion Terms

Use the glossary to find the definitions of the following:

Position; Distance, Displacement, Speed, Velocity, Acceleration & Time.

Average Speed = Distance/Time

$$v_{sp} = \frac{d}{t}$$

Average Velocity = Displacement/Time

vector direction matters  $\vec{v}_{avg} = \frac{\vec{d}_f - \vec{d}_o}{t}$

change in position

final position

starting position

## Calculating Distance, Displacement, Speed & Velocity

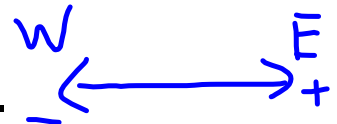
A car drives 20 km [E], 45 km [W], 35 km [W] and finally 80 km [E]. All of this happens in 5 hours.

a) Calculate the distance traveled.

$$\text{distance, } d = 20 + 45 + 35 + 80$$

$$d = 180 \text{ km}$$

b) Calculate the car's final position.



\* Initial position,  $\vec{d}_0 = 0 \text{ m}$

$$\text{final } \vec{d}_f = 20 - \underbrace{45}_{\text{west}} - 35 + 80 = 20 \text{ km [E]}$$

c) Calculate the car's average speed.

$$v_{sp} = \frac{d}{t} = \frac{180 \text{ km}}{5 \text{ hr}} = 36 \text{ km/h}$$

total distance

d) Calculate the car's average velocity.

$$\vec{v}_{avg} = \frac{\vec{d}}{t} = \frac{20 \text{ km}}{5 \text{ h}} = 4 \text{ km/h [E]}$$

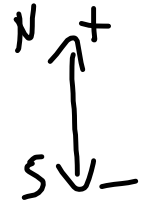
## Calculating Distance, Displacement, Speed & Velocity

A car drives 120 km [S], 75 km [N], 55 km [S] and finally 25 km [N]. This happens in 3 hours.

a) Calculate the distance traveled.

$$d = 120 + 75 + 55 + 25$$

$$d = 275 \text{ km}$$



b) Calculate the car's final position.

$$\vec{d} = -120 + 75 - 55 + 25$$

$$\vec{d} = -75 \text{ km}$$

\* That means 75 km South of start.

c) Calculate the car's average speed.

$$v_{sp} = \frac{d}{t} = \frac{275 \text{ km}}{3 \text{ h}} = 92 \text{ km/h}$$

d) Calculate the car's average velocity.

$$\vec{v}_{avg} = \frac{\vec{d}}{t} = \frac{-75 \text{ km}}{3 \text{ h}}$$

$$\vec{v}_{avg} = -25 \text{ km/h}$$

25 km/h  
South  
for 3 hrs.