Motion

Kinematics - the study of motion

Scalar quantity - has size (magnitude) only

25 s, 25 km, 301 g

vector quantity - has size and direction

2.8 km [E], 5.2 m [up], 32 $\frac{km}{h}$ [E 30° S]

position ($\vec{d}$) - the location of an object with respect to a reference point
(vector)

$\vec{d}$ = 5 km [W]

distance (Δd) - how far the object has travelled
(scalar)

Δd = 100 km

displacement ($\Delta \vec{d}$) - where the object is now in relation to where it started
(vector)

or the change in position

$\Delta \vec{d}$ = 125 km [E]

$\Delta \vec{d} = \vec{d}_f - \vec{d}_i$

time interval (Δt) - the time that it takes for the motion (s)
(scalar!)

t_i - the initial time (s)

t_f - the final time (s)

$\Delta t = t_f - t_i$

speed (v) - how fast; the rate at which the distance (scalar) is covered
(scalar)

$10 \frac{km}{h}$, $32 \frac{m}{s}$

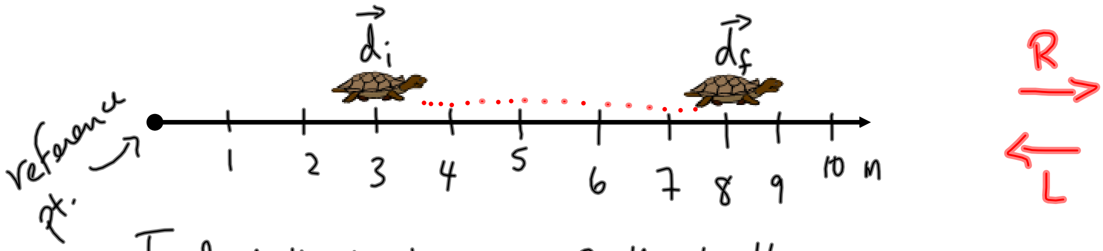
velocity ($\vec{v}$) - the rate at which the position (displacement) changes
(vector)

$52 \frac{km}{h}$ [E] $3.1 \frac{m}{s}$ [W]

Remember:

speed → use distance (scalar)

velocity → use displacement (vector)



To find the displacement of the turtle:

$\vec{d}_i = 3m\,[R]$

$\vec{d}_f = 8m\,[R]$

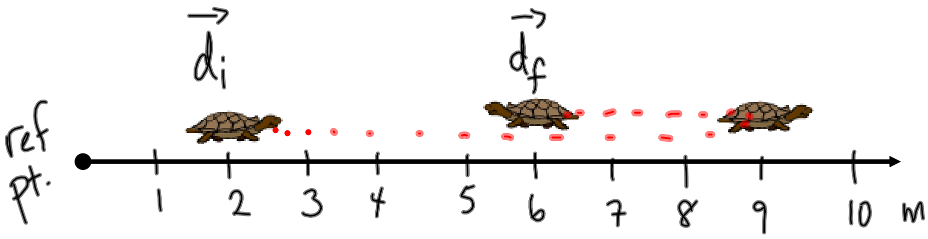
$\Delta\vec{d} = \vec{d}_f - \vec{d}_i$

$\Delta\vec{d} = 8m[R] - 3m[R]$

$\Delta\vec{d} = 5m\,[R]$

turtle went 5m to the right of its starting pt.

The distance travelled: $\Delta d = 5m$



Displacement: $\Delta\vec{d} = \vec{d}_f - \vec{d}_i$

$\vec{d}_i = 2m\,[R]$

$\vec{d}_f = 6m\,[R]$

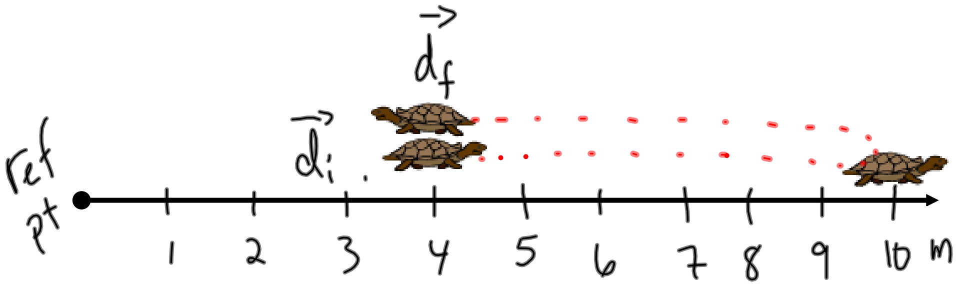
$\Delta\vec{d} = 6m[R] - 2m[R]$

Where the turtle is now in relation to where it started → $\Delta\vec{d} = 4m\,[R]$

Distance (how far the turtle travelled):

$\Delta d = 7m + 3m$ (7m: to right; 3m: to left)

$\Delta d = 10m$



Displacement:

$\vec{d}_i = 4m[R]$

$\vec{d}_f = 4m[R]$

$\Delta\vec{d} = \vec{d}_f - \vec{d}_i$

$\Delta\vec{d} = 4m[R] - 4m[R]$

$\Delta\vec{d} = 0m$

Distance: $\Delta d = 6m + 6m$

$\Delta d = 12m$

Displacement:

$\Delta\vec{d} = \vec{d}_f - \vec{d}_i$

$\Delta\vec{d} = 6m[L] - 3m[R]$

$\Delta\vec{d} = 6m[L] - (-3m[L])$

$\Delta\vec{d} = 6m[L] + 3m[L]$

$\Delta\vec{d} = 9m[L]$

3m [R] = -3m [L]

can't do the math with different directions

Distance: $\Delta d = 9m$