Vectors and Scalars
Science 10 Notes

Ch8 Physics

Scalars

- A scalar quantity, (also called a scalar) only has magnitude. They do not have direction.
- Scalars are always positive values.
  - Examples of scalars are:

distance d = 75cm d = 2.5 feet

speed v = 25 m/s

Vectors

- Quantities that include both direction and magnitude are called vectors or vector quantities.
- May be positive or negative.
  - Examples of vectors are:

position $\vec{d}$ = 75cm [E]

velocity $\vec{v}$ = 25m/s [N]

position is relative to a starting point "reference point" or "origin"

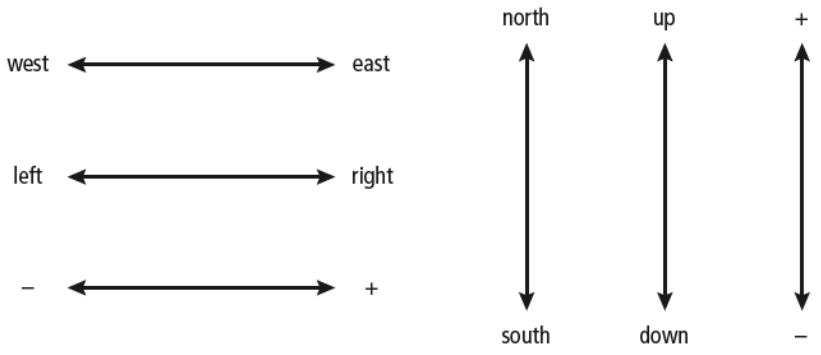
Time

- Time is a special case, because time never moves backwards and therefore has no direction.
- Time is important for describing _____
  - Initial time t_i is when the event begins
  - Final time t_f is when the event is finished
  - The time interval is the difference between final and initial times.
  - Time interval is calculated as: $\Delta t = t_f - t_i$

Δt

Δ : Delta
"how much did it change by"

Common Sign Conventions for Vectors



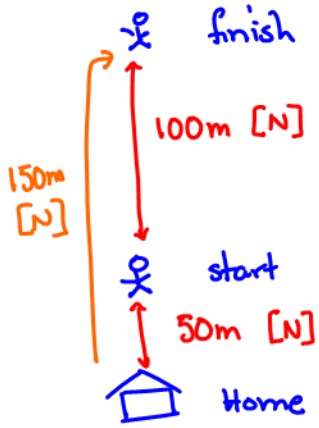
–15 m [E] = 15 m [W]

An object is E/W

–15 m/s = 15m/s [W]

Scalars, Vectors and Symbols

Name	Means	SI Unit
distance d	The length of a path between two points.	meter (m)
position $\vec{d}$ $\vec{d_i}$, $\vec{d_f}$	A specific point relative to a point of origin	meter (m)
displacement $\Delta\vec{d}$ $\Delta\vec{d} = \vec{d_f} - \vec{d_i}$	Straight line distance between two points (they do not have to be the origin)	meter (m)
time t t_i or t_f	When an event occurs	seconds (s)
time interval $\Delta t = t_f - t_i$	Duration of an event how long is the event	



Example 1

$t_i = 4.2\text{s}$ $t_f = 7.3\text{s}$ $\vec{d}_i = -12.4\text{m}$ $\vec{d}_f = +18.9\text{m}$

Determine Δt and $\Delta\vec{d}$. Did the object go up or down?
What is the distance traveled?

$\Delta t = t_f - t_i$
$= 7.3\text{s} - 4.2\text{s}$
$\Delta t = 3.1\text{ s}$

$\Delta\vec{d} = \vec{d_f} - \vec{d_i}$
$= +18.9 - (-12.4)$
$\Delta\vec{d} = 31.3\text{ m [up]}$

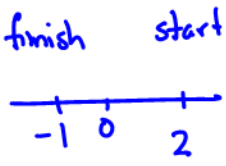
Example 2

$t_i = 2.0\text{s}$ $\Delta t = 4.0\text{s}$ $\vec{d}_i = +2.0\text{m}$ $\vec{d}_f = -1.0\text{m}$

Determine t_f and $\Delta\vec{d}$. Did the object travel right or left?
What is the distance traveled?

$t_f = 6.0\text{s}$

$\Delta\vec{d} = 3\text{m [L]}$ or -3m [R]
$\Delta\vec{d} = \vec{d_f} - \vec{d_i}$
$= -1 - (+2)$
$= -3\text{ m [R]}$



Example 3

$\Delta t = 6.7\text{s}$ $t_f = 7.3\text{s}$ $\Delta\vec{d} = 5.4\text{m [N]}$ $\vec{d}_f = -2.5\text{m}$

Determine t_i and $\vec{d}_i$. Did the object travel north or south?
What is the distance traveled?

$t_i = 0.6\text{s}$

$\vec{d}_i = -7.9\text{m [N]}$
or
-7.9m
or
7.9m [S]