Vector Math

1) Multiplying a vector by a scalar

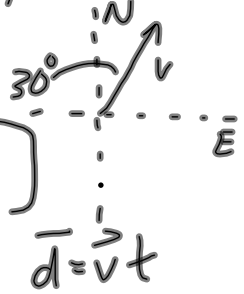
say $\vec{v} = 15 \frac{m}{s} [N\ 30^\circ E]$

then $3\vec{v} = 45 \frac{m}{s} [N\ 30^\circ E]$

If $t = 5$ s

then $\vec{v}t = 75\ m [N\ 30^\circ E]$

$\left[\frac{m}{s}\right][s]$



2) Multiplying vectors together

$\vec{V_1} \cdot \vec{V_2}$ → dot product (gives a scalar)

$\vec{V_1} \times \vec{V_2}$ → cross product (gives another vector)

3) Adding (and subtracting) vectors

Use the "tail-to-tip" method

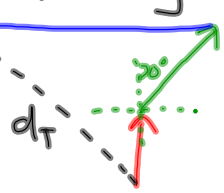
→ represent vectors with arrows
- length ~ magnitude
- direction is its direction

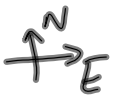
Eg. $\vec{d}_1 = 25\text{ m [N]}$

$\vec{d}_2 = 40\text{ m [N 30° E]}$

$\vec{d}_3 = 100\text{ m [W]}$

$\vec{d}_1 + \vec{d}_2 + \vec{d}_3 = \vec{d}_T$





$\vec{d}_1 = 25\text{ m [N]}$

$\vec{d}_2 = 40\text{ m [N 30° E]}$

$\vec{d}_3 = 100\text{ m [W]}$

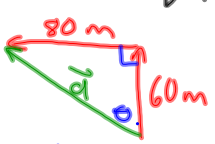
1) Component method
- divide vectors into their components
  - N-S & E-W
  - vertical & horizontal
  - x & y

	$\vec{d}_1$	$\vec{d}_2$	$\vec{d}_3$	d_T
N⁺-S⁻	25 m	35 m	0 m	60 m
E⁺-W⁻	0 m	20 m	-100 m	-80 m

$(25\text{ m} + 35\text{ m})$

$40\sin 30$

d_3 $40\cos 30$ 30 $d_2 = 40\text{ m}$



$|\vec{d}|^2 = 80^2 + 60^2$

$|\vec{d}| = 100\text{ m}$

$\therefore \vec{d} = 100\text{ m [N 53° W]}$

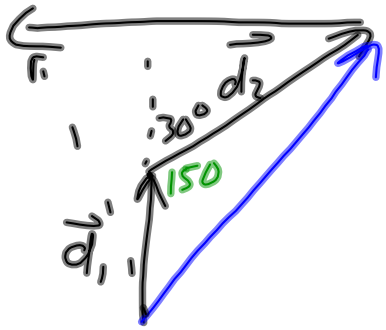
$\tan\theta = \frac{O}{A}$

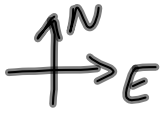
$= \frac{80}{60}$

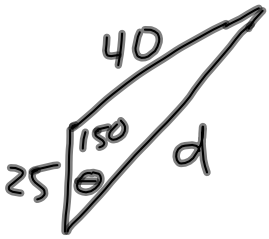
$\theta = 53°$

Trig Method (w/ 2 vectors)

$\vec{d}_1 + \vec{d}_2 = \vec{d}_r$







$d^2 = 40^2 + 25^2 - 2(40)(25)\cos 150$

$\frac{\sin\theta}{40} = \frac{\sin 150}{d}$