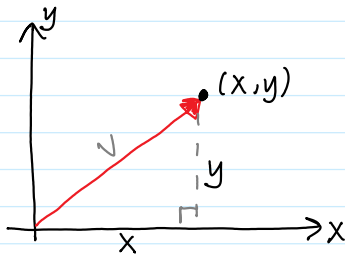# 6.1··· An Intro to VECTORS

VECTOR: magnitude & direction
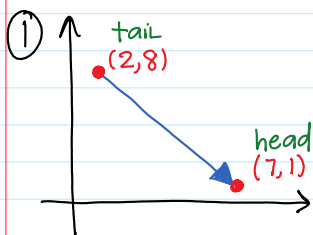(length)
ex· velocity···

component form: $\langle x, y \rangle$
where x is the horizontal component &
y is the vertical component

magnitude: $|v|$ = length of a vector

$$|v| = \sqrt{x^2 + y^2}$$ (from pythag. theorem)

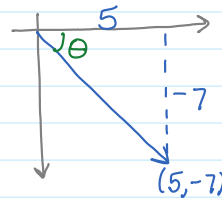## Find Component Form, magnitude & direction angle

① tail (2,8) head (7,1)

Head Minus Tail (HMT)

$\langle 7-2, 1-8 \rangle$
$\langle 5, -7 \rangle$

$|v| = \sqrt{5^2 + (-7)^2}$
$|v| = \sqrt{74}$

(5,-7)

$\tan\theta = -\dfrac{7}{5}$
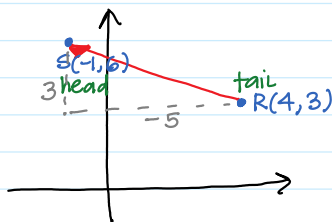$\theta = \tan^{-1}\left(-\dfrac{7}{5}\right)$
$\theta = -54.46°$
or $305.54°$

② $\vec{RS}$: R (4,3) & S (-1,6)

S(-1,6) head   tail R(4,3)

component form:
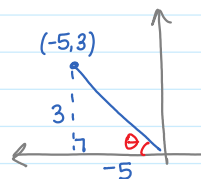(use HMT)
$\langle -1-4, 6-3 \rangle$
$\langle -5, 3 \rangle$
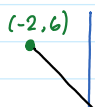
magnitude:
$|v| = \sqrt{(-5)^2 + 3^2}$
$|v| = \sqrt{34}$

direction angle:
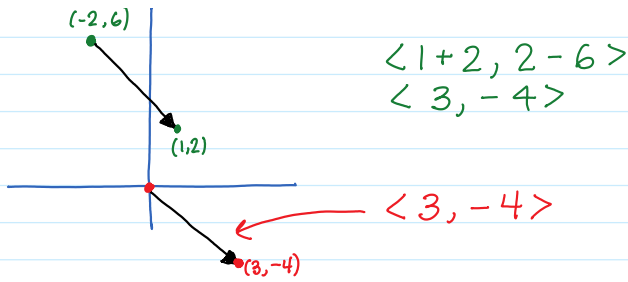
(-5,3)

$\tan\theta = \dfrac{3}{-5}$
$\theta = -30.96$
$\theta = 149.04°$

Equivalent Vectors

(-2,6)

$\langle 1+2, 2-6 \rangle$
$\langle 3, -4 \rangle$

(-2,6)

(1,2)

(3,-4)

$\langle 1+2, 2-6 \rangle$
$\langle 3, -4 \rangle$

* equivalent vectors
  have the SAME
  direction & magnitude

$\langle 3, -4 \rangle$

Adding, Subtracting & Scalar Multiplication

$$u = \langle 2, -4 \rangle \quad \& \quad v = \langle 3, -5 \rangle$$

① u + v

$\langle 2, -4 \rangle + \langle 3, -5 \rangle$
$\langle 2+3, -4 + -5 \rangle$
$\langle 5, -9 \rangle$

② v - u

$\langle 3, -5 \rangle - \langle 2, -4 \rangle$
$\langle 3-2, -5 + 4 \rangle$
$\langle 1, -1 \rangle$

③ 2u - 4v

$2\langle 2, -4 \rangle - 4\langle 3, -5 \rangle$
$\langle 4, -8 \rangle - \langle 12, -20 \rangle$
$\langle 4-12, -8+20 \rangle$
$\langle -8, 12 \rangle$

Resolving a Vector... finding the components of a vector

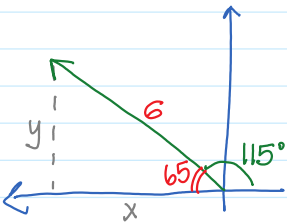**① $|v| = 12$ & $\theta = 40°$**

magnitude   direction angle

$\cos 40° = \dfrac{x}{12}$ $\sin 40° = \dfrac{y}{12}$
$x = 9.19$ $y = 7.71$

$\langle 9.19, 7.71 \rangle$

② $|v| = 6$ & $\theta = 115°$

$\cos 65° = \dfrac{x}{6}$ $\sin 65° = \dfrac{y}{6}$
$x = -2.54$ $y = 5.44$
↑
quad 2

$\langle -2.54, 5.44 \rangle$