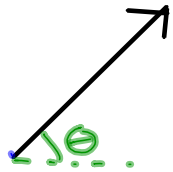
Vectors: Addition + Components

Vectors have both direction and magnitude



In Physics you can define you angle from whatever direction you want, as long as you draw a picture.

How to write a vector:

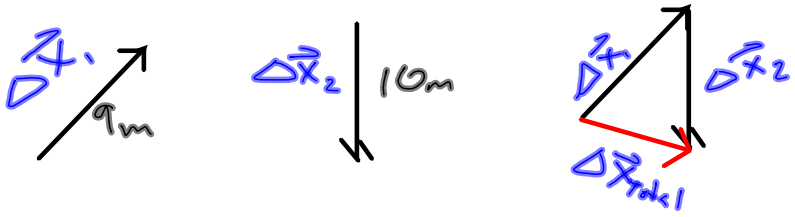
$\vec{A}$

~> text books often bold letters that are vectors

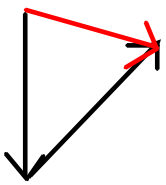
$|\vec{A}| = 3m$ $\vec{A} \neq 3m$ $A = 3m$

Vector Addition

Tip-To-Tail



$\Delta\vec{x}_{Total} = \Delta\vec{x}_1 + \Delta\vec{x}_2$



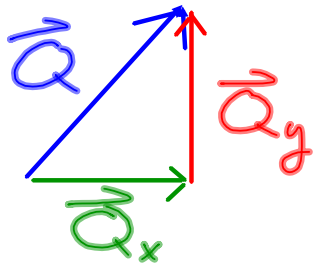
the order does not matter

cannot just add the magnitudes together!!

$9m + 10m \neq 19m$

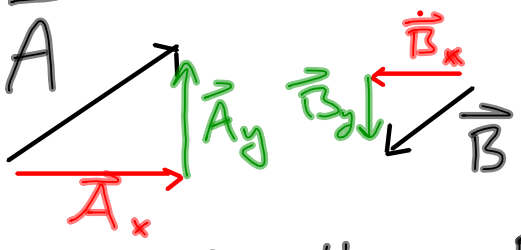
unless the vectors are in the same direction

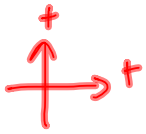
Vector Components



Can always break a vector into x and y components

Why?!?!





$A_x = 4\hat{x}$

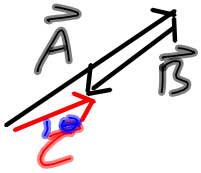
$A_y = 3\hat{y}$

$\vec{A} = \vec{A}_x + \vec{A}_y$

$B_x = -2\hat{x}$

$B_y = -2\hat{y}$

$$\vec{C} = \vec{A} + \vec{B}$$



$$\vec{C} = (\vec{A}_x + \vec{A}_y) + (\vec{B}_x + \vec{B}_y)$$

$$\vec{C} = (\vec{A}_x + \vec{B}_x) + (\vec{A}_y + \vec{B}_y)$$

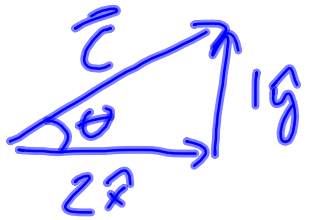
$$\vec{C} = (4\hat{x} + -2\hat{x}) + (3\hat{y} + -2\hat{y})$$

$$\vec{C} = 2\hat{x} + 1\hat{y}$$

1) What is $|\vec{c}|$

2) What is θ

1.



$\vec{c}^2 = 2^2 + 1^2$

$c = \sqrt{5}$

$c = 2.23607$

2.

SOH CAH TOA

$\sin\theta = \frac{1}{\sqrt{5}}$ $\cos\theta = \frac{2}{\sqrt{5}}$ $\tan\theta = \frac{1}{2}$

$\tan^{-1}(\tan\theta) = \tan^{-1}\left(\frac{1}{2}\right)$

$\theta = 26.57°$