VECTORS – a directed line segment $\vec{v}$ **v**

2 components

1) Magnitude. (Length) $= |v|$
2) Direction

Form 1:

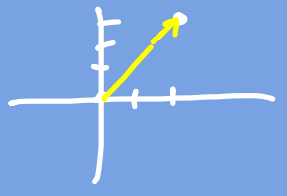
$|v| = 4 \quad \theta = 120°$

(r, θ)

Form 2: Component Form

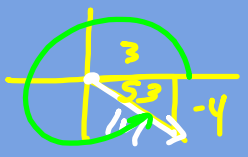
$\langle x, y \rangle$

$\langle 2, 3 \rangle$



Find magnitude + direction

$\langle 3, -4 \rangle$



$9 + 16 = |v|^2$

$25 = |v|^2$

$5 = |v|$

$\tan\theta = \frac{-4}{3}$

$\tan^{-1}(4/3) = 53°$

$\theta = 307°$

$\boxed{|v| = 5 \quad \theta = 307°}$

Find component form. $\langle x, y \rangle$

$|v| = 8 \quad \theta = 227°$

$x = |v|\cos\theta = 8\cos 227°$

$= -5.46$

$y = |v|\sin\theta = 8\sin 227°$

$= -5.85$

$\langle -5.46, -5.85 \rangle$

Parallel Vectors

Vectors has same slope $\left(\frac{y}{x}\right)$

$\langle a, -3 \rangle$ $\langle -4, 6 \rangle$

$m = \frac{-3}{2}$ $m = \frac{6}{-4} = -\frac{3}{2}$

Parallel

Orthogonal (Perpendicular) Vectors

Orthogonal if dot product $= 0$

Dot product

$\langle x_1, y_1 \rangle \cdot \langle x_2, y_2 \rangle$

$= (x_1 \cdot x_2) + (y_1 \cdot y_2)$

$\langle 2, -3 \rangle \cdot \langle 6, 4 \rangle$

$= 12 + -12 = 0$

Yes! It's orthogonal!!

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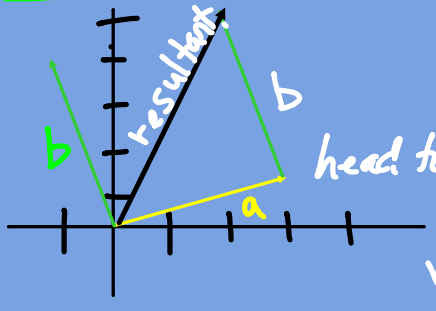
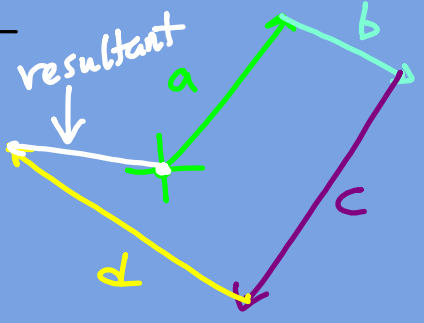
Adding Vectors



head to tail

resultant = goes from the original start pt. to the final end pt.



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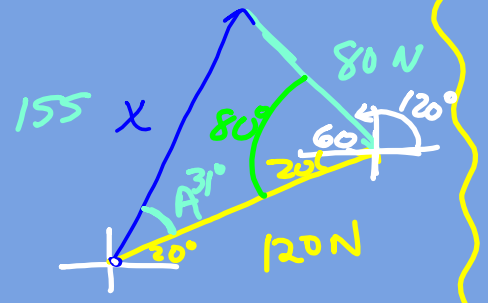
120 N force acting at 20°
80 N force acting at 120°
What is the magnitude + direction of:
resultant force



$X^2 = 120^2 + 80^2 - 2(120)(80)\cos 80°$

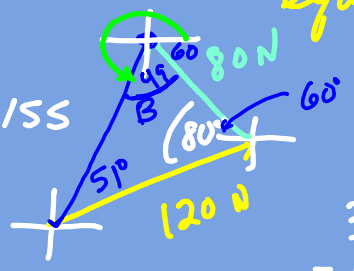
$X = 155$ N

$\frac{\sin A}{80} = \frac{\sin 80° \cdot 80}{155}$

$\sin^{-1}(\quad) = 31°$

$|V| = 155\text{ N}\ @\ -51°$

3rd force that produces equilibrium.



$360° - 109° = 251°$

155 N @ 251°