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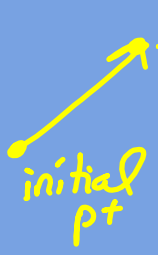
VECTORS – a directed line segment

2 components
1) Magnitude (length)
2) Direction



Symbols
$\vec{v}$, $\mathbf{v}$
magnitude $|v|$, $\|v\|$

Form 1: Magnitude + Direction

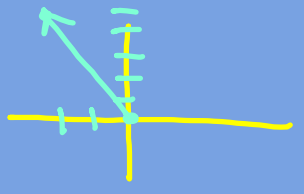
$|v| =$ $\theta =$

$|v| = 6$ $\theta = 210°$

Form 2: Component Form

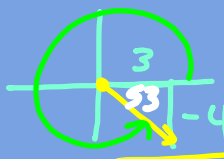
$\langle x, y \rangle$ ← shows x + y motion of the vector

$\langle -2, 5 \rangle$



Find magnitude + direction

$\langle 3, -4 \rangle$ Find $|v|$ + θ



$|v| = \sqrt{3^2 + (-4)^2}$

$|v| = 5$

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

$\tan^{-1}(4/3) = 53°$

$\theta = 307°$

c) $|v| = \sqrt{x^2 + y^2}$

$\tan\theta = y/x$

Find component form.

$|v| = 8 \quad \theta = 227°$

d) $x = |v| \cos\theta$

$y = |v| \sin\theta$

$x = 8\cos 227° = -5.46$

$y = 8\sin 227° = -5.85$

$\langle -5.46, -5.85 \rangle$

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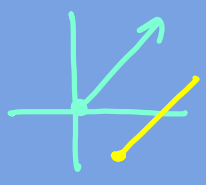
Parallel Vectors

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

$\langle 3, 5 \rangle$
$\Delta x, \Delta y$

$m = \frac{\Delta y}{\Delta x} = \frac{5}{3}$



Parallel?

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

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

Parallel vectors

$\langle -2, 3, 5 \rangle \cdot \langle 1, 4, -6 \rangle$

Orthogonal (Perpendicular) Vectors

Orthogonal if dot product $= 0$

Dot product

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

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

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

$= 2 \cdot 6 + -3 \cdot 4$

$= 12 + -12 = 0$

$-\frac{3}{2}$

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

$\langle 1, -8 \rangle \cdot \langle -3, 5 \rangle$

$-3 + -40 = -43$

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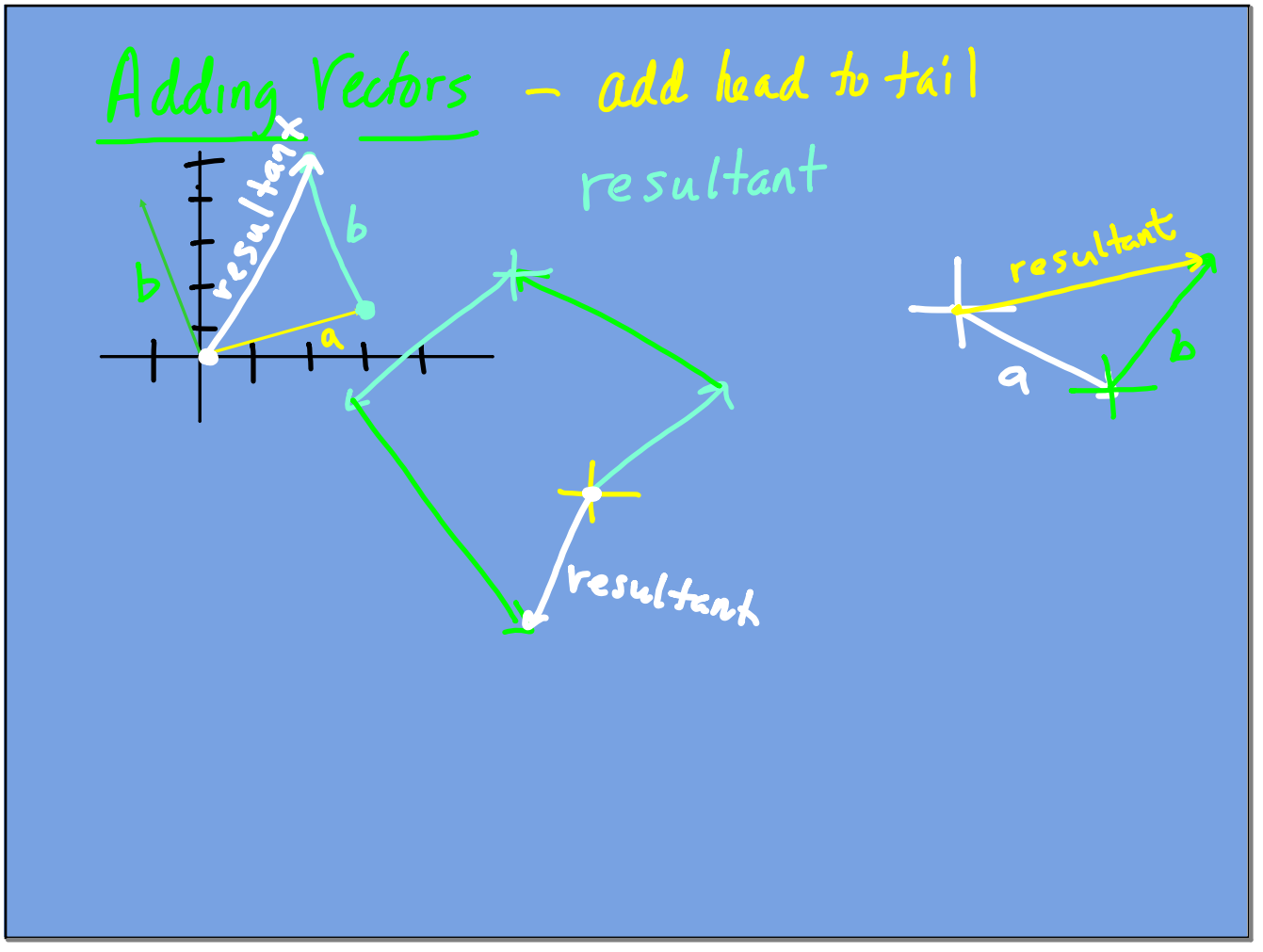
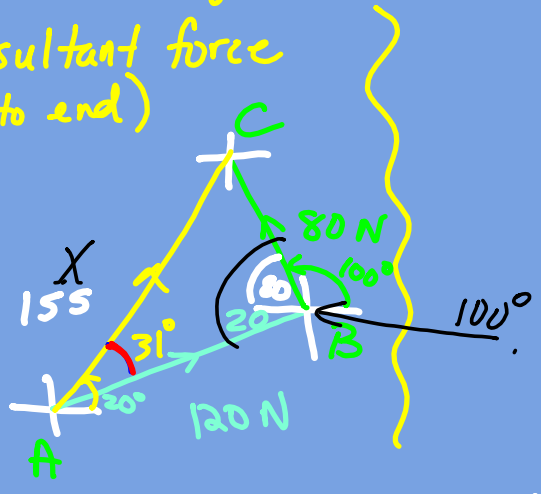


120 N force acting at 20°
80 N force acting at 100°
What is the magnitude + direction of:

Force = lb. N

resultant force
(start to end)



$\frac{\sin A}{80} = \frac{\sin 100° \cdot 80}{155}$

$\sin A = 0.50$

$A = 31°$

$X^2 = 120^2 + 80^2 - 2(120)(80)\cos 100°$

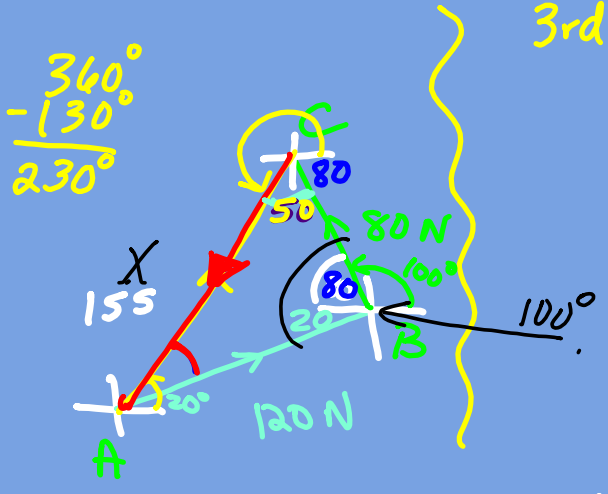
$X = 155$ N

20° + 31° = 51°

155 N @ 51°

120 N force acting at 20°
80 N force acting at 100°
What is the magnitude + direction of:
3rd force that produces equilibrium.
end to start

Force = lb. N



$\frac{\sin C}{120} = \frac{\sin 100° \cdot 120}{155}$

$\sin C = 0.76$

$C = 49.7 \approx 50°$

$X^2 = 120^2 + 80^2 - 2(120)(80)\cos 100°$

$X = 155$ N

155 N @ 230°

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