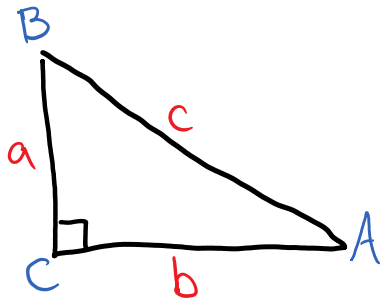


Lesson 1.4 - Vector Components

Monday, February 2, 2026 8:33 AM

All we remember about trig:



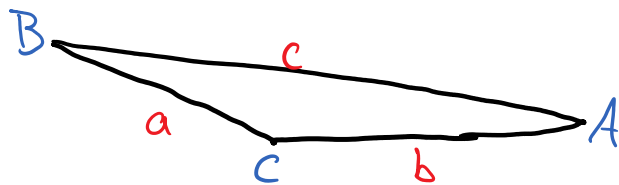
Pythagoras $a^2 + b^2 = c^2$

$\sin \theta = \frac{O}{H}$ $\cos \theta = \frac{A}{H}$ $\tan \theta = \frac{O}{A}$

$\theta = \sin^{-1}\left(\frac{O}{H}\right) = \arcsin\left(\frac{O}{H}\right)$

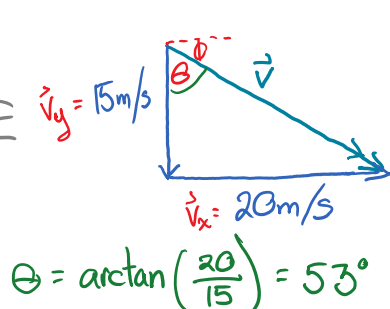
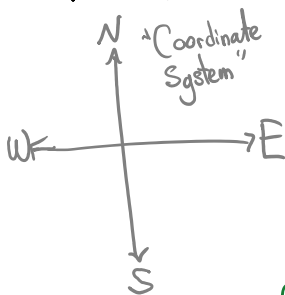
Sine law: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

Cosine law: $c^2 = a^2 + b^2 - 2ab \cos C$



Vectors with right angle triangles:

Ex. Add 15m/s south + 20m/s east.



$\theta = \arctan\left(\frac{20}{15}\right) = 53^\circ$

$\vec{V}_x^2 + \vec{V}_y^2 = \vec{V}^2$

$\vec{V} = \sqrt{\vec{V}_x^2 + \vec{V}_y^2}$

$\vec{V} = \sqrt{(20\text{m/s})^2 + (15\text{m/s})^2}$

$\vec{V} = 25\text{m/s}$

$\vec{V} = 25\text{m/s at } 53^\circ \text{ E of S}$

Ex. Add 15N north, 3.0N east, and 12N south.

Combine vectors in same direction 1st.



$\vec{F} = \sqrt{(3.0)^2 + (3.0)^2}$

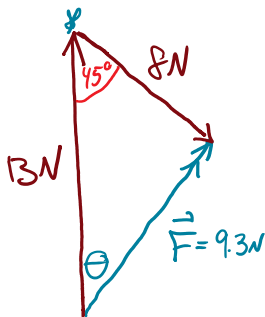
$= 4.2\text{N at } 45^\circ \text{ E of N}$

Vectors that do NOT form right angles:

vectors may be added using trigonometry.

Ex. Add 8.0 N [SE] and 13 N [N]

Method #1: sine + cosine laws



$$F^2 = 8^2 + 13^2 - 2(8)(13)\cos(45)$$

$$F = \sqrt{85.92}$$

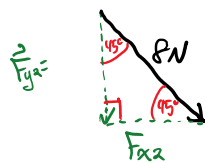
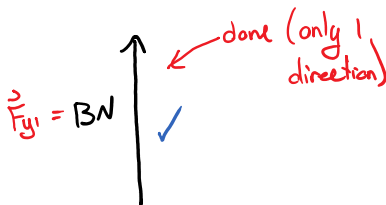
$$= 9.3\text{ N at } 38^\circ \text{ E of N}$$

$$\frac{8\text{ N}}{\sin \theta} = \frac{9.3\text{ N}}{\sin 45}$$

$$\theta = \arcsin\left(\frac{8 \sin 45}{9.3}\right)$$

$$= 38^\circ$$

Method #2: Split into components.



$$\sin \theta = \frac{O}{H}$$

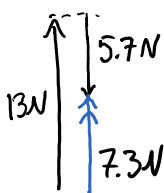
$$F_{y2} = 8 \sin(45)$$

$$= 5.7\text{ N south.} \checkmark$$

$$F_{x2} = 8 \sin(45)$$

$$= 5.7\text{ N east.}$$

Vector addition:

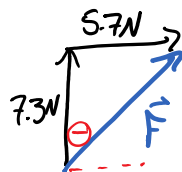


$$13\text{ N [N]} + 5.7\text{ [S]}$$

$$= 13 - 5.7 = 7.3\text{ N [N]}$$

$$\theta = \arctan\left(\frac{5.7}{7.3}\right)$$

$$\theta = 38^\circ$$



$$F = \sqrt{(7.3)^2 + (5.7)^2}$$

$$F = 9.3\text{ N at } 38^\circ \text{ E of N.}$$

Complete the following:

