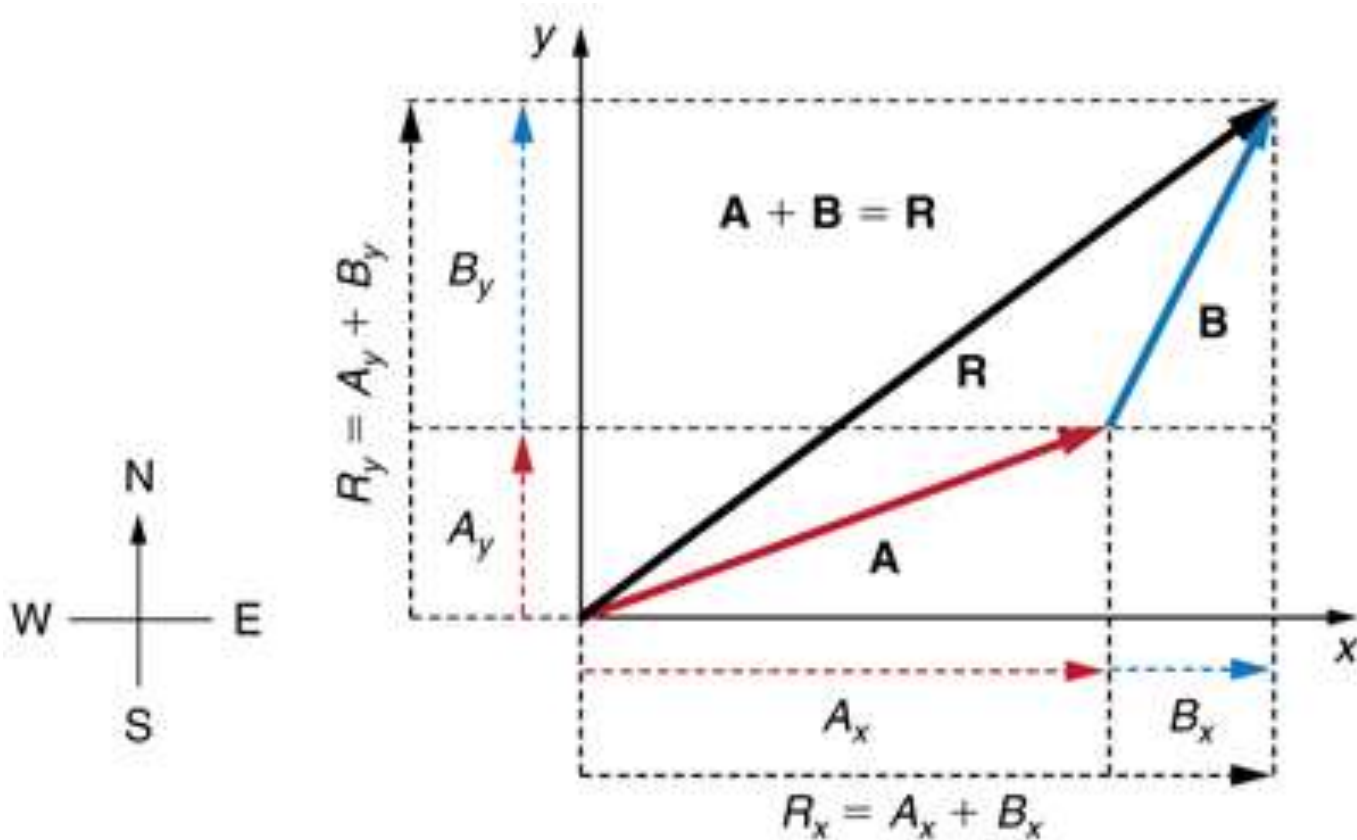
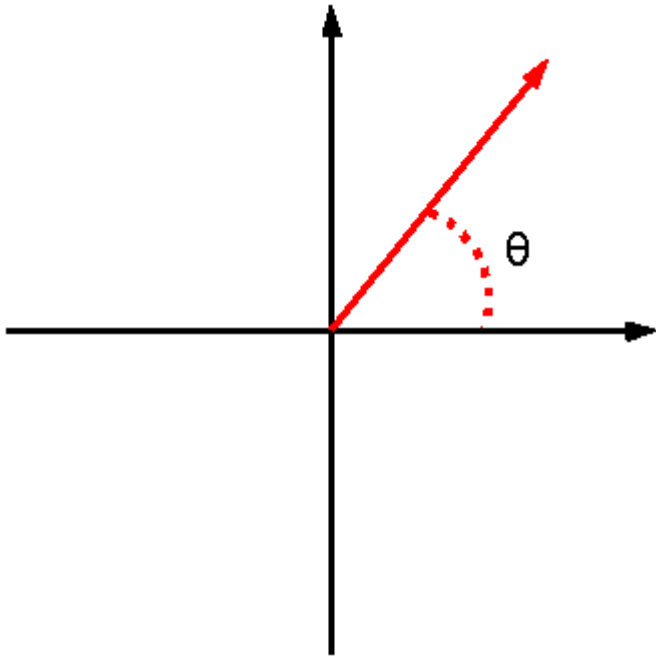


Vektor



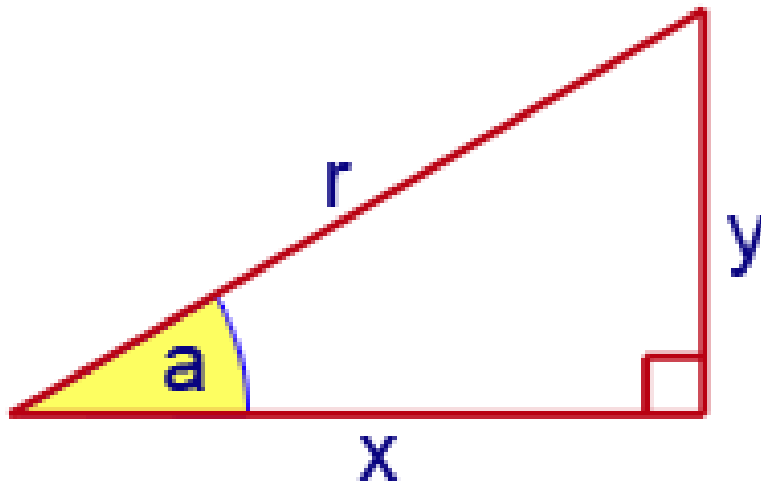
Vektor: besaran yang memiliki besar dan arah

Contoh.....



- Vektor memiliki besar dan arah
- Vektor digambarkan oleh sebuah panah
- Besar vektor \rightarrow panjang panah
- Arah vektor \rightarrow arah panah
- Notasi: \mathbf{A} , \vec{A}

PHET: <https://phet.colorado.edu/>



$$\sin a = \frac{y}{r}$$

$$\cos a = \frac{x}{r}$$

$$\tan a = \frac{y}{x}$$

$$\mathbf{v} = v_x \hat{i} + v_y \hat{j} = (v_x, v_y)$$

$$v_x = |\mathbf{v}| \cos \theta$$

$$v_y = |\mathbf{v}| \sin \theta$$

<https://www.geogebra.org/m/QGYDPzJ2>

<https://www.geogebra.org/m/UNFMFbPh>

$$\vec{5} + \vec{5} = \vec{10}$$

$$\vec{5} + \overleftarrow{-5} = \vec{0}$$

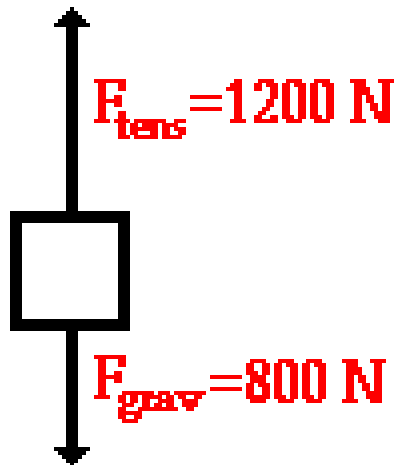
$$\vec{5} + \vec{10} = \vec{15}$$

$$\vec{5} + \overleftarrow{-10} = \overleftarrow{-5}$$

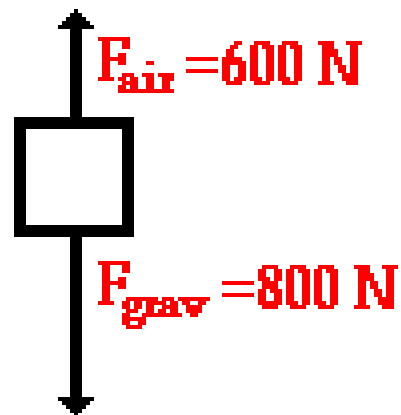
$$\vec{5} + \overleftarrow{-15} = \overleftarrow{-10}$$

$$\vec{10} + \overrightarrow{-5} = \vec{5}$$

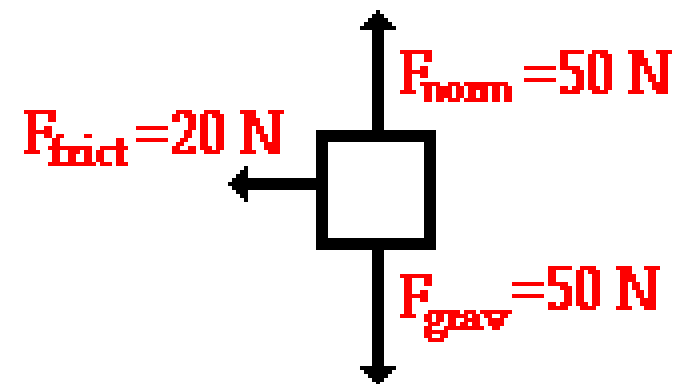
F_{net} is 400 N, up



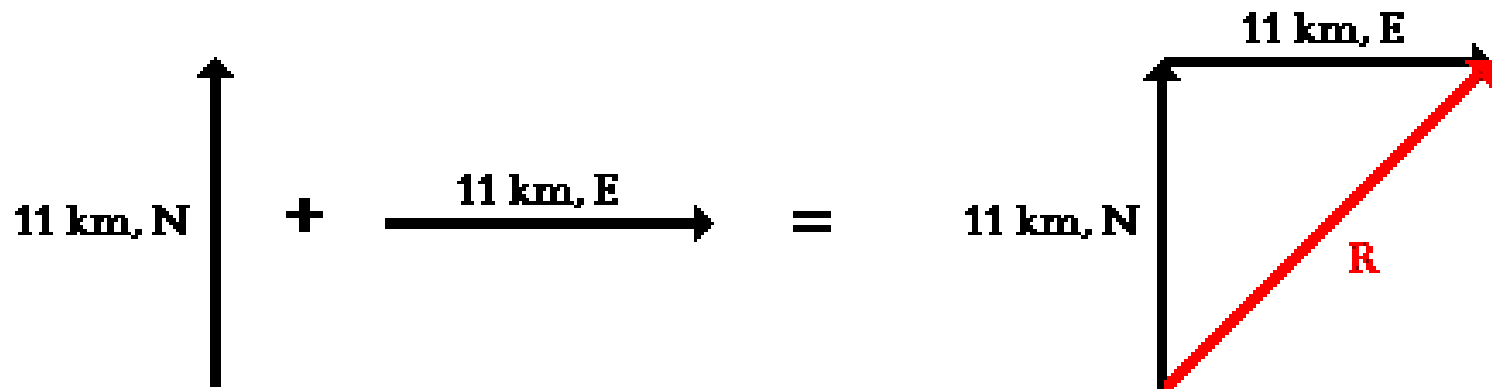
F_{net} is 200 N, down



F_{net} is 20 N, left



Phytagorean Theorem



$$11^2 + 11^2 = R^2$$

$$242 = R^2$$

$$15.6 = R$$



PENJUMLAHAN/PENGURANGAN VEKTOR

- Metode segitiga
- Metode paralelogram
- Metode analitik

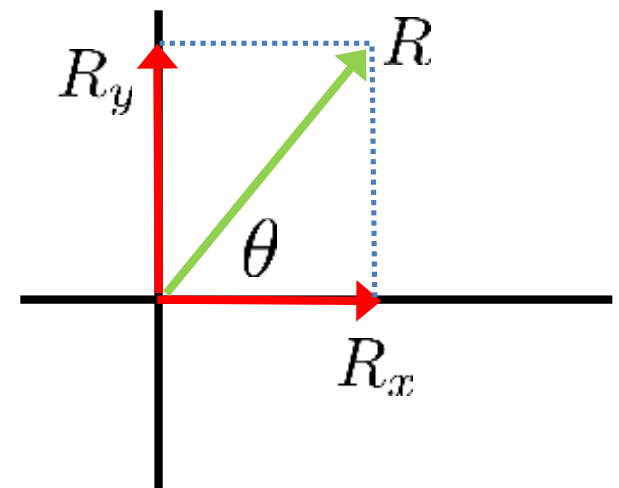
<https://www.geogebra.org/m/HMje3hdt>

<https://www.geogebra.org/m/FCknj7c3>

	Arah x	Arah y
\vec{A}	A_x	A_y
\vec{B}	B_x	B_y
	R_x	R_y

$$R = \sqrt{R_x^2 + R_y^2}$$

$$\tan \theta = \frac{R_y}{R_x}$$





PERKALIAN SKALAR DAN VEKTOR

$$a(\mathbf{A} + \mathbf{B}) = a\mathbf{A} + a\mathbf{B}$$

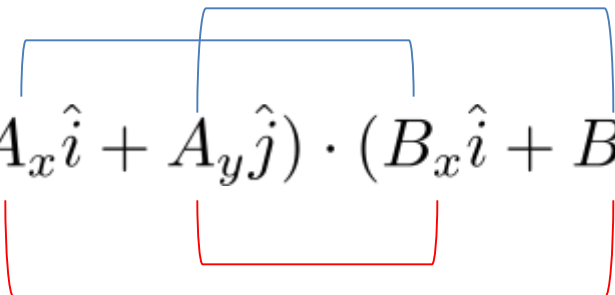
Dot Product \rightarrow hasil: skalar

$$\mathbf{A} \cdot \mathbf{B} = AB \cos \theta$$

Secara geometris, dot product dari vektor \mathbf{A} dan \mathbf{B} adalah perkalian antara panjang vektor \mathbf{A} dengan proyeksi vektor \mathbf{B} pada vektor \mathbf{A} .

Ilustrasi dot product

<https://www.geogebra.org/m/KMifob4i>

$$\mathbf{A} \cdot \mathbf{B} = (A_x \hat{i} + A_y \hat{j}) \cdot (B_x \hat{i} + B_y \hat{j})$$


Suku langsung(biru)

$$A_x B_x (\hat{i} \cdot \hat{i}) + A_y B_y (\hat{j} \cdot \hat{j}) = A_x B_x + A_y B_y$$

Suku silang (warna merah)

$$A_x B_y (\hat{i} \cdot \hat{j}) + A_y B_x (\hat{j} \cdot \hat{i}) = 0$$

Cross Product → hasil: vektor

$$\mathbf{A} \times \mathbf{B} = \mathbf{C}$$

$$|\mathbf{C}| = AB \sin \theta$$

Secara geometris, nilai cross product vektor \mathbf{A} dan \mathbf{B} sama dengan luas bidang yang dibentuk oleh vektor \mathbf{A} dan \mathbf{B}

<https://www.geogebra.org/m/pcMtbdq8>

<https://www.geogebra.org/m/psMTGDgc>

$$\begin{aligned}\mathbf{A} \times \mathbf{B} &= \begin{vmatrix} \hat{i} & \hat{j} & \hat{k} \\ A_x & A_y & A_z \\ B_x & B_y & B_z \end{vmatrix} \\ &= \hat{i} \begin{vmatrix} A_y & A_z \\ B_y & B_z \end{vmatrix} - \hat{j} \begin{vmatrix} A_x & A_z \\ B_x & B_z \end{vmatrix} + \hat{k} \begin{vmatrix} A_x & A_y \\ B_x & B_y \end{vmatrix} \\ &= (A_y B_z - A_z B_y) \hat{i} - (A_x B_z - A_z B_x) \hat{j} + (A_x B_y - A_y B_x) \hat{k}\end{aligned}$$

A student drives his car 6.0 km, North before making a right hand turn and driving 6.0 km to the East. Finally, the student makes a left hand turn and travels another 2.0 km to the north. What is the magnitude of the overall displacement of the student?

Max plays middle linebacker for South's football team. During one play in last Friday night's game against New Greer Academy, he made the following movements after the ball was snapped on third down. First, he back-pedaled in the southern direction for 2.6 meters. He then shuffled to his left (west) for a distance of 2.2 meters. Finally, he made a half-turn and ran downfield a distance of 4.8 meters in a direction of 240° counter-clockwise from east (30° W of S) before finally knocking the wind out of New Greer's wide receiver. Determine the magnitude and direction of Max's overall displacement.

A motorboat traveling 4 m/s, East encounters a current traveling 3.0 m/s, North.

- a. What is the resultant velocity of the motorboat?
- b. If the width of the river is 80 meters wide, then how much time does it take the boat to travel shore to shore?
- c. What distance downstream does the boat reach the opposite shore?