

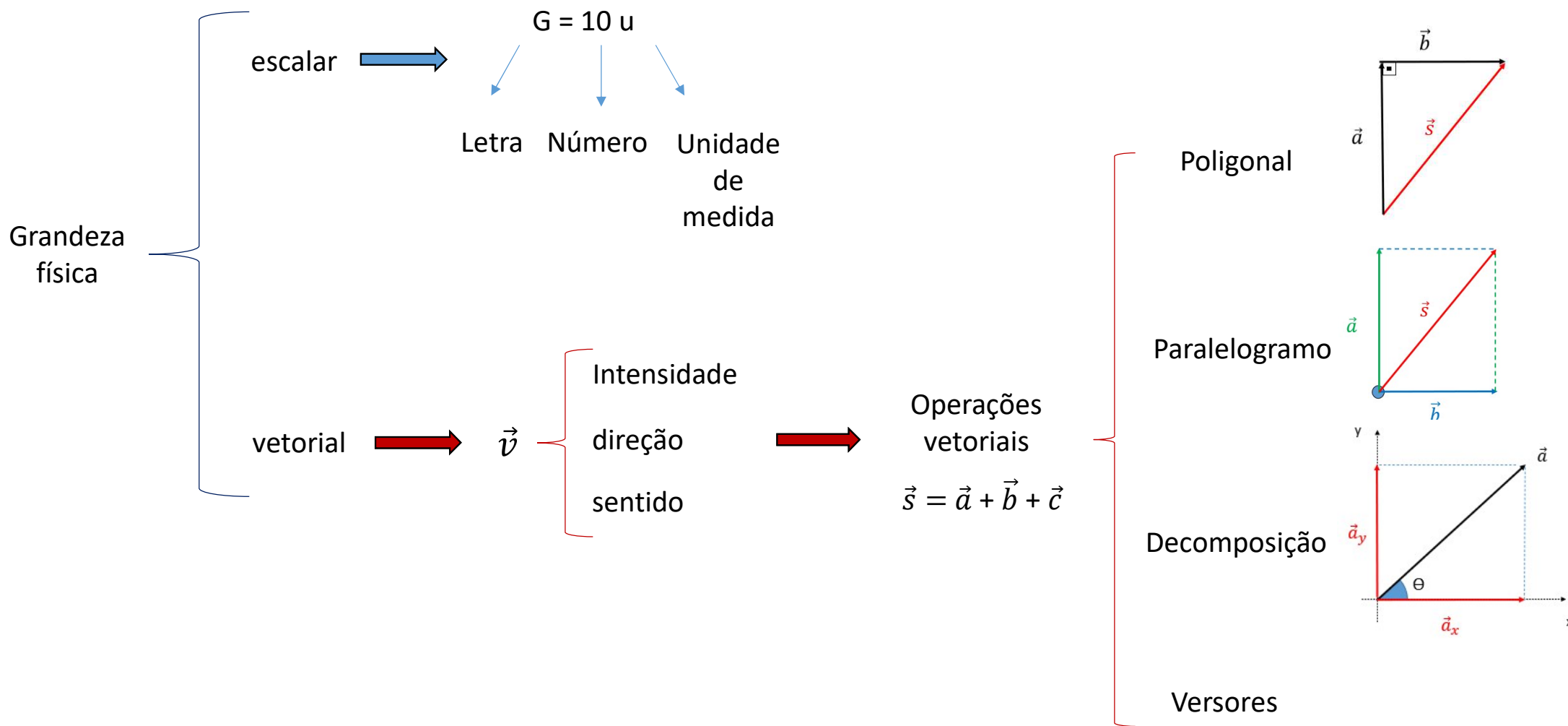
## Operações vetoriais

- Aula 2 / Caderno 1 / Setor A

Apresentação e demais documentos: [fisicasp.com.br](http://fisicasp.com.br)

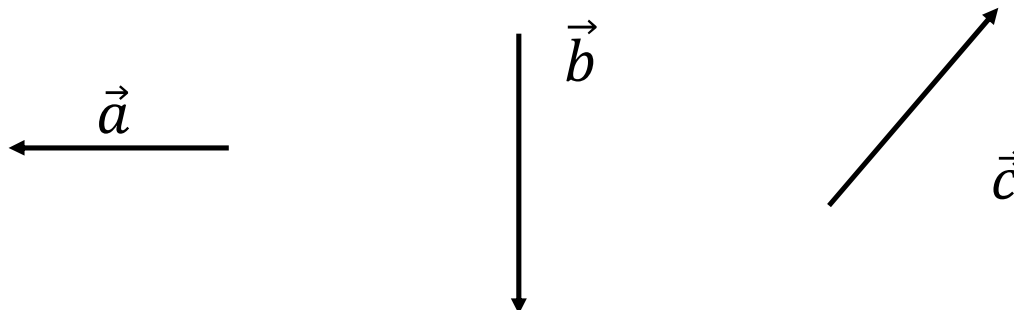
**Professor Caio**

# 1. Grandeza escalar x vetorial



## 2. Resultante de vetores ou soma de vetores

$$\vec{s} = \vec{a} + \vec{b} + \vec{c}$$

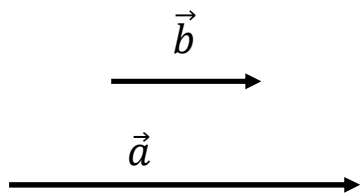


Não é a simples soma algébrica de suas intensidades!



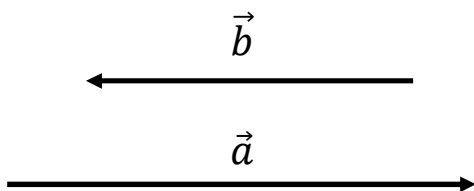
### 3. Regra da linha poligonal

Mesma direção e sentido



$$a = 4 \text{ e } b = 3$$

Mesma direção e sentidos contrários

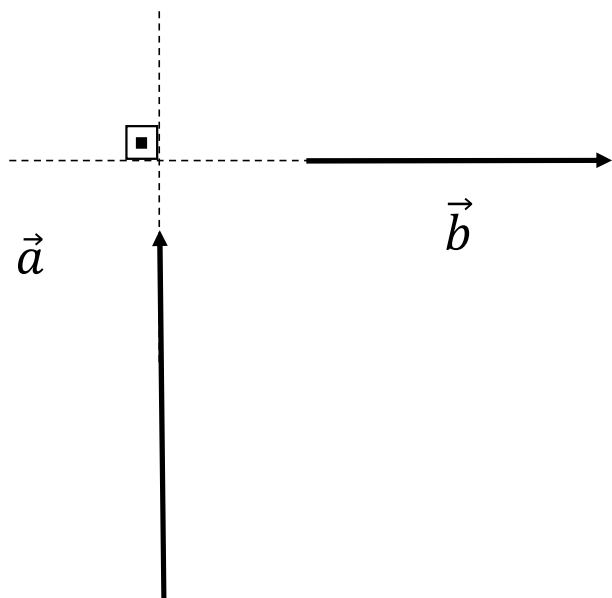


$$a = 4 \text{ e } b = 3$$

### 3. Regra da linha poligonal

Vetores perpendiculares entre si

$$\vec{s} = \vec{a} + \vec{b}$$

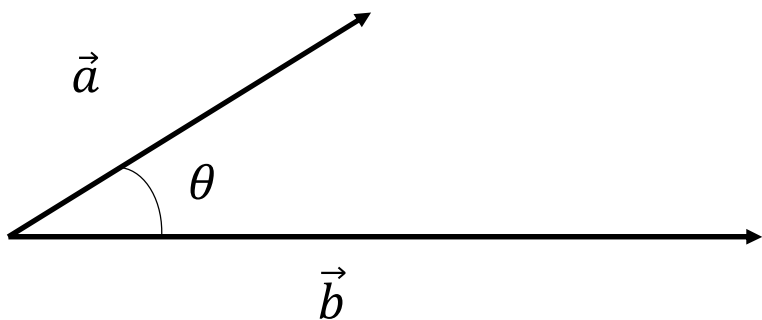


$$a = 4 \text{ e } b = 3$$

### 3. Regra da linha poligonal

Ângulo qualquer entre os vetores

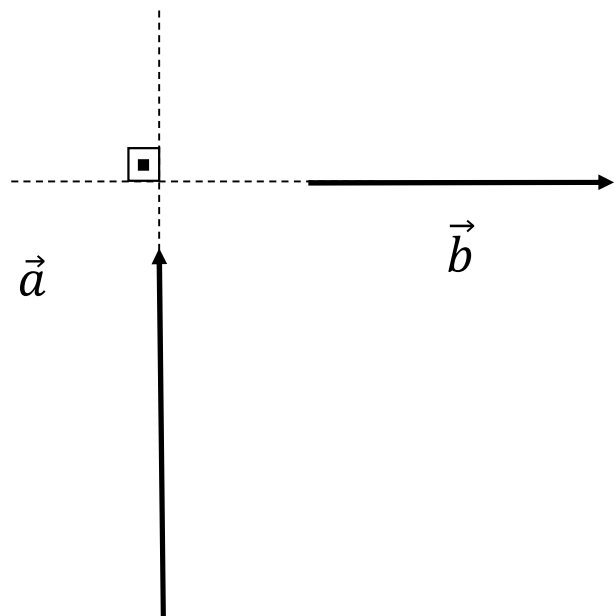
$$\vec{s} = \vec{a} + \vec{b}$$



## 4. Regra do paralelogramo

Vetores perpendiculares entre si

$$\vec{s} = \vec{a} + \vec{b}$$

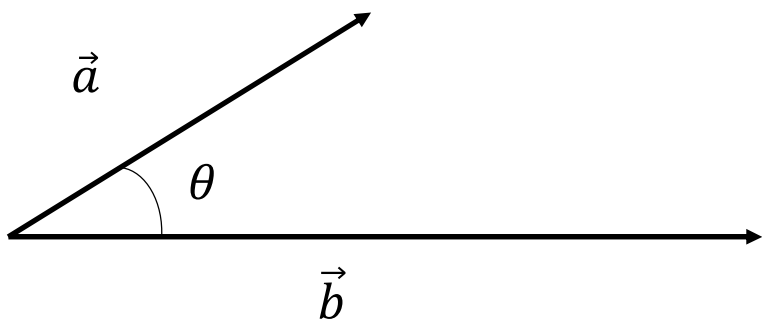


$$a = 4 \text{ e } b = 3$$

## 4. Regra do paralelogramo

Ângulo qualquer entre os vetores

$$\vec{s} = \vec{a} + \vec{b}$$

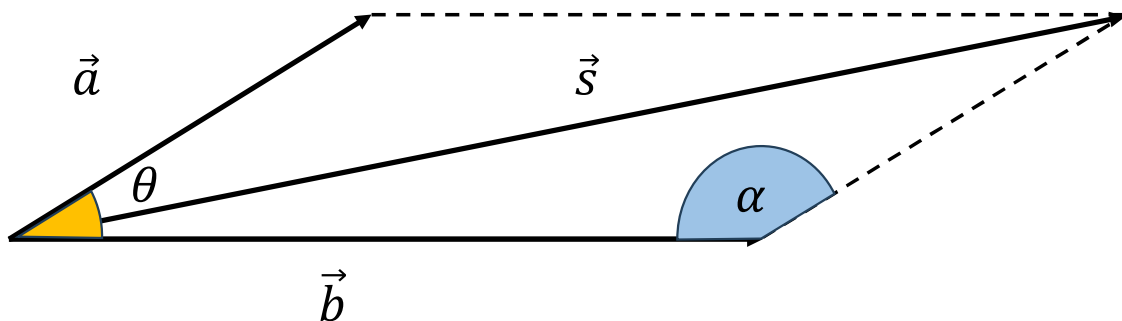




## 4. Regra do paralelogramo

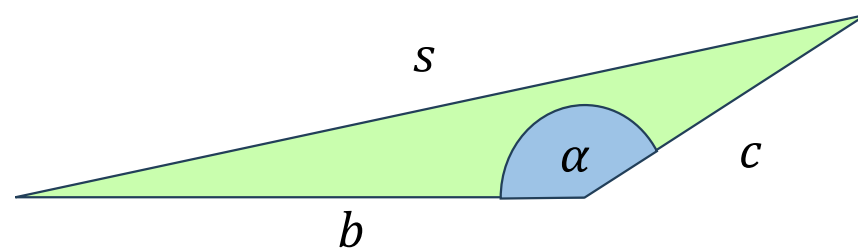
Ângulo qualquer entre os vetores

$$\vec{s} = \vec{a} + \vec{b}$$



$$\alpha + \theta = 180^\circ$$

$$\cos \theta = -\cos \alpha$$

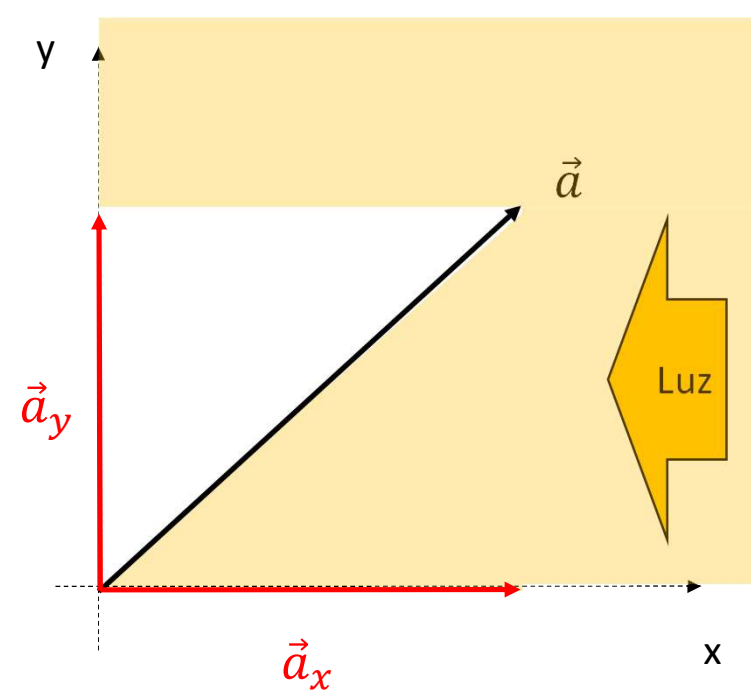
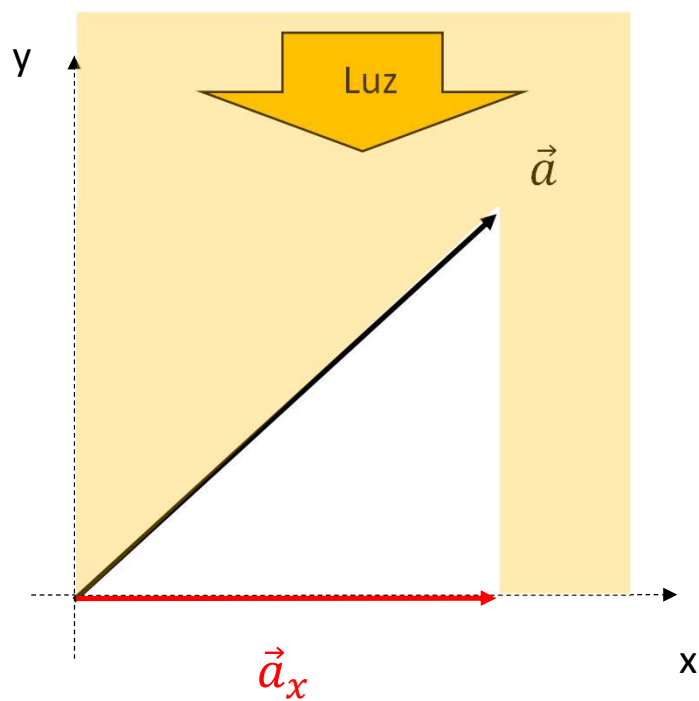
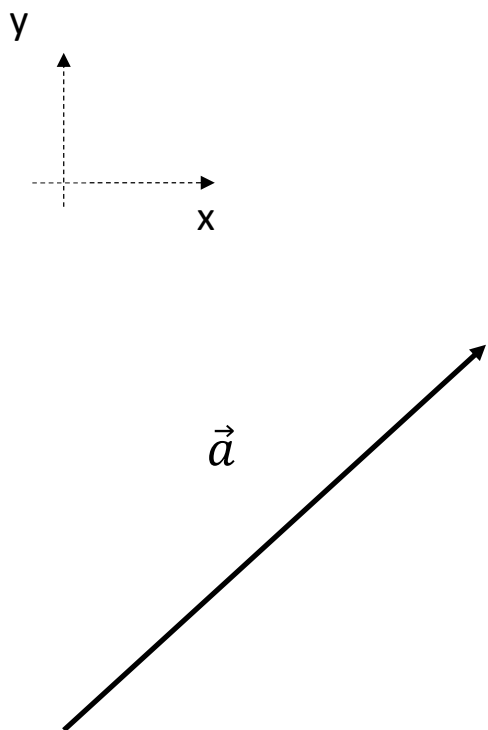


$$s^2 = a^2 + b^2 - 2.a.b.\cos\alpha$$

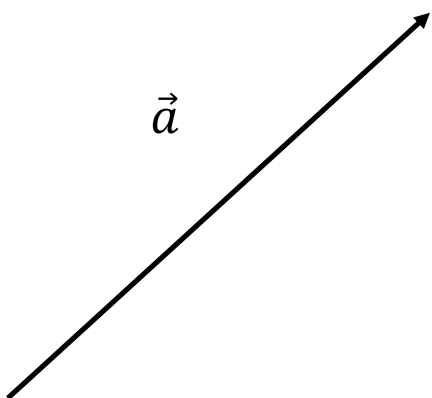
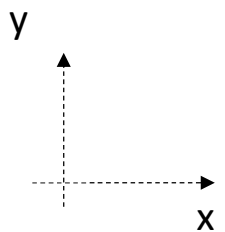
ou

$$s^2 = a^2 + b^2 + 2.a.b.\cos\theta$$

## 5. Decomposição de um vetor

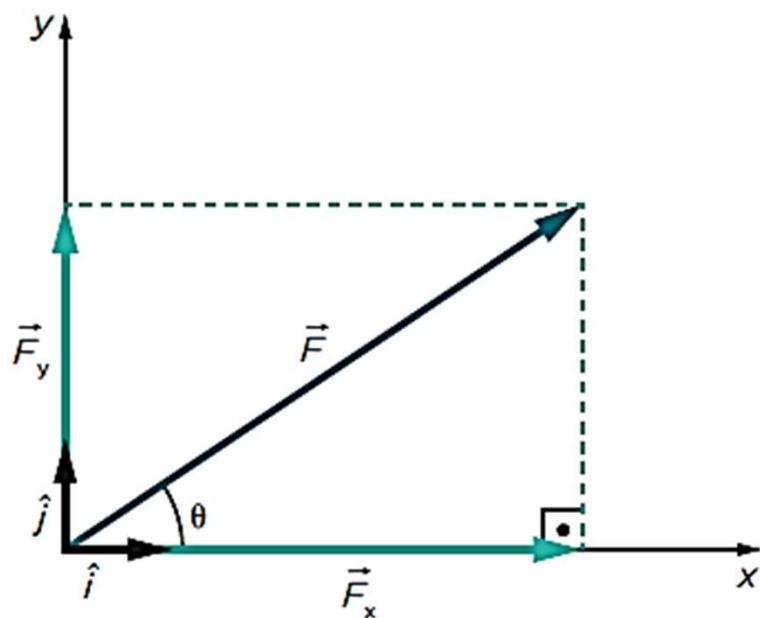


## 5. Decomposição de um vetor



## 5. Vetores unitários ou versores

Versores são vetores unitários utilizados para indicar a direção e o sentido das componentes de um vetor. É convenção que:



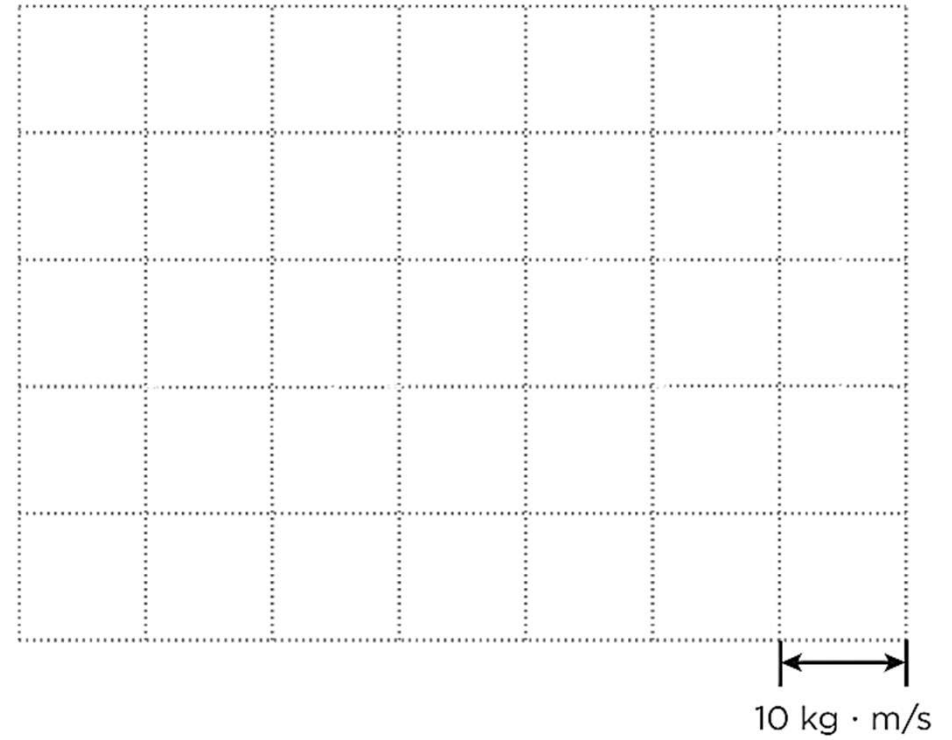
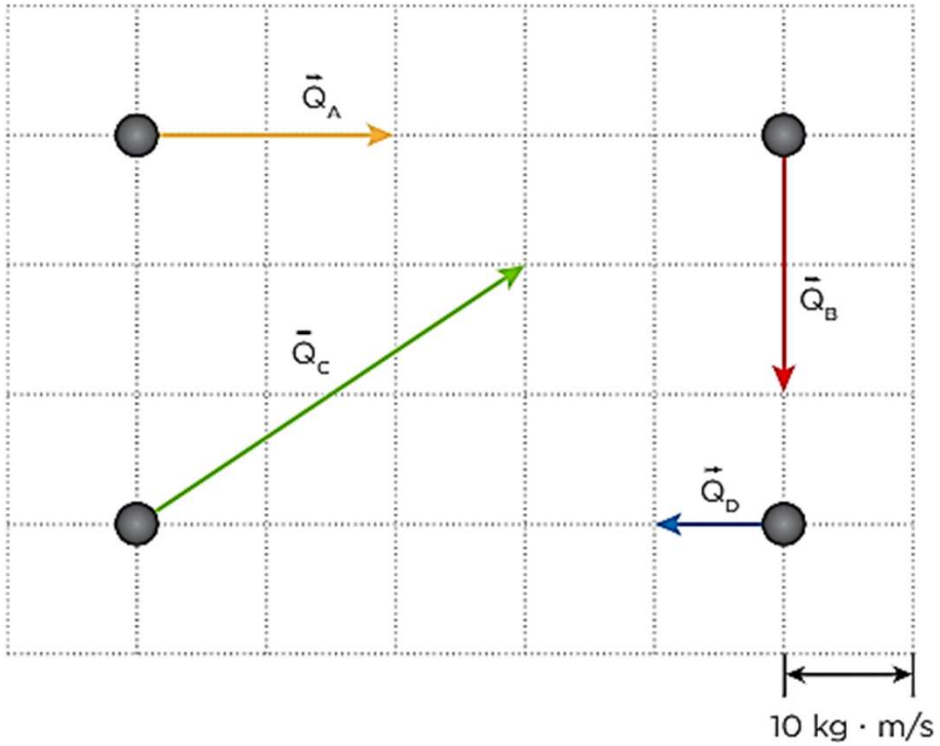
$$\hat{i} = \{1 \text{ unidade, horizontal, para a direita}\}$$

$$\hat{j} = \{1 \text{ unidade, vertical, para cima}\}$$

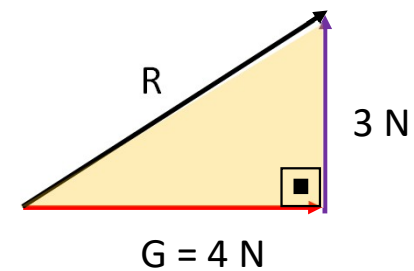
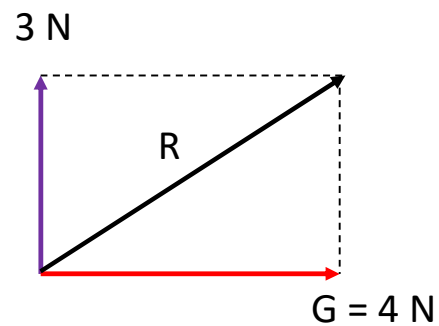
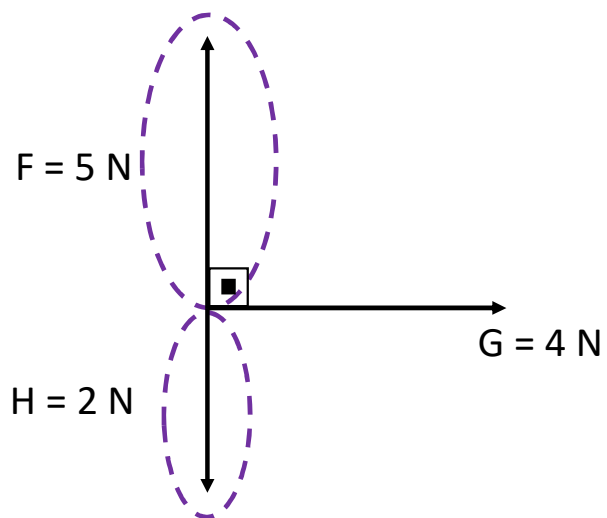
$$\vec{F} = F_x \cdot \hat{i} + F_y \cdot \hat{j}$$

## Exercícios do Caio

1. Observe o sistema de quatro corpos a seguir e caracterize o vetor  $\vec{Q}_{sistema} = \vec{Q}_A + \vec{Q}_B + \vec{Q}_C + \vec{Q}_D$  por meio do método gráfico



2. Determine a intensidade da resultante das forças.



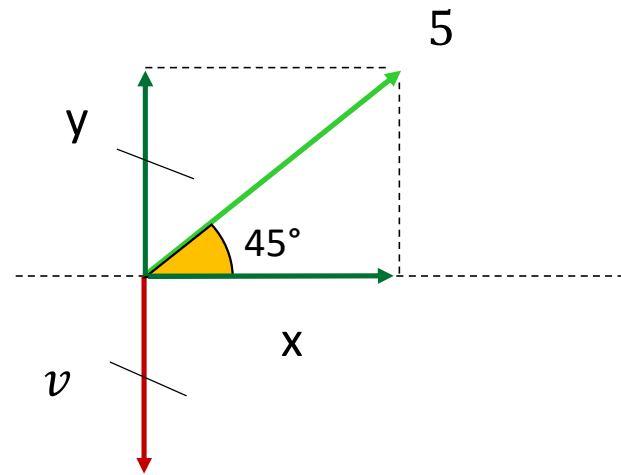
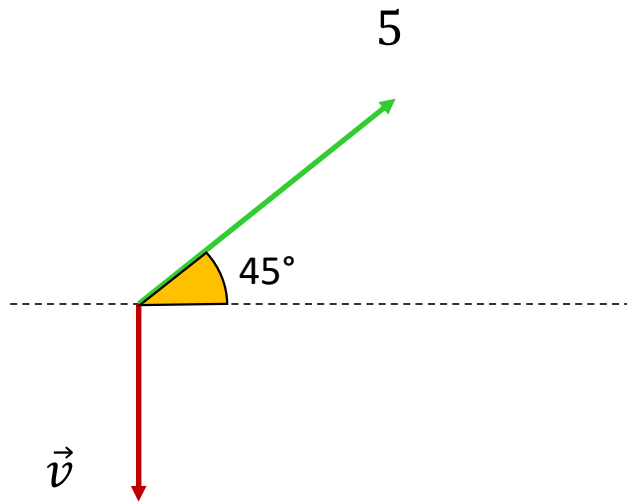
$$R^2 = 4^2 + 3^2$$

$$R^2 = 16 + 9$$

$$R^2 = 25$$

$$R = 5\text{ N}$$

3. Determine a intensidade do vetor  $\vec{v}$  sabendo que o vetor soma tem somente componente horizontal

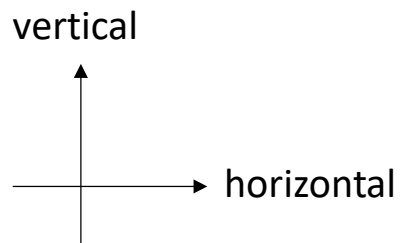


$$v = y$$

$$\text{sen } 45^\circ = \frac{y}{5}$$

$$\frac{\sqrt{2}}{2} = \frac{y}{5}$$

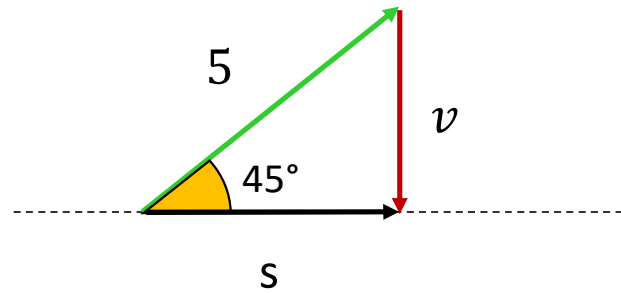
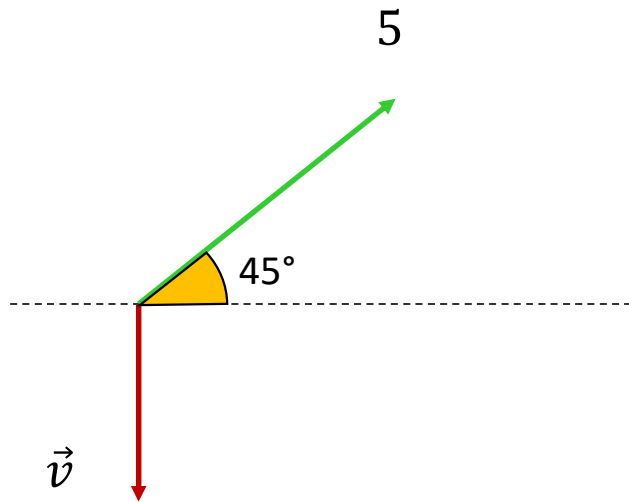
$$y = \frac{5\sqrt{2}}{2}$$



$$\therefore v = y = \frac{5\sqrt{2}}{2}$$



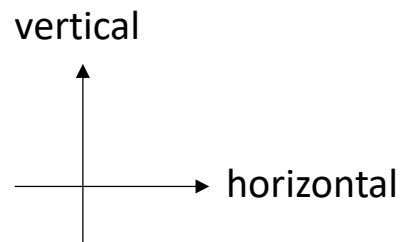
3. Determine a intensidade do vetor  $\vec{v}$  sabendo que o vetor soma tem somente componente horizontal



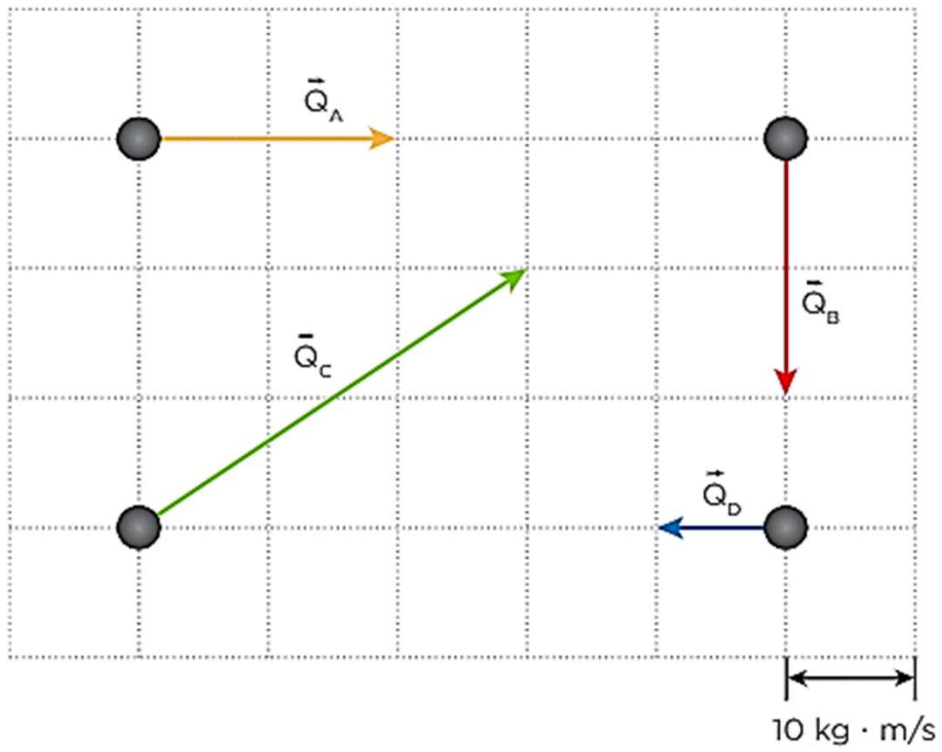
$$\text{sen } 45^\circ = \frac{v}{5}$$

$$\frac{\sqrt{2}}{2} = \frac{v}{5}$$

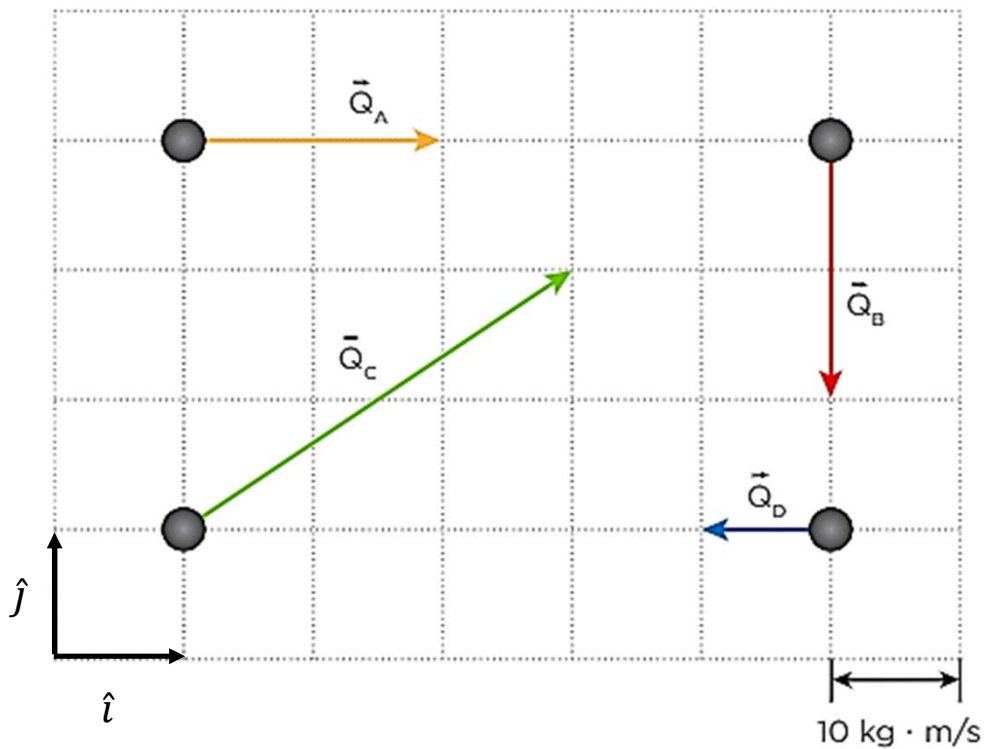
$$v = \frac{5\sqrt{2}}{2}$$



4. Observe o sistema de quatro corpos a seguir e caracterize o vetor  $\vec{Q}_{sistema} = \vec{Q}_A + \vec{Q}_B + \vec{Q}_C + \vec{Q}_D$   
Resolva utilizando versores.



4. Observe o sistema de quatro corpos a seguir e caracterize o vetor  $\vec{Q}_{sistema} = \vec{Q}_A + \vec{Q}_B + \vec{Q}_C + \vec{Q}_D$ . Resolva e apresente o resultado utilizando versores.



$$\vec{Q}_A = 2 \hat{i} \quad \vec{Q}_C = 3 \hat{i} + 2 \hat{j}$$

$$\vec{Q}_B = -2 \hat{j} \quad \vec{Q}_D = -1 \hat{i}$$

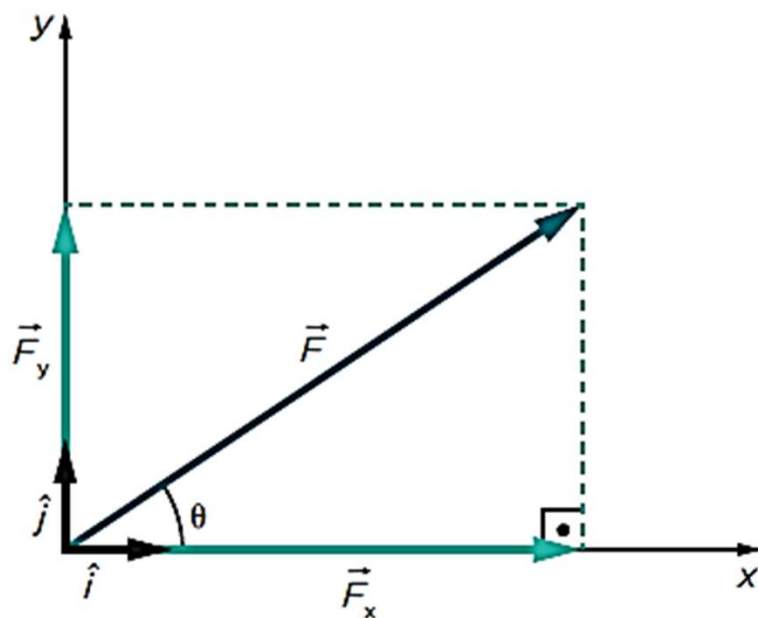
$$\vec{Q}_{sistema} = \vec{Q}_A + \vec{Q}_B + \vec{Q}_C + \vec{Q}_D$$

$$\vec{Q}_{sistema} = (2 \hat{i}) + (-2 \hat{j}) + (3 \hat{i} + 2 \hat{j}) + (-1 \hat{i})$$

$$\vec{Q}_{sistema} = 4 \hat{i}$$

## Vetores unitários ou versores

Versores são vetores unitários utilizados para indicar a direção e o sentido das componentes de um vetor. É convenção que:



$$\hat{i} = \{1 \text{ unidade, horizontal, para a direita}\}$$

$$\hat{j} = \{1 \text{ unidade, vertical, para cima}\}$$

$$\vec{F} = F_x \cdot \hat{i} + F_y \cdot \hat{j}$$