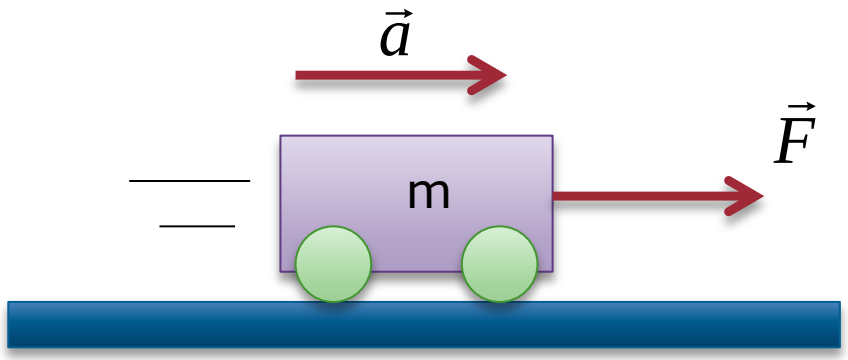
DINÁMICA

La Dinámica es la parte de la mecánica que estudia las causas del movimiento

El estudio de la Dinámica está basado en dos leyes :
1ra. Ley : Equilibrio
2da. Ley : fuerza - aceleración



2da. LEY DE NEWTON

La aceleración que adquiere un cuerpo es directamente proporcional de la fuerza resultante e inversamente proporcional a su masa

$$\vec{a} = \frac{\vec{F}_R}{m}$$

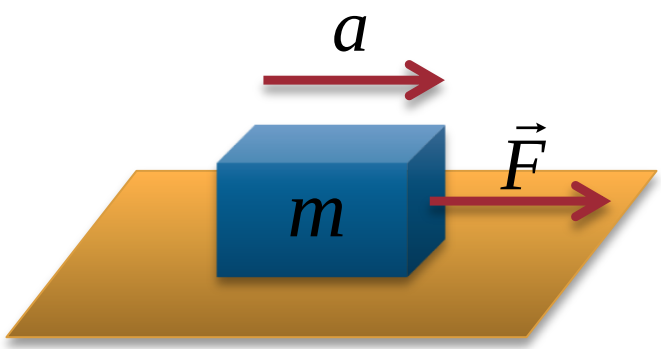
$$\vec{F}_R = \sum F$$

$\vec{a}$: aceleración

$\vec{F}_R$: Fuerza resultante

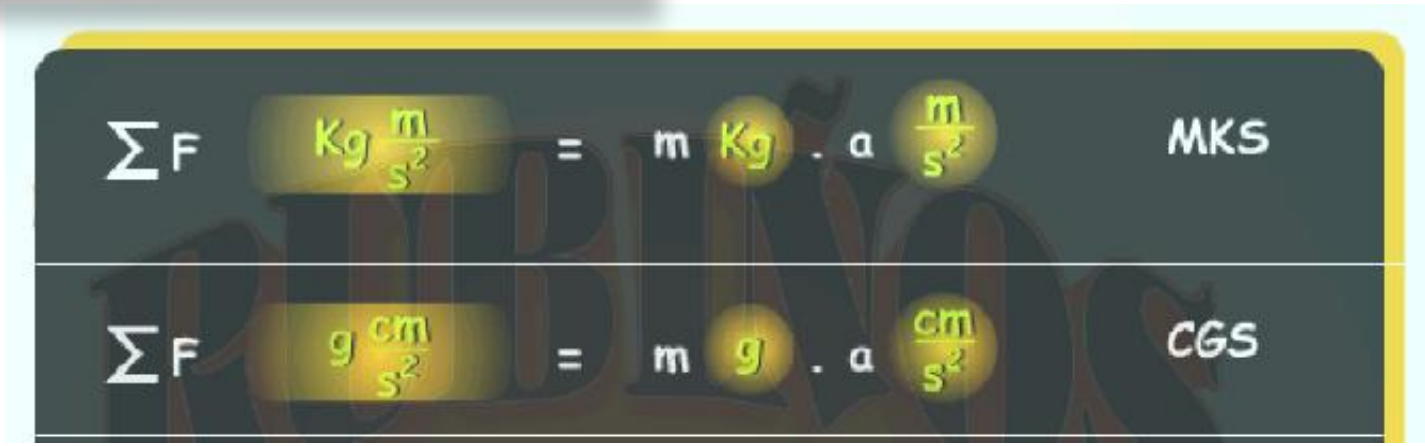
m : Masa

$\sum F$: Sumatoria de fuerzas



La aceleración y la fuerza resultante tienen la misma dirección y sentido

UNIDADES DE FUERZA



$$\vec{F}_R = m\,\vec{a}$$

$$F\,[Newton] = m\,[kg].a\,[m/s^2]$$

$$F\,[dina] = m\,[g].a\,[cm/s^2]$$

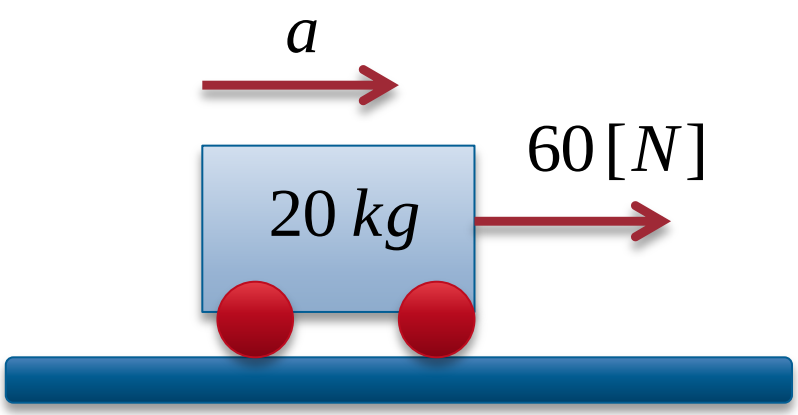
$$1[N] = 1[kg\,\frac{m}{s^2}]$$

$$1[dina] = 1[g\,\frac{cm}{s^2}]$$

EJEMPLO 1

Calcular la aceleración.

$$\vec{F}_R = m\,\vec{a}$$



$$\vec{a} = \frac{\vec{F}_R}{m}$$

$$a = \frac{60\,[N]}{20\,[kg]}$$

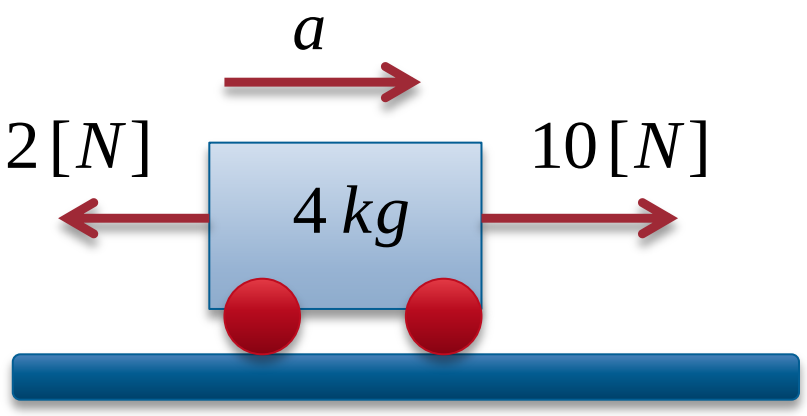
$$a = \frac{60\,[kg\,\frac{m}{s^2}]}{20\,[kg]}$$

$$a = 3\,[m/s^2]$$

EJEMPLO 2

Calcular la aceleración.

$$\vec{a} = \frac{\vec{F}_R}{m}$$



$$\vec{F}_R = 10[N] - 2[N]$$

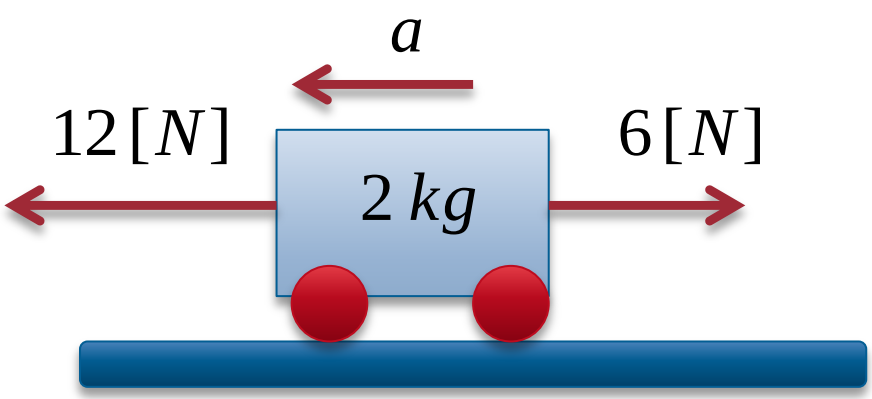
$$\vec{F}_R = 8[N]$$

$$a = \frac{8[N]}{4[kg]}$$

$$a = 2[m/s^2]$$

EJEMPLO 3

Calcular la aceleración.



$$\vec{a} = \frac{\vec{F}_R}{m}$$

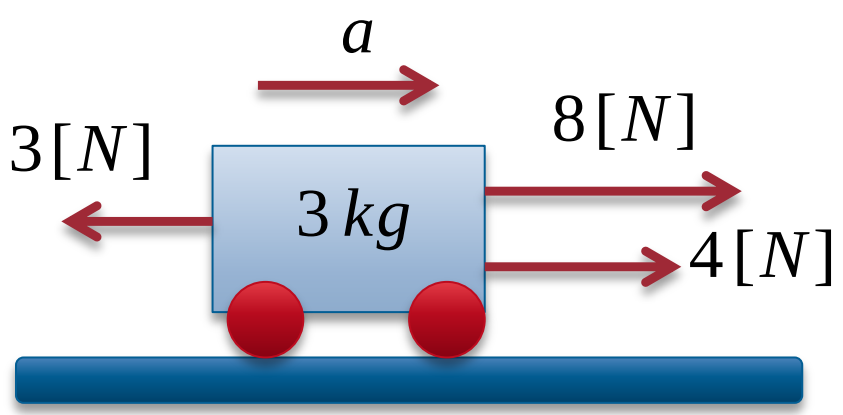
$$\vec{F}_R = 12[N] - 6[N]$$

$$\vec{F}_R = 6[N]$$

$$a = \frac{6[N]}{2[kg]} \quad \Rightarrow \quad a = 3[m/s^2]$$

EJEMPLO 4

Calcular la aceleración.



$$\vec{a} = \frac{\vec{F}_R}{m}$$

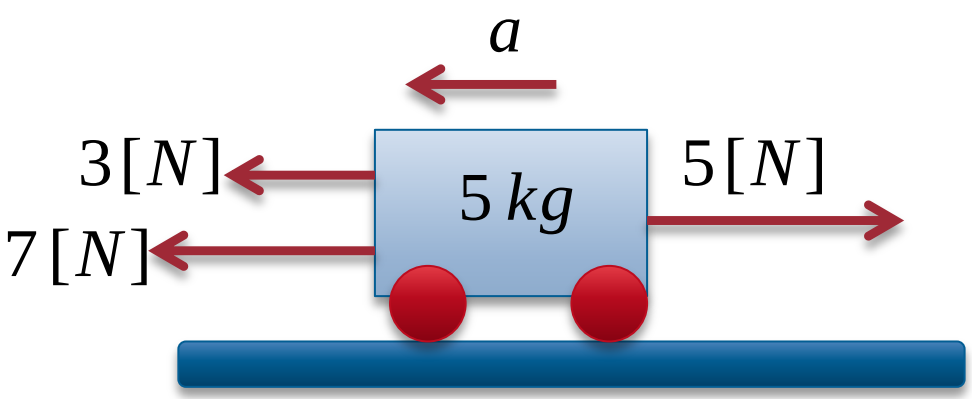
$$\vec{F}_R = 8[N] + 4[N] - 3[N]$$

$$\vec{F}_R = 9[N]$$

$$a = \frac{9[N]}{3[kg]} \quad \Rightarrow \quad a = 3[m/s^2]$$

EJEMPLO 5

Calcular la aceleración.



$$\vec{a} = \frac{\vec{F}_R}{m}$$

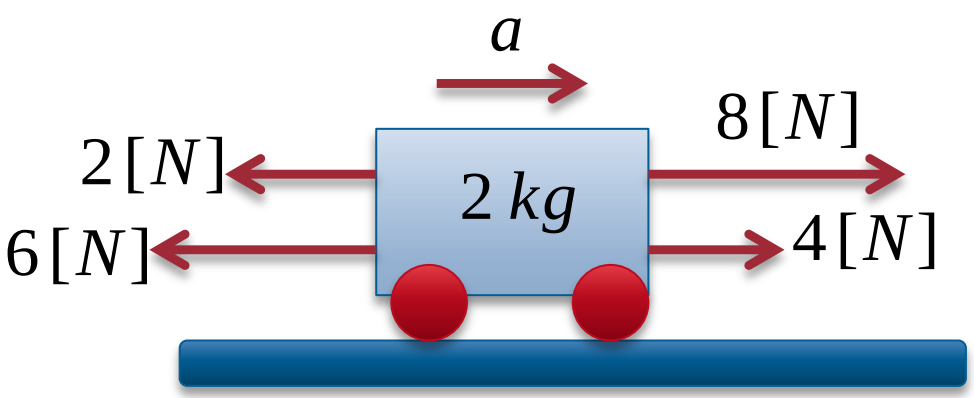
$$\vec{F}_R = 7[N] + 3[N] - 5[N]$$

$$\vec{F}_R = 5[N]$$

$$a = \frac{5[N]}{5[kg]} \Rightarrow a = 1[m/s^2]$$

EJEMPLO 6

Calcular la aceleración.

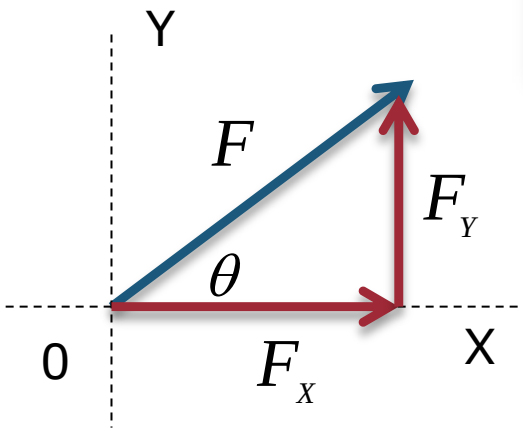


$$\vec{a} = \frac{\vec{F}_R}{m}$$

$$\vec{F}_R = 8[N] + 4[N] - 2[N] - 6[N] \qquad \vec{F}_R = 4[N]$$

$$a = \frac{4[N]}{2[kg]} \Rightarrow a = 2[m/s^2]$$

COMPONENTES DE UN VECTOR

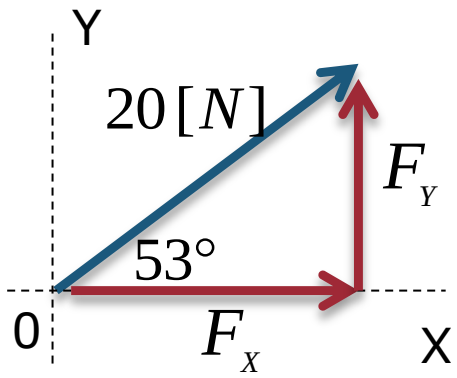


$$F_Y = F\ sen\ \theta$$

$$F_X = F\cos\theta$$

EJEMPLO

Hallar las componentes del vector.



$$F = \sqrt{F_X^{\,2} + F_Y^{\,2}}$$

$$F = \sqrt{12^2 + 16^2}$$

$$F = 20\,[N]$$

$$F_X = 20\,[N]\cos 53°$$

$$F_X = 20\,[N]\frac{3}{5}$$

$$F_X = 12\,[N]$$

$$F_Y = 20\,[N]\,sen\,53°$$

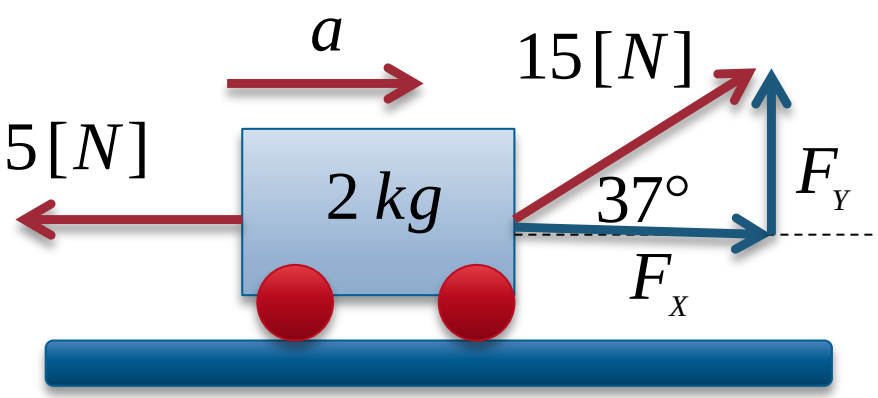
$$F_Y = 20\,[N]\frac{4}{5}$$

$$F_Y = 16\,[N]$$

EJEMPLO 7

Calcular la aceleración.

$$\vec{a} = \frac{\vec{F}_R}{m}$$



$$F_X = F \cos 37°$$

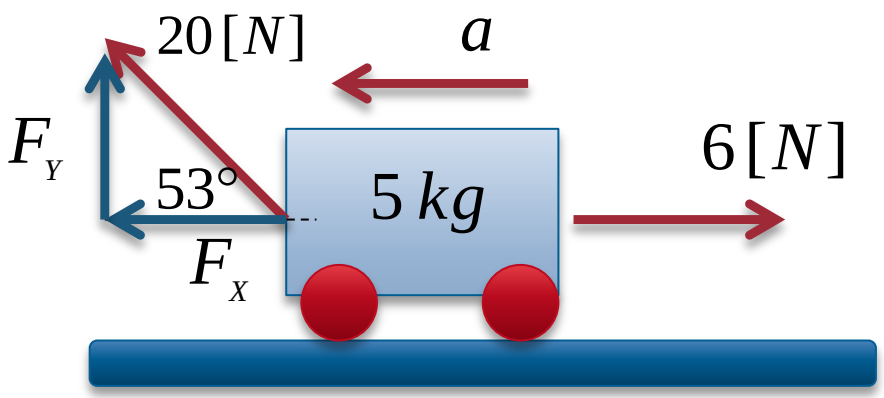
$$F_X = 15 \frac{3}{5} [N] \qquad F_X = 9[N] \qquad \vec{F}_R = 9[N] - 5[N]$$

$$\vec{F}_R = 4[N] \qquad a = \frac{4[N]}{2[kg]} \Rightarrow \boxed{a = 2[m/s^2]}$$

EJEMPLO 8

Calcular la aceleración.

$$\vec{a} = \frac{\vec{F}_R}{m}$$

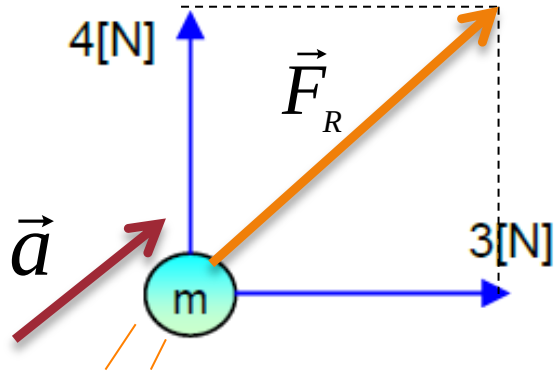


$$F_X = F \cos 53°$$

$$F_X = 20 \frac{4}{5} [N] \qquad F_X = 16[N] \qquad \vec{F}_R = 16[N] - 6[N]$$

$$\vec{F}_R = 10[N] \qquad a = \frac{10[N]}{5[kg]} \Rightarrow a = 2[m/s^2]$$

1. Sobre un cuerpo de 10 kg actúan dos fuerzas perpendiculares 3 [N] y 4 [N]. Halla aceleración que experimenta el cuerpo.



$$\vec{a} = \frac{\vec{F}_R}{m}$$

$$F_R = \sqrt{F_1^2 + F_2^2 + 2F_1F_2\cos\alpha}$$

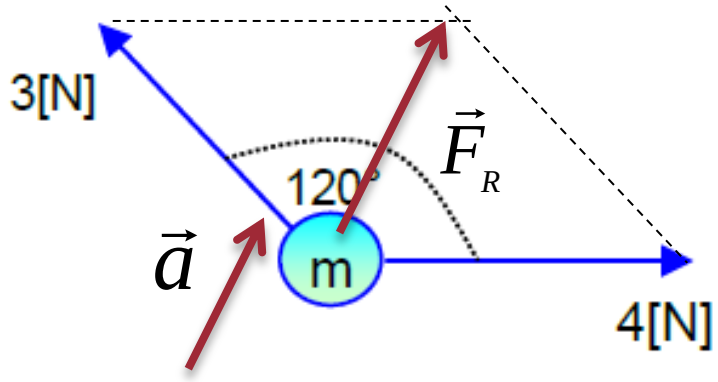
$$a = \frac{5[N]}{10[kg]}$$

$$F_R = \sqrt{3^2 + 4^2 + 2.3.4\cos 90°}$$

$$a = 0{,}5[m/s^2]$$

$$F_R = 5[N]$$

2. Sobre un cuerpo de 250 [g] actúan dos fuerzas de 3[N] y 4[N]. Calcular la aceleración que experimenta el cuerpo si las fuerzas forman un de 120°. , m = 0,25[kg]



$$F_R = \sqrt{F_1^2 + F_2^2 + 2F_1F_2\cos\alpha}$$

$$F_R = \sqrt{3^2 + 4^2 + 2.3.4\cos 120°}$$

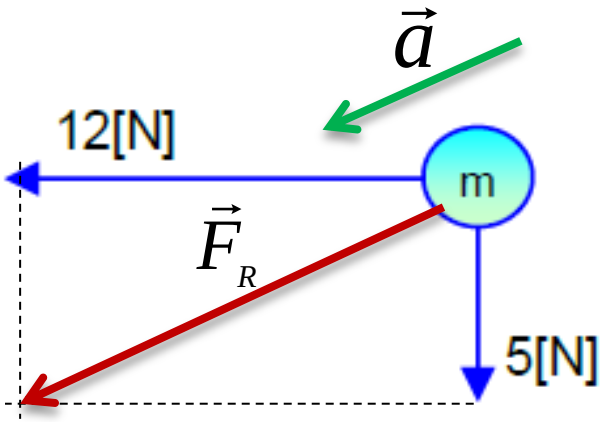
$$F_R = 3{,}6\,[N]$$

$$\vec{a} = \frac{\vec{F}_R}{m}$$

$$a = \frac{3{,}6\,[N]}{0{,}25\,[kg]}$$

$$a = 14{,}4\,[m/s^2]$$

3. Sobre un cuerpo de 26 kg actúan dos fuerzas perpendiculares 5 [N] y 12 [N]. Halla la aceleración que experimenta el cuerpo.



$$F_R = \sqrt{F_1^2 + F_2^2 + 2F_1F_2\cos\alpha}$$

$$F_R = \sqrt{12^2 + 5^2 + 2.12.5\cos 90°}$$

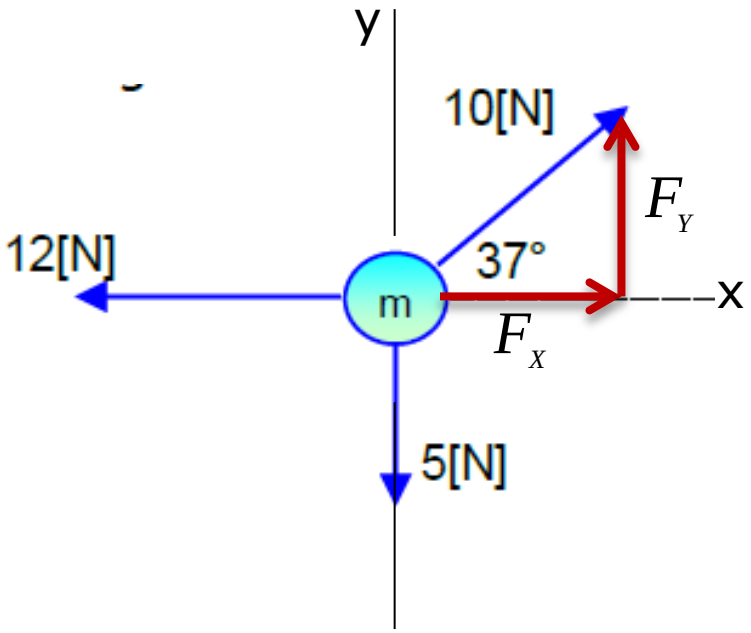
$$F_R = 13[N]$$

$$\vec{a} = \frac{\vec{F}_R}{m} \qquad a = \frac{13[N]}{26[kg]}$$

$$a = 0{,}5[m/s^2]$$

5. Hallar la aceleración que experimenta el cuerpo.

m = 4 kg.



$$F_x = F\cos 37° = 10[\mathrm{N}]\,4/5 = 8[\mathrm{N}]$$

$$F_y = F\,\mathrm{sen}\,37° = 10[\mathrm{N}]\,3/5 = 6[\mathrm{N}]$$

$$\sum F_X = 8[\mathrm{N}] - 12[\mathrm{N}] = -4[\mathrm{N}]$$

$$\sum F_y = 6[\mathrm{N}] - 5[\mathrm{N}] = 1[\mathrm{N}]$$

$$F_R = \sqrt{\sum F_x^{\,2} + \sum F_Y^{\,2}}$$

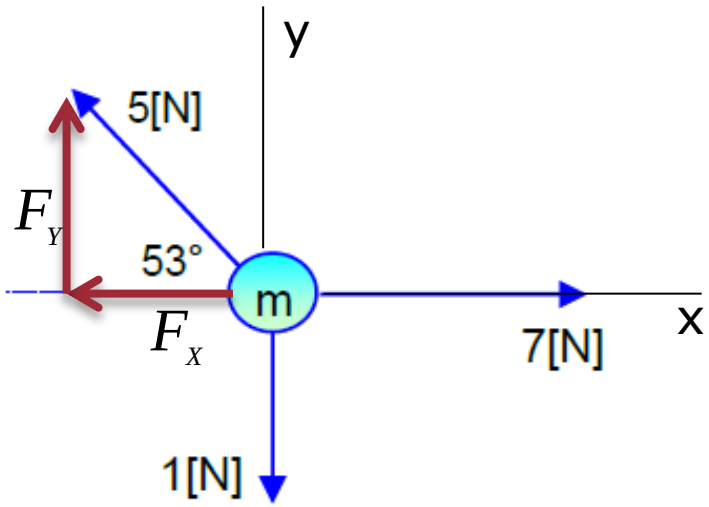
$$F_R = \sqrt{8^2 + 1^2} = \sqrt{65} = 8{,}06\,[N]$$

$$\vec{a} = \frac{\vec{F}_R}{m}$$

$$a = \frac{8{,}06\,[N]}{4\,[kg]}$$

$$a = 2{,}02\,[\mathrm{m/s^2}]$$

10. Calcula la aceleración, si el cuerpo tiene una masa m= 5 kg.



$$F_x = F\cos 53° = 5[\mathrm{N}]\,3/5 = 3[\mathrm{N}]$$

$$F_y = F\,\mathrm{sen}\,53° = 5[\mathrm{N}]\,4/5 = 4[\mathrm{N}]$$

$$\sum F_X = -3[\mathrm{N}] + 7[\mathrm{N}] = 4[\mathrm{N}]$$

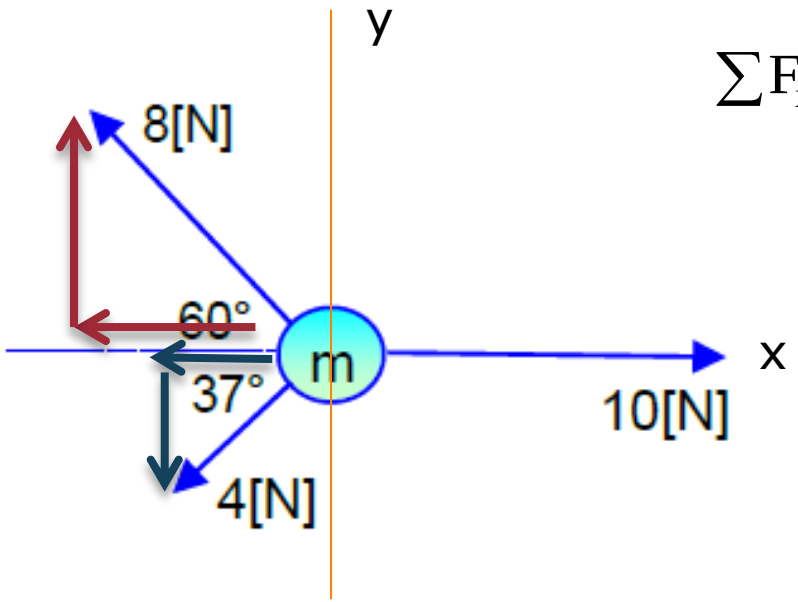
$$\sum F_Y = 4[\mathrm{N}] - 1[\mathrm{N}] = 3[\mathrm{N}]$$

$$F_R = \sqrt{\sum F_x^{\,2} + \sum F_Y^{\,2}}$$

$$F_R = \sqrt{4^2 + 3^2} = 5[N] \qquad \vec{a} = \frac{\vec{F}_R}{m} \qquad a = \frac{5[N]}{5[kg]}$$

$$a = 1[\mathrm{m/s^2}]$$

11. Calcular la aceleración del cuerpo, m = 12 kg.



$$\sum F_X = 10\,[\mathrm{N}] - 8\,[\mathrm{N}]\cos 60° - 4\,[\mathrm{N}]\cos 37°$$

$$\sum F_X = 2{,}8\,[\mathrm{N}]$$

$$\sum F_y = 8\,[\mathrm{N}]\,\mathrm{sen}\,60° - 4\,[\mathrm{N}]\,\mathrm{sen}\,37°$$

$$\sum F_y = 4{,}5\,[\mathrm{N}]$$

$$F_R = \sqrt{\sum F_x^{\,2} + \sum F_Y^{\,2}}$$

$$F_R = \sqrt{2{,}8^2 + 4{,}5^2} = 5{,}3\,[N]$$

$$\vec{a} = \frac{\vec{F}_R}{m} \qquad a = \frac{5{,}3\,[N]}{12\,[kg]}$$

$$a = 0{,}44\,[\mathrm{m/s^2}]$$

FÍSICA

JORGE CABRERA