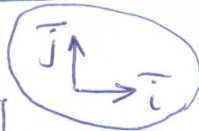


# Rectangular Components of a force

lect. #2

تحليل القوى في اتجاهين متعامدين



$$\vec{F} = F_x \vec{i} + F_y \vec{j} \quad \text{Cartesian vector (vector form)}$$

$$\vec{F}_1 = F_{1x} \vec{i} + F_{1y} \vec{j}$$

$$\vec{F}_2 = -F_{2x} \vec{i} + F_{2y} \vec{j}$$

$$\vec{F}_3 = F_{3x} \vec{i} - F_{3y} \vec{j}$$

$$\Sigma \vec{F} = (F_{1x} - F_{2x} + F_{3x}) \vec{i} + (F_{1y} + F_{2y} - F_{3y}) \vec{j}$$

$$\vec{F}_R = F_{Rx} \vec{i} + F_{Ry} \vec{j}$$

$$F_{Rx} = \Sigma F_x = F_{1x} - F_{2x} + F_{3x}$$

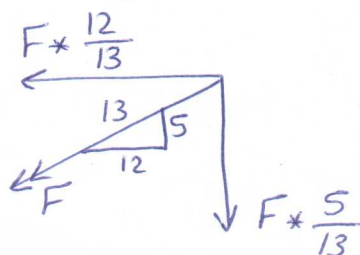
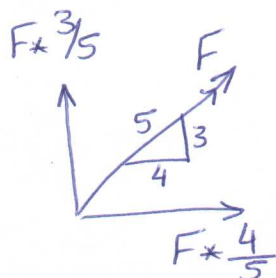
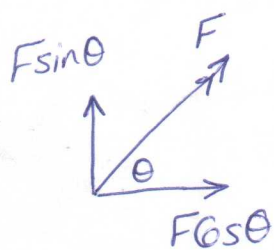
$$F_{Ry} = \Sigma F_y = F_{1y} + F_{2y} - F_{3y}$$

$$\begin{aligned} F_{Rx} &= \Sigma F_x \quad \rightarrow \\ F_{Ry} &= \Sigma F_y \quad \uparrow \end{aligned}$$

$$F_R = \sqrt{F_{Rx}^2 + F_{Ry}^2}$$

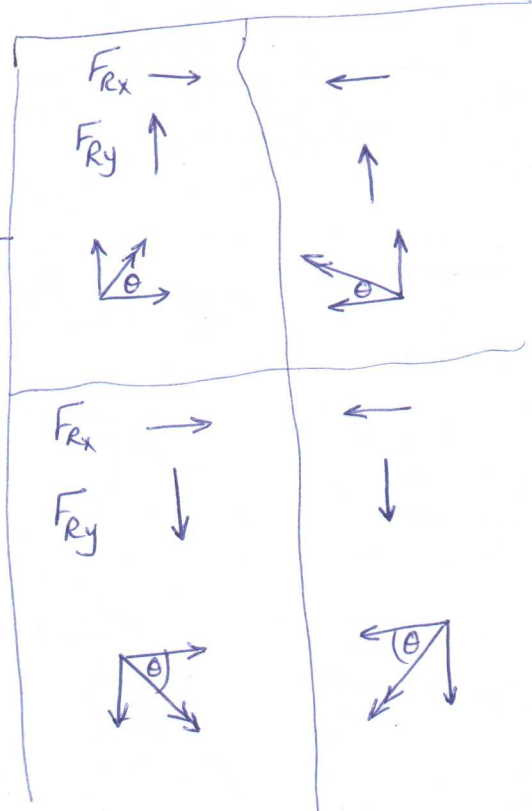
Pythagorean

$$\theta = \tan^{-1} \left| \frac{F_{Ry}}{F_{Rx}} \right|$$

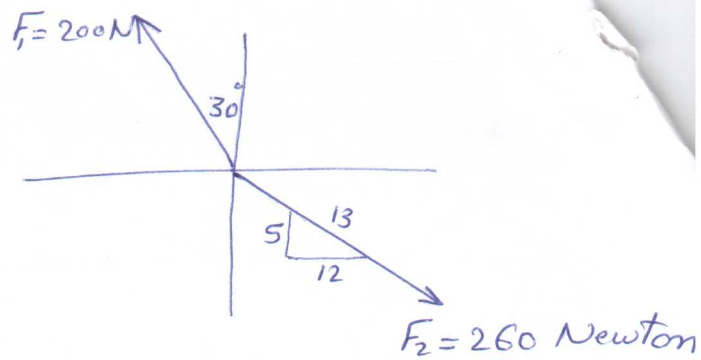
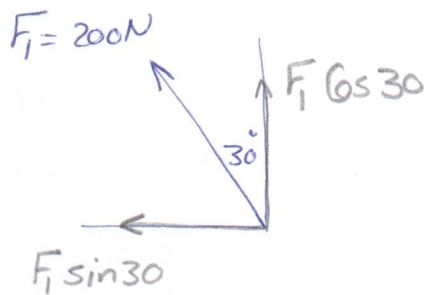


في الأول

لا يوجد اتجاهات على الترتيب



ex. 2-5



Cartesian vector

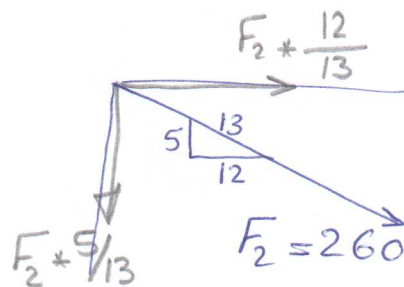
$$\vec{F}_1 = -200 \sin 30 \vec{i} + 200 \cos 30 \vec{j}$$

$$\vec{F}_1 = -100 \vec{i} + 173.2 \vec{j}$$

Cartesian vector

$$\vec{F}_2 = 260 * \frac{12}{13} \vec{i} - 260 * \frac{5}{13} \vec{j}$$

$$\vec{F}_2 = 240 \vec{i} - 100 \vec{j}$$



ex. 2-6

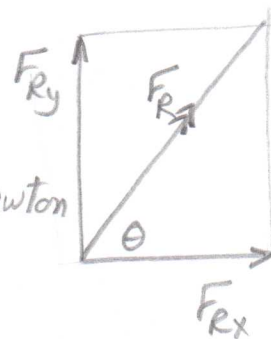
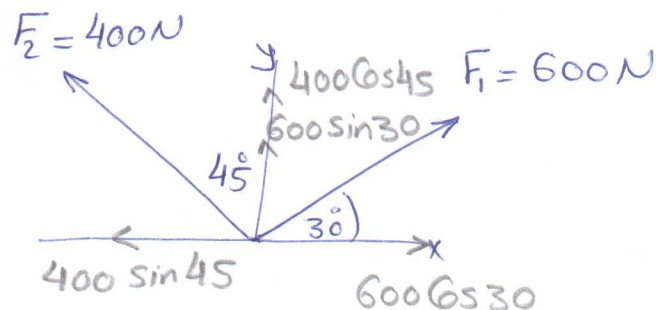
$F_R = ??$  ,  $\theta = ??$

$$\begin{aligned} \rightarrow F_{Rx} &= 600 \cos 30 - 400 \sin 45 \\ &= 236.77 \text{ Newton} \end{aligned}$$

$$\begin{aligned} \uparrow F_{Ry} &= 600 \sin 30 + 400 \cos 45 \\ &= 582.84 \text{ Newton} \end{aligned}$$

$$F_R = \sqrt{(236.77)^2 + (582.84)^2} = 629.1 \text{ Newton}$$

$$\theta = \tan^{-1} \frac{582.84}{236.77} = 67.89^\circ$$



Cartesian vector لوطيب

$$\vec{F}_R = 236.77 \vec{i} + 582.84 \vec{j}$$

ex. 2-7

$$F_R = ?? , \theta = ??$$

$$\begin{aligned} \rightarrow F_{Rx} &= \sum F_x \\ &= 250 \sin 45 - 400 - 200 \times \frac{4}{5} \\ &= -383.22 \text{ Newton} \end{aligned}$$

$$\begin{aligned} \uparrow F_{Ry} &= \sum F_y \\ &= 250 \cos 45 + 200 \times \frac{3}{5} \\ &= 296.78 \text{ Newton} \end{aligned}$$

$$\begin{aligned} F_R &= \sqrt{F_{Rx}^2 + F_{Ry}^2} \\ &= \sqrt{(-383.22)^2 + (296.78)^2} \\ &= 484.7 \text{ Newton} \end{aligned}$$

$$\begin{aligned} \theta &= \tan^{-1} \frac{F_{Ry}}{F_{Rx}} = \tan^{-1} \left| \frac{296.78}{-383.22} \right| \\ &= 37.76^\circ \end{aligned}$$

