TEHNIČKA MEHANIKA

Inženjerstvo zaštite životne sredine

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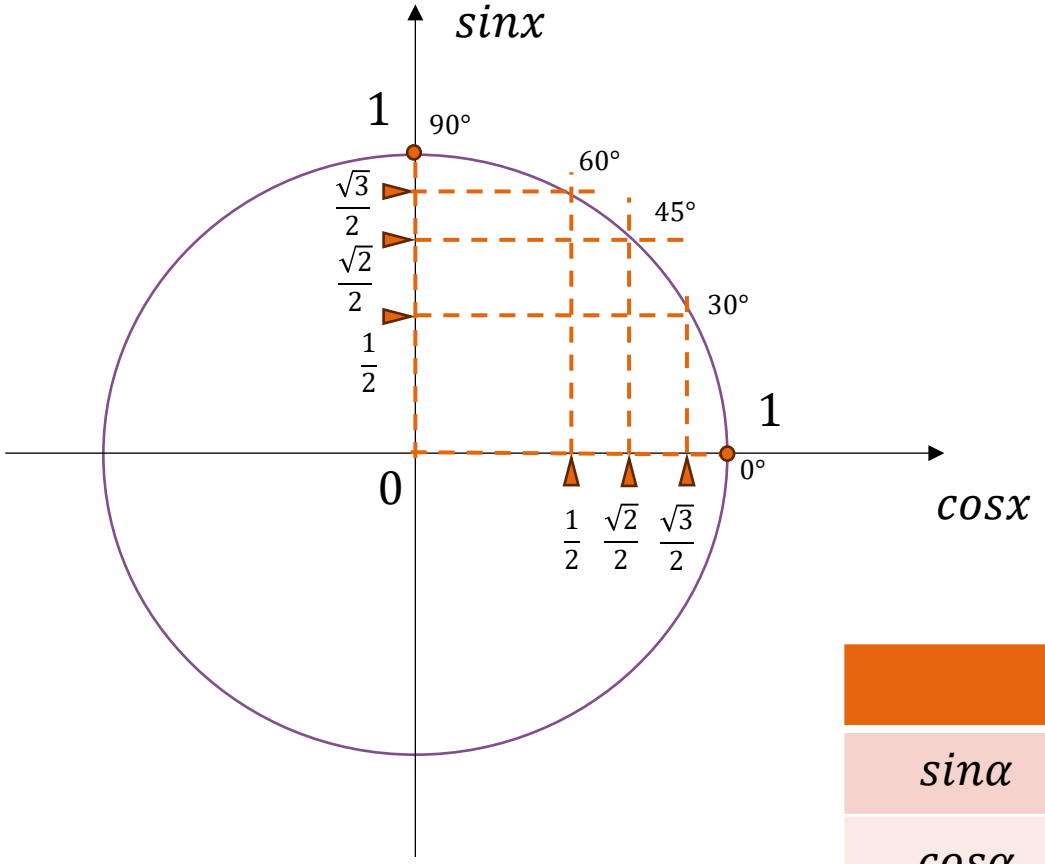
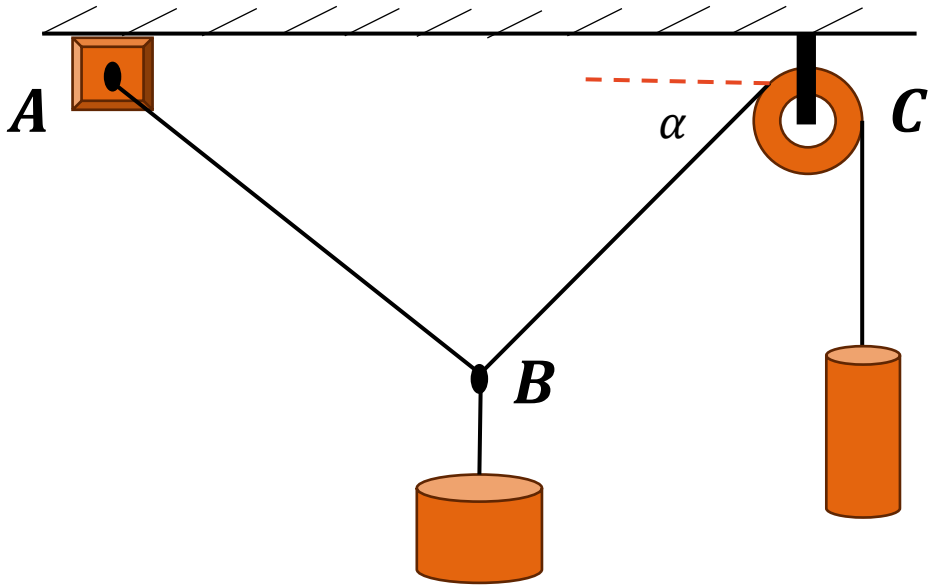
TRIGONOMETRIJSKI KRUG



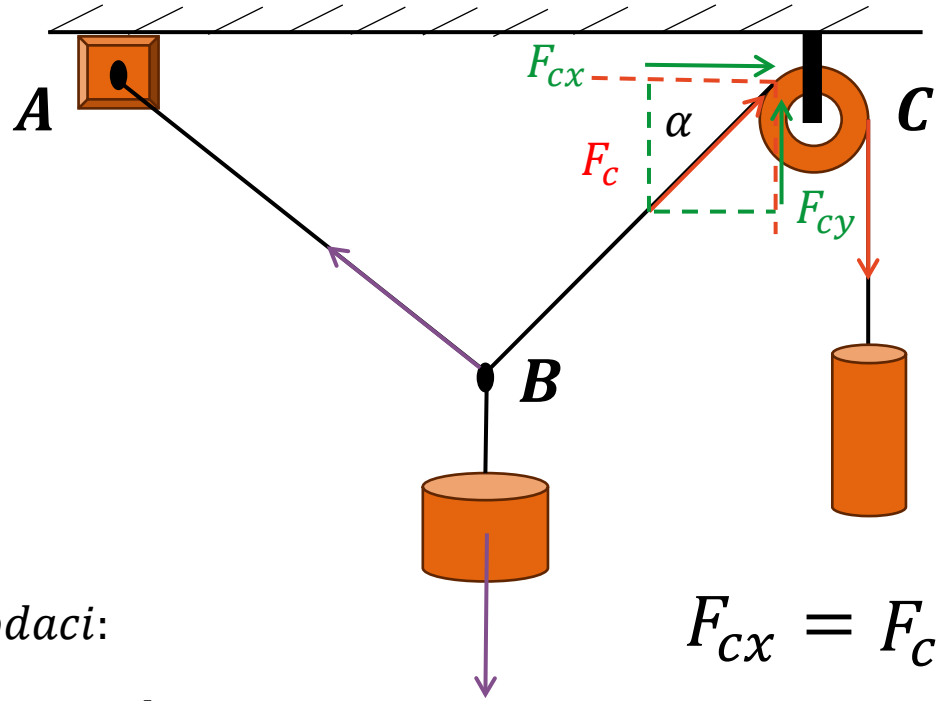
	0°	30°	45°	60°	90°
$sin\alpha$	0	$\frac{1}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{\sqrt{3}}{2}$	1
$cos\alpha$	1	$\frac{\sqrt{3}}{2}$	$\frac{\sqrt{2}}{2}$	$\frac{1}{2}$	0

ZADATAK 1.

- Za sistem prikazan na slici, potrebno je odrediti komponente sile u užetu BC. Ako je težina tela u tački B =*30kg* a u tački C =*78kg*, ugao $\alpha = 30°$.



ZADATAK 1.



$$F_c = m_c * \mathrm{a} \longrightarrow a = g = 9.81\ \frac{m}{s^2}$$

$$F_c = 78 * 9.81$$

$$F_c = 765.18\ N$$

Podaci:

$m_b = 30\ kg$

$m_c = 78\ kg$

$\alpha = 30°$

$F_{cx} = ?\quad F_{cy} = ?$

$$F_{cx} = F_c * cos\alpha$$

$$F_{cx} = 765.18 * cos30$$

$$F_{cx} = 662.665\ N$$

$$F_{cy} = F_c * sin\alpha$$

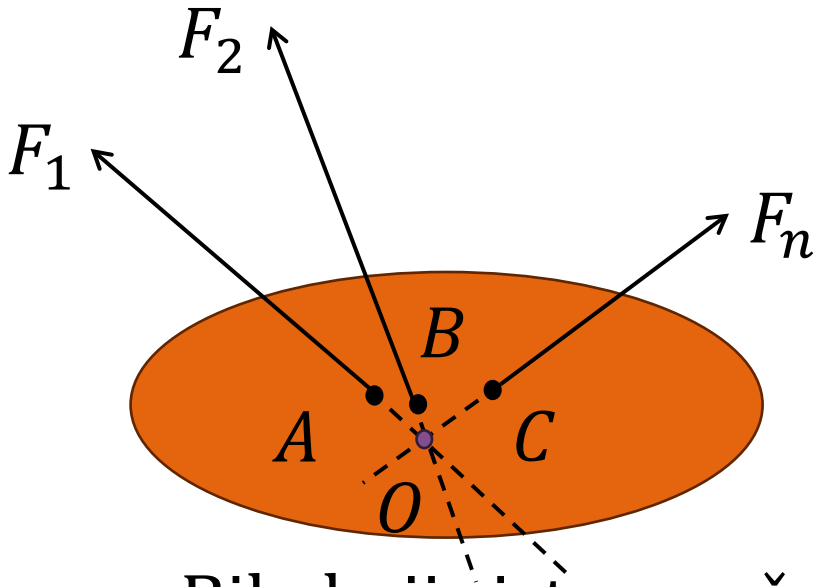
$$F_{cy} = 765.18 * sin30$$

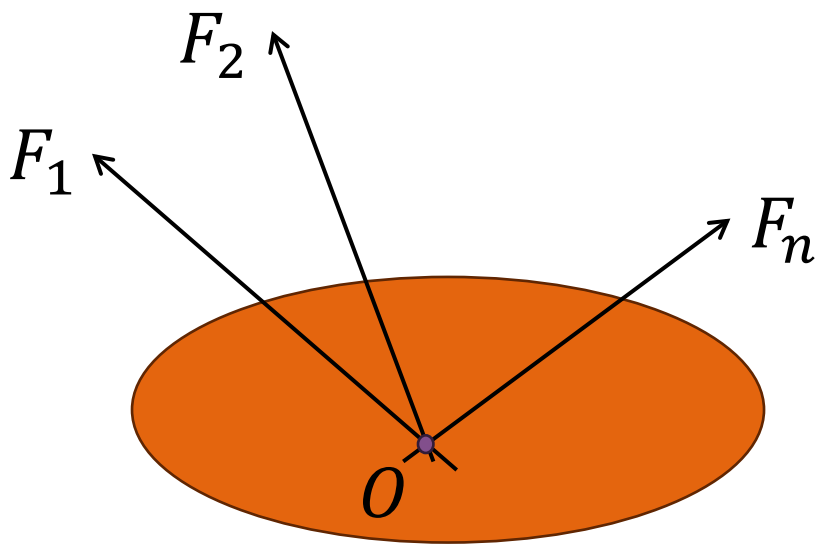
$$F_{cy} = 382.59\ N$$

ANALITIČKI NAČIN ODREĐIVANJE REZULTANTE SISTEMA SUČELJENIH SILA

SUČELJENE SILE

Sile čije se napadne linije seku u jednoj tački, čine sistem sučeljenih sila.

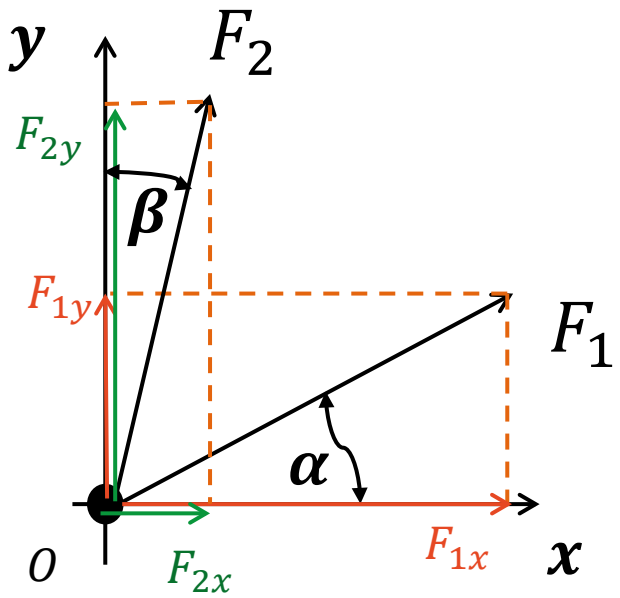




Bilo koji sistem sučeljenih sila, može se zameniti jednom ekvivalentom silom – REZULTANTOM.

ANALITIČKI NAČIN ODREĐIVANJE REZULTANTE SISTEMA SUČELJENIH SILA

SUČELJENE SILE



$$F_{1x} = F_1 * cos\alpha \qquad F_{2x} = F_2 * sin\beta$$

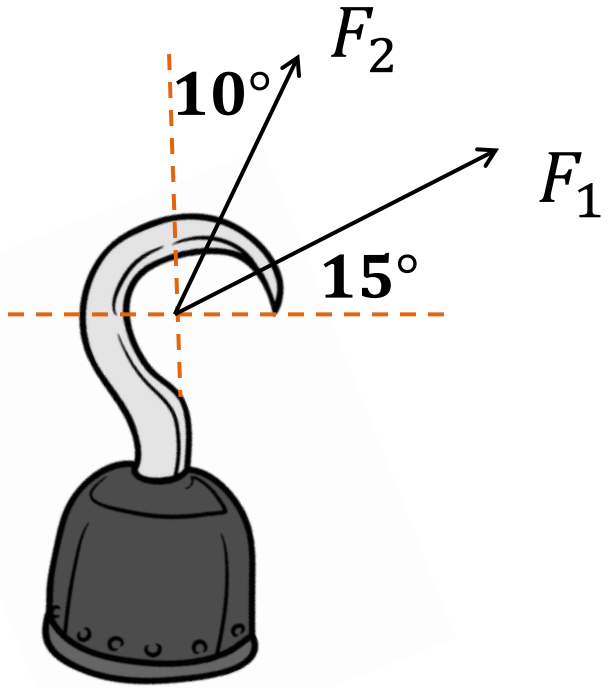
$$F_{1y} = F_1 * sin\alpha \qquad F_{2y} = F_2 * cos\beta$$

$$X_R = \sum_{i=1}^{n} X_i = F_{1x} + F_{2x} \qquad F_R = \sqrt{X_R^2 + Y_R^2}$$

$$Y_R = \sum_{i=1}^{n} Y_i = F_{1y} + F_{2y} \qquad tg\alpha_R = \frac{Y_R}{X_R}$$

ZADATAK 1.

- Kuka je opterećena silama $F_1 = 100\ N, i\ F_2 = 150\ N$, prema slici. Odrediti intenzitet i pravac rezultante.

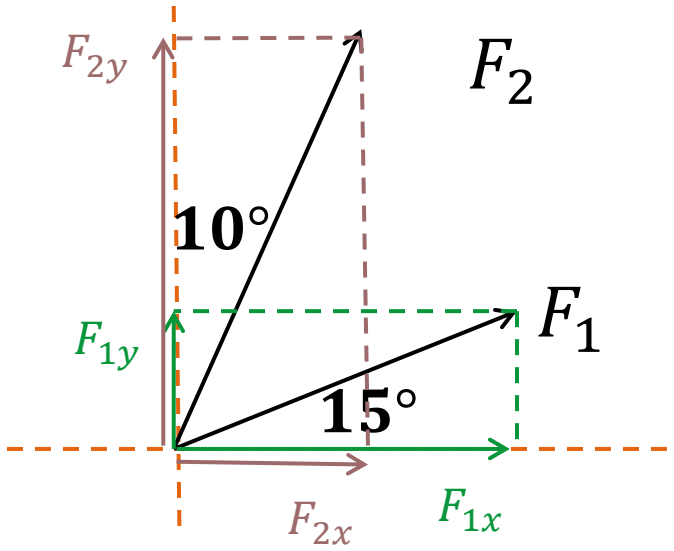


ZADATAK 1.

$Podaci$:

$F_1 = 100\ N$

$F_2 = 150\ N$



$$F_R = \sqrt{X_R^2 + Y_R^2}$$

$$F_{1x} = F_1 * cos15 = 100 * cos15 = 96.59\ N$$

$$F_{1y} = F_1 * sin15 = 100 * sin15 = 25.88\ N$$

$$F_{2x} = F_2 * sin10 = 150 * cos10 = 26.047\ N$$

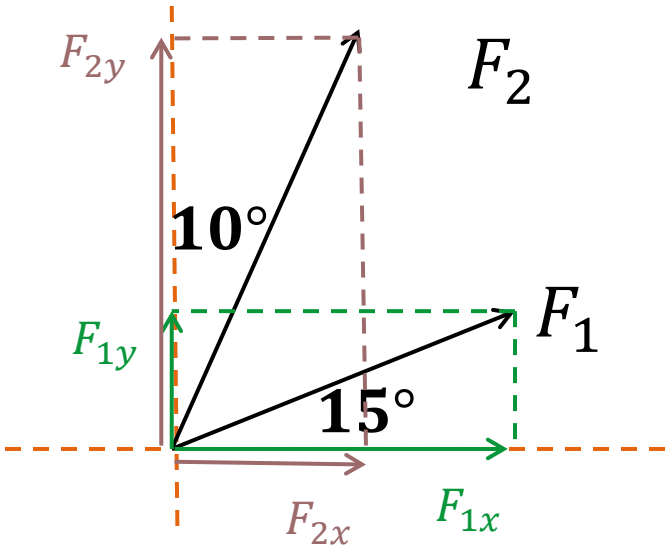
$$F_{2y} = F_2 * cos10 = 150 * sin10 = 147.721\ N$$

ZADATAK 1.

$Podaci$:

$F_1 = 100\ N$

$F_2 = 150\ N$



$$X_R = \sum_{i=1}^{n} X_i = F_{1x} + F_{2x} \qquad Y_R = \sum_{i=1}^{n} Y_i = F_{1y} + F_{2y}$$

$$X_R = 96.59 + 26.047 \qquad Y_R = 25.88 + 147.721$$

$$X_R = 122.637\ N \qquad Y_R = 173.601\ N$$

$$F_R = \sqrt{X_R^2 + Y_R^2} = \sqrt{122.637^2 + 173.601^2} = 212.55\ N$$

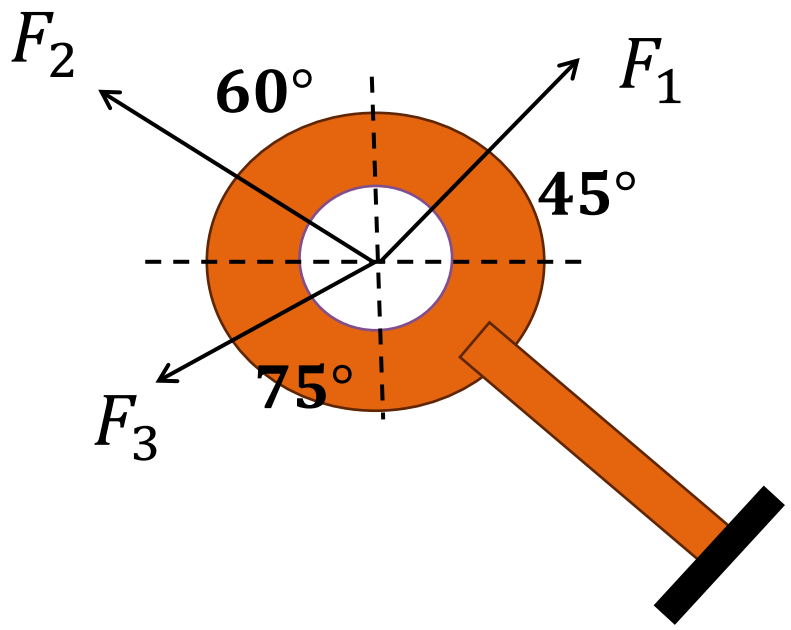
$$tg\alpha_R = \frac{Y_R}{X_R} = \frac{173.601}{122.637} = 1.417$$

$$\alpha_R = \text{arctg}(1.417) = 54.79°$$

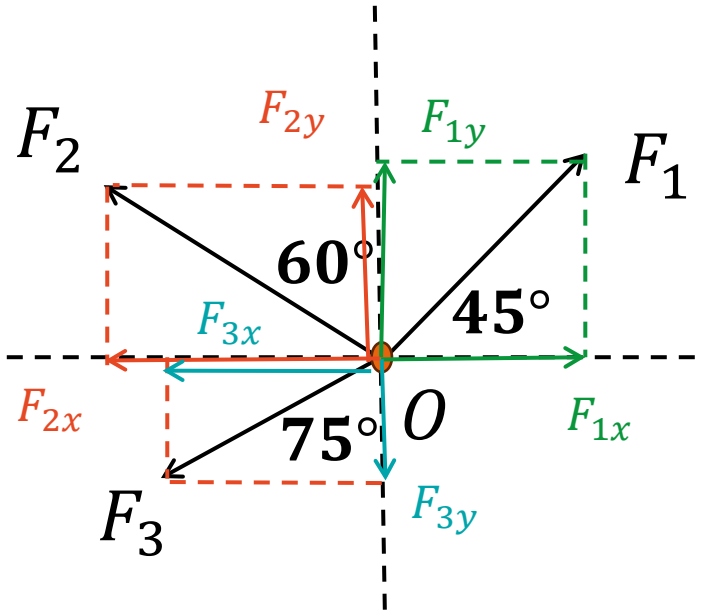
ZADATAK 2.

Odrediti rezultantu sistema sučeljenih sila na slici.

$Podaci:\ F_1 = 600\ N, F_2 = 800\ N\ i\ F_3 = 450\ N.$



ZADATAK 2.



$$F_{1x} = F_1 * cos45 = 600 * \frac{\sqrt{2}}{2} = 300\sqrt{2}\ N$$

$$F_{1y} = F_1 * sin45 = 600 * \frac{\sqrt{2}}{2} = 300\sqrt{2}\ N$$

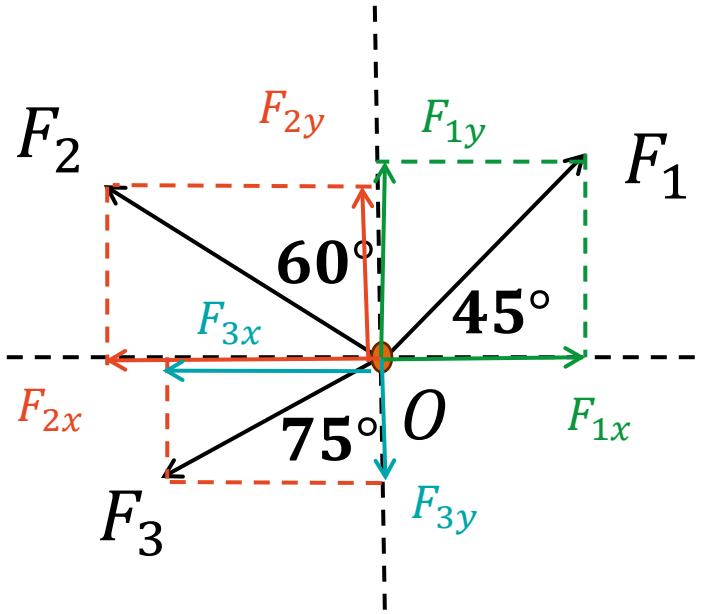
$$F_{2x} = F_2 * sin60 = 800 * \frac{\sqrt{3}}{2} = 400\sqrt{3} N$$

$$F_{2y} = F_2 * cos60 = 800 * \frac{1}{2} = 400\ N$$

$$F_{3x} = F_3 * sin75 = 450 * 0.965 = 434.667 N$$

$$F_{3y} = F_3 * cos75 = 450 * 0.2588 = 116.468 N$$

ZADATAK 2.



$$X_R = \sum_{i=1}^{n} X_i = F_{1x} - F_{2x} - F_{3x}$$

$$X_R = 300\sqrt{2} - 400\sqrt{3} - 434.667$$

$$X_R = -704.487\ N$$

$$Y_R = \sum_{i=1}^{n} Y_i = F_{1y} + F_{2y} - F_{3y}$$

$$Y_R = 300\sqrt{2} + 400 - 116.468$$

$$Y_R = 706.487\ N$$

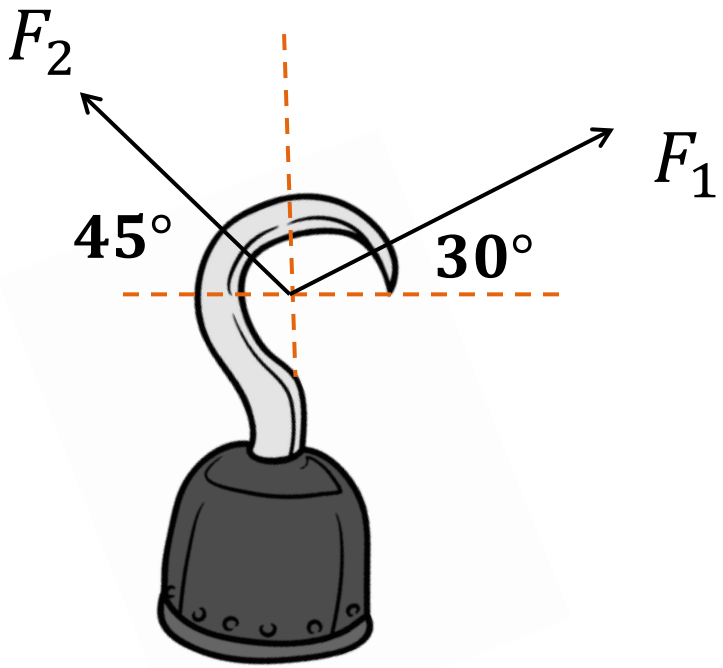
$$F_R = \sqrt{X_R^2 + Y_R^2} = \sqrt{(-704.487)^2 + (706.487)^2} = 997.71\ N$$

$$tg\alpha_R = \frac{Y_R}{X_R} = \frac{706.487}{-704.487} = -1.002 \approx -1$$

$$\alpha_R = \text{arctg}(-1) = -45°$$

ZADATAK 3.

- Kuka je opterećena silama $F_1 = 250\ N, i\ F_2 = 150\ N$, prema slici. Odrediti intenzitet i pravac rezultante.

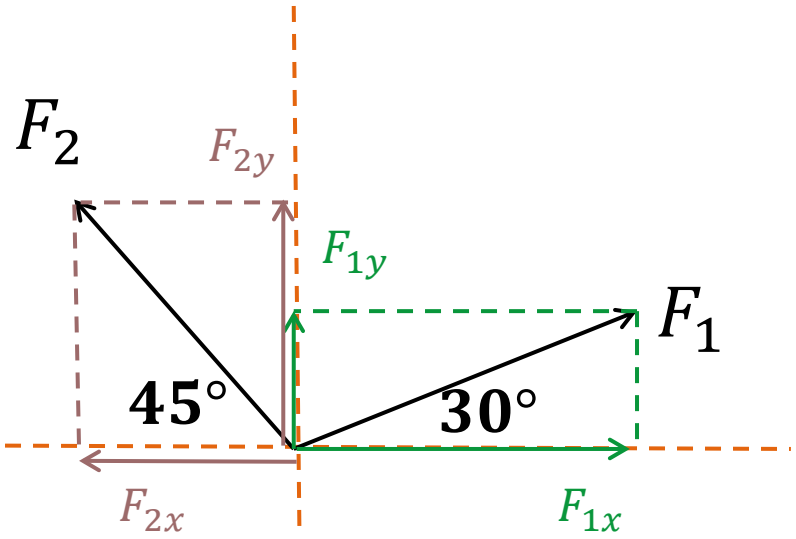


ZADATAK 3.

$Podaci$:

$F_1 = 250\ N$

$F_2 = 150\ N$



$$F_R = \sqrt{X_R^2 + Y_R^2}$$

$$F_{1x} = F_1 * cos30 = 250 * \frac{\sqrt{3}}{2} = 216.506\ N$$

$$F_{1y} = F_1 * sin30 = 250 * \frac{1}{2} = 125N$$

$$F_{2x} = F_2 * cos45 = 150 * \frac{\sqrt{2}}{2} = 106.066\ N$$

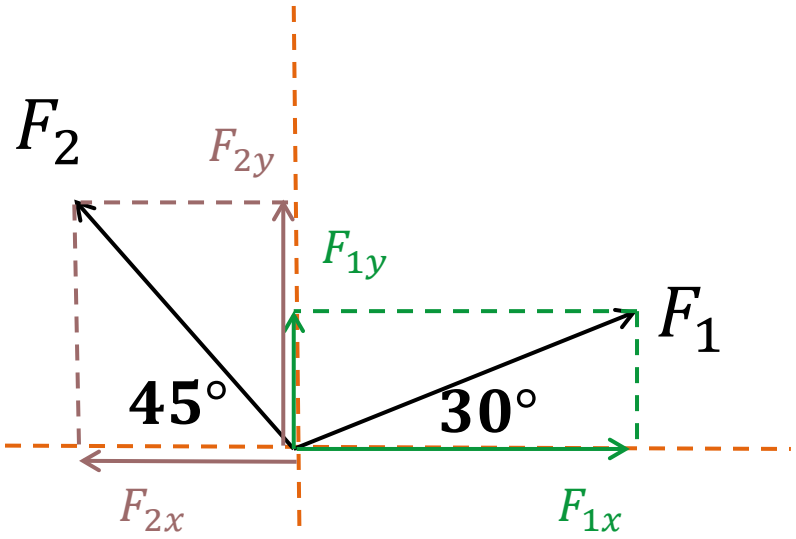
$$F_{2y} = F_2 * sin45 = 150 * \frac{\sqrt{2}}{2} = 106.066\ N$$

ZADATAK 3.

$Podaci$:

$F_1 = 250\ N$

$F_2 = 150\ N$



$$X_R = \sum_{i=1}^{n} X_i = F_{1x} - F_{2x}$$

$$X_R = 216.51 - 106.066$$

$$X_R = 110.76\ N$$

$$Y_R = \sum_{i=1}^{n} Y_i = F_{1y} + F_{2y}$$

$$Y_R = 125 + 106.066$$

$$Y_R = 231.066\ N$$

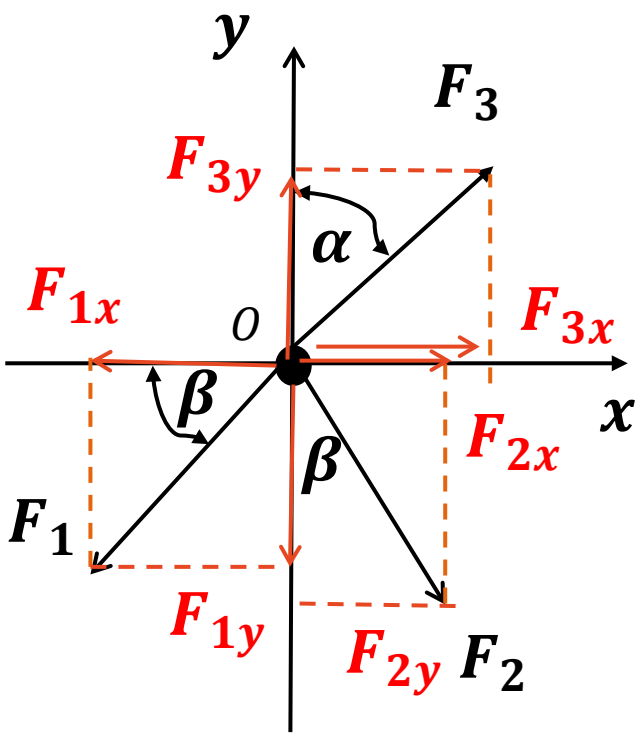
$$F_R = \sqrt{X_R^2 + Y_R^2} = \sqrt{(110.76)^2 + (231.066)^2} = 256.19\ N$$

$$tg\alpha_R = \frac{Y_R}{X_R} = \frac{110.76}{231.066} = 2.09$$

$$\alpha_R = \text{arctg}(2.09) = 64.43°$$

ZADATAK 4.

- Kuka je opterećena silama $F_1 = 120\ N,\ F_2 = 50\ N\ i\ F_3 = 100N$, prema slici. Odrediti intenzitet i pravac rezultante. $\alpha = 45°, \beta = 60°$



REŠENJE:

$F_{1x} = F_1 * cos\beta$

$F_{1x} = 120 * cos60°$

$F_{1x} = 120 * \frac{1}{2}$

$F_{1x} = 60\ N$

$F_{1y} = F_1 * sin\beta$

$F_{1y} = 120 * sin60°$

$F_{1y} = 120 * \frac{\sqrt{3}}{2}$

$F_{1y} = 60\sqrt{3}$ kN

$F_{2x} = F_2 * sin\beta$

$F_{2x} = 50 * sin60°$

$F_{2x} = 50 * \frac{\sqrt{3}}{2}$

$F_{2x} = 25\sqrt{3}N$

$F_{2y} = F_2 * cos\beta$

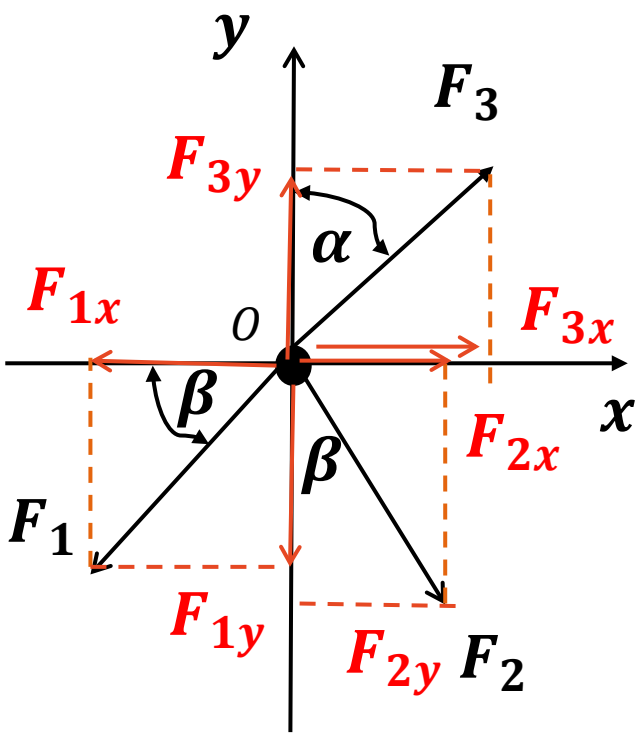
$F_{2y} = 50 * cos60°$

$F_{2y} = 50 * \frac{1}{2}$

$F_{2y} = 25$ N

ZADATAK 4.

- Kuka je opterećena silama $F_1 = 120\ N,\ F_2 = 50\ N\ i\ F_3 = 100N$, prema slici. Odrediti intenzitet i pravac rezultante. $\alpha = 45°, \beta = 60°$



REŠENJE:

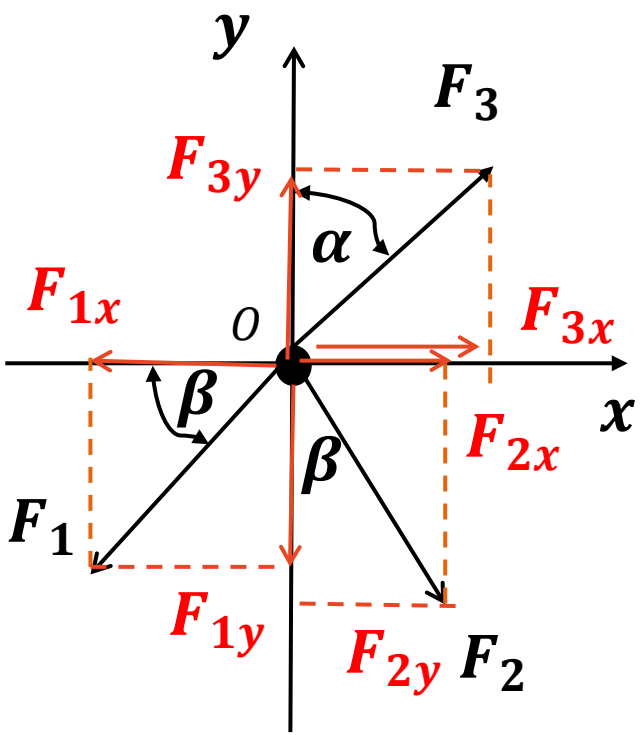
$F_{3x} = F_3 * sin\alpha$ $\quad F_{3y} = F_3 * cos\alpha$

$F_{3x} = 100 * sin45°$ $\quad F_{3y} = 100 * cos60°$

$F_{3x} = 100 * \frac{\sqrt{2}}{2}$ $\quad F_{3y} = 100 * \frac{\sqrt{2}}{2}$

$F_{3x} = 50\sqrt{2}N$ $\quad F_{3y} = 50\sqrt{2}\ \mathrm{N}$

ZADATAK 4.



$$X_R = \sum_{i=1}^{n} X_i = -F_{1x} + F_{2x} + F_{3x}$$

$$X_R = -60 + 25\sqrt{3} + 70.71$$

$$X_R = 54.01\ N$$

$$Y_R = \sum_{i=1}^{n} Y_i = F_{3y} - F_{1y} - F_{2y}$$

$$Y_R = 50\sqrt{2} - 60\sqrt{3} - 25$$

$$Y_R = -58.21\ N$$

$$F_R = \sqrt{X_R^2 + Y_R^2} = \sqrt{(54.01)^2 + (-58.21)^2} = 79.4N$$

$$tg\alpha_R = \frac{Y_R}{X_R} = \frac{-58.21}{54.01} = -1.07$$

$$\alpha_R = \text{arctg}(-1.07) = -47°$$

HVALA NA PAŽNJI!

PITANJA?