

ZADACI II:

①

① Zadatak 1: Odrediti zbir tri sile: $\vec{F}_1$, $\vec{F}_2$ i $\vec{F}_3$, čije su projekcije na ose jednake: $x_1 = 6 \text{ kp}$, $y_1 = 3 \text{ kp}$, $z_1 = 12 \text{ kp}$;
 $x_2 = 3 \text{ kp}$, $y_2 = -7 \text{ kp}$, $z_2 = 1 \text{ kp}$; $x_3 = 5 \text{ kp}$, $y_3 = 2 \text{ kp}$ i $z_3 = -8 \text{ kp}$.

$$X_R = x_1 + x_2 + x_3 = 6 \text{ kp} + 3 \text{ kp} + 5 \text{ kp} = 14 \text{ kp}$$

$$Y_R = y_1 + y_2 + y_3 = 3 \text{ kp} + (-7 \text{ kp}) + 2 \text{ kp} = -2 \text{ kp}$$

$$Z_R = z_1 + z_2 + z_3 = 12 \text{ kp} + 1 \text{ kp} + (-8 \text{ kp}) = 5 \text{ kp}$$

$$F_R = \sqrt{X_R^2 + Y_R^2 + Z_R^2} = \sqrt{14^2 \text{ kp}^2 + (-2 \text{ kp})^2 + (5 \text{ kp})^2}$$

$$F_R = \sqrt{196 \text{ kp}^2 + 4 \text{ kp}^2 + 25 \text{ kp}^2}$$

$$F_R = \sqrt{225 \text{ kp}^2}$$

$$\boxed{F_R = 15 \text{ kp}}$$

$$\cos \alpha = \frac{X_R}{F_R} = \frac{14 \text{ kp}}{15 \text{ kp}} = 0,933 \Rightarrow \alpha =$$

$$\cos \beta = \frac{Y_R}{F_R} = \frac{-2 \text{ kp}}{15 \text{ kp}} = -0,133 \Rightarrow \beta =$$

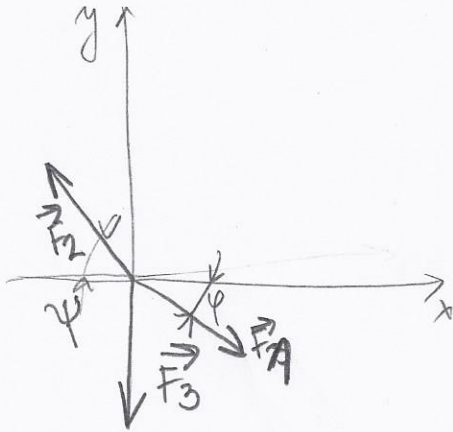
$$\cos \mu = \frac{Z_R}{F_R} = \frac{5 \text{ kp}}{15 \text{ kp}} = 0,333 \Rightarrow \mu =$$

(2)

Zadatak 2: Odrediti rezultantu tri međusobno sile, koje deluju u istoj ravni, ako je dato:

$$F_1 = 17,32 \text{ kp}; F_2 = 10 \text{ kp}; F_3 = 24 \text{ kp}; \varphi = 30^\circ, \psi = 60^\circ$$

Šema je data na slici.



Slika 1.

Projekciju sile na x i y osu:

$$X_1 = F_1 \cdot \cos \varphi = 17,32 \text{ kp} \cdot \cos 30^\circ = 17,32 \text{ kp} \cdot \frac{\sqrt{3}}{2} = 14,999 \text{ kp} \approx 15 \text{ kp}$$

$$Y_1 = F_1 \cdot \sin \varphi = 17,32 \text{ kp} \cdot \sin 30^\circ = -8,66 \text{ kp}$$

$$X_2 = -F_2 \cos \psi = -10 \text{ kp} \cdot \cos 60^\circ = -5 \text{ kp}$$

$$Y_2 = F_2 \sin \psi = +10 \text{ kp} \cdot \sin 60^\circ = 8,66 \text{ kp}$$

$$X_3 = F_3 \cdot \cos \theta = F_3 \cos 270^\circ = 0$$

$$Y_3 = -F_3 \sin \theta = -F_3 \sin 270^\circ = -24 \text{ kp}$$

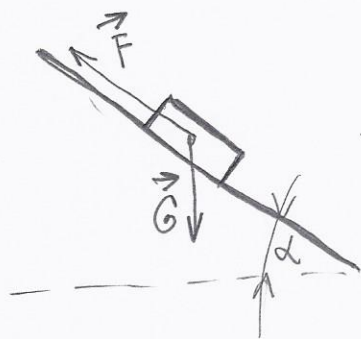
$$F_R = \sqrt{X_R^2 + Y_R^2}, \text{ pa nam trebaju: } X_R, Y_R \text{ i } Z_R.$$

$$X_R = X_1 + X_2 + X_3 = 15 \text{ kp} - 5 \text{ kp} + 0 = 10 \text{ kp}$$

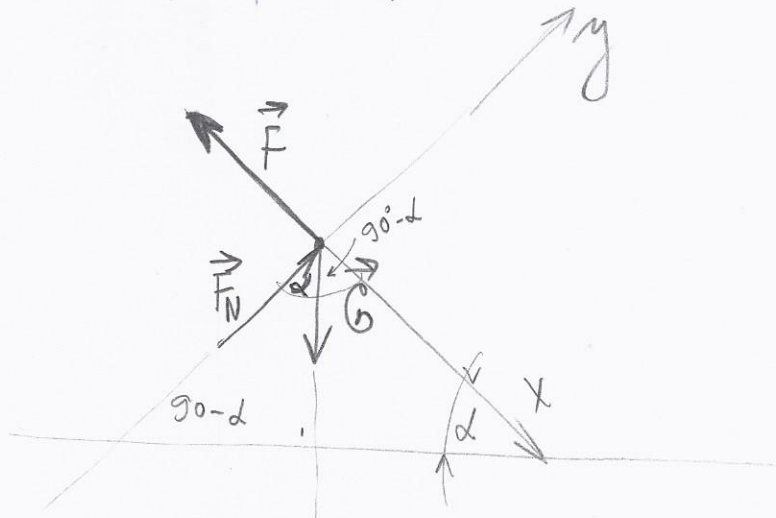
$$Y_R = Y_1 + Y_2 + Y_3 = -8,66 \text{ kp} + 8,66 \text{ kp} - 24 \text{ kp} = -24 \text{ kp}$$

$$F_R = \sqrt{10^2 + (-24)^2} = \sqrt{100 + 576} = \sqrt{676} = 26 \text{ kp}$$

Zadatak 3: Teret težine G ideži po strmoj ravni, koja sa horizontalom gradi ugao α . Odrediti veličinu sile $\vec{F}$, koja je paralelna datoj ravni, a kojom treba delovati na teret da bi on bio u ravnoteži. Odrediti silu pritiska tereta F_p na strmu ravan u tom položaju. (3)



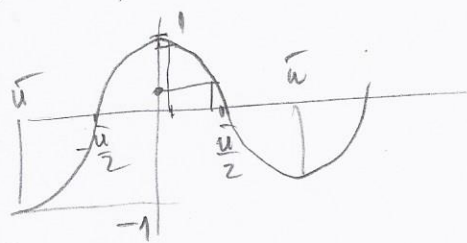
Slika 1



Da bi telo bilo u ravnoteži, potrebno je da sile grade zatvoreni trougao ili da suma sila na x i y osu budu jednake nuli.

$$(1) \sum X_i = 0 \quad -F + G \cos(90^\circ - \alpha) = 0$$

$$(2) \sum Y_i = 0 \quad F_N - G \cos \alpha = 0$$

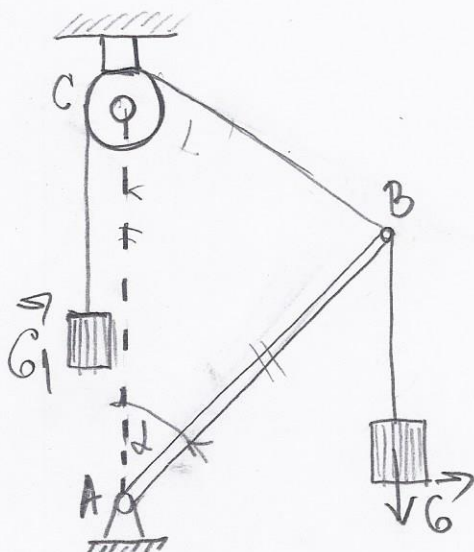


$$\text{Iz (1): } F = G \cos(90^\circ - \alpha) = G \sin \alpha$$

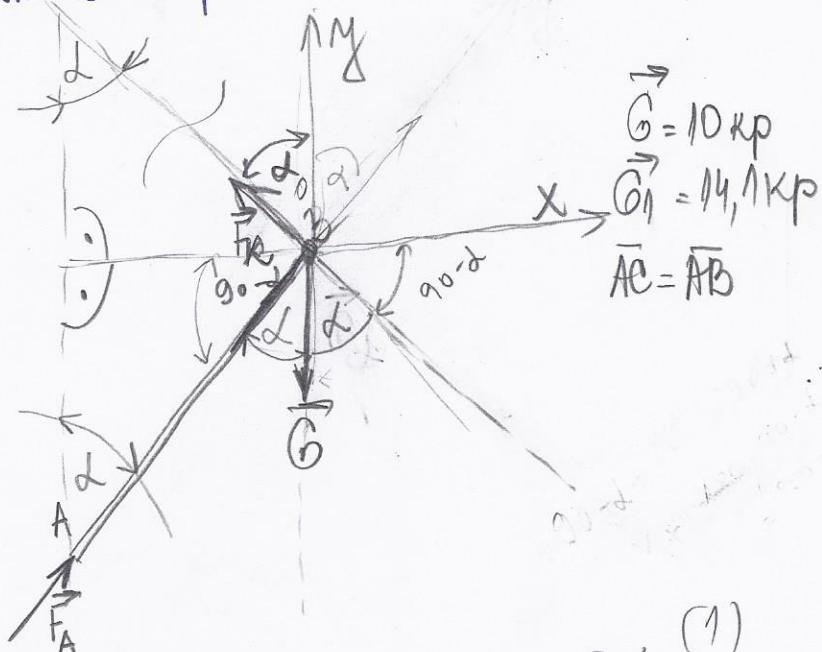
$$\text{Iz (2): } F_N = G \cos \alpha$$

Zadatak 4:

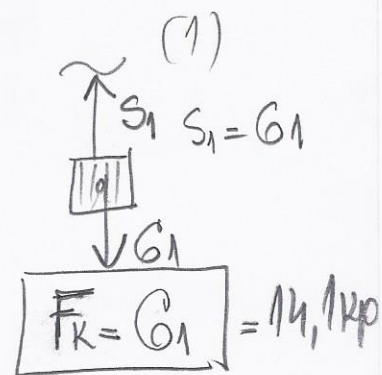
Štap AB je pričvršćen za nepomičan zglob A, a o kraj B obešen je teret težine $G = 10 \text{ kp}$ i pričvršćen za konopac, koji je prebačen preko kotura C. O njegov drugi kraj je obešen teret težine $G_1 = 14,1 \text{ kp}$. Osovina kotura C i zgloba A se nalaze na istoj vertikali, pri čemu je $AC = AB$.
 Odrediti pri kome će uglu α sistem biti u ravnoteži i kolika će u tom slučaju biti sila u štapu AB (težina štapa i dimenzije kotura zanemariti).



Slika 1



Slika 2



$$(2) \sum X_i = 0 \Rightarrow G FK \sin \alpha + F_A \cos(90^\circ - \alpha) = 0$$

$$(3) \sum Y_i = 0 \Rightarrow F G + FK \cos \alpha + F_A \cos \alpha = 0$$

$$(2) FK \sin \alpha = F_A \sin \alpha$$

$$(3) F G + F_A \cos \alpha = 0 \Rightarrow F_A = -\frac{G}{\cos \alpha}$$

$$\frac{G_1}{G} = \frac{14,1 \text{ kp}}{10 \text{ kp}} = 1,41$$