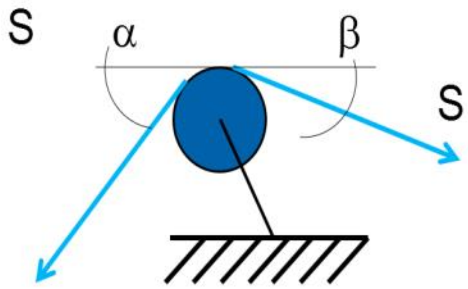
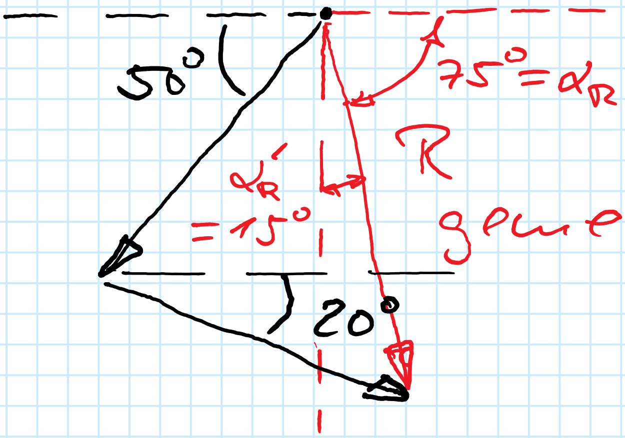
BEISPIEL 2.1 – Ermittlung der resultierenden Kraft auf eine Umlenkrolle



$\alpha = 50°$
$\beta = 20°$
$S = 30\ kN$

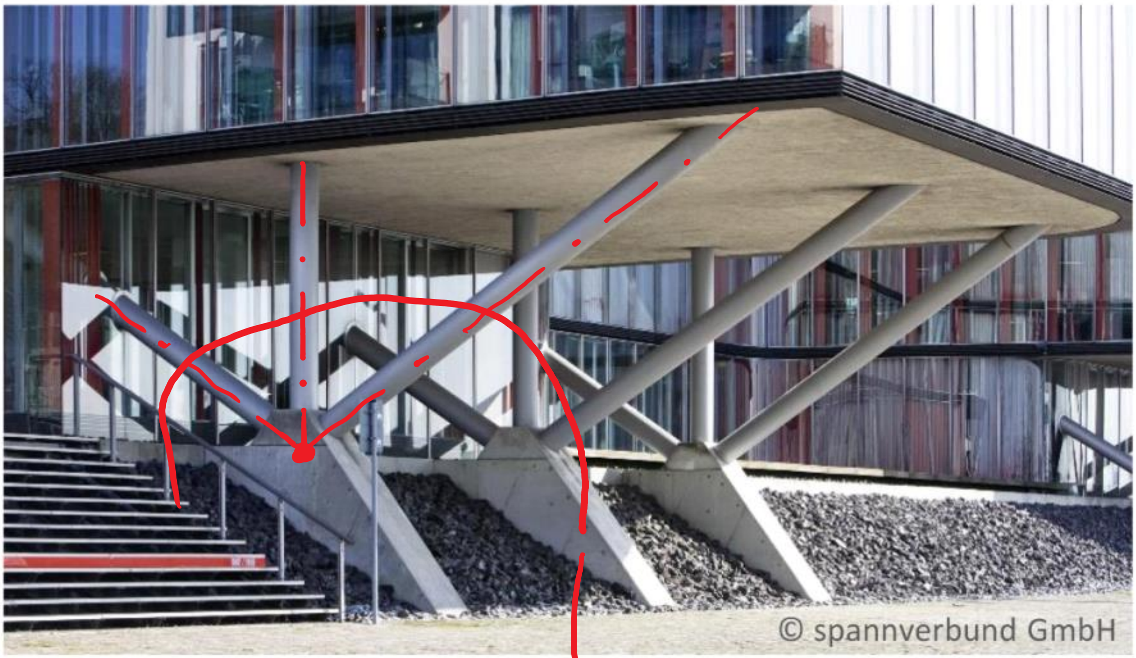
$30\ kN \mathrel{\hat{=}} 3\ cm$



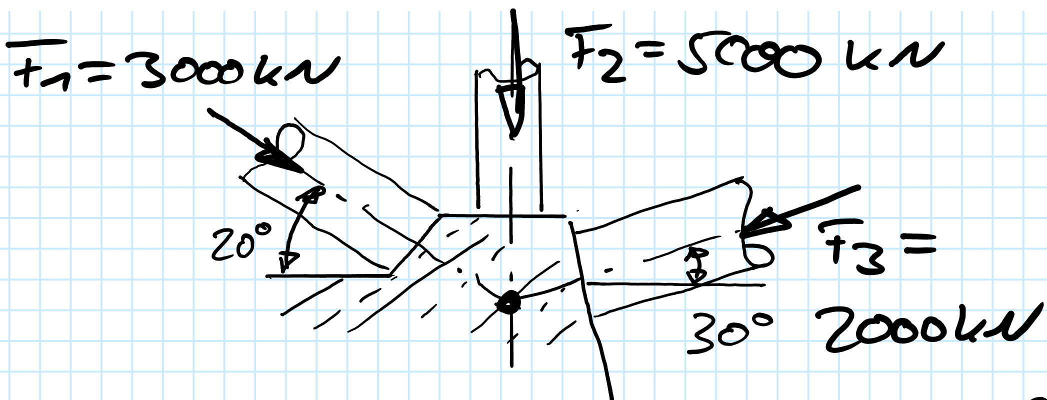
gemessen: 3,5 cm

$\mathrel{\hat{=}} 35\ kN$

BEISPIEL 2.2

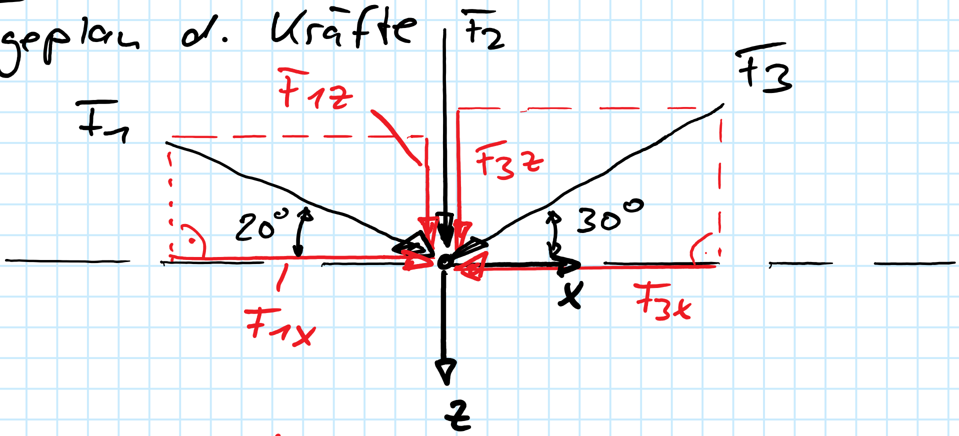


Freischnitt



<u>ges.:</u> Resultierende R aus F_1, F_2 & F_3

Lageplan d. Kräfte



<u>Zerlegen d. Kräfte:</u>

$F_{1x} = 3000 \cdot \cos 20° = 2819\ kN$

$F_{1z} = 3000 \cdot \sin 20° = 1026\ kN$

$F_{2x} = 5000 \cdot \cos 90° = 0$ offensichtlich

$F_{2z} = 5000 \cdot \sin 90° = 5000 \text{ kN}$

$F_{3x} = 2000 \cdot \cos 30° = 1732 \text{ kN}$

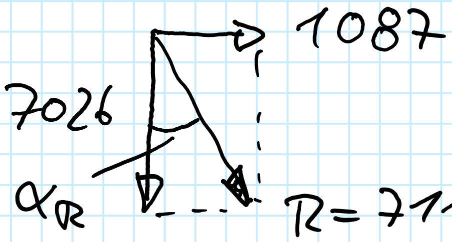
$F_{3z} = 2000 \cdot \sin 30° = 1000 \text{ kN}$

Bilden der Komponenten von R:

$R_z = 1026 + 5000 + 1000 = 7026 \text{ kN}$

$R_x = 2819 + 0 - 1732 = 1087 \text{ kN}$

$R = \sqrt{R_x^2 + R_z^2} = \sqrt{7026^2 + 1087^2} = 7110 \text{ kN}$



$R = 7110 \text{ kN}$

$\alpha_R = \operatorname{atan}\left(\frac{1087}{7026}\right) = \underline{8{,}8°}$

BEISPIEL 2.3

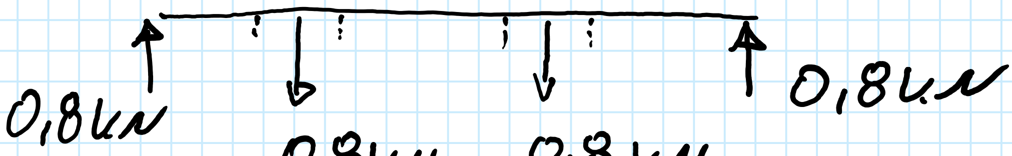
Gegeben:

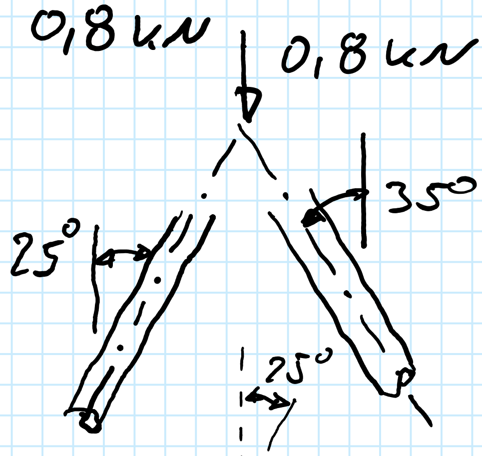
G = Gewichtskraft
von 1 Menschen à 80kg

$G = 80\,kg \cdot 10\,\frac{m}{s^2} = 800\,N$

$G = 0{,}8\,kN$

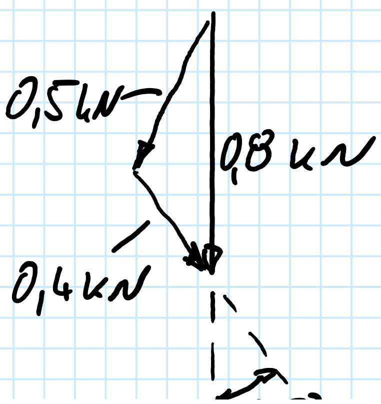
Querbalken

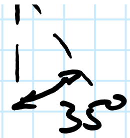




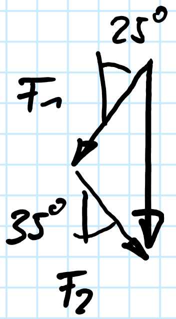
zeichnerisch:

0,8kN ≙ 4cm

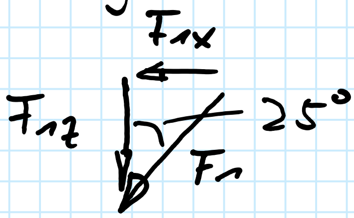




Rechnerisch:



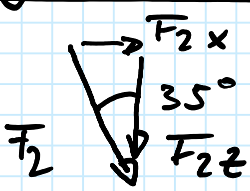
zerlegen von F_1:



$$F_{1z} = F_1 \cdot \cos 25° = F_1 \cdot 0{,}906$$

$$F_{1x} = F_1 \cdot \sin 25° = F_1 \cdot 0{,}423$$

zerlegen von F_2:



$$F_{2z} = F_2 \cdot \cos 35° = 0{,}819 \cdot F_2$$

$$F_{2x} = F_2 \cdot \sin 35° = 0{,}574\, F_2$$

Zusammensetzen:

$$R_z = F = 0{,}8\,kN = F_{1z} + F_{2z}$$

$$\leadsto 0{,}8\,kN = 0{,}906 \cdot F_1 + 0{,}819 \cdot F_2 \qquad (1)$$

$$R_x = 0 = -F_{1x} + F_{2x} = -0{,}423 \cdot F_1 + 0{,}574\, F_2 \qquad (2)$$

$$\leadsto F_1 = \frac{0{,}574}{0{,}423} \cdot F_2 = 1{,}357 \cdot F_2 \qquad (2')$$

einsetzen in (1):

$0{,}8 = 0{,}906 \cdot (1{,}357 \cdot \overline{F_2}) + 0{,}819 \cdot \overline{F_2}$

$0{,}8 = 2{,}048 \cdot \overline{F_2}$

$\rightsquigarrow \underline{\overline{F_2}} = 0{,}8 / 2{,}048 = \underline{0{,}391\ kN}$

in 2′ $\rightsquigarrow \underline{\overline{F_1}} = 1{,}357 \cdot 0{,}391 = \underline{0{,}531}$ kN