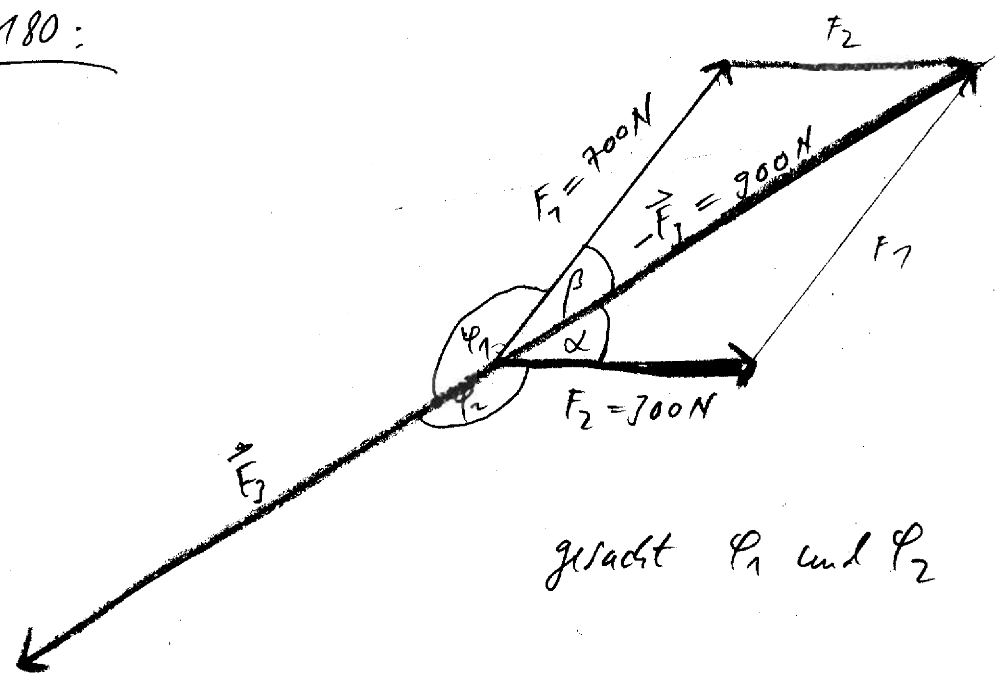
Lösungen (sin-/cos-Satz)

Afg 180:



gesucht φ_1 und φ_2

cos-Satzs (sss)

$$F_1^2 = F_2^2 + F_3^2 - 2F_2F_3\cos\alpha \Rightarrow \alpha = \cos^{-1}\left(\frac{F_2^2+F_3^2-F_1^2}{2F_2F_3}\right)$$

$$= \cos^{-1}(0{,}76) = 40{,}6°$$

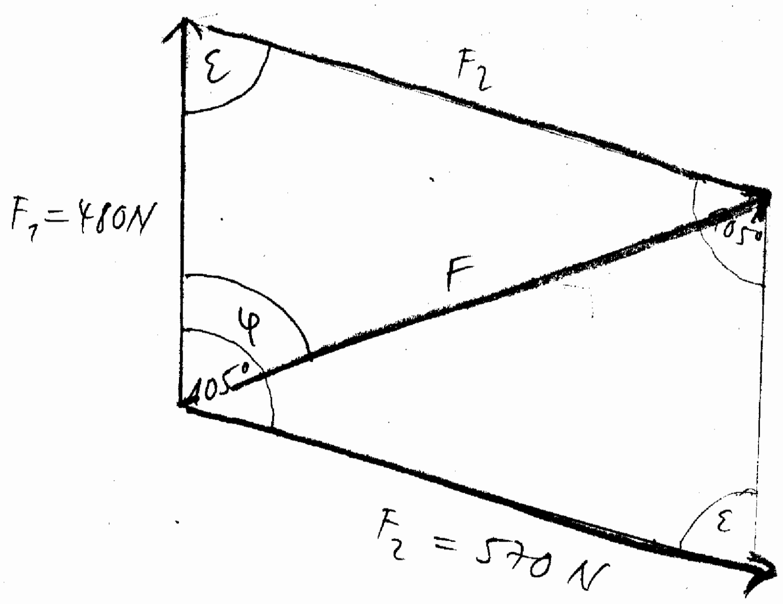
$$\Rightarrow \varphi_2 = 180 - \alpha = \underline{\underline{139{,}4°}} = \measuredangle(\vec{F}_2, \vec{F}_3)$$

$$F_2^2 = F_1^2 + F_3^2 - 2F_1F_3\cos\beta \Rightarrow \beta = \cos^{-1}\left(\frac{F_1^2+F_3^2-F_2^2}{2F_1F_3}\right)$$

$$= \cos^{-1}(0{,}96) = 16{,}2°$$

$$\varphi_1 = 180 - \beta = \underline{\underline{163{,}8°}} = \measuredangle(\vec{F}_1, \vec{F}_3)$$

Afg 181



$$\varepsilon = \frac{360 - 2 \cdot 105}{2} = 180 - 105 = 75°$$

Cos - Satz (SWS) $F_1 \; \varepsilon \; F_2$

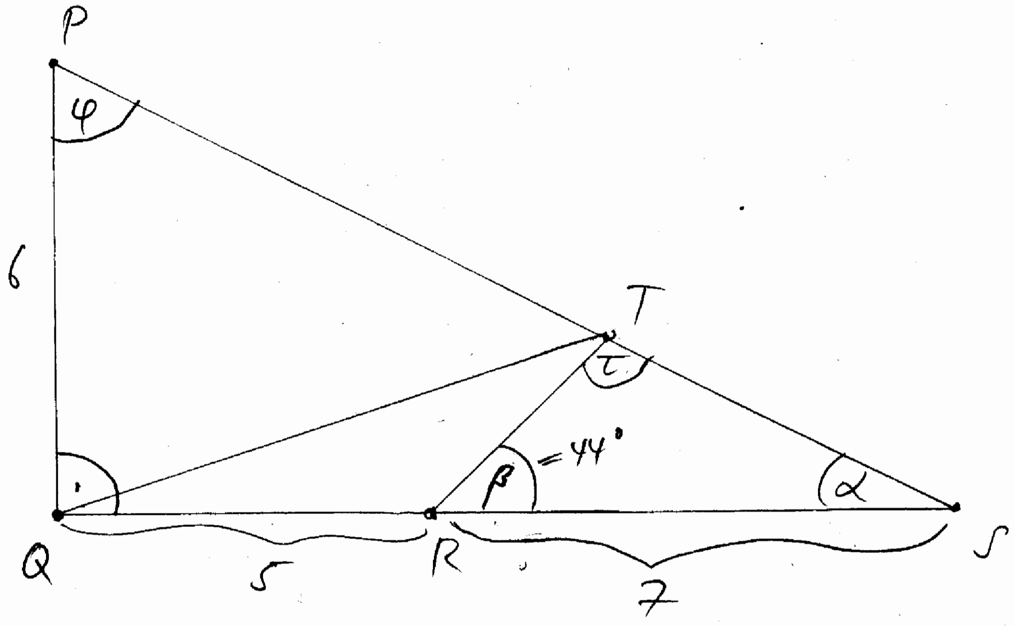
$$F^2 = F_1^2 + F_2^2 - 2 F_1 F_2 \cos \varepsilon = 413.674{,}22$$

$$\Rightarrow \quad F = \underline{\underline{643{,}18\,N}}$$

Sin- Satz (SSW) $F, F_2 \; \varepsilon$

$$\frac{\sin \varphi}{F_2} = \frac{\sin \varepsilon}{F} \Rightarrow \varphi = \sin^{-1}\left(\frac{F_2 \sin \varepsilon}{F}\right) = 58{,}87°$$

Afg 182



α und $\overline{PS}$ berechnen:

$$\tan\alpha = \frac{6}{5+7} = \frac{6}{12} = \frac{1}{2} \Rightarrow \alpha = 26{,}57^\circ$$

$$\overline{PS}^2 = 6^2 + (5+7)^2 = 36 + 144 = 180 \quad (\text{Pythagoras})$$

$$\Rightarrow \overline{PS} = \sqrt{180} = 6\sqrt{5} = 13{,}42\ \text{cm}$$

$\overline{ST}$ berechnen:

$$\tau = 180 - \alpha - \beta = 109{,}43^\circ$$

sin-Satz: (WSW) $\alpha, 7, \beta$

$$\frac{\overline{ST}}{\sin\beta} = \frac{7}{\sin\tau} \Rightarrow \overline{ST} = \frac{7\sin\beta}{\sin\tau} = 5{,}16\ \text{cm}$$

$\overline{PT}$ berechnen: $\overline{PT} = \overline{PS} - \overline{ST} = 8{,}26\ \text{cm}$

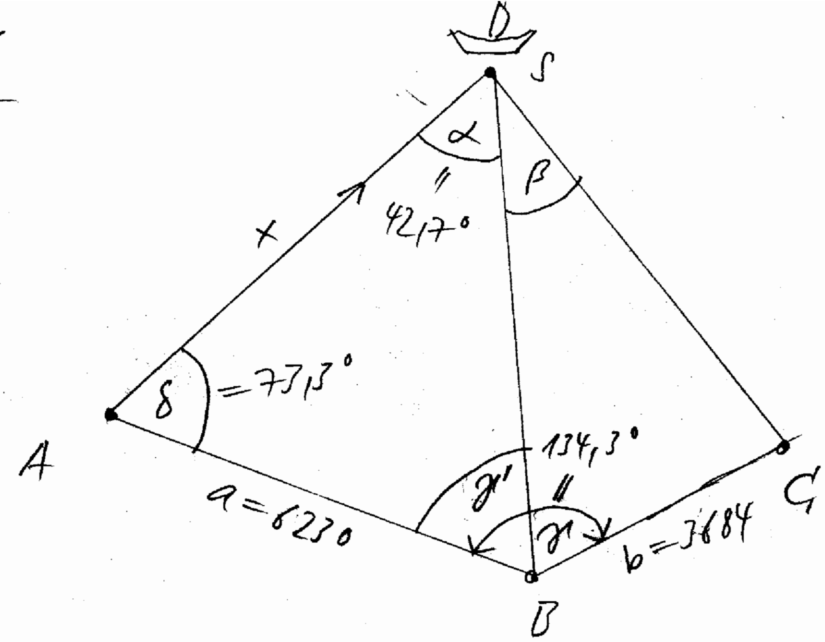
$\overline{QT}$ berechnen: $\varphi = 90 - \alpha = 63{,}43^\circ$

cos-Satz (SWS) $6, \varphi, \overline{PT}$

$$\overline{QT}^2 = 6^2 + \overline{PT}^2 - 2\cdot 6\cdot \overline{PT}\cdot\cos\varphi = 59{,}89$$

$$\Rightarrow \overline{QT} = 7{,}74\ \text{cm}$$

Afg 184



a) <u>x berechnen:</u> $\gamma' = 180 - \alpha - \delta = \underline{\underline{64°}}$

sin-Satz (WWS) α, δ, a

$$\frac{x}{\sin\gamma'} = \frac{a}{\sin\alpha} \Rightarrow x = \frac{a\sin\gamma'}{\sin\alpha} = \underline{\underline{8257\ m}}$$

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b) <u>β-berechnen</u>

- zunächst $\overline{BS}$ berechnen: sin-Satz (WWS)

$$\frac{\overline{BS}}{\sin\delta} = \frac{a}{\sin\alpha} \Rightarrow \overline{BS} = \frac{a\sin\delta}{\sin\alpha} = \underline{\underline{8800\ m}}$$

- $\overline{SC}$ berechnen: cos-Satz (SWS) $\overline{BS}, \gamma-\gamma', b$

$$\gamma - \gamma' = 134{,}3 - 64 = 70{,}3°$$

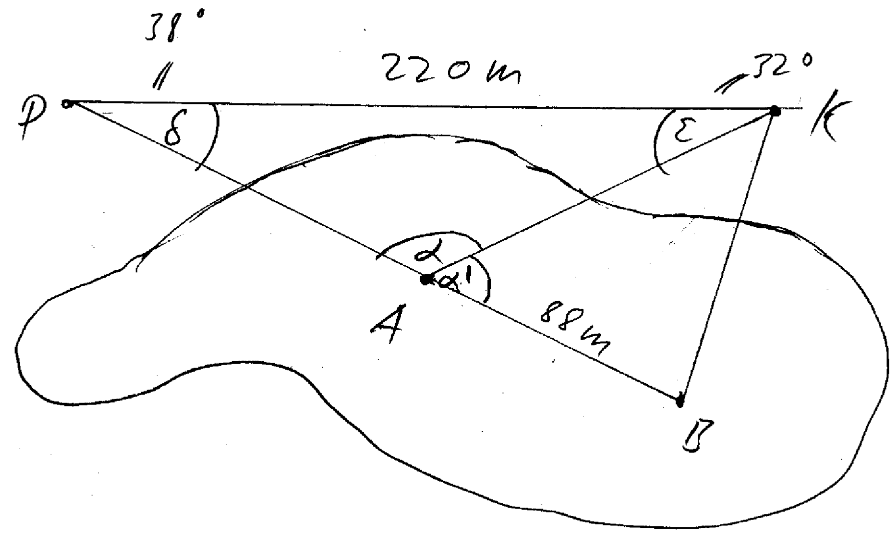
$$\overline{SC}^2 = \overline{BS}^2 + b^2 - 2\,\overline{BS}\cdot b\cdot\cos(\gamma-\gamma') = 69.155.138{,}8$$

$$\Rightarrow \overline{SC} = 8316\ m$$

- sin-Satz (SSW – $b, \overline{SC}, \gamma-\gamma'$)

$$\frac{\sin\beta}{b} = \frac{\sin(\gamma-\gamma')}{\overline{SC}} \Rightarrow \beta = \sin^{-1}\left(\frac{b\sin(\gamma-\gamma')}{\overline{SC}}\right) = 24{,}65°$$

Afg 183



$\overline{KA}$ berechnen: $\alpha = 180 - \delta - \varepsilon = \underline{\underline{110°}}$

sin-Satz (WSW) $\delta, \overline{PK}, \varepsilon$

$$\frac{\overline{KA}}{\sin\delta} = \frac{\overline{PK}}{\sin\alpha} \Rightarrow \overline{KA} = \frac{\overline{PK}\sin\delta}{\sin\alpha} = \underline{\underline{144{,}14\,m}}$$

$$\approx 144\,m$$

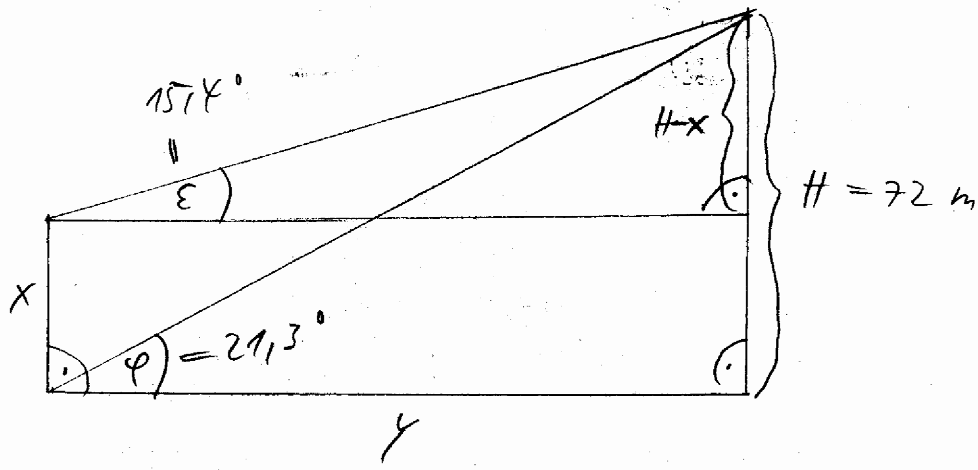
$\overline{KB}$ berechnen: $\alpha' = 180 - \alpha = 70°$

Cos-Satz (SWS – $KA, \alpha', \overline{AB}$)

$$\overline{KB}^2 = \overline{AB}^2 + \overline{KA}^2 - 2\,\overline{AB}\cdot\overline{KA}\cdot\cos\alpha' = 19.843{,}75$$

$$\Rightarrow \overline{KB} = \underline{\underline{140{,}87}}\,m \approx 141\,m$$

Afg 185



y berechnen:

$$\tan\varphi = \frac{H}{y} \Rightarrow y = \frac{H}{\tan\varphi} = 184{,}67\,m$$

x berechnen:

$$\tan\varepsilon = \frac{H-x}{y} \Rightarrow H-x = y\tan\varepsilon$$

$$\Rightarrow x = H - y\tan\varepsilon = H - \frac{H\tan\varepsilon}{\tan\varphi}$$

$$\boxed{x = H\left(1 - \frac{\tan\varepsilon}{\tan\varphi}\right)} = \underline{\underline{21{,}13\,m}}$$