

## Winkel funktoren

①

a)  $\Delta x = 253\text{m}$ ,  $\Delta y = 417\text{m}$

$$a = \frac{\Delta y}{\Delta x} = \frac{417}{253} \approx 1.6482 = \underline{\underline{164.82\%}}$$

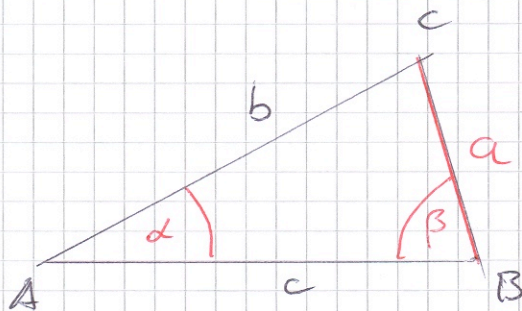
$$\tan d = 1.6482$$

$$d = \arctan(1.6482) \approx \underline{\underline{58.75^\circ}}$$

b)  $a = 28\% = 0.028$

$$d = \arctan(0.028) \approx \underline{\underline{1.6^\circ}}$$

②



$$a = 14.3\text{cm}$$

$$\alpha = 31.5^\circ$$

$$\beta = 104.2^\circ$$

$$\gamma = 44.3^\circ = 180^\circ - \alpha - \beta$$

$$\frac{a}{\sin \alpha} = \frac{b}{\sin \beta} \Rightarrow$$

$$\frac{a \cdot \sin \beta}{\sin \alpha} = b \approx \underline{\underline{26.5\text{cm}}}$$

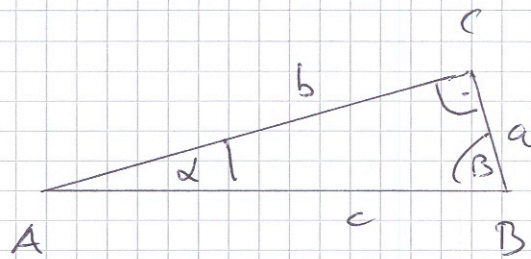
$$\frac{a}{\sin \alpha} = \frac{c}{\sin \gamma} \Rightarrow$$

$$\frac{a \cdot \sin \gamma}{\sin \alpha} = c \approx \underline{\underline{19.1\text{cm}}}$$

Achtung: Steigung und Winkel nicht prop.!  
Schreib...



3



$$10 \cdot b = a$$

$$\Rightarrow \frac{a}{b} = 10$$

$$\Rightarrow \frac{b}{a} = \frac{1}{10}$$

$$\tan \alpha = \frac{a}{b} = 10$$

$$\alpha = \arctan(10) = \underline{\underline{84.29^\circ}}$$

$$\tan \beta = \frac{b}{a} = \frac{1}{10}$$

$$\beta = \arctan\left(\frac{1}{10}\right) \approx \underline{\underline{5.71^\circ}}$$

Setze  $a' = 1\text{m}$ : (ähnliches  $\triangle A'B'C'$  mit Seiten  $a', b', c'$ )

$$\frac{b}{c} = \frac{b'}{c'}$$

$$\sin \alpha = \frac{a'}{c'} \Rightarrow c' = \frac{a'}{\sin \alpha} = 1.004987 \dots$$

$$\tan \alpha = \frac{a'}{b'} \Rightarrow b' = \frac{a'}{\tan \alpha} = 0.1$$

$$\text{resp. } \frac{b'}{a'} = \frac{1}{10} \Rightarrow b' = 0.1$$

$$\Rightarrow a : b : c = 1 : \frac{1}{10} : 1.004988$$

~~$$a = 1.43\text{m} \quad 2.38\text{m}$$~~

~~$$b = 0.143\text{m} \quad 0.238\text{m}$$~~

~~$$c = 1.43\text{m} \quad 2.39\text{m}$$~~

$$a = \frac{5\text{m}}{1+0.1+1.005} \cdot 1$$

$$b = \frac{5\text{m}}{1.015} \cdot 0.1$$

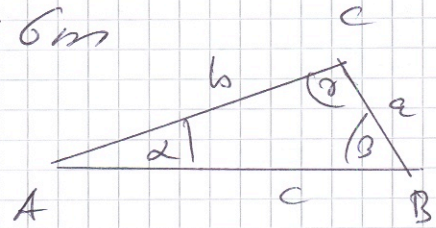
$$c = \frac{5\text{m}}{1.015} \cdot 1.005$$

→ stehe auch ganz hinten!



④

$$a = 4\text{m}, b = 5\text{m}, c = 6\text{m}$$



$$a^2 = b^2 + c^2 - 2bc \cdot \cos \alpha$$

$$\frac{a^2 - b^2 - c^2}{-2bc} = \cos \alpha$$

$$\alpha = \arccos \left( \frac{a^2 - b^2 - c^2}{-2bc} \right) \approx \underline{\underline{41.41^\circ}}$$

$$b^2 = a^2 + c^2 - 2ac \cdot \cos \beta$$

$$\frac{b^2 - a^2 - c^2}{-2ac} = \cos \beta$$

$$\beta = \arccos \left( \frac{b^2 - a^2 - c^2}{-2ac} \right) \approx \underline{\underline{55.77^\circ}}$$

$$\gamma = \underline{\underline{82.82^\circ}}$$

⑤

$$c^2 = a^2 + b^2 - 2ab \cdot \cos \gamma$$

$$c = \sqrt{\quad} = \underline{\underline{9.9\text{cm}}}$$

(9.8685...)



$$\textcircled{6} \quad \alpha : \beta : \gamma = 7 : 5 : 8$$

$$\Rightarrow \alpha = 63^\circ, \beta = 45^\circ, \gamma = \cancel{72}^\circ = 72^\circ$$

$a' = 1\text{m}$  (ähnliches Dreieck  $A'B'C'$  mit Seiten  $a' = 1\text{m}$ ,  $b'$  und  $c'$ )

$$\frac{a}{\sin \alpha} = \frac{b}{\sin \beta} \Rightarrow b = \frac{a \cdot \sin \beta}{\sin \alpha} \approx 0.794\text{m}$$

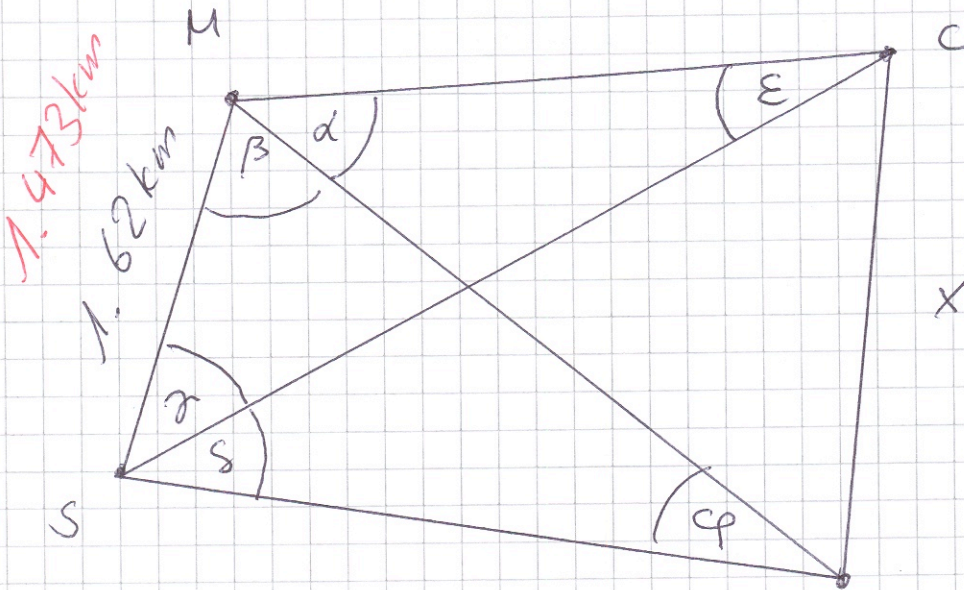
$$\frac{a}{\sin \alpha} = \frac{c}{\sin \gamma} \Rightarrow c = \frac{a \cdot \sin \gamma}{\sin \alpha} = 1.067$$

$$a' : b' : c' = 1 : 0.79 : 1.07 = a : b : c$$

$$\Rightarrow \begin{cases} a = 0.7\text{m} \\ b = 0.55\text{m} \\ c = 0.75\text{m} \end{cases}$$



7



$$d = 56.7^\circ$$

$$\beta = 79.5^\circ$$

$$\gamma = 34.1^\circ$$

$$\delta = 50.1^\circ$$

$$\epsilon = 180^\circ - d - \beta - \gamma = 9.7^\circ \quad W$$

$$\phi = 180^\circ - \beta - \gamma - \delta = 16.3^\circ$$

$$\overline{MC}: \quad \frac{\overline{MS}}{\sin \epsilon} = \frac{\overline{MC}}{\sin \gamma}$$

$$\overline{MC} = \frac{\overline{MS} \cdot \sin \gamma}{\sin \epsilon} \approx \underline{\underline{5'890.459m}}$$

$$\overline{MW}: \quad \frac{\overline{MS}}{\sin \phi} = \frac{\overline{MW}}{\sin(\gamma + \delta)}$$

$$\overline{MW} = \frac{\overline{MS} \cdot \sin(\gamma + \delta)}{\sin \phi} \approx \underline{\underline{5'742.422m}}$$

4'901.325

5'221.35

$$\overline{SW}: \quad \frac{\overline{MS}}{\sin \phi} = \frac{\overline{SW}}{\sin \beta}$$

$$\overline{SW} = \frac{\overline{MS} \cdot \sin \beta}{\sin \phi} = \underline{\underline{5'675.318m}}$$

$$\overline{SC}: \quad \frac{\overline{MS}}{\sin \epsilon} = \frac{\overline{SC}}{\sin(\alpha + \beta)}$$

$$\overline{SC} = \frac{\overline{MS} \cdot \sin(\alpha + \beta)}{\sin \epsilon} = \underline{\underline{6'654.852m}}$$

6'050.986



$$X = \sqrt{\overline{SC}^2 + \overline{SW}^2 - 2\overline{SC} \cdot \overline{SW} \cdot \cos \beta}$$
$$= \underline{\underline{5'295.587m}}$$

$$X = \sqrt{\overline{MW}^2 + \overline{MC}^2 - 2\overline{MW} \cdot \overline{MC} \cdot \cos \alpha}$$
$$= \underline{\underline{5'295.587m}}$$

$4'815.062$

Zu 3: Eine Stede von 24m  
soll im Verh. 1:2:5 aufgeteilt  
werden.

$$1:2:5 \hat{=} 8 \text{ Teile} \hat{=} 24m$$

$$1 \text{ Teil} \hat{=} 3m$$

$$2 \text{ Teile} \hat{=} 6m$$

$$5 \text{ Teile} \hat{=} 15m$$

$$1:2:5 = 3m:6m:15m$$