

GBM 4M, 8.5.2012 (eigentl. 11.5.)

Winkelfunktionen

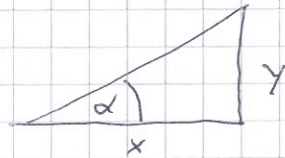
①

$$x = 253 \text{ m}$$

$$y = 417 \text{ m}$$

$$a = \frac{y}{x} = \frac{417}{253} \approx 1.64922$$

$$\approx \underline{\underline{164.82\%}}$$

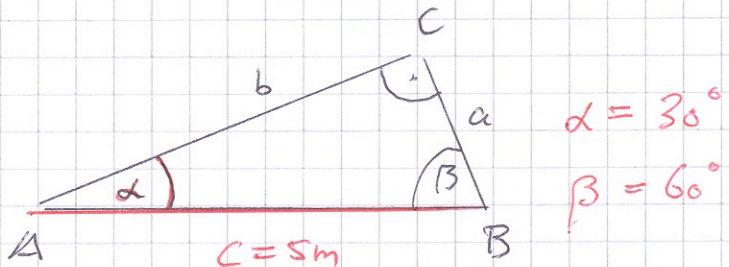


$$a = \tan \alpha$$

$$\alpha = \arctan(a) \approx \underline{\underline{58.75^\circ}}$$

$$b) \alpha = \arctan(0.028) = \underline{\underline{1.604^\circ}}$$

②

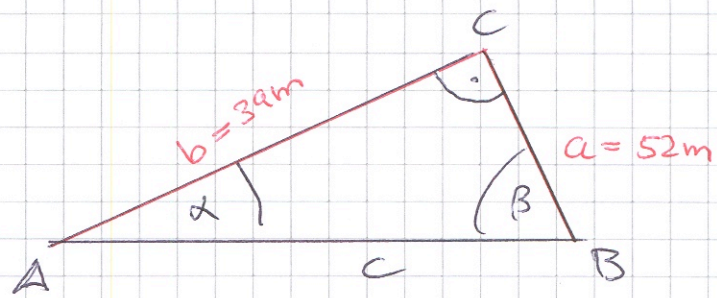


$$\sin \alpha = \frac{a}{c} \Rightarrow a = c \cdot \sin \alpha = \frac{1}{2} c = \underline{\underline{2.5 \text{ m}}}$$

$$\cos \alpha = \frac{b}{c} \Rightarrow b = c \cdot \cos \alpha = \frac{\sqrt{3}}{2} \cdot 5$$

$$= \underline{\underline{4.33 \text{ m}}}$$

(3)



$$\tan \alpha = \frac{a}{b} = \frac{52}{39} = 1.\bar{3}$$

$$\alpha = \arctan(1.\bar{3}) = \underline{\underline{53.13^\circ}}$$

$$\beta = 90^\circ - \alpha = \underline{\underline{36.87^\circ}}$$

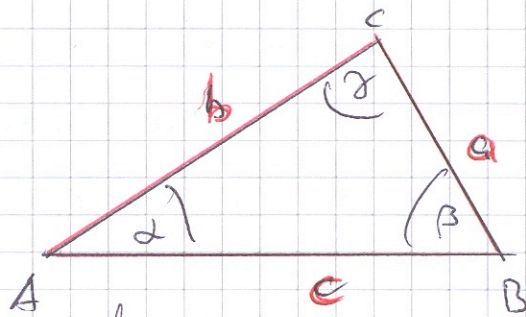
$$\sin \alpha = \frac{a}{c} \Rightarrow c = \frac{a}{\sin \alpha} = \underline{\underline{65m}}$$

(4)

$$a = 4 \text{ cm}$$

$$b = 5 \text{ m}$$

$$c = 6 \text{ m}$$



$$c^2 = a^2 + b^2 - 2ab \cdot \cos \gamma \quad | -a^2 - b^2$$
$$c^2 - a^2 - b^2 = -2ab \cdot \cos \gamma \quad (: (-2ab))$$

$$\frac{c^2 - a^2 - b^2}{-2ab} = \cos \gamma$$

$$\arccos\left(\frac{c^2 - a^2 - b^2}{-2ab}\right) = \gamma = \underline{\underline{82.82^\circ}}$$

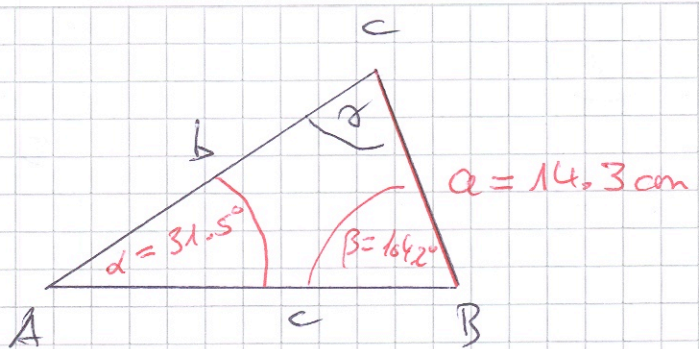
$$a^2 = b^2 + c^2 - 2bc \cdot \cos \alpha$$

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

$$\arccos\left(\frac{a^2 - b^2 - c^2}{-2bc}\right) = \alpha = \underline{\underline{41.41^\circ}} \quad \beta = 180^\circ - \alpha - \gamma = \underline{\underline{55.77^\circ}}$$

5

$$\frac{a}{\sin \alpha} = \frac{b}{\sin \beta} \quad | \cdot \sin \beta$$



$$\frac{a \cdot \sin \beta}{\sin \alpha} = b = \underline{\underline{26.53 \text{ cm}}}$$

$$\frac{a}{\sin \alpha} = \frac{c}{\sin \gamma} = \frac{c}{\sin(180^\circ - \alpha - \beta)} \quad | \cdot \sin(180^\circ - \alpha - \beta)$$

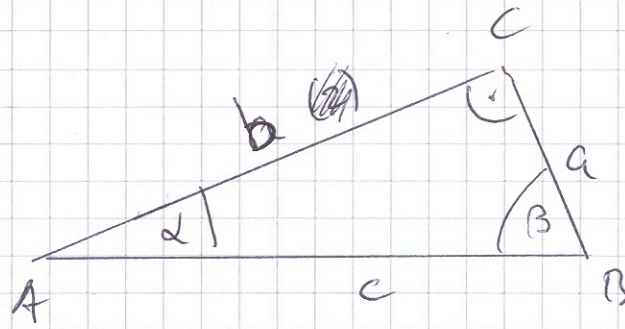
$$\frac{a \cdot \sin(180^\circ - \alpha - \beta)}{\sin \alpha} = c = \underline{\underline{19.11 \text{ cm}}}$$

6

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

$$c = \sqrt{a^2 + b^2 - 2ab \cos \gamma} = \underline{\underline{9.87 \text{ cm}}}$$

7



$$a : b = 2 : 1$$

$$\tan \alpha = \frac{a}{b} = 2$$

$$\alpha = \arctan(2) = \underline{\underline{63.43^\circ}}$$

$$\beta = 90^\circ - \alpha = \underline{\underline{26.57^\circ}}$$

Winkel:
2 P.

$$\text{Setze } a' = 1 \Rightarrow b' = 0.5$$

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

$$c' = \frac{a'}{\sin \alpha} = 1.118$$

4 P.

$$a' : b' : c' = a : b : c = 1 : \frac{1}{2} : 1.118$$

$$a = \frac{5 \text{ m}}{1 + \frac{1}{2} + 1.118} \cdot 1 = \underline{\underline{1.91 \text{ m}}}$$

$$b = \frac{5 \text{ m}}{1 + \frac{1}{2} + 1.118} \cdot \frac{1}{2} = \underline{\underline{0.955 \text{ m}}}$$

$$c = \frac{5 \text{ m}}{1 + \frac{1}{2} + 1.118} \cdot 1.118 = \underline{\underline{2.135 \text{ m}}}$$