

Achtung:

Die Aufgabennummern der  
Kusterlösung können abweichen,  
da ich für zwei verschiedene  
Prüfungen eine gemeinsame Lösung  
geschrieben habe.



TRIGON; TBM 3B

29.9.2015

①

$\triangle ADC$ : SSWg

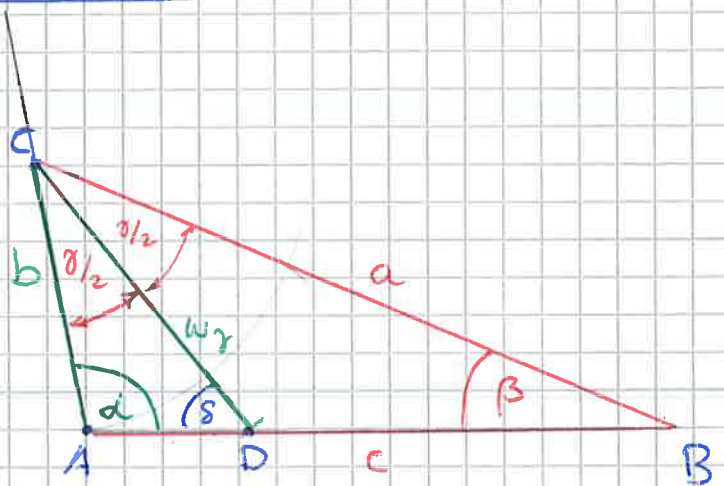
$$\frac{\sin \delta}{b} = \frac{\sin \alpha}{w_y}$$

$$\delta = \sin^{-1} \left( \frac{b \cdot \sin \alpha}{w_y} \right)$$

$$\delta \approx 51.98^\circ$$

$$\frac{\gamma}{2} = 180^\circ - \alpha - \delta \approx 28.02^\circ$$

$$\underline{\underline{\gamma \approx 56.03^\circ}} \quad ; \quad \underline{\underline{\beta \approx 23.969^\circ}}$$



$\triangle ABC$ : SWW

$$\frac{b}{\sin \beta} = \frac{c}{\sin \gamma} \Rightarrow c = \frac{b \cdot \sin \beta}{\sin \gamma} \approx \underline{\underline{7.35m}}$$

$$\frac{a}{\sin \alpha} = \frac{b}{\sin \beta} \Rightarrow a = \frac{b \cdot \sin \alpha}{\sin \beta} \approx \underline{\underline{8.73m}}$$

$$\alpha = 100^\circ$$

$$\beta \approx 23.9694^\circ \approx 23.97^\circ$$

$$\gamma \approx 56.031^\circ \quad / \quad 56^\circ / 56.03^\circ$$

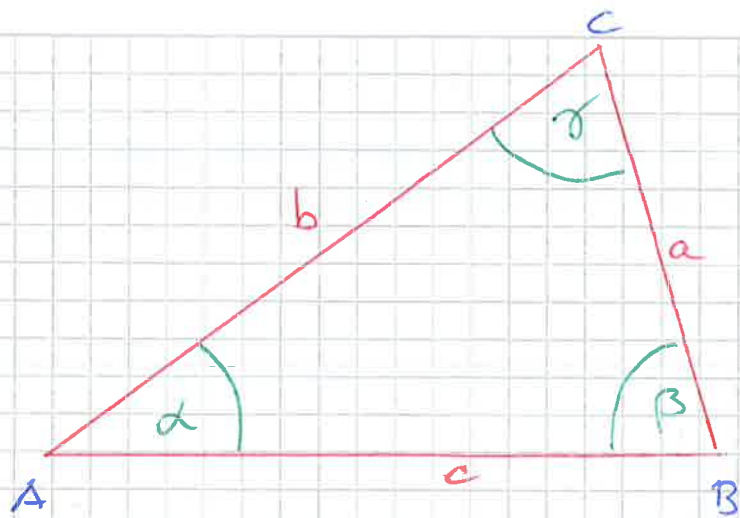
$$a \approx 8.726948m \approx 8.73m$$

$$b = 3.6m$$

$$c \approx 7.349226m \approx 7.35m$$

②

Nehme  $c$  als gegeben an:



$$\frac{c}{\sin \gamma} = \frac{b}{\sin \beta} \Rightarrow b = \frac{c \cdot \sin \beta}{\sin \gamma}$$

$$\alpha = 0.61 \text{ rad}$$

$$\beta = 1.4 \text{ rad}$$

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

$$U = a + b + c$$

$$U = \frac{c \cdot \sin \alpha}{\sin \gamma} + \frac{c \cdot \sin \beta}{\sin \gamma} + c$$

$$= c \left( \frac{\sin \alpha}{\sin \gamma} + \frac{\sin \beta}{\sin \gamma} + 1 \right)$$

$$= \frac{c}{\sin \gamma} (\sin \alpha + \sin \beta + \sin \gamma)$$

$$\frac{U \cdot \sin \gamma}{(\sin \alpha + \sin \beta + \sin \gamma)} = c \approx \begin{matrix} 30.2686 \text{ m} & 7.348 \text{ m} \\ \approx 30.269 \text{ m} & \end{matrix}$$

$$b = \frac{c \cdot \sin \beta}{\sin \gamma} \approx \begin{matrix} 32.956 \text{ m} & 8.001 \text{ m} \end{matrix}$$

$$a = \frac{c \cdot \sin \alpha}{\sin \gamma} = \begin{matrix} 19.158191 \text{ m} & 4.651 \text{ m} \\ \approx 19.158 \text{ m} & \end{matrix}$$

$$\text{Fläche } \triangle ABC = \frac{1}{2} b \cdot c \cdot \sin \alpha \approx \underline{\underline{285.727 \text{ m}^2}} \quad \begin{matrix} 16.83984 \text{ m}^2 \\ 16.84 \text{ m}^2 \end{matrix}$$

③ nehme  $c = 1000 \text{ m}$  an und berechne daraus  $a$ :

$$d: \frac{d}{\sin \gamma} = \frac{c}{\sin(180^\circ - \alpha - \beta - \gamma)}$$

$$(\triangle ADC) \quad d = \frac{c \cdot \sin \gamma}{\sin(180^\circ - \alpha - \beta - \gamma)} \cong 452.483 \text{ m}$$

$$e: \triangle CBD \quad \frac{e}{\sin(\gamma + \delta)} = \frac{c}{\sin(180^\circ - \beta - \gamma - \delta)}$$

$$d \quad e = \frac{c \cdot \sin(\gamma + \delta)}{\sin(180^\circ - \beta - \gamma - \delta)} \cong 910.986 \text{ m}$$

$$f: \triangle ADC \quad \frac{f}{\sin(\alpha + \beta)} = \frac{c}{\sin(180^\circ - \alpha - \beta - \gamma)}$$

$$f = \frac{c \cdot \sin(\alpha + \beta)}{\sin(180^\circ - \alpha - \beta - \gamma)} \cong 756.545 \text{ m}$$

$$b: \triangle CBD \quad \frac{b}{\sin \beta} = \frac{c}{\sin(180^\circ - \beta - \gamma - \delta)}$$

$$b = \frac{c \cdot \sin \beta}{\sin(180^\circ - \beta - \gamma - \delta)} \cong 495.84 \text{ m}$$

$$a = \sqrt{b^2 + f^2 - 2bf \cdot \cos \delta} \cong 492.341 \text{ m}$$

$$a = \sqrt{d^2 + e^2 - 2de \cdot \cos \alpha} \cong 492.341 \text{ m}$$

$$a : c = 492.341 : 1000$$

$$\frac{a}{c} = \frac{492.341}{1000} \Rightarrow c = \frac{1000 a}{492.341}$$

$$c \cong 72.453 \text{ km}$$

$$\cong 72'453.891 \text{ m}$$

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5-Eck:

Variante 1:  $\overline{FG}$  ist Durchschnitt von  $\overline{AD}$  und  $\overline{BC} = 10\text{cm}$   
( $ABCD$  ist Trapez;  $\overline{GF} \parallel \overline{BC}$ )

$$\overline{AD} = \sqrt{\overline{DE}^2 + \overline{AE}^2 - 2 \overline{AE} \cdot \overline{DE} \cdot \cos 108^\circ}$$

$$= \sqrt{10^2 + 10^2 - 2 \cdot 100 \cdot \cos 108^\circ} \approx 16.18\text{cm}$$

$$\overline{GF} = \frac{\overline{BC} + \overline{AD}}{2} \approx \underline{\underline{13.09\text{cm}}}$$

$$h_1: \cos 18^\circ = \frac{h_1}{10}$$

$$h_1 = 10 \cdot \cos 18^\circ$$

$$\cos 54^\circ = \frac{h_2}{10}$$

$$h_2 = 10 \cdot \cos 54^\circ$$



$$h_1 + h_2 = 10 (\cos 18^\circ + \cos 54^\circ) \approx 15.39\text{cm}$$

$$S = \sqrt{h^2 + 5^2 - 2 \cdot h \cdot 5 \cdot \cos 54^\circ}$$

$$= \underline{\underline{13.09\text{cm}}}$$

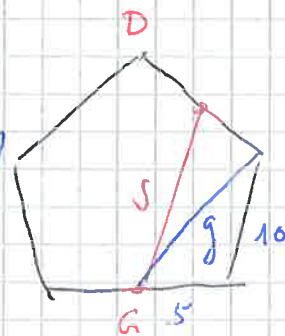
$$g = \sqrt{5^2 + 10^2 - 2 \cdot 5 \cdot 10 \cdot \cos 108^\circ}$$

$$\approx 12.48\text{cm}$$

$$\approx 12.49\text{cm}$$

$$\overline{GD} = 10 \cdot \cos 54^\circ + 10 \cdot \cos 18^\circ = 15.388\text{cm}$$

$$5.88 + 9.51 =$$



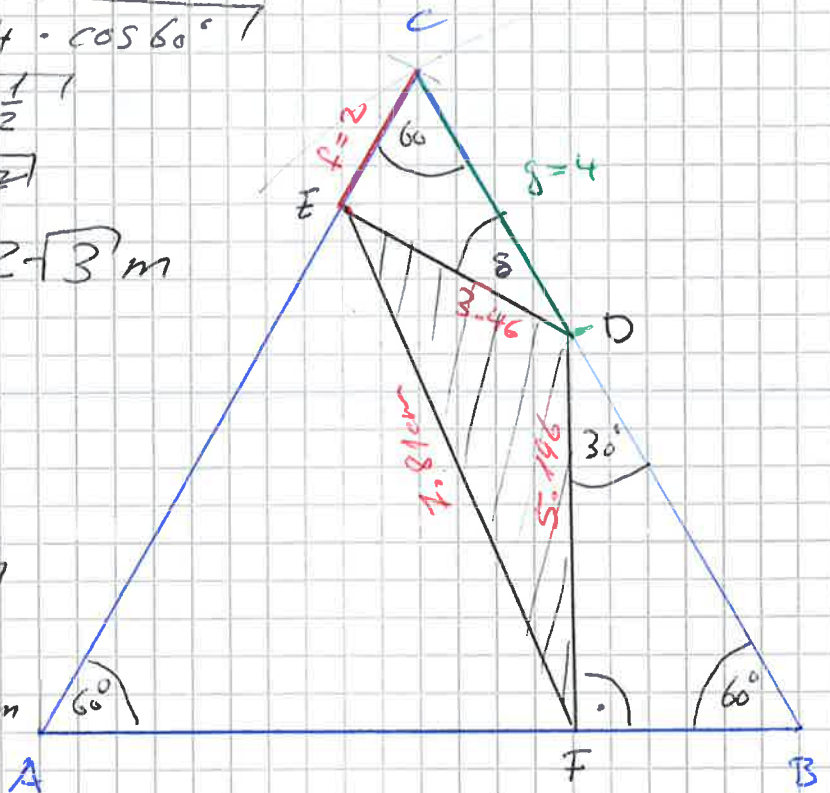
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$$\begin{aligned} \overline{ED} &= \sqrt{2^2 + 4^2 - 2 \cdot 2 \cdot 4 \cdot \cos 60^\circ} \\ &= \sqrt{4 + 16 - 16 \cdot \frac{1}{2}} \\ &= \sqrt{28} = 2\sqrt{7} \\ &= \sqrt{20 - 8} = 2\sqrt{3} \text{ m} \end{aligned}$$

$$\overline{ED} \approx 3.46 \text{ m}$$

$$\begin{aligned} \overline{DF} &= \frac{\sqrt{3}}{2} \cdot \overline{DB} \\ &= 6 \frac{\sqrt{3}}{2} = 3\sqrt{3} \end{aligned}$$

$$\overline{DF} = 3\sqrt{3} \text{ m} = 5.196 \text{ m}$$



$$\delta = \angle(CDE): \quad \frac{\sin 60^\circ}{\overline{ED}} = \frac{\sin \delta}{2}$$

$$\delta = \sin^{-1} \left( \frac{2 \cdot \sin 60^\circ}{\overline{ED}} \right)$$

$\approx 30^\circ$  (g ist doppelt so gross wie f, also ist  $\triangle EDC$  halbes gleichs.  $\triangle$ )

$$\Rightarrow \angle(EDF) = 120^\circ$$

$$A_{\triangle DEF} = \frac{1}{2} \overline{ED} \cdot \overline{DF} \cdot \sin 120^\circ \approx 7.794 \text{ m}^2$$

(7.7942286...)

$$\overline{FB} = \frac{1}{2} \cdot \overline{BD} = \frac{1}{2} (10 - 4) = 3$$

$$\overline{EF} = \sqrt{3^2 + 7^2 - 2 \cdot 3 \cdot 7 \cdot \cos 60^\circ} \approx 7.81 \text{ cm}$$

7.55 cm

# Roche-Tower

1. Weg:

$x$  = Entfernung von 2 zu Tower

$$\tan 0.54 \text{ rad} = \frac{h}{x} \quad \tan 0.42 \text{ rad} = \frac{h}{x+100}$$

$\rightarrow h = x \cdot \tan 0.54$  — einsetzen

$$\tan 0.42 = \frac{x \cdot \tan 0.54}{x+100} \cdot (x+100)$$

$$(x+100) \cdot \tan 0.42 = x \cdot \tan 0.54$$

$$x(\tan 0.42 - \tan 0.54) = -100 \cdot \tan 0.42$$

$$x(\tan 0.54 - \tan 0.42) = 100 \cdot \tan 0.42$$

$$x = \frac{100 \cdot \tan 0.42}{\tan 0.54 - \tan 0.42} \approx 292.1504 \text{ m}$$

$$x \cdot \tan 0.54 = h \approx \underline{\underline{175.124 \text{ m}}}$$

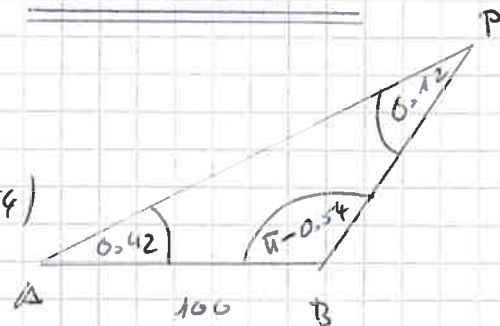
2. Weg:  $\triangle ABP$ :

$$\sphericalangle APB = \pi + 0.42 - (\pi - 0.54)$$
$$= 0.12 \text{ rad}$$

$$\frac{100}{\sin(0.12)} = \frac{\overline{AP}}{\sin(\pi - 0.54)}$$

$$\overline{AP} = \frac{100 \cdot \sin(\pi - 0.54)}{\sin(0.12)} \approx 429.477 \text{ m}$$

$$\sin(0.42) = \frac{h}{\overline{AP}} \Rightarrow h = \overline{AP} \cdot \sin(0.42)$$
$$\approx 175.124 \text{ m}$$



$$\left( \begin{array}{l} 0.42 \text{ rad} \approx 24.06^\circ \\ 0.54 \text{ rad} \approx 29.22^\circ \end{array} \right)$$