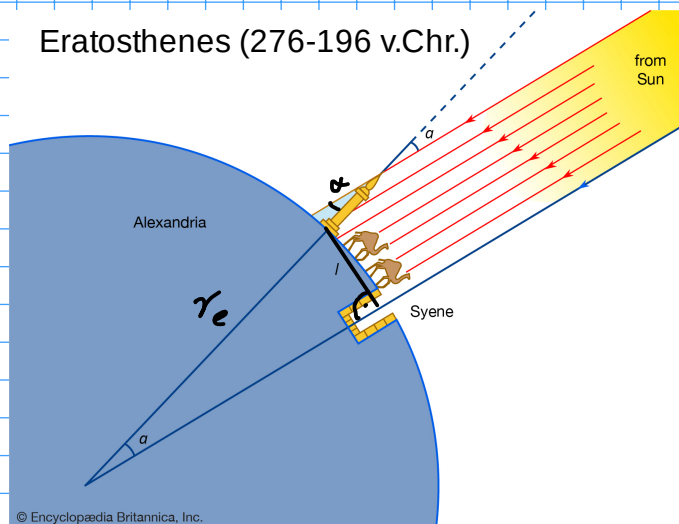


Trigonometrie - Satz des Pythagoras
Sinus, Cosinus und Tangens bei Dreiecken

$$\sin(\alpha) = \frac{e}{r_e} \quad | \cdot r_e \quad | : \sin(\alpha)$$

$$r_e = \frac{e}{\sin(\alpha)} = 6283,5 \text{ Km} \approx 6370 \text{ Km}$$

Eratosthenes (276-196 v.Chr.)



$$e = 5000 \text{ stadien} = 787,5 \text{ Km}$$

$$\alpha = 7,2^\circ$$

Satz des Pythagoras

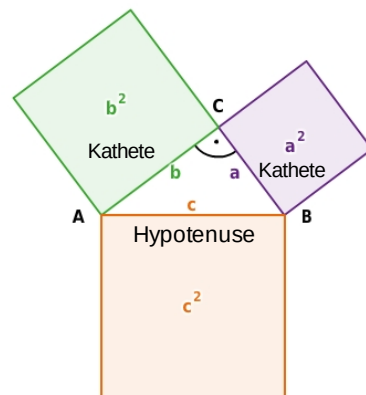
$$c^2 = a^2 + b^2$$

$$\hookrightarrow a = 3 \text{ cm} \quad 3^2 + 4^2 = c^2$$

$$b = 4 \text{ cm} \quad 9 + 16 = 25 = c^2 \quad | \sqrt{\quad}$$

$$c = 5 \quad c = \sqrt{25} = 5 \text{ cm}$$

$$\hookrightarrow a^2 = c^2 - b^2, \quad b^2 = c^2 - a^2$$



Sinus-, Cosinus und Tangens im rechtwinkligen Dreieck

$$a = 5 \text{ cm} \quad \alpha = 20^\circ \quad \beta = 70^\circ$$

$$c = 14,62 \text{ cm} \quad b = 13,738 \text{ cm}$$

$$20^\circ + \beta + 90^\circ = 180^\circ \quad | -110^\circ$$

$$\beta = 180^\circ - 110^\circ = 70^\circ$$

$$\sin(\alpha) = \frac{a}{c} \quad | \cdot c \quad | : \sin(\alpha)$$

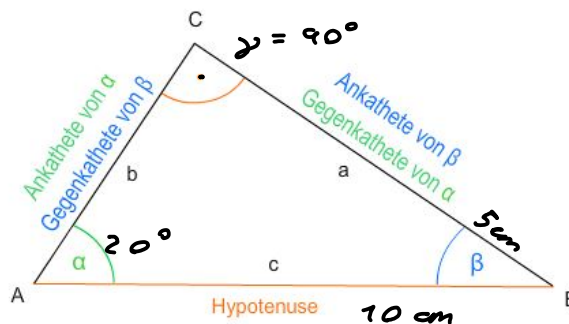
$$c = \frac{a}{\sin(\alpha)} = \frac{5}{\sin(20^\circ)} = 14,62 \text{ cm}$$

$$b \Rightarrow \sin(\beta) = \frac{b}{c} \quad | \cdot c$$

$$\sin(\beta) \cdot c = b$$

$$\sin(70^\circ) \cdot 14,62 = 13,738 \text{ cm}$$

$$\rightarrow \alpha + \beta + \gamma = 180^\circ$$



$$\hookrightarrow \sin(\alpha) = \frac{\text{Geg. K}(\alpha)}{\text{Hyp.}} = \frac{\text{An. K}(\beta)}{\text{Hyp.}} = \cos(\beta)$$

$$\cos(\alpha) = \frac{\text{An. K}(\alpha)}{\text{Hyp.}} = \frac{\text{Geg. K}(\beta)}{\text{Hyp.}} = \sin(\beta)$$

$$\tan(\alpha) = \frac{\text{Geg. K}(\alpha)}{\text{An. K}(\alpha)}$$

Sinus- und Cosinussatz für allgemeine Dreiecke

Sinussatz

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

Kosinussatz

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

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

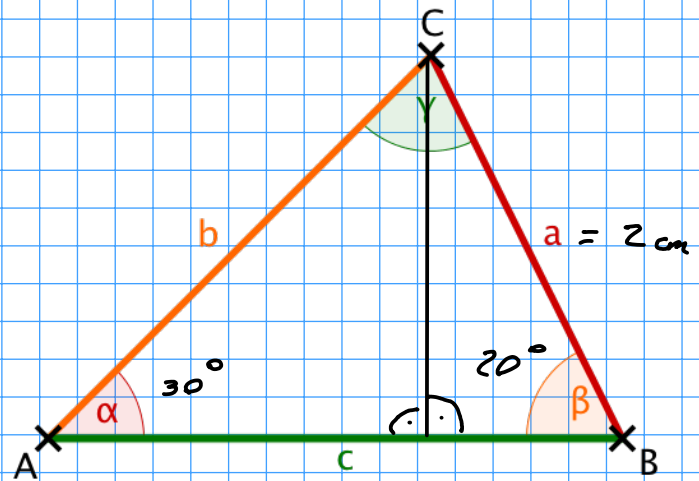
$$c^2 = a^2 + b^2 - 2ab \cos(\gamma)$$

$$\hookrightarrow a^2 = b^2 + c^2 - 2bc \cos(\alpha)$$

$$b = ? \text{ cm} \quad c = 3 \text{ cm} \quad \alpha = 20^\circ$$

$$\begin{aligned} a^2 &= 2^2 + 3^2 - 2 \cdot 2 \cdot 3 \cos(20^\circ) \\ &= 4 + 9 - 12 \cos(20^\circ) = 1,7237 \end{aligned}$$

$$\hookrightarrow a = 1,312 \text{ cm}$$



$$\frac{2 \text{ cm}}{\sin(30^\circ)} = \frac{b}{\sin(20^\circ)} \quad | \cdot \sin(20^\circ)$$

$$\frac{2 \text{ cm}}{\sin(30^\circ)} \cdot \sin(20^\circ) = \underline{\underline{b = 1,368 \text{ cm}}}$$