Trigonometrie Aufgabe 171

Wie groß sind die Seite c und der Winkel α, wenn a + b = 52 cm, γ = 60° , A = 160 * √3 cm² und a > b sein soll?

a + b = 52 cm | -b

a = 52 – b

$\sin 60° = ½ * \sqrt{3}$

$$A = \frac{a * b * \sin γ}{2} = \frac{(52 – b) * b * \sin γ}{2}$$
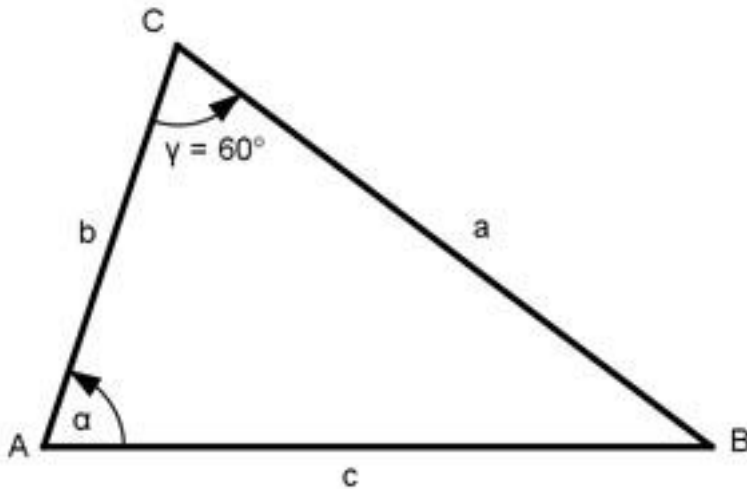
$$160 * \sqrt{3} = \frac{(52 * b – b²) * ½ * \sqrt{3}}{2} \quad | : \sqrt{3}$$

$$160 = \frac{52 * b – b²}{4} \quad | *4$$

640 = 52 * b – b² | +b²

b² + 640 = 52 * b | -52 * b

b² - 52b + 640 = 0

p = -52 ; q = 640

$$b_{1,2} = \frac{52}{2} ± \sqrt{(\frac{52}{2})² – 640}$$

$b_{1,2} = 26 \pm \sqrt{676 - 640}$

$b_{1,2} = 26 \pm \sqrt{36}$

$b_{1,2} = 26 \pm 6$

$b_1 = 26 + 6 = 32$ cm

$b_2 = 26 - 6 = 20$ cm

$a_1 = 52 - b_1 = 52$ cm $- 32$ cm $= 20$ cm

$a_2 = 52 - b_2 = 52$ cm $- 20$ cm $= 32$ cm

Wegen a > b ist a = 32 cm und b = 20 cm

Fall SWS:

Cosinussatz:

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

$c^2 = 32^2 + 20^2 - 2 * 32 * 20 * \cos 60°$

$c^2 = 32^2 + 20^2 - 2 * 32 * 20 * 0{,}5 = 784$

$c^2 = 784 \mid \sqrt{}$

c = 28 cm

Fall SSW:

Sinussatz:

$$\frac{a}{\sin \alpha} = \frac{c}{\sin \gamma} \mid * \sin \gamma$$

$$\frac{a * \sin \gamma}{\sin \alpha} = c \mid * \sin \alpha$$

$a * \sin \gamma = c * \sin \alpha \mid :c$

$$\sin \alpha = \frac{a * \sin \gamma}{c} = \frac{32 \text{ cm} * \sin 60°}{28 \text{ cm}} = \frac{32 \text{ cm} * 0,866}{28 \text{ cm}} = 0,9897$$

α = 81,8°