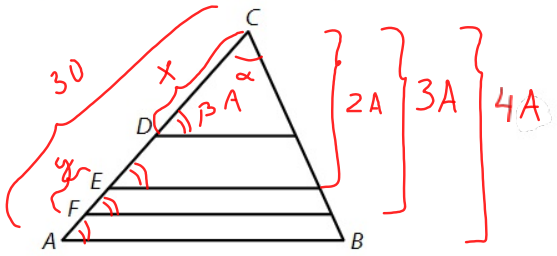
4.23 Janan AC pituus on 30 ja kolmion ABC kannan suuntaiset janat jakavat kolmion pinta-alaltaan neljään yhtä suureen osaan. Laske janan **a)** CD **b)** EF pituus.



Kaikki 4 kolmiota ovat yhdenmuotoisia, niillä kaikilla yhteinen kulma α ja samankohtainen kulma β.

Yhdenmuotoisten kuvioiden pinta-alojen suhde = (mittakaava)^2

a) $\frac{A}{4A} = \left(\frac{x}{30}\right)^2$

$4x^2 = 30^2 \;||:4$

$x^2 = \frac{30^2}{4} \;||\sqrt{}$

$x = \pm\sqrt{\frac{30^2}{4}} = \frac{30}{2} = 15$

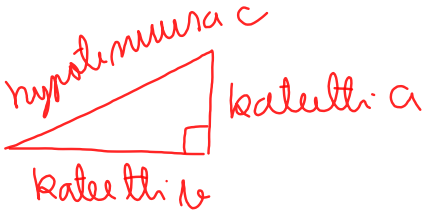
b) $EF = CF - CE$

$\frac{A}{3A} = \left(\frac{CD}{CF}\right)^2 = \left(\frac{15}{CF}\right)^2$

$\vdots$

$\frac{A}{2A} = \left(\frac{15}{CE}\right)^2 \ldots$

Suorakulmainen kolmio

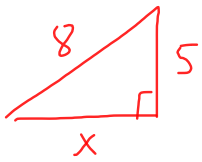


Pythagoraan lause:

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

Esim. Ratkaise x

a)



Pythagoras:

$x^2 + 5^2 = 8^2$

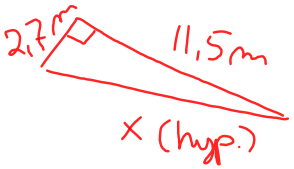
$x^2 = 8^2 - 5^2 \quad \| \sqrt{\ }$

$x = \pm\sqrt{8^2 - 5^2}$

$= \sqrt{64 - 25}$

$= \sqrt{39} \ (\approx 6{,}2)$

b)



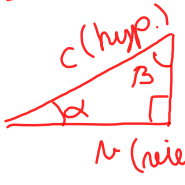
Pythagoras:

$2{,}7^2 + 11{,}5^2 = x^2 \quad \| \sqrt{\ }$

$x = \pm\sqrt{2{,}7^2 + 11{,}5^2} = 11{,}81 \text{ m}$

$\approx 12 \text{ m}$

Kulmien ja sivujen suhde

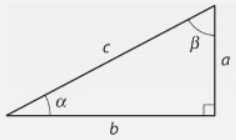


$\sin\alpha = \frac{a}{c}$ $\left(\frac{\text{vast.}}{\text{hyp.}}\right)$

$\cos\alpha = \frac{b}{c}$ $\left(\frac{\text{vier.}}{\text{hyp.}}\right)$

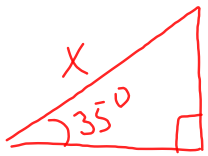
$\tan\alpha = \frac{a}{b}$ $\left(\frac{\text{vast.}}{\text{vier.}}\right)$

Suorakulmaisen kolmion trigonometria

$a^2 + b^2 = c^2$ (Pythagoraan lause)	
$A = \frac{1}{2}ab$	
$\beta = 90° - \alpha$	
$\sin\alpha = \frac{a}{c}$	
$\cos\alpha = \frac{b}{c}$	
$\tan\alpha = \frac{a}{b}$	

← MAOL

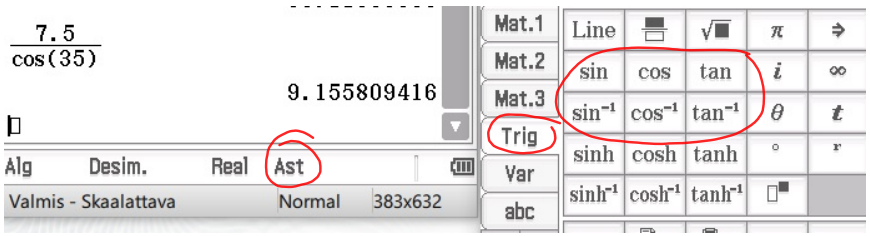
Esim. Ratkaise x



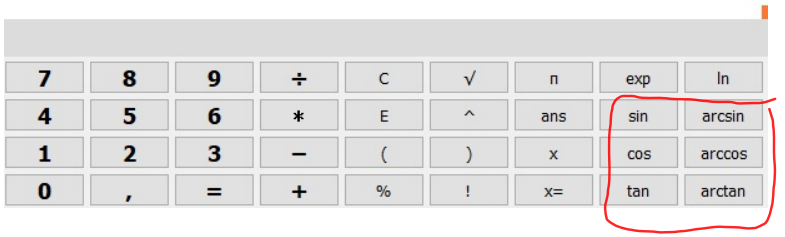
$\cos 35° = \frac{7{,}5}{x}$ (kerrotaan ristiin)

$x \cdot \cos 35° = 7{,}5 \;\; /: \cos 35°$

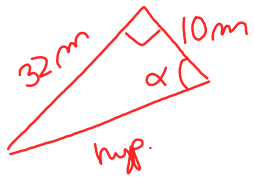
$x = \frac{7{,}5}{\cos 35°} = 9{,}15\,\text{cm} \approx 9{,}2\,\text{cm}$



7,5/cos(35)
= 9,15580941571092051251



Esim. Ratkaise α



$$\tan\alpha = \frac{32}{10}$$

$$\alpha = \underbrace{\tan^{-1}}_{\arctan}\left(\frac{32}{10}\right) = 72{,}6^\circ$$

$$\tan^{-1}\left(\frac{32}{10}\right) \qquad 72.64597536$$

arctan(32/10)
= 72,64597536373867799139

käytetään kun ratkaistaan kulman suuruutta