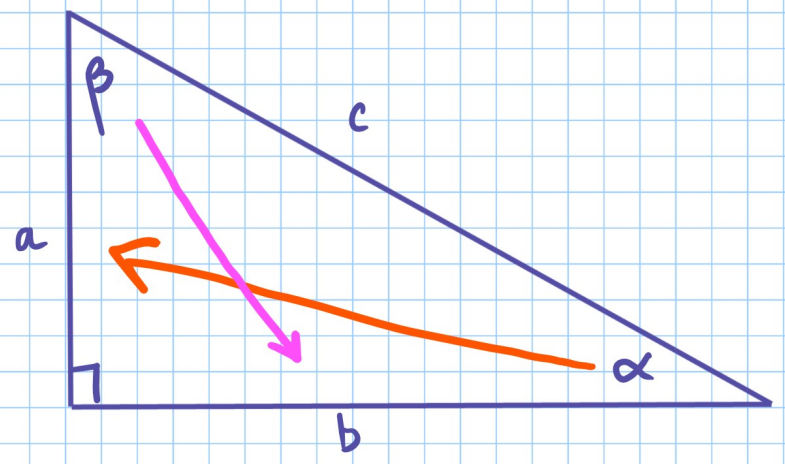
Section 7.1 Right Triangles

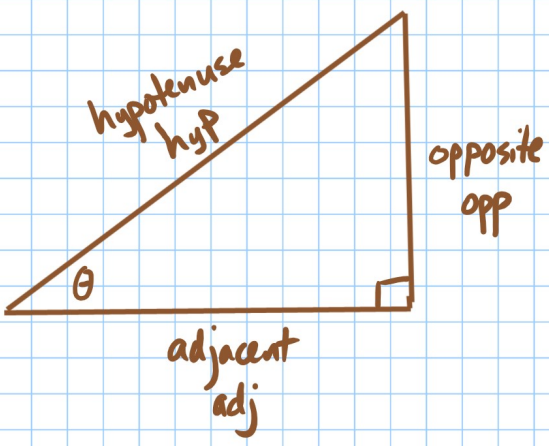
To solve a right triangle means to find its missing sides. α is always opposite side a

β is always opposite side b

The right angle is opposite side c.



Trig Ratios



$$\sin\theta = \frac{opp}{hyp} \quad \cos\theta = \frac{adj}{hyp} \quad \tan\theta = \frac{opp}{adj}$$ SOH CAH TOA

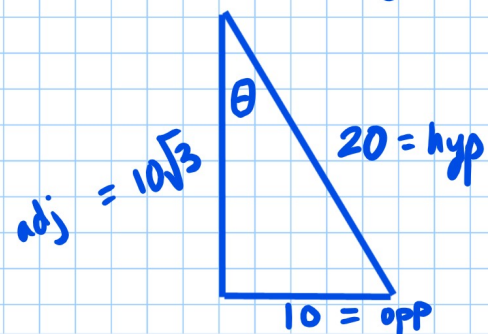
cosecant $\csc\theta = \frac{hyp}{opp}$

secant $\sec\theta = \frac{hyp}{adj}$

cotangent $\cot\theta = \frac{adj}{opp}$

CHO SHA CAO

ex: Find the 6 trig ratios of θ:



$\sin\theta = \frac{10}{20} = \frac{1}{2}$ $\quad \csc\theta = \frac{2}{1} = 2$

$\cos\theta = \frac{10\sqrt{3}}{20} = \frac{\sqrt{3}}{2}$ $\quad \sec\theta = \frac{2}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{2\sqrt{3}}{3}$

$\tan\theta = \frac{10}{10\sqrt{3}} = \frac{1}{\sqrt{3}} \cdot \frac{\sqrt{3}}{\sqrt{3}} = \frac{\sqrt{3}}{3}$ $\quad \cot\theta = \frac{\sqrt{3}}{1} = \sqrt{3}$

$10^2 + b^2 = 20^2$

$100 + b^2 = 400$

$b^2 = 300$

$b = \sqrt{300} = \sqrt{100}\sqrt{3} = 10\sqrt{3}$

---

sine and cosine
tangent and cotangent
secant and cosecant
} cofunctions

$\sin 40^\circ = \cos 50^\circ$

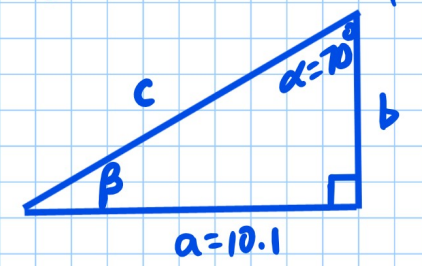
$\cot 20^\circ = \tan 70^\circ$

$\sec 55^\circ = \csc 35^\circ$

---

ex: Solve the right triangle that has $\alpha = 70^\circ$ and $a = 10.1$

STEP 1 Draw a picture



STEP 2: What's missing?

$\beta = 20^\circ$

$c = 10.8$

$b = 3.7$

STEP 3: What's easiest?

$\beta = 180 - 90 - 70 = 20^\circ$

STEP 4: Use trig to find another side: $\tan 20^\circ = \frac{b}{10.1}$

$10.1 \cdot .3640 = \frac{b}{10.1} \cdot 10.1$

$b = 3.7$

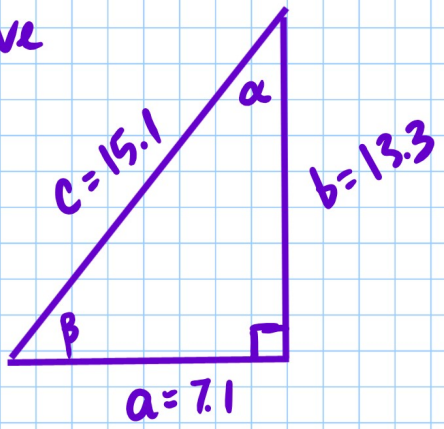
STEP 5: Pythagorean Thm

$10.1^2 + 3.7^2 = c^2$

$115.7 = c^2$

$c = 10.8$

ex: Solve



$a = 7.1$

$\alpha = 28.3^\circ$

$\beta = 61.7^\circ$

$\sin\beta = \frac{13.3}{15.1} = \frac{opp}{hyp}$

$\beta = \sin^{-1}\left(\frac{13.3}{15.1}\right)$

$\beta = 61.7^\circ$

$a^2 + 13.3^2 = 15.1^2$

$a^2 = 51.12$

$a = 7.1$

$\alpha = 90 - 61.7$

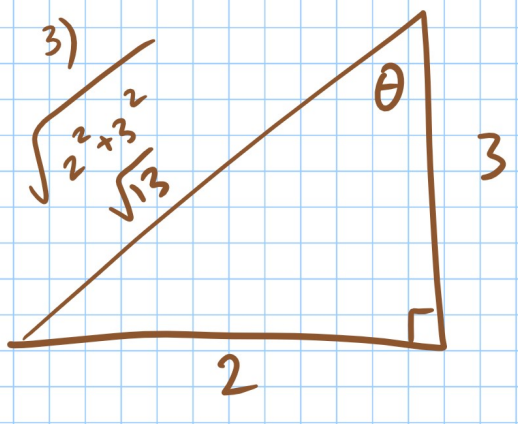
$\alpha = 28.3^\circ$

p536 1, 3, 11, 13, 17, 21, 25, 31, 33

Put Books back

Put calculators back

3)



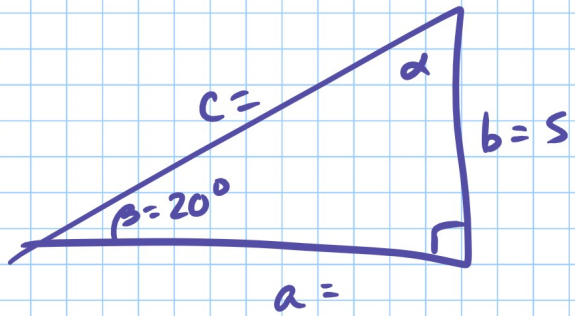
$\sin\theta = \frac{2}{\sqrt{13}} = \frac{2\sqrt{13}}{13}$ $\quad \csc\theta = \frac{\sqrt{13}}{2}$

$\cos\theta = \frac{3}{\sqrt{13}} = \frac{3\sqrt{13}}{13}$ $\quad \sec\theta = \frac{\sqrt{13}}{3}$

$\tan\theta = \frac{2}{3}$ $\quad \cot\theta = \frac{3}{2}$

21) $b = 5$

$\beta = 20°$



$\alpha = 70°$

$a = 13.7$

$c = 14.6$

$\alpha = 90 - 20 = 70°$

$\frac{\sin 20°}{1} = \frac{5}{c}$

$\frac{c \sin 20°}{\sin 20°} = \frac{5}{\sin 20°}$

$c = 14.6$

$a^2 + 5^2 = 14.6^2$

$a^2 = 188.16$

$a = 13.7$