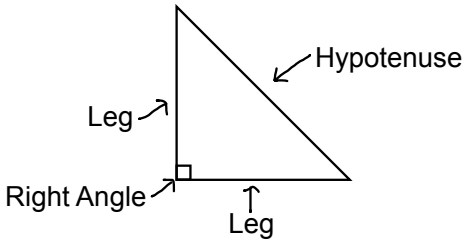
5-3

Solving Right Triangles

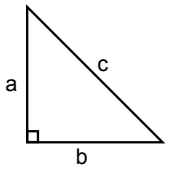
Right Triangle

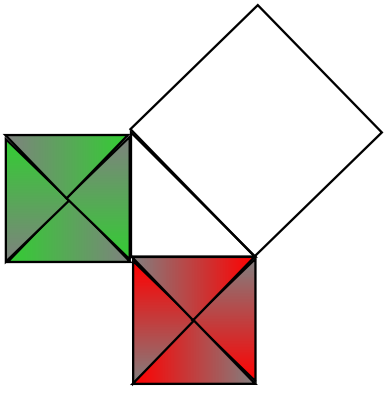


Pythagorean Theorem

In a right triangle where a and b are the legs and c is the hypotenuse,

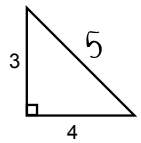
$$a^2 + b^2 = c^2$$





Find the missing side in the right triangle using the pythagorean theorem:

ex.



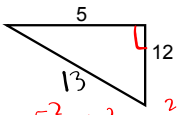
$3^2+4^2=c^2$

$9+16=c^2$

$\sqrt{25}=\sqrt{c^2}$

$5=c$

ex.



$5^2+12^2=c^2$

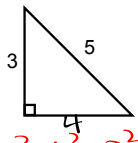
$25+144=c^2$

$\sqrt{169}=\sqrt{c^2}$

$13=c$

Find the missing side in the right triangle using the pythagorean theorem:

ex.



$3^2+b^2=5^2$

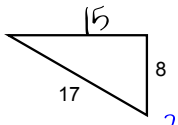
$9+b^2=25$

$-9 \quad -9$

$\sqrt{b^2}=\sqrt{16}$

$b=4$

ex.



$8^2+b^2=17^2$

$64+b^2=289$

$-64 \quad -64$

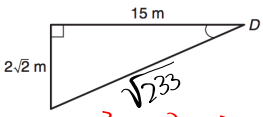
$\sqrt{b^2}=\sqrt{225}$

$b=15$

Find the missing side in the right triangle using the pythagorean theorem:

ex.

$2\sqrt{2}\cdot 2\sqrt{2}=4\sqrt{4}=4\cdot 2=8$



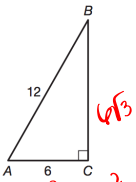
$(2\sqrt{2})^2+15^2=c^2$

$8+225=c^2$

$\sqrt{233}=\sqrt{c^2}$

$\sqrt{233}=c$

ex.



$6^2+b^2=12^2$

$36+b^2=144$

$-36 \quad -36$

$\sqrt{b^2}=\sqrt{108}=6\sqrt{3}$

2 54

~~2~~ 27

3 9

~~3~~ 3

How to find trig in **RIGHT** triangles:

SOH CAH TOA

$\sin\theta=\dfrac{opp}{hyp}$ $\qquad$ $\csc\theta=\dfrac{hyp}{opp}$

cosecant

$\cos\theta=\dfrac{adj}{hyp}$ $\qquad$ $\sec\theta=\dfrac{hyp}{adj}$

secant

$\tan\theta=\dfrac{opp}{adj}$ $\qquad$ $\cot\theta=\dfrac{adj}{opp}$

cotangent

Find:

sinA= $\frac{a}{c}$ sinB= $\frac{b}{c}$

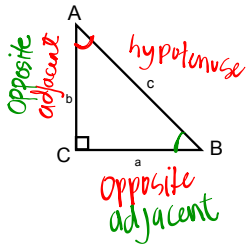
cosA= $\frac{b}{c}$ cosB= $\frac{a}{c}$

tanA= $\frac{a}{b}$ tanB= $\frac{b}{a}$

cscA= $\frac{c}{a}$ cscB= $\frac{c}{b}$

secA= $\frac{c}{b}$ secB= $\frac{c}{a}$

cotA= $\frac{b}{a}$ cotB= $\frac{a}{b}$



Find:

sinA= $\frac{6}{10} = \frac{3}{5}$ sinB=

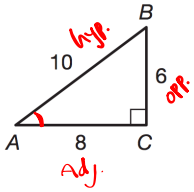
cosA= $\frac{8}{10} = \frac{4}{5}$ cosB=

tanA= $\frac{6}{8} = \frac{3}{4}$ tanB=

cscA= $\frac{5}{3}$ cscB=

secA= $\frac{5}{4}$ secB=

cotA= $\frac{4}{3}$ cotB=



Find: sinA= $\frac{7}{25}$

cosA= $\frac{24}{25}$

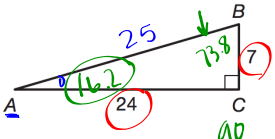
tanA= $\frac{7}{24}$

tan⁻¹

$\tan A = \left(\frac{7}{24}\right)$

$A = \tan^{-1}\left(\frac{7}{24}\right)$

$A = 16.2°$



$24^2 + 7^2 = c^2$

$576 + 49 = c^2$

$\sqrt{625} = \sqrt{c^2}$

$25 = c$

90

-16.2

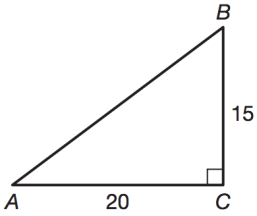
73.8

Find:

sinA= cscA=

cosA= secA=

tanA= cotA=



Find the other six trigonometric functions:

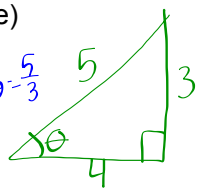
(hint: draw a triangle)

$$\sin\theta = \frac{3}{5}$$

← opp

← hyp

$\csc\theta = \frac{5}{3}$



$\cos\theta = \frac{4}{5}$ $\sec\theta = \frac{5}{4}$

$\tan\theta = \frac{3}{4}$ $\cot\theta = \frac{4}{3}$

$\sin\theta =$ $\csc\theta =$

$\cos\theta =$ $\sec\theta =$

$\tan\theta =$ $\cot\theta =$

Find the other six trigonometric functions:

(hint: draw a triangle)

$$\cos\theta = \frac{12}{13}$$