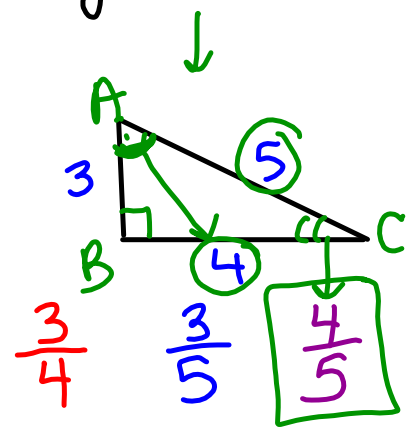
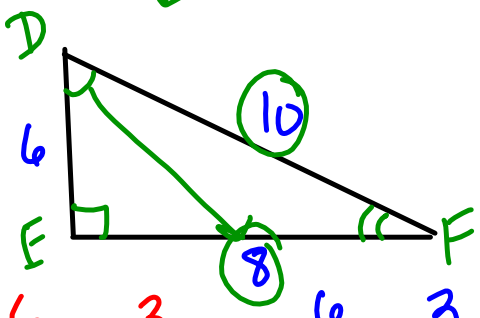
Sec. 10.6 Trigonometric Ratios

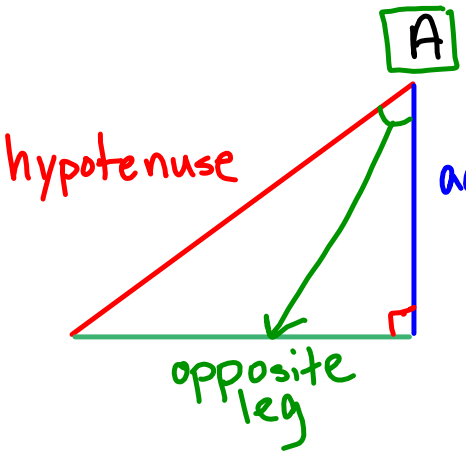
trigonometric ratios:
ratios of the side lengths of right triangles.



$\frac{3}{4}$ $\frac{3}{5}$ $\frac{4}{5}$



$\frac{6}{8} = \frac{3}{4}$ $\frac{6}{10} = \frac{3}{5}$ $\frac{8}{10} = \frac{4}{5}$



SOHCAHTOA

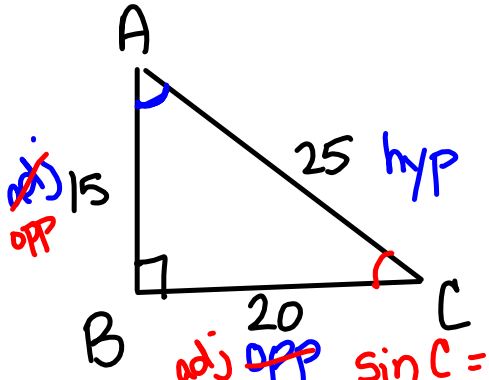
S O H — sine: $\sin A = \frac{\text{opposite}}{\text{hypotenuse}}$

C A H — cosine: $\cos A = \frac{\text{adjacent}}{\text{hypotenuse}}$

T O A — tangent: $\tan A = \frac{\text{opposite}}{\text{adjacent}}$

Problem 1:

What are sin A, cos A, and tan A for the triangle below?



adj ~~opp~~ 15 ~~opp~~ hyp

SOH CAH TOA

$\sin A = \frac{opp}{hyp} = \frac{20}{25} = \frac{4}{5}$

$\cos A = \frac{adj}{hyp} = \frac{15}{25} = \frac{3}{5}$

$\sin C = \frac{15}{25} = \frac{3}{5}$

$\cos C = \frac{20}{25} = \frac{4}{5}$

$\tan A = \frac{opp}{adj} = \frac{20}{15} = \frac{4}{3}$

$\tan C = \frac{15}{20} = \frac{3}{4}$

Problem 2:

What is the sin 29° to the nearest ten-thousandth?

Calc : Deg Rad Grad

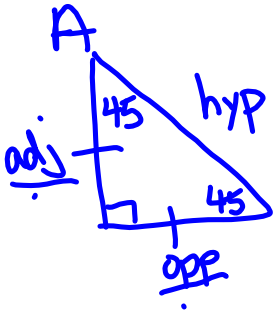
0.4848

sin 80°? = 0.9848

tan 45°? = 1

cos 45°? = 0.7071

sin 45°? = 0.7071



Problem 3: To the nearest tenth, how long is leg x in the triangle below?

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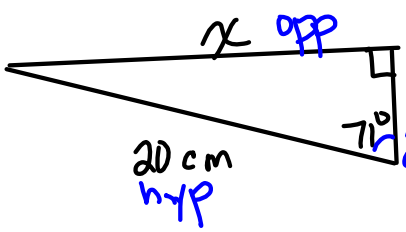
a.



$\sin\theta = \frac{opp}{hyp}$

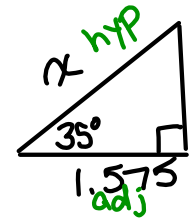
$\sin 71° = \frac{x}{20}$ · 20

$x = 20 \sin 71°$

$20(0.9455)$

18.9104

b.

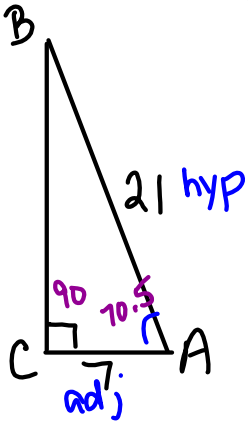


$\cos\theta = \frac{adj}{hyp}$

$\cos 35° = \frac{1.575}{x}$

$x = \frac{1.575}{\cos 35°} = 1.9227$

Problem 4: What is the measure of each angle in the triangle below?



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$\cos\theta = \frac{adj}{hyp}$

$\cos A = \frac{7}{21}$

$\cos A = \frac{1}{3}$

$90 + 70.5 + B = 180$

$160.5 + B = 180$

$-160.5 \quad -160.5$

$B = 19.5°$

$\cos^{-1}(\cos A) = \cos^{-1}\left(\frac{1}{3}\right)$

$A = \cos^{-1}\left(\frac{1}{3}\right)$

2nd

$\cos^{-1}$

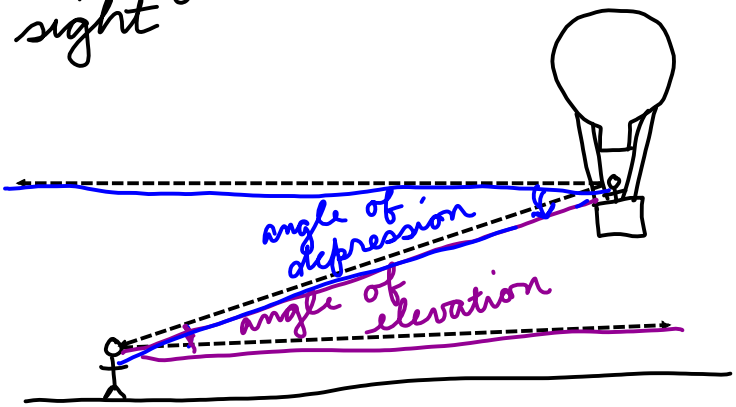
cos

$A = 70.5288$

$1 \div 3$ 2nd $\cos^{-1}$ cos

angle of elevation: an angle from the horizontal up to the line of sight

angle of depression: an angle from the horizontal down to the line of sight



Problem 5: Suppose a plane takes off at an angle of 42° with the ground. What horizontal distance has the plane traveled when it reaches an altitude of 30,000 ft? Round to the nearest foot.

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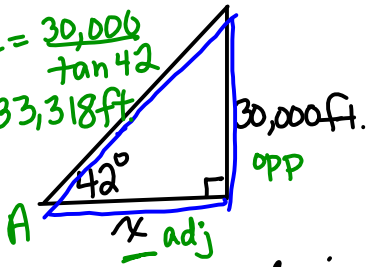
$\tan\theta = \frac{opp}{adj}$

$\tan 42 = \frac{30,000}{x}$

$x = \frac{30,000}{\tan 42}$

$x = 33,318 ft$



Suppose you are waiting in line for a ride. You see your friends at the top of the ride. How far are you from the base of the ride?