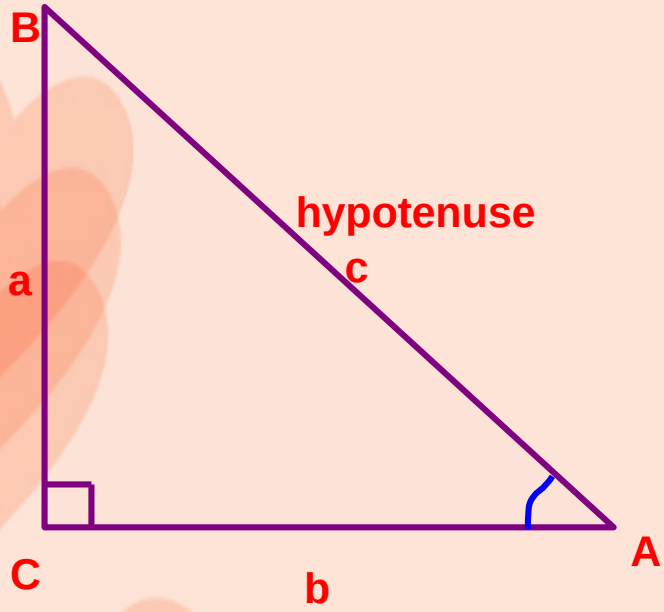
Right Triangle Trigonometry

SOH CAH TOA

Trigonometric Ratios

A ratio of the lengths of two sides of a right triangle is called a trigonometric ratio. The three most common ratios are sine, cosine, and tangent.



$$\text{Sin } A = \frac{\text{side opp. } \angle A}{\text{hypotenuse}}$$

$$\text{Cos } A = \frac{\text{side adj. to } \angle A}{\text{hypotenuse}}$$

$$\tan A = \frac{\text{side opp. } \angle A}{\text{side adj. to } \angle A}$$

We can also set up the same ratios with the other acute angle.

One way to remember these formulas is:

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****You must always remember to check your calculator. It needs to be in degree mode in order to calculate the answers correctly.**

Some Of Her Children Are Having Trouble Over Algebra.
Some Out-Houses Can Actually Have Totally Odorless Aromas.
She Offered Her Cat A Heaping Teaspoon Of Acid.
Soaring Over Haiti, Courageous Amelia Hit The Ocean And ...
Tom's Old Aunt Sat On Her Chair And Hollered. -- (from Ann Azevedo)
Stamp Out Homework Carefully, As Having Teachers Omit Assignments.
Some Old Horse Caught Another Horse Taking Oats Away.
Some Old Hippie Caught Another Hippie Tripping On Apples.
School! Oh How Can Anyone Have Trouble Over Academics.

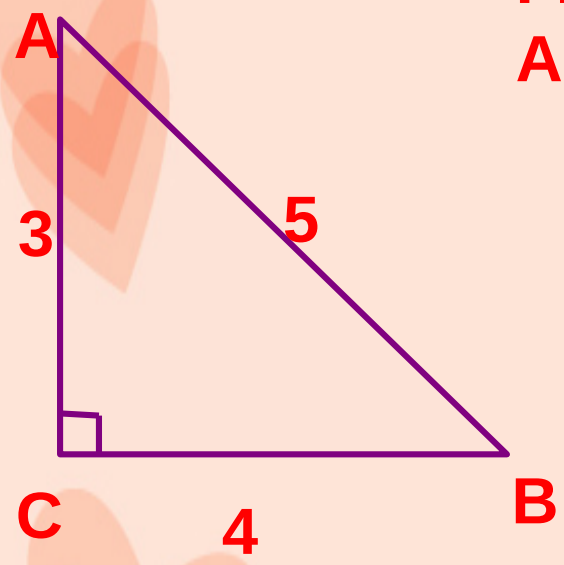
Let's make sure we can use our calculator.

sin 48´

tan 22´

cos 43´

Find: sin, cos, and tan for <A AND <B.



Key things to solve trig problems:

1) The calculator is in degree mode.

2) Remember the formulas:

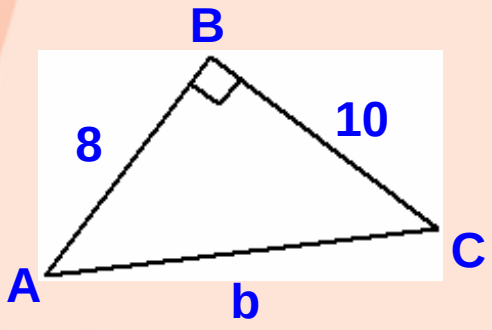
sin = $\frac{\text{opp}}{\text{hyp}}$ **cos = $\frac{\text{adj}}{\text{hyp}}$** **tan= $\frac{\text{opp}}{\text{adj}}$**

3) When you are looking for a side measure: use sin, cos, and tan buttons on the calculator.

Every right triangle has one right angle, two acute angles, one hypotenuse, and two legs. To **solve a right triangle** means to determine the measures of all six parts. You can solve a right triangle if you know either of the following:

- **Two side lengths** (to be discussed in Math IV)
- **one side length & one acute angle measure**

Review: Pythagorean Theorem



Note: Round decimals to the nearest hundredth

Begin by using the Pythagorean Theorem to find the length of the hypotenuse.

$$8^2 + 10^2 = b^2$$

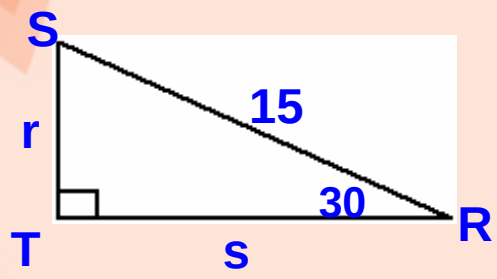
$$64 + 100 = b^2$$

$$164 = b^2$$

$$\sqrt{164} = b$$

$$12.8 = b$$

Solving a right triangle when you know one side length and one acute angle measure.



Note: Round decimals to the nearest hundredth

Use trigonometric ratios to find the values of r and s.

$$\sin R = \frac{\text{opp}}{\text{hyp}} \qquad \cos R = \frac{\text{adj}}{\text{hyp}}$$

$$\sin 30^\circ = \frac{r}{15} \qquad \cos 30^\circ = \frac{s}{15}$$

$$15 \sin 30^\circ = r \qquad 15 \cos 30^\circ = s$$

$$r \approx 7.5 \qquad s \approx 12.99$$

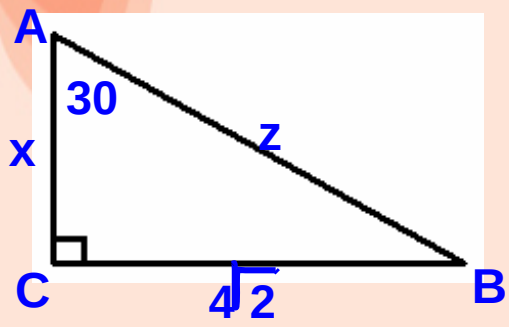
Because <S and <R are complements, you can write

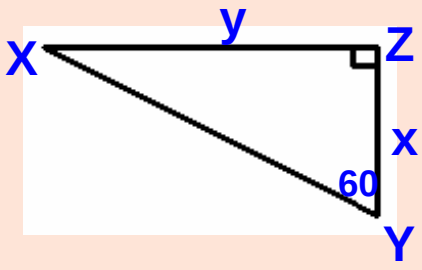
$$m\angle S = 90^\circ - m\angle R = 90^\circ - 30^\circ = 60^\circ .$$

The side lengths of the triangle are about 7.5, 12.99, and 15. The triangle has one right angle and two acute angles whose measures are 30° and 60°.

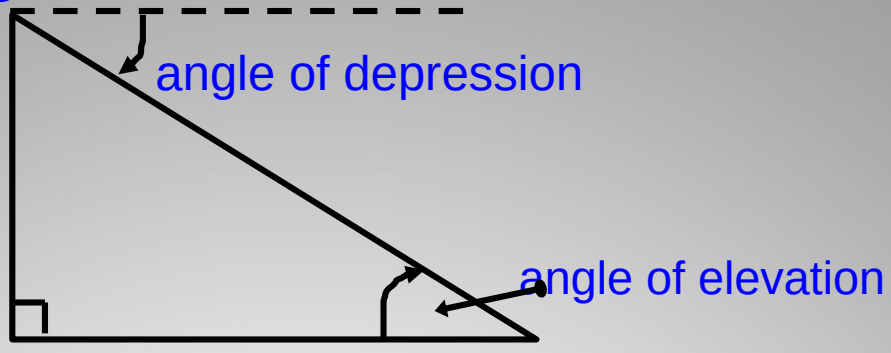
Your turn:

Solve the following triangles. Round decimals to the nearest hundredth.





Trig Word Problems



Using the rules with parallel lines and transversals, what can you conclude about the two angles and why?

In order to solve trig word problems, follow these steps:

1) **draw a picture. (Right triangle)**

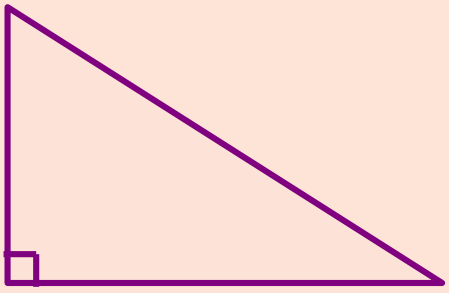
2) **Label the given parts.**

3) **Set up the trig ratios and solve.**

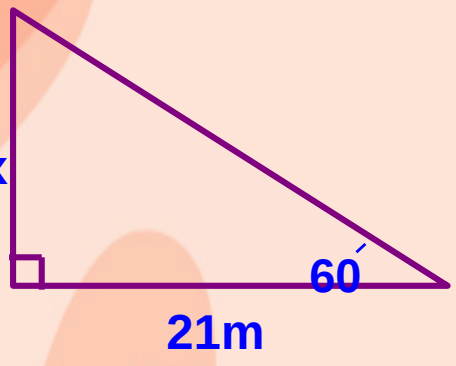
Examples:

1) A tree casts a shadow 21 m long. The angle of elevation of the sun is 60. What is the height of the tree?

1) Draw a picture.



2) label



3) trig ratios:

$$21 \tan 60 = \frac{x}{21} \cdot 21$$

$$21 \tan 60 = x$$

36.37 meters = x

Your turn

1) From the top of a tower, the angle of depression to a stake on the ground is 60. The top of the tower is 80 feet above ground. How far is the stake from the foot of the tower?

2) A ladder leaning against a house makes an angle of 30 with the ground. The foot of the ladder is 7 feet from the foot of the house. How long is the ladder?

Assignment:
p. 161 (1-13) &
p. 166 (1-13)

(McDougal Littell Mathematics 2 Book)