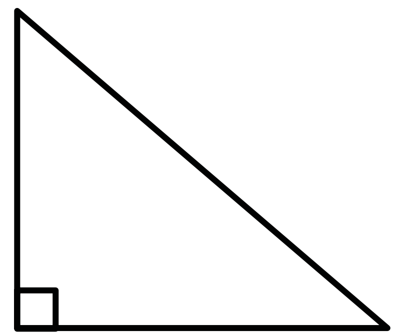
Name:____________________________________Date:___________Period:______

INTRO TO TRIGONOMETRY *notes*

- Right Triangle Trigonometry (trig)- branch of math that deals with the _____________ between the __________ and ____________ of a___________ ___________.

- Trig. Ratio- the _______ between the _______ in a right triangle.
  - Sine (sin)- ____________________
  - Cosine (cos)- __________________
  - Tangent (tan)- __________________

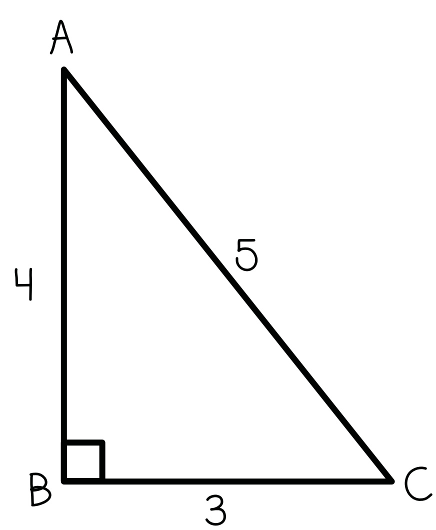


*Opposite side and adjacent side depend on the __________.

*Hypotenuse is always across from the _________ __________.

Examples:

1. sin(A)=
2. cos(A)=
3. tan(A)=
4. sin(C)=
5. cos(C)=
6. tan(C)=



Name:______________________________________Date:____________Period:______

INTRO TO TRIGONOMETRY *practice*

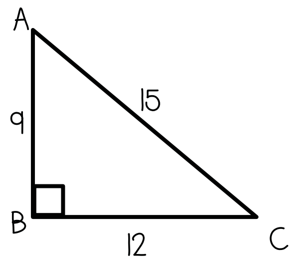
Directions: Find the trig. ratios for the right triangles. Make sure to reduce all fractions! *Pictures may not be drawn to scale.*

1.

sin(A)=

cos(A)=

tan(A)=

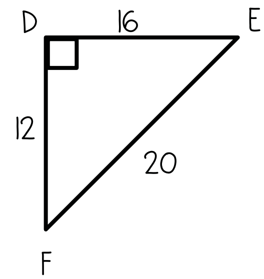


2.

sin(F)=

cos(F)=

tan(F)=

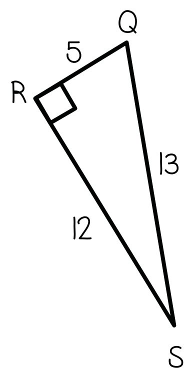


3.

sin(Q)=

cos(Q)=

tan(Q)=

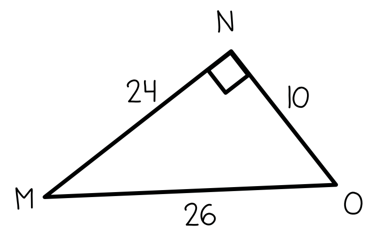


4.

sin(M)=

cos(M)=

tan(M)=

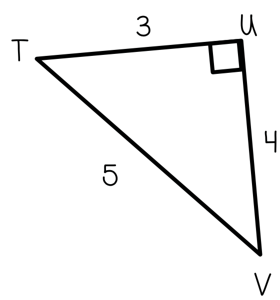


5.

sin(V)= sin(T)=

cos(V)= cos(T)=

tan(V)= tan(T)=

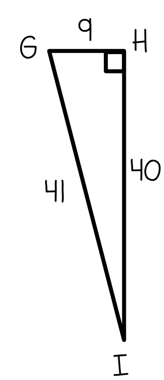


6.

sin(G)= sin(I)=

cos(G)= cos(I)=

tan(G)= tan(I)=

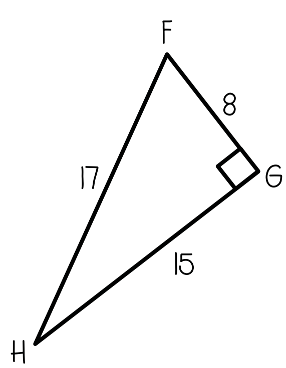


7.

sin(F)= sin(H)=

cos(F)= cos(H)=

tan(F)= tan(H)=

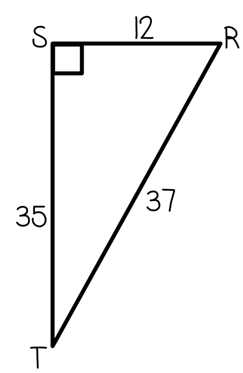


8.

sin(R)= sin(T)=

cos(R)= cos(T)=

tan(R)= tan(T)=



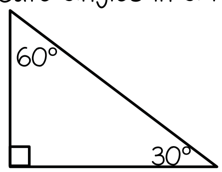
Name:_____________________________Date:____________Period:______

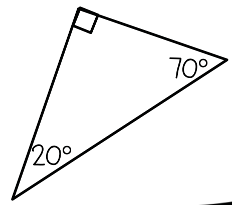
SIN, COS, TAN OF COMPLEMENTARY ANGLES *notes*

Reminders:

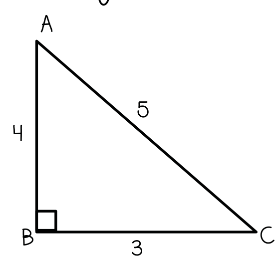
- Complementary Angles- two angles that add to equal _______
- In a right triangle, one angle is _________ and the other two angles add to equal _______
- Therefore, the two acute angles in a right triangle are always ___________________

Examples:





Look for a pattern: Use the triangle below to answer the questions.



Sin(A)=______ Sin(C)=______ What do you notice?

Cos(A)=______ Cos(C)=______

Tan(A)=______ Tan(C)=______

Look for a pattern: Type the following in your calculator.

Sin(30°)=______ Cos(60°)=_______ What do you notice?

Sin(71°)=______ Cos(19°)=________

Tan(30°)=_______ $\frac{1}{\tan(60°)}$=________

So…

***The sine and cosine of complementary angles are ___________

***The tangent of complementary angles are ___________________

Name:____________________________________Date:___________Period:______

SIN, COS, TAN OF COMPLEMENTARY ANGLES *practice*

1. What are complementary angles? Give an example.	2. Fill in the blank. sin(30°)=cos(____°)
3. Fill in the blank. $\tan(27°) = \dfrac{1}{\tan(\_\_\_\_\_°)}$	4. If the sin(50°)=0.77, what is the cos(40°)? (Don't use a calculator!)
5. What do you know about the sine and cosine of complementary angles?	6. What do you know about the tangent of complementary angles?
7. If the tan(81°)=6.3, what is the tan(9°)? (Don't use a calculator!)	8. In a right triangle ABC, the two acute angles are ∠A and ∠C. If the sin(A)=$\frac{2}{5}$, what is the cos(C)?
9. In right triangle RST, the two acute angles are ∠R and ∠T. If the tan(R)=$\frac{7}{3}$, what is the tan(T)?	10. If Sarah knows the sin(11°)=0.19, how can she approximate the cos(79°) without a calculator?
11. Choose the correct answer. $\sin\theta =$ a. $\cos\theta$ b. $\cos(90-\theta)$ c. $\tan\theta$ d. $\sin(90-\theta)$	12. Ted knows that the tan(53°)=0.7. How can he approximate the tan(55°) without a calculator?

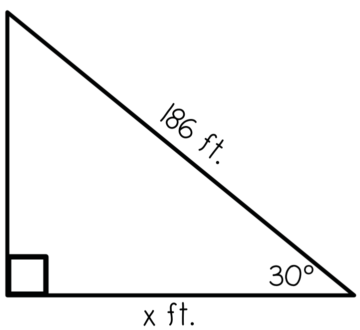
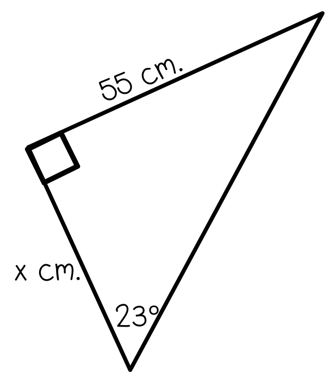
Name:______________________________Date:____________Period:______

FIND A MISSING SIDE *notes*

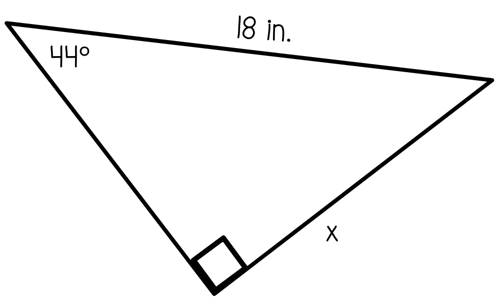
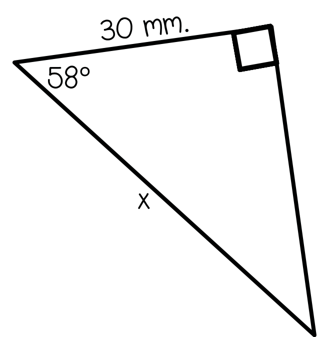
- In a right triangle, if you have one _________ (besides the right angle) and one side, you can solve for any other __________.

Steps to Solve for a Missing Side:

1. _______________________(opposite, adjacent, hypotenuse)
2. Identify what __________________to use (sin, cos, or tan)
3. Set up an ______________
4. Solve

<u>x is the numerator</u>	<u>x is the denominator</u>
	

Examples:

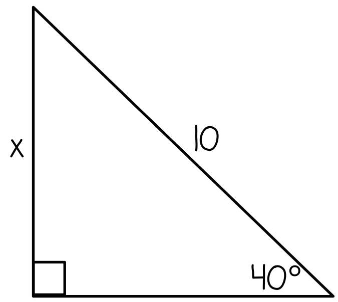
1. Solve for x.	2. Solve for x.
	

Name:______________________________________ Date:____________ Period:______

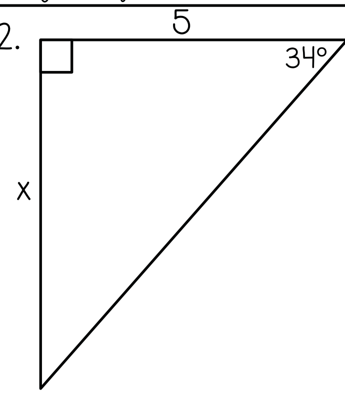
FIND A MISSING SIDE *practice*

Directions: Solve for the missing side. Round to the tenths place. *Triangles may not be drawn to scale.*

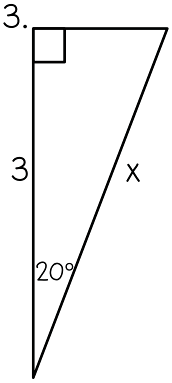
1.



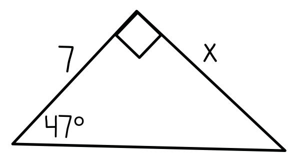
2.



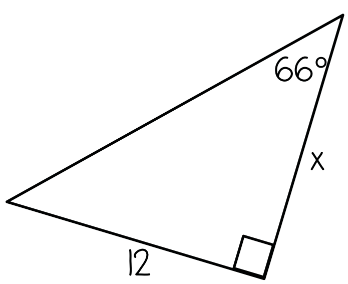
3.



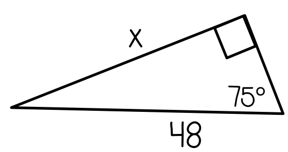
4.



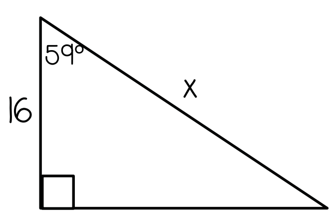
5.



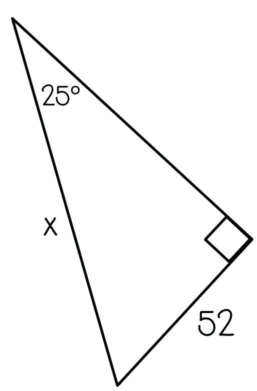
6.



7.



8.

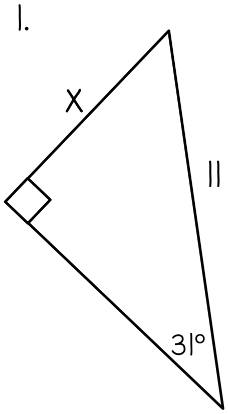


Name:______________________________________Date:____________Period:______

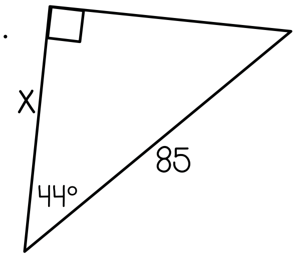
FIND A MISSING SIDE *practice 2*

Directions: Solve for the missing side. Round to the tenths place. *Triangles may not be drawn to scale.*

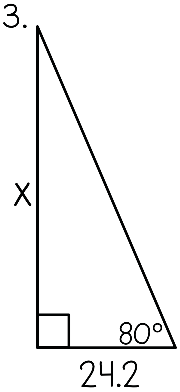
1.



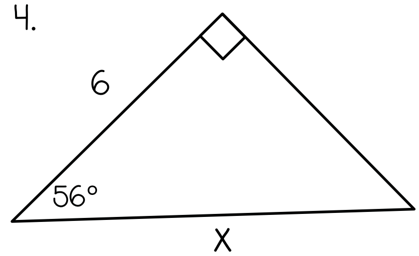
2.



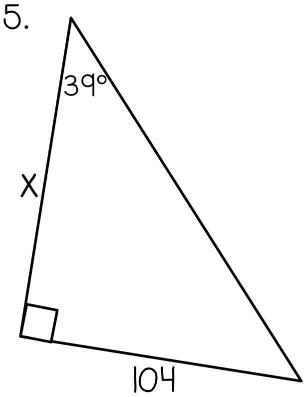
3.



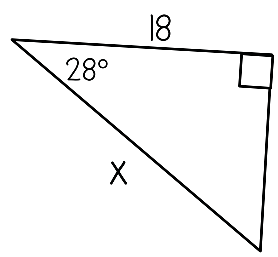
4.



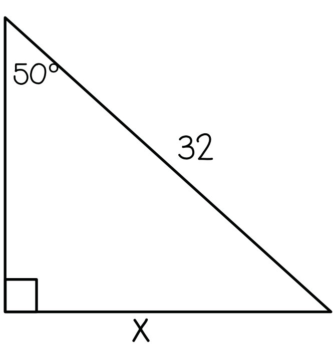
5.



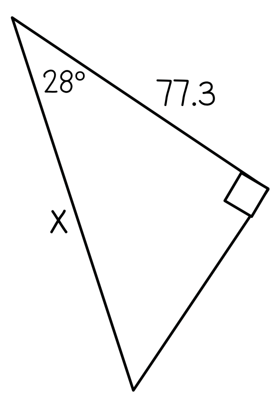
6.



7.



8.



Name:________________________________Date:_____________Period:_______

FIND A MISSING ANGLE *notes*

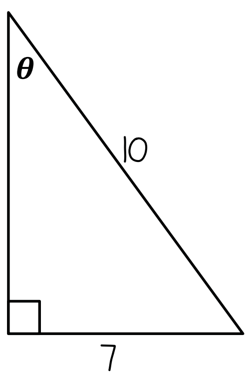
- In a right triangle, if you have two _________ you can solve for either of the acute __________.

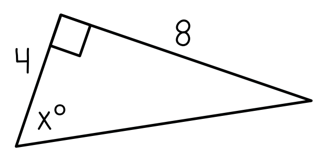
Steps to Solve for a Missing Angle:

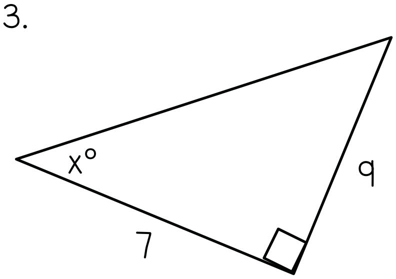
1. _________________________(opposite, adjacent, hypotenuse)
2. Identify what ____________________to use (sin, cos, or tan)
3. Set up an _______________
4. Use the _____________ trig ratio to solve

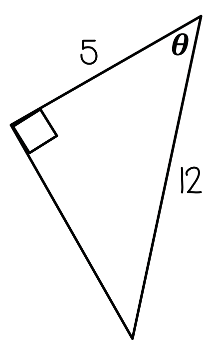
- Theta-variable for an angle
  Symbol: $\boldsymbol{\theta}$

Examples:

1.


2.


3.


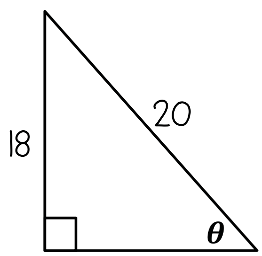
4.


Name:____________________________________Date:___________Period:______

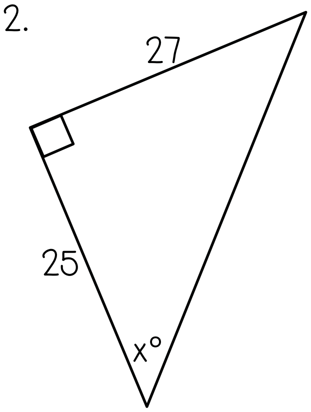
FIND A MISSING ANGLE *practice*

Directions: Solve for the missing angle. Round to the nearest degree. *Triangles may not be drawn to scale.*

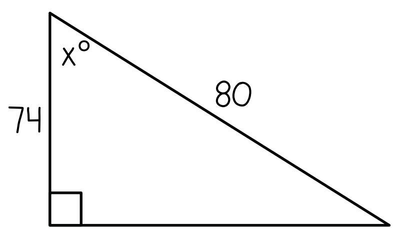
1.



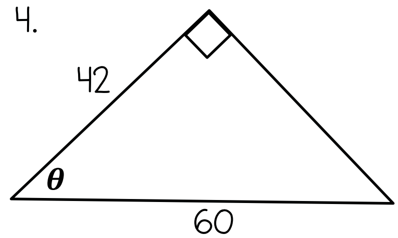
2.



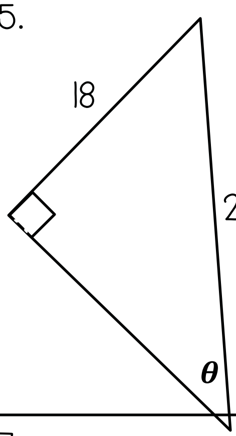
3.



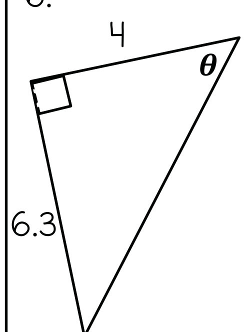
4.



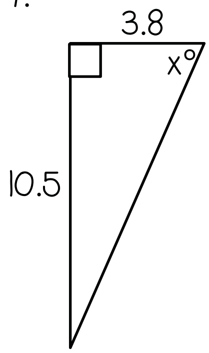
5.



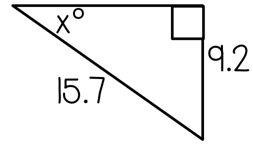
6.



7.



8.

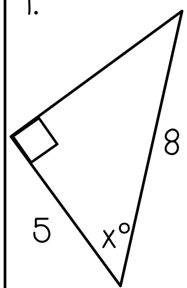


Name:_______________________________________Date:____________Period:______

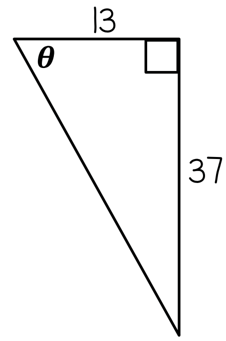
FIND A MISSING ANGLE *practice 2*

Directions: Solve for the missing angle. Round to the nearest degree. *Triangles may not be drawn to scale.*

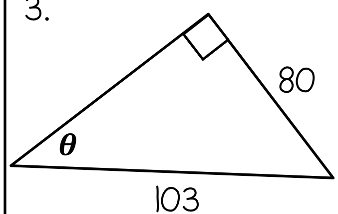
1.



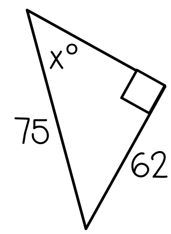
2.



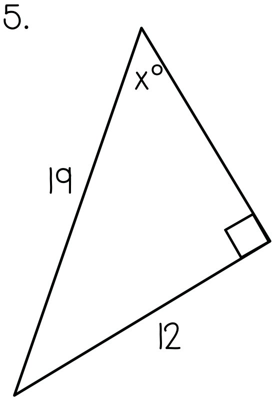
3.



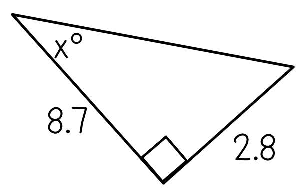
4.



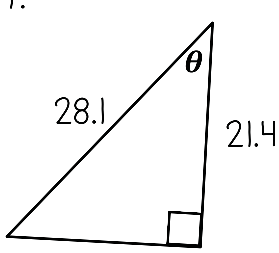
5.



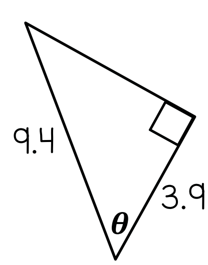
6.



7.



8.

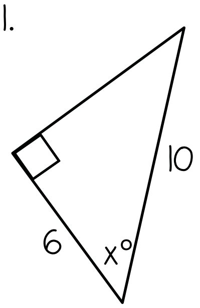


Name:____Date:____________Period:______

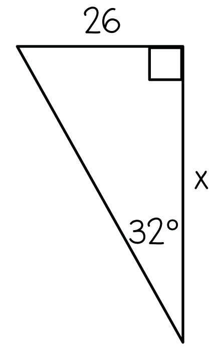
FIND MISSING SIDES & ANGLES *practice*

Directions: Solve for the missing piece. Round to the tenths place for sides and whole number for angles.

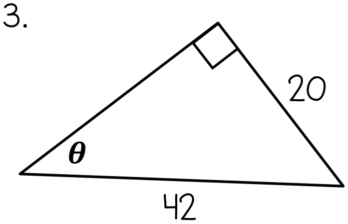
1.



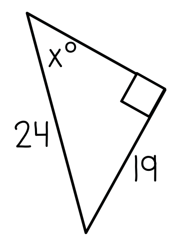
2.



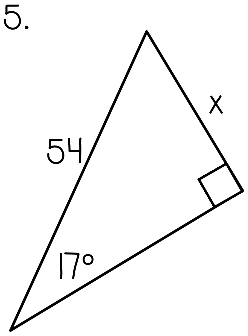
3.



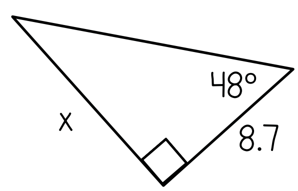
4.



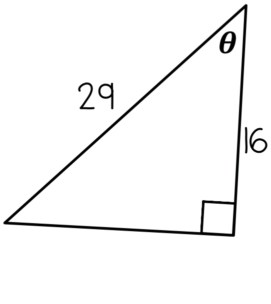
5.



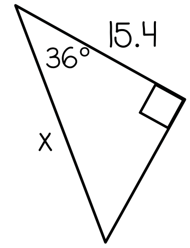
6.



7.



8.

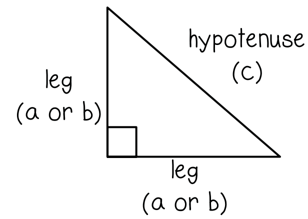


Name:____________________________Date:___________Period:______

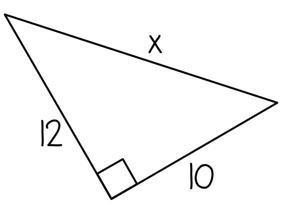
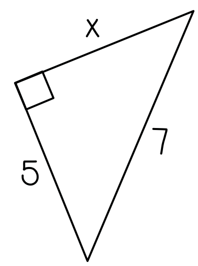
PYTHAGOREAN THEOREM REVIEW *notes*

- If you have two sides of a right triangle, you can use the Pythagorean Theorem to find the third.

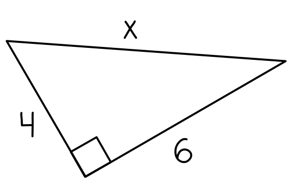
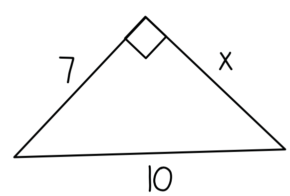
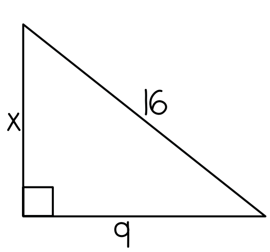
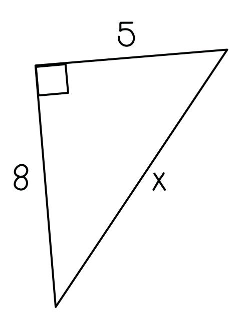
$$a^2+b^2=c^2$$



Examples:

Hypotenuse is missing	Leg is missing
	

Practice problems:

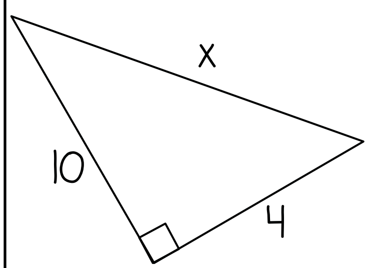
1. Solve for x 	2. Solve for x 
3. Solve for x 	4. Solve for x 

Name:______________________________________Date:___________Period:______

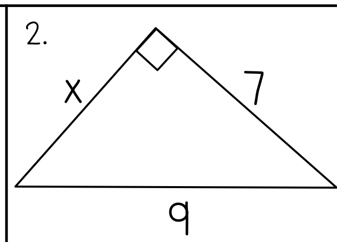
PYTHAGOREAN THEOREM REVIEW *practice*

Directions: Solve for the missing side. *Triangles may not be drawn to scale.*

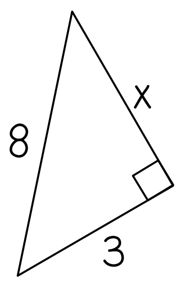
1.



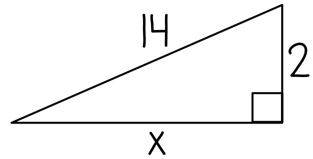
2.



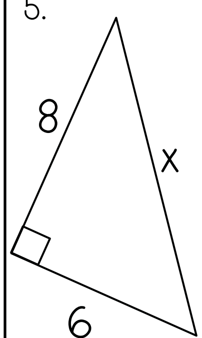
3.



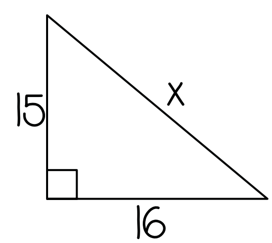
4.



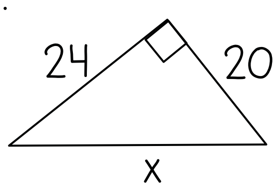
5.



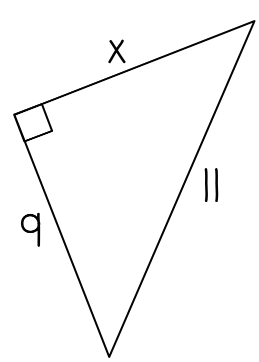
6.



7.



8.

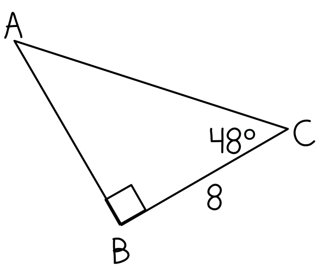


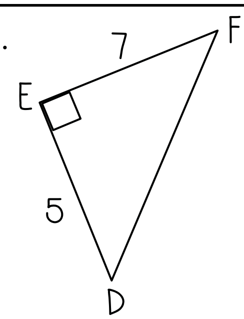
Name:______________________________Date:____________Period:______

SOLVING RIGHT TRIANGLES *notes*

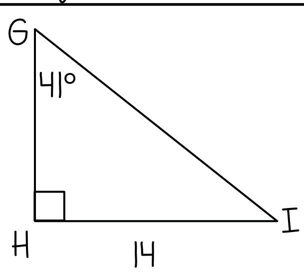
- Solving a triangle means to find all missing _________ and __________.
- You can solve a right triangle if you have one ________ and one acute ___________ or if you have two __________.

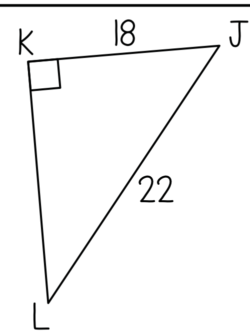
Examples: Solve each triangle.

1. 

2. 

You try:

1. 

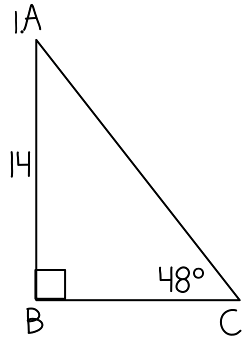
2. 

Name:______________________________________Date:___________Period:______

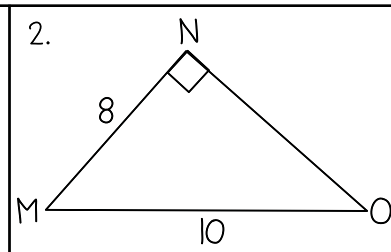
SOLVING RIGHT TRIANGLES *practice*

Directions: Solve the right triangle. *Triangles may not be drawn to scale.*

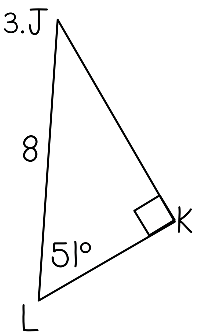
1.



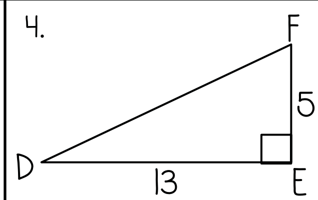
2.



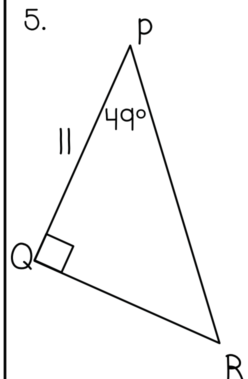
3.



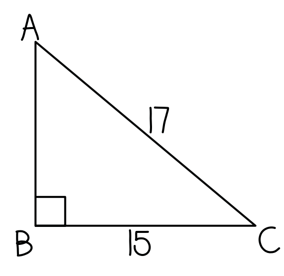
4.



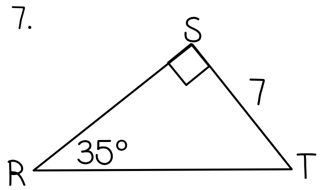
5.



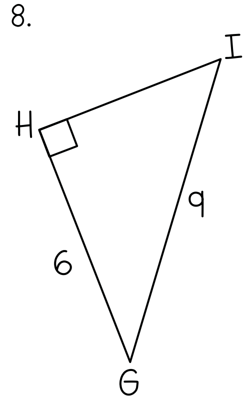
6.



7.



8.

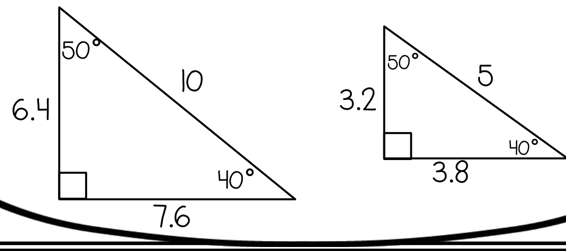


Name:_____________________________Date:____________Period:______

TRIG AND SIMILAR TRIANGLES *notes*

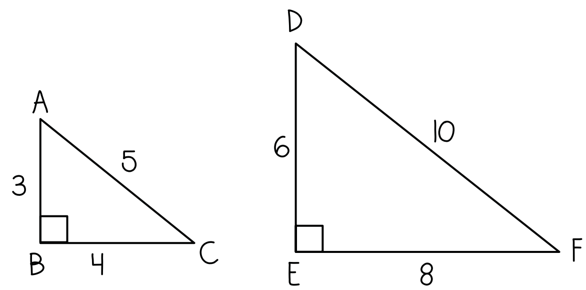
Remember…

- Similar triangles have _________ angles and ______________ sides.



**Since similar triangles have ____________ angles, the trig. ratios for those angles will also be ____________. **

Let's prove it. △ABC~△DEF. Find the ratios for the cos(C) and the cos(F). Make sure to reduce the fractions. What do you notice?



Now find the sin(C) and the sin(F). Then, find the tan(C) and the tan(F) Make sure to reduce the fractions. What do you notice?

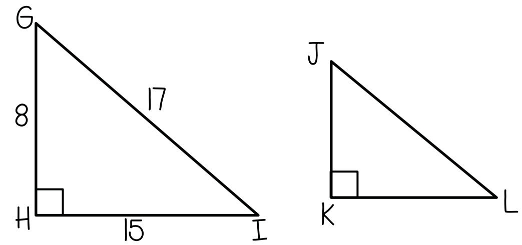
Why does this happen?

Name:_______________________________________Date:____________Period:______

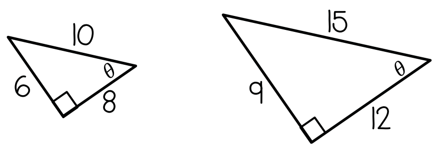
TRIG AND SIMILAR TRIANGLES *practice*

1. $\triangle ABC \sim \triangle DEF$. If $\tan(B)=3/8$, what is the $\tan(E)$?

2. $\triangle GHI \sim \triangle JKL$. What is the $\cos(L)$?



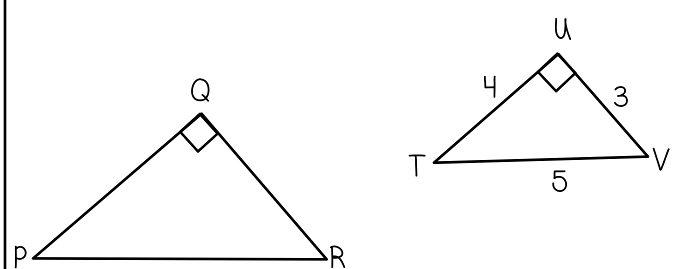
3. Are the triangles similar?



Solve for the two missing angles. What do you notice?

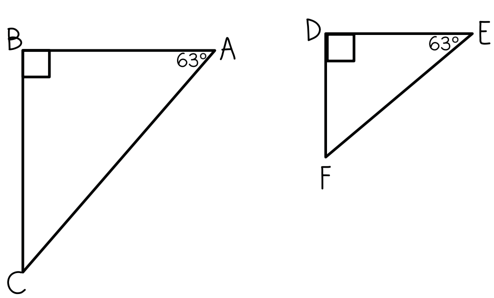
4. Triangle MNO is similar to triangle PQR. If the $\sin(R)=12/13$, what is the the $\sin(O)$?

5. $\triangle PQR \sim \triangle TUV$. What is the $\tan(P)$?



6. $\triangle QRS \sim \triangle TUV$. If $\cos(R)=0.7$, what is the $\cos(U)$?

7. What do you know about the $\sin(C)$ and the $\sin(F)$? Why?



8. Tony is 6 ft. tall and has a shadow that is 8 ft. long. At the same time of day, a 12 ft. light post cast shadow that is 16 ft. long. Find the angle of elevation for both triangles.

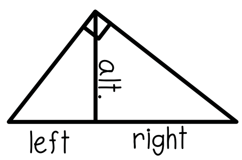
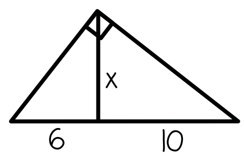
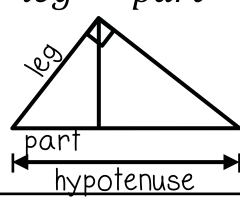
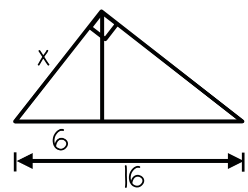
Name:______________________________Date:____________Period:______

GEOMETRIC MEAN *notes*

Geometric Mean- a special type of __________ between two numbers found by multiplying them and taking the ______ ____.

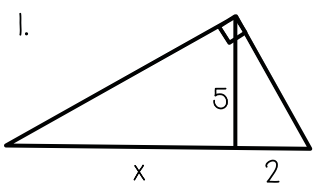
Example: Find the geometric mean of 10 and 8.

The geometric mean can be useful to find missing pieces of right triangles that are split into ___________ ________ with an ___________ (height).

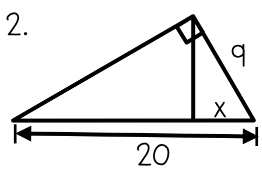
TYPE	THEOREM RULE	EXAMPLE
Altitude Rule	$\frac{left}{alt.} = \frac{alt.}{right}$ 	
Leg Rule	$\frac{hyp.}{leg} = \frac{leg}{part}$ 	

Examples:

1.



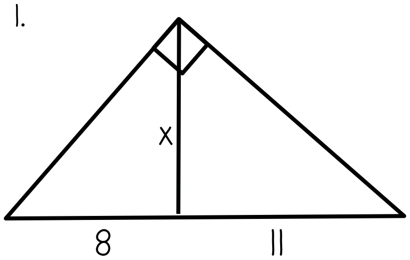
2.



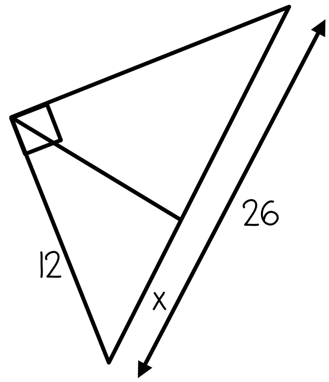
Name:_____________________________________Date:___________Period:______

GEOMETRIC MEAN *practice*

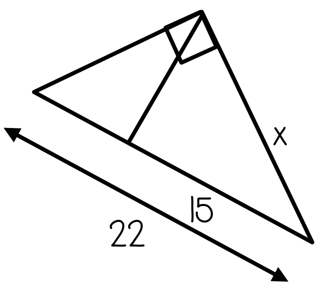
1.



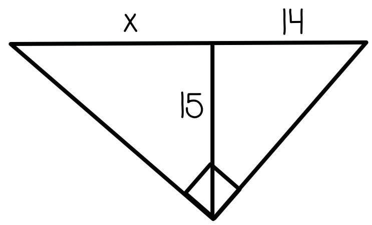
2.



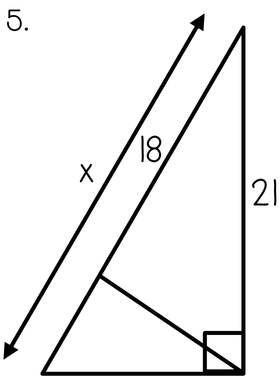
3.



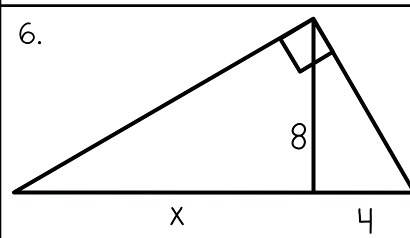
4.



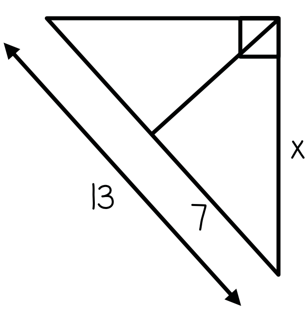
5.



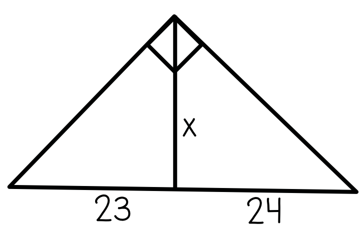
6.



7.



8.

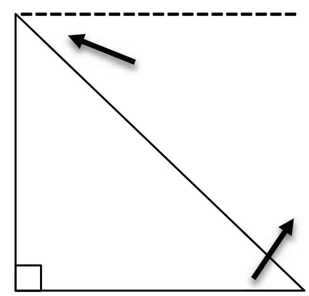


Name:_____________________________Date:____________Period:______

TRIG APPLICATION PROBLEMS *notes*

Key Words/Phrases in Application Problems

- Angle of Elevation-from the horizon looking up
- Angle of Depression-equal to the angle of elevation
- "Away from"-horizontal
- "Height"/ "High"/"Tall"-vertical
- "Rises"-vertical
- "Leaning"-hypotenuse
- "Above the ground"-vertical
- Shadows-horizontal
- Kite Strings, Ladders, Wires, Slides, Ramps-hypotenuse



Examples:

1. At a certain time of day, Lindsay's shadow is 9 ft. long. If the angle of elevation of the sun is 32°, how tall is Lindsay?	2. A 13 ft. ladder is leaning against a house. The bottom of the ladder is 5 ft. from the base of the house. What angle does the ladder make with the ground?
3. Parker is flying a kite. The kite string is 30 yards long. If Parker is sitting on the ground and holding the string at an angle of 42°, what is the height of the kite?	4. A fishing boat is 200 m. from a cliff. A hiker is sitting at the top of the cliff looking down at the boat. If the cliff is 150 m. tall, what is the angle of depression of the hiker down to the boat?

Name:____________________________________Date:___________Period:______

TRIG APPLICATION PROBLEMS *practice*

1. A slide is 12 ft. high. If the slides makes a 30° angle with the ground, how long is the slide?	2. A rectangular garden has a length of 10 yards and a width of 7 yards. Sally wants to plant daisies along the diagonal of the garden. How long will the line of daisies be?
3. A 100 ft. building has a wire that stretches from roof to the ground. If the wire is 200 ft. long, what is measure of the angle it makes with the ground?	4. A ramp rises 4 ft. and makes a 20° with the ground. How long is the ramp?
5. At a certain time of day, an 8 ft. tree creates a 12 ft. shadow. What is the angle of elevation of the sun?	6. $\triangle JKL \sim \triangle MNO$. If the cos(J)=4/9, what is the cos(M)? *Why?*
7. John is flying a kite at an angle of 30°. If the kite is 10 ft. away from John, how long is the kite string? How high is the kite?	8. A dog is standing 2 m. from a tree. A cat is 5 m. up the tree looking down at the dog. Find the angle of depression of the cat's eyes down to the dog.

Name:___________________________________Date:___________Period:______

TRIG APPLICATION PROBLEMS *practice 2*

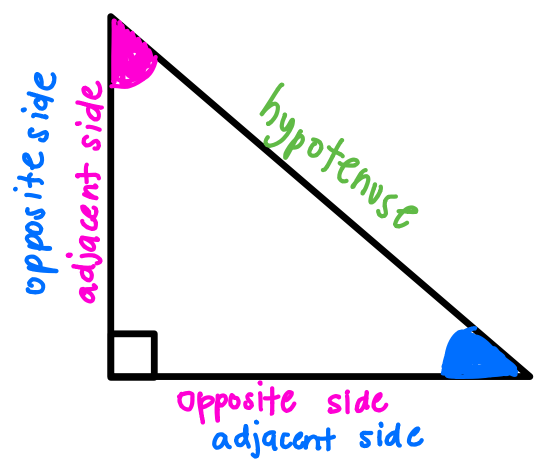
1. A building has a wire that stretches from the roof to the ground. The wire is 299 ft. long and the end of the wire is 150 ft. away from the base of the building. Find the height of the building and the angle the wire makes with the ground.	2. $\triangle ABC \sim \triangle DEF$. If the sin(A)=7/10, what is the sin(D)? *Why?*
3. A plane is flying at an altitude of 2800 meters. Haley is 1000 m. away from the plane. What is the diagonal distance between her and the plane? What is the angle of elevation Haley's eyes must make to look up at the plane?	4. A boat is 300 m. from a lighthouse. The angle of depression from the lighthouse down to the boat is 41 degrees. How tall is the lighthouse? What is the distance from the boat to the top of the lighthouse?
5. An artist is cutting a square piece of wood in half diagonally to make a 3D sculpture. If the square is 8 inches by 8 inches, what is the length of the diagonal? At what angle will the saw cut the wood?	6. A flagpole is 12 ft. tall and is on a small platform 2 ft. high. If the flagpole creates a 14 ft. shadow, what is the angle of elevation of the sun?
7. Jill is flying a kite that has a 30 ft. long string. If Jill is 5.4 ft. tall and her arm is making a 31° with the ground, how high is the kite in the air?	8. A ramp rises 6 ft. and has a horizontal length of 8 ft. How long is the ramp and what angle does it make with the ground?

Name:________________________________ Date:__________ Period:______

INTRO TO TRIGONOMETRY *notes*

- Right Triangle Trigonometry (trig)- branch of math that deals with the relationship between the sides and angles of a right triangle.

- Trig. Ratio- the ratio between the sides in a right triangle.
  - Sine (sin)- opposite side / hypotenuse
  - Cosine (cos)- adjacent side / hypotenuse
  - Tangent (tan)- opposite side / adjacent side



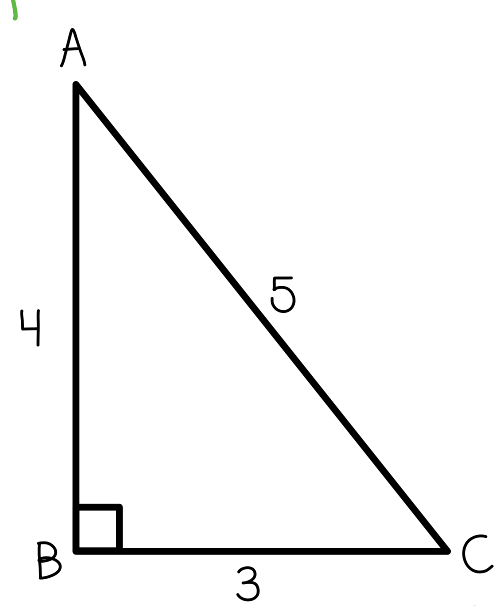
*Opposite side and adjacent side depend on the angle.

*Hypotenuse is always across from the right angle.

Examples:

* SOH - CAH - TOA

1. sin(A)= 3/5
2. cos(A)= 4/5
3. tan(A)= 3/4
4. sin(C)= 4/5
5. cos(C)= 3/5
6. tan(C)= 4/3



Name:______________________________ Date:____________ Period:______

INTRO TO TRIGONOMETRY *practice*

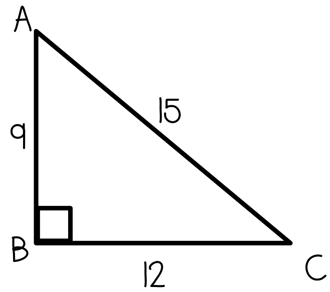
Directions: Find the trig. ratios for the right triangles. Make sure to reduce all fractions! *Pictures may not be drawn to scale.*

1.

sin(A)= $12/15 = 4/5$

cos(A)= $9/15 = 3/5$

tan(A)= $12/9 = 4/3$

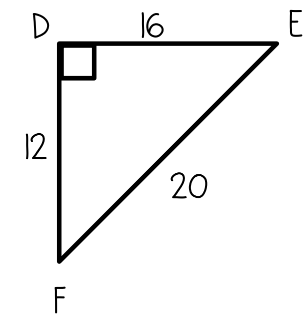


2.

sin(F)= $16/20 = 4/5$

cos(F)= $12/20 = 3/5$

tan(F)= $16/12 = 4/3$

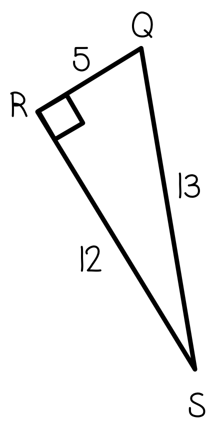


3.

sin(Q)= $12/13$

cos(Q)= $5/13$

tan(Q)= $12/5$

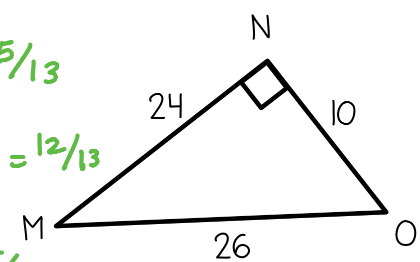


4.

sin(M)= $10/26 = 5/13$

cos(M)= $24/26 = 12/13$

tan(M)= $10/24 = 5/12$

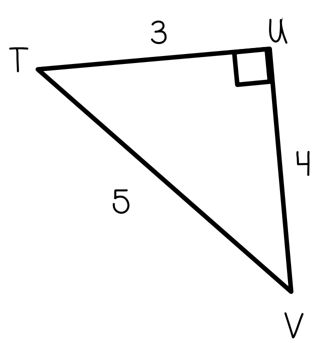


5.

sin(V)= $3/5$ sin(T)= $4/5$

cos(V)= $4/5$ cos(T)= $3/5$

tan(V)= $3/4$ tan(T)= $4/3$

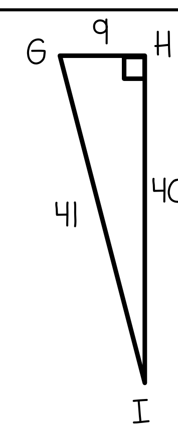


6.

sin(G)= $40/41$ sin(I)= $9/41$

cos(G)= $9/41$ cos(I)= $40/41$

tan(G)= $40/9$ tan(I)= $9/40$

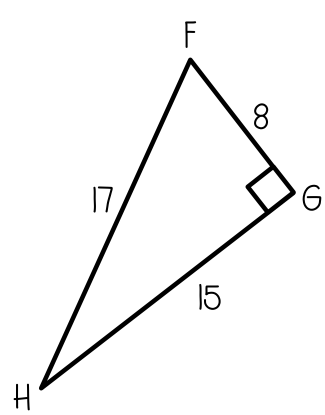


7.

sin(F)= $15/17$ sin(H)= $8/17$

cos(F)= $8/17$ cos(H)= $15/17$

tan(F)= $15/8$ tan(H)= $8/15$

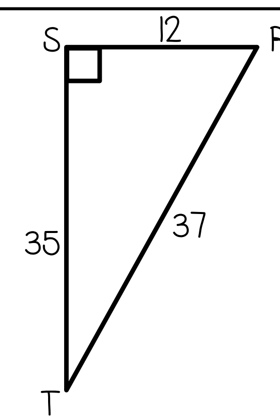


8.

sin(R)= $35/37$ sin(T)= $12/37$

cos(R)= $12/37$ cos(T)= $35/37$

tan(R)= $35/12$ tan(T)= $12/35$



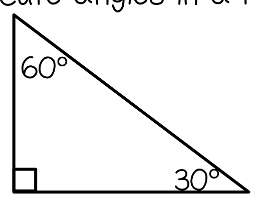
Name:_______________________________ Date:_____________ Period:_______

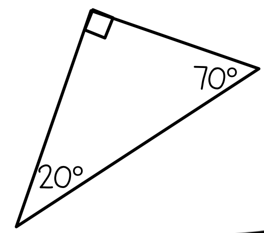
SIN, COS, TAN OF COMPLEMENTARY ANGLES *notes*

Reminders:

- Complementary Angles- two angles that add to equal 90°
- In a right triangle, one angle is right (90°) and the other two angles add to equal 90°
- Therefore, the two acute angles in a right triangle are always complementary

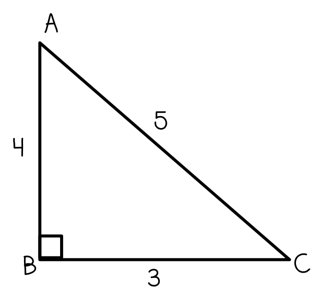
Examples:





Look for a pattern: Use the triangle below to answer the questions.

*SOH - CAH - TOA



Sin(A)= 3/5

Cos(A)= 4/5

Tan(A)= 3/4

Sin(C)= 4/5

Cos(C)= 3/5

Tan(C)= 4/3

What do you notice?

sin(A) = cos(C)

cos(A) = sin(C)

tan(A) and tan(C) are reciprocals

Look for a pattern: Type the following in your calculator.

Sin(30°)= 0.5

Sin(71°)= 0.946

Tan(30°)= 0.577

Cos(60°)= 0.5

Cos(19°)= 0.946

$\frac{1}{\tan(60°)}$= 0.577

What do you notice?

sin(30°) = cos(60°)

sin(71°) = cos(19°)

tan(30°) = $\frac{1}{\tan(60°)}$

So...

***The sine and cosine of complementary angles are equal

***The tangent of complementary angles are reciprocals

Name:____________________________________Date:____________Period:______

SIN, COS, TAN OF COMPLEMENTARY ANGLES *practice*

1. What are complementary angles? Give an example.

two angles that add to 90°

20° and 70°

2. Fill in the blank.

sin(30°)=cos(_60_°)

3. Fill in the blank.

$\tan(27°) = \dfrac{1}{\tan(\_63\_°)}$

4. If the sin(50°)=0.77, what is the cos(40°)? (Don't use a calculator!)

0.77

5. What do you know about the sine and cosine of complementary angles?

they are equal

6. What do you know about the tangent of complementary angles?

they are reciprocals

7. If the tan(81°)=6.3, what is the tan(9°)? (Don't use a calculator!)

$\dfrac{1}{6.3}$

8. In a right triangle ABC, the two acute angles are ∠A and ∠C. If the sin(A)=$\frac{2}{5}$, what is the cos(C)?

2/5

9. In right triangle RST, the two acute angles are ∠R and ∠T. If the tan(R)=$\frac{7}{3}$, what is the tan(T)?

3/7

10. If Sarah knows the sin(11°)=0.19, how can she approximate the cos(79°) without a calculator?

0.19

11. Choose the correct answer.

sinθ =

a. cosθ
b. cos(90-θ)
c. tanθ
d. sin(90-θ)

12. Ted knows that the tan(53°)=0.7. How can he approximate the tan(55°) without a calculator?

He can't because 53° and 55° are not complementary angles.

Name:______________________________ Date:____________ Period:______

FIND A MISSING SIDE *notes*

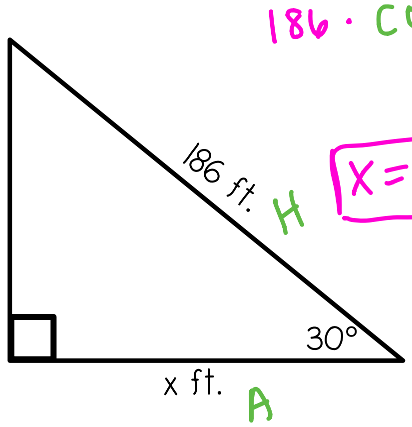
- In a right triangle, if you have one _angle_ (besides the right angle) and one side, you can solve for any other _side_.

Steps to Solve for a Missing Side:

✓1. _Label the sides_ (opposite, adjacent, hypotenuse) → *based on the given acute angle
✓2. Identify what _trig. ratio_ to use (sin, cos, or tan)
3. Set up an _equation_
4. Solve

x is the numerator	**x is the denominator**

x is the numerator

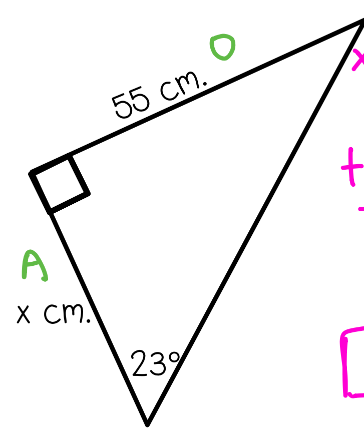


$$186 \cdot \cos(30) = \frac{x}{186} \cdot 186$$

$$\boxed{x = 161.1\text{ ft}}$$

MULTIPLY

x is the denominator



$$x \cdot \tan(23) = \frac{55}{x} \cdot x$$

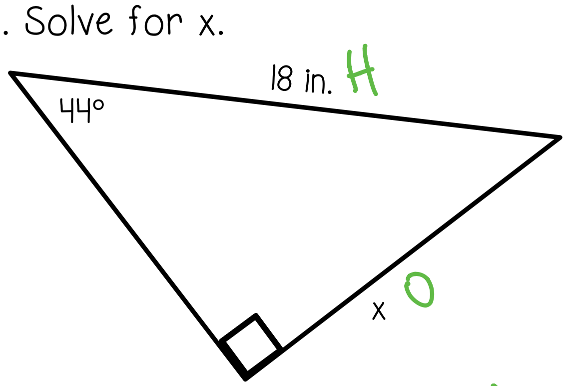
$$\frac{\tan(23)\,x}{\tan(23)} = \frac{55}{\tan(23)}$$

$$\boxed{x = 129.6\text{ cm}}$$

DIVIDE

Examples:

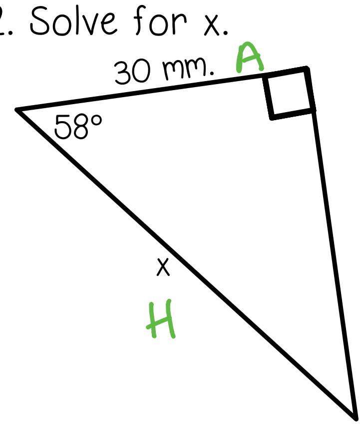
1. Solve for x.



$$18 \cdot \sin(44) = \frac{x}{\cancel{18}} \cancel{\cdot 18}$$

$$\boxed{x = 12.5\text{ in}}$$

2. Solve for x.



$$\cos(58) = \frac{30}{x}$$

$$30 \div \cos(58)$$

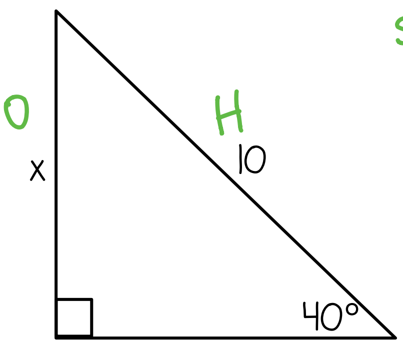
$$\boxed{x = 56.6\text{ mm}}$$

Name:____ Date:____________ Period:______

FIND A MISSING SIDE *practice*

Directions: Solve for the missing side. Round to the tenths place. *Triangles may not be drawn to scale.*

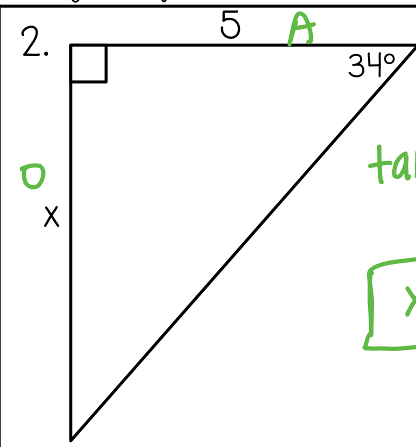
1.



$\sin(40) = \frac{x}{10}$

$\boxed{x = 6.4}$

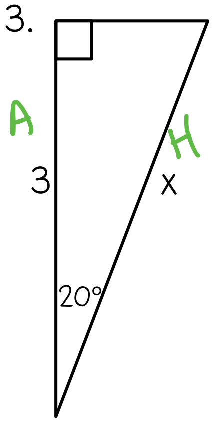
2.



$\tan(34) = \frac{x}{5}$

$\boxed{x = 3.4}$

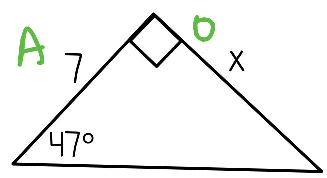
3.



$\cos(20) = \frac{3}{x}$

$\boxed{x = 3.2}$

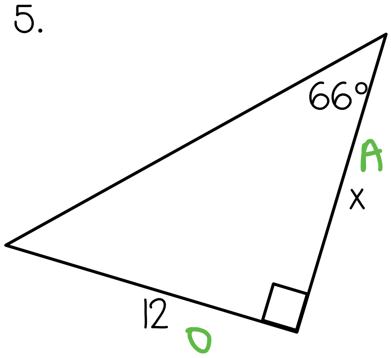
4.



$\tan(47) = \frac{x}{7}$

$\boxed{x = 7.5}$

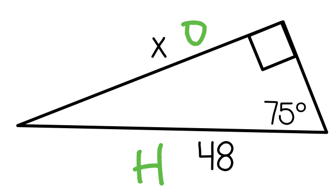
5.



$\tan(66) = \frac{12}{x}$

$\boxed{x = 5.3}$

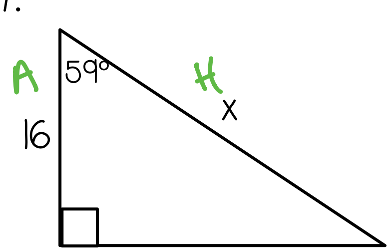
6.



$\sin(75) = \frac{x}{48}$

$\boxed{x = 46.4}$

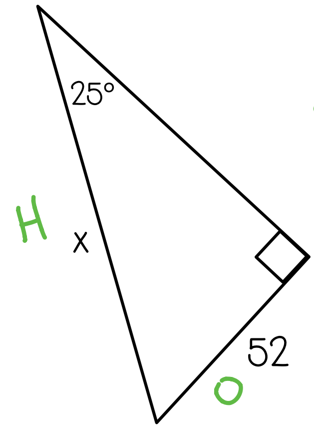
7.



$\cos(59) = \frac{16}{x}$

$\boxed{x = 31.1}$

8.



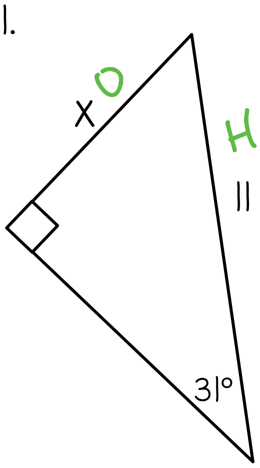
$\sin(25) = \frac{52}{x}$

$\boxed{x = 123.0}$

FIND A MISSING SIDE *practice 2*

Directions: Solve for the missing side. Round to the tenths place. *Triangles may not be drawn to scale.*

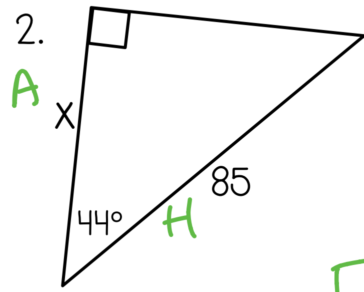
1.



$\sin(31) = \frac{x}{11}$

$\boxed{x = 5.7}$

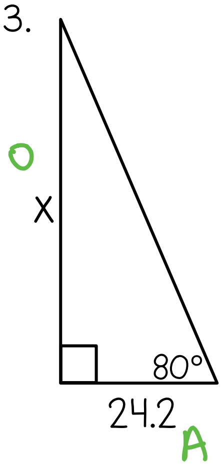
2.



$\cos(44) = \frac{x}{85}$

$\boxed{x = 61.1}$

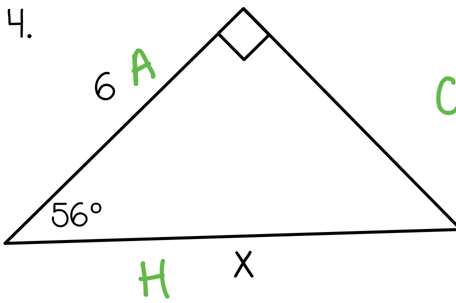
3.



$\tan(80) = \frac{x}{24.2}$

$\boxed{x = 137.2}$

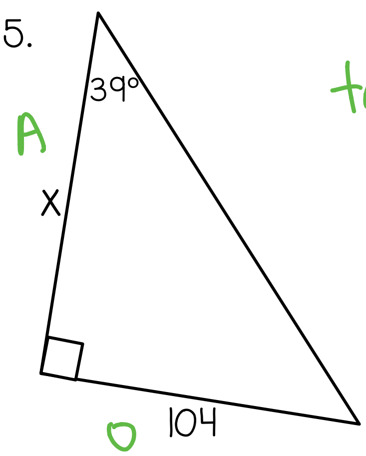
4.



$\cos(56) = \frac{6}{x}$

$\boxed{x = 10.7}$

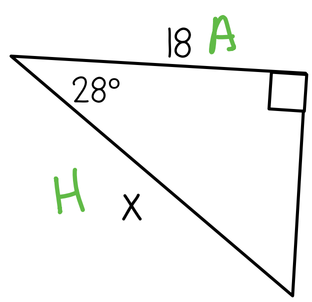
5.



$\tan(39) = \frac{104}{x}$

$\boxed{x = 128.4}$

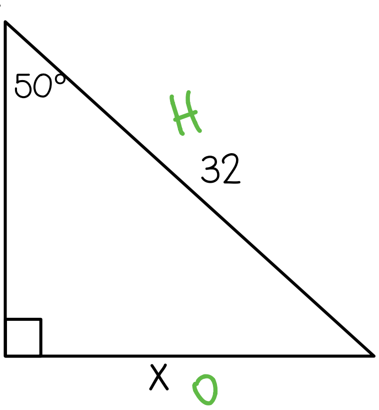
6.



$\cos(28) = \frac{18}{x}$

$\boxed{x = 20.4}$

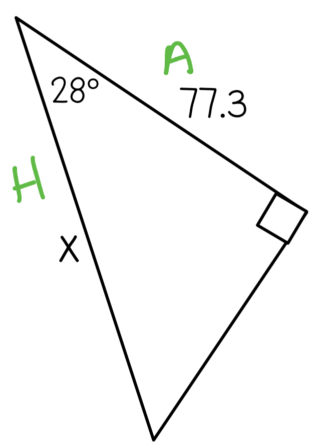
7.



$\sin(50) = \frac{x}{32}$

$\boxed{x = 24.5}$

8.



$\cos(28) = \frac{77.3}{x}$

$\boxed{x = 87.5}$

Name:______________________________ Date:_____________ Period:_______

FIND A MISSING ANGLE *notes*

- In a right triangle, if you have two __sides__ you can solve for either of the acute __angles__.

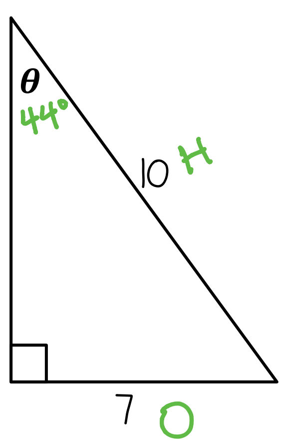
Steps to Solve for a Missing Angle:

1. __Label the sides__ (opposite, adjacent, hypotenuse)
2. Identify what __trig ratio__ to use (sin, cos, or tan)
3. Set up an __equation__
4. Use the __inverse__ trig ratio to solve

- Theta-variable for an angle
  Symbol: $\boldsymbol{\theta}$

Examples:

1.

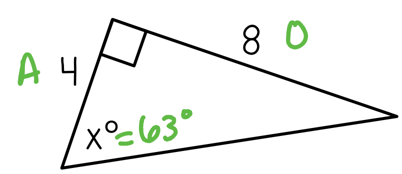


$\sin(\theta) = \frac{7}{10}$

$\sin^{-1}(7 \div 10)$

$\boxed{44^\circ}$

2.

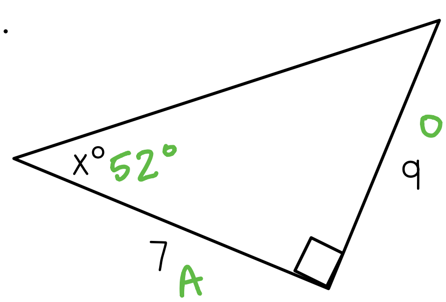


$\tan(x) = \frac{8}{4}$

$\tan^{-1}(8 \div 4)$

$\boxed{63^\circ}$

3.

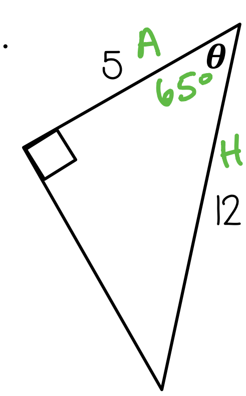


$\tan(x) = \frac{9}{7}$

$\tan^{-1}(9 \div 7)$

$\boxed{52^\circ}$

4.



$\cos(\theta) = \frac{5}{12}$

$\cos^{-1}(5 \div 12)$

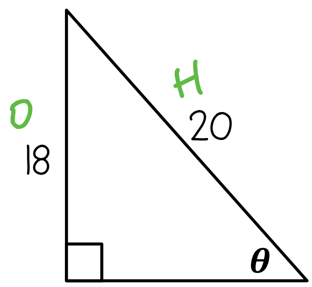
$\boxed{65^\circ}$

Name:________________________________ Date:____________ Period:______

FIND A MISSING ANGLE *practice*

Directions: Solve for the missing angle. Round to the nearest degree. *Triangles may not be drawn to scale.*

1.

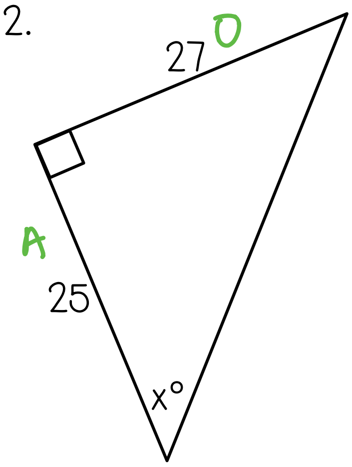


$\sin(\theta) = \frac{18}{20}$

$\sin^{-1}(18/20)$

$\boxed{64°}$

2.

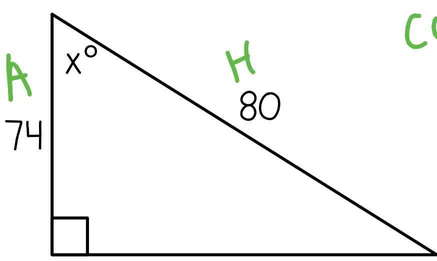


$\tan(x) = \frac{27}{25}$

$\tan^{-1}(27/25)$

$\boxed{47°}$

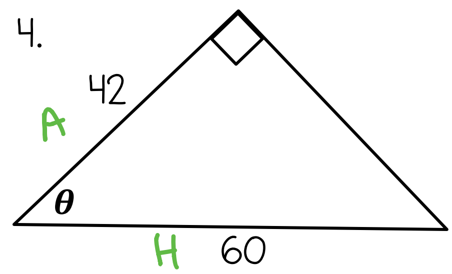
3.



$\cos^{-1}(74/80)$

$\boxed{22°}$

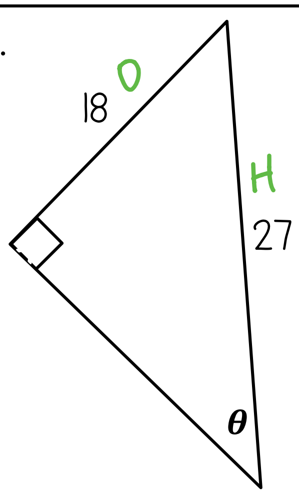
4.



$\cos^{-1}(42/60)$

$\boxed{46°}$

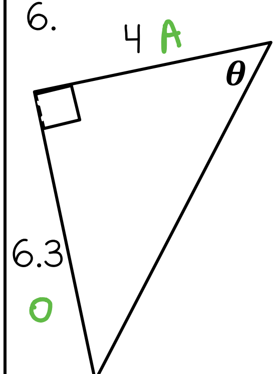
5.



$\sin^{-1}(18/27)$

$\boxed{42°}$

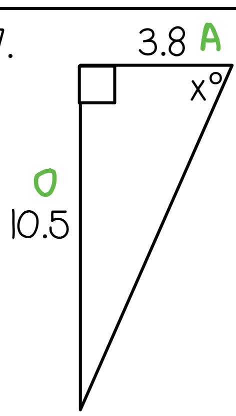
6.



$\tan^{-1}(6.3/4)$

$\boxed{58°}$

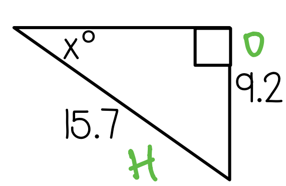
7.



$\tan^{-1}(10.5/3.8)$

$\boxed{70°}$

8.



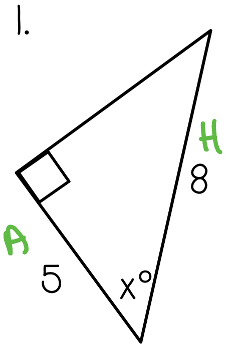
$\sin^{-1}(9.2/15.7)$

$\boxed{36°}$

FIND A MISSING ANGLE *practice 2*

Directions: Solve for the missing angle. Round to the nearest degree. *Triangles may not be drawn to scale.*

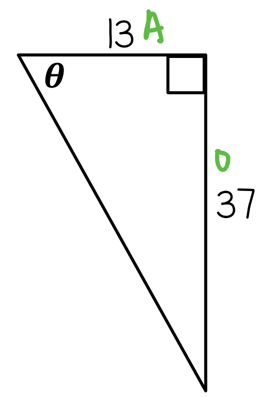
1.



$\cos^{-1}(5/8)$

$\boxed{51°}$

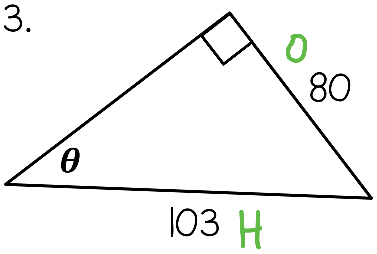
2.



$\tan^{-1}(37/13)$

$\boxed{71°}$

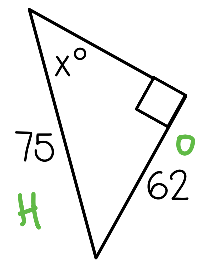
3.



$\sin^{-1}(80/103)$

$\boxed{51°}$

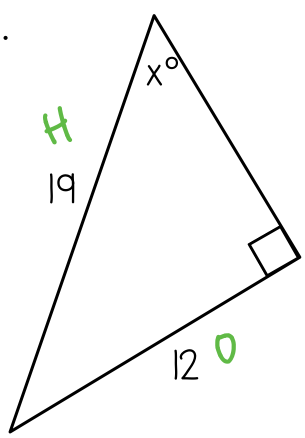
4.



$\sin^{-1}(62/75)$

$\boxed{56°}$

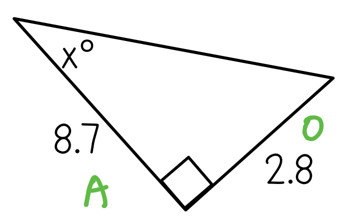
5.



$\sin^{-1}(12/19)$

$\boxed{39°}$

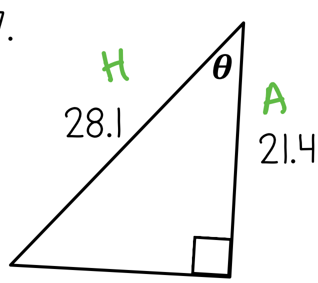
6.



$\tan^{-1}(2.8/8.7)$

$\boxed{18°}$

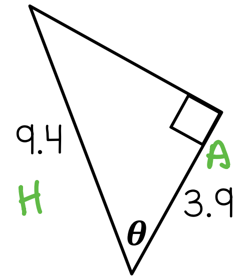
7.



$\cos^{-1}(21.4/28.1)$

$\boxed{40°}$

8.



$\cos^{-1}(3.9/9.4)$

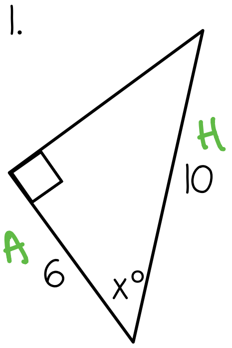
$\boxed{65°}$

Name:________________________________ Date:____________ Period:______

FIND MISSING SIDES & ANGLES *practice*

Directions: Solve for the missing piece. Round to the tenths place for sides and whole number for angles.

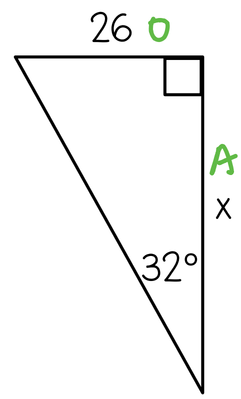
1.



$\cos^{-1}(6/10)$

$\boxed{53^\circ}$

2.

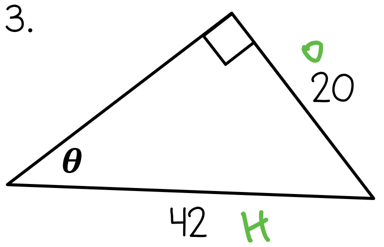


$\tan(32) = \frac{26}{x}$

$26 \div \tan(32)$

$\boxed{41.6}$

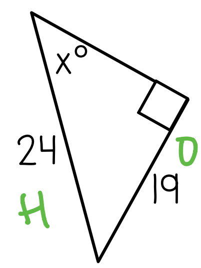
3.



$\sin^{-1}(20/42)$

$\boxed{28^\circ}$

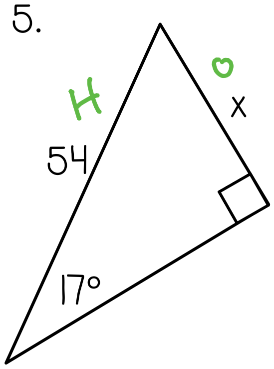
4.



$\sin^{-1}(19/24)$

$\boxed{52^\circ}$

5.

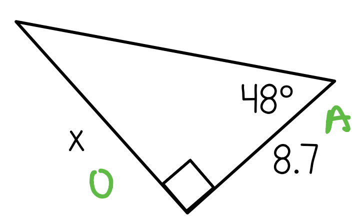


$\sin(17) = \frac{x}{54}$

$54 \cdot \sin(17)$

$\boxed{15.8}$

6.

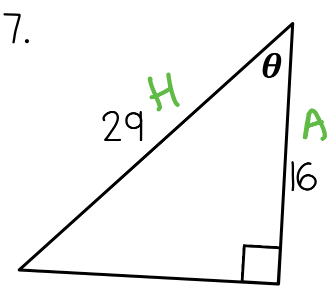


$\tan(48) = \frac{x}{8.7}$

$8.7 \cdot \tan(48)$

$\boxed{9.7}$

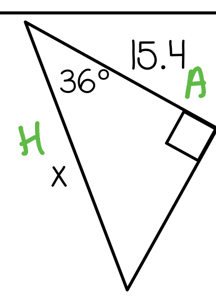
7.



$\cos^{-1}(16/29)$

$\boxed{57^\circ}$

8.



$\cos(36) = \frac{15.4}{x}$

$15.4 \div \cos(36)$

$\boxed{19.0}$

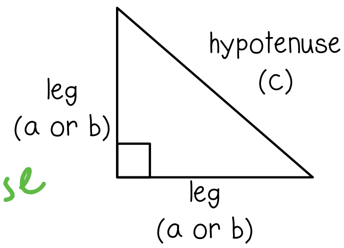
Name:______________________________Date:_____________Period:_______

PYTHAGOREAN THEOREM REVIEW *notes*

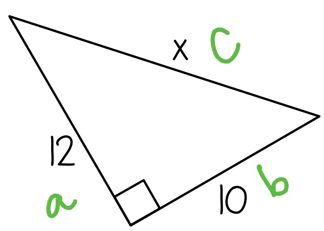
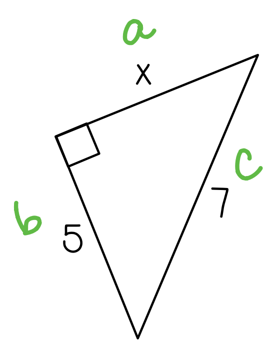
- If you have two sides of a right triangle, you can use the Pythagorean Theorem to find the third.

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

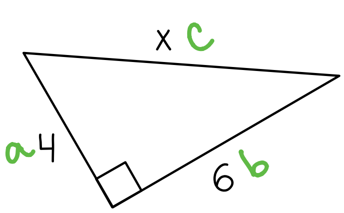
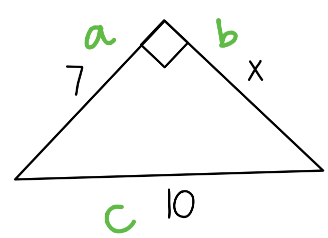
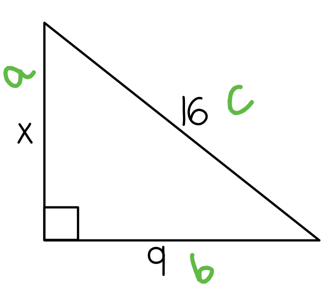
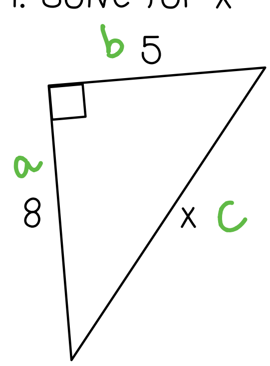
leg leg hypotenuse



Examples:

Hypotenuse is missing	**Leg** is missing
 $a^2+b^2=c^2$ $12^2+10^2=x^2$ $144+100=x^2$ $\sqrt{244}=\sqrt{x^2}$ $\boxed{15.6=x}$	 $a^2+b^2=c^2$ $x^2+5^2=7^2$ $x^2+25=49$ $-25\ \ -25$ $\sqrt{x^2}=\sqrt{24}$ $\boxed{x=4.9}$

Practice problems:

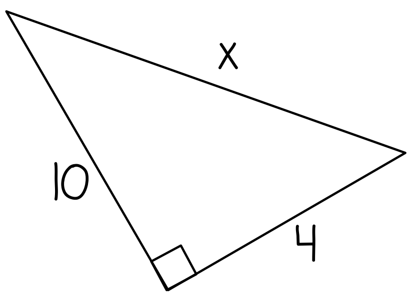
1. Solve for x  $a^2+b^2=c^2$ $4^2+6^2=x^2$ $16+36=x^2$ $\sqrt{52}=\sqrt{x^2}$ $\boxed{7.2=x}$	2. Solve for x  $7^2+x^2=10^2$ $49+x^2=100$ $-49\ \ -49$ $\sqrt{x^2}=\sqrt{51}$ $\boxed{x=7.1}$
3. Solve for x  $x^2+9^2=16^2$ $x^2+81=256$ $-81\ \ -81$ $\sqrt{x^2}=\sqrt{175}$ $\boxed{x=13.2}$	4. Solve for x  $8^2+5^2=x^2$ $64+25=x^2$ $\sqrt{89}=\sqrt{x^2}$ $\boxed{9.4=x}$

Name:____ Date:____________ Period:______

PYTHAGOREAN THEOREM REVIEW *practice*

Directions: Solve for the missing side. *Triangles may not be drawn to scale.*

1.

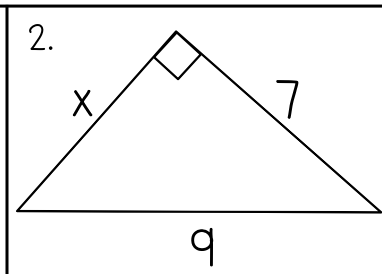


$10^2 + 4^2 = x^2$

$116 = x^2$

$\boxed{10.8 = x}$

2.



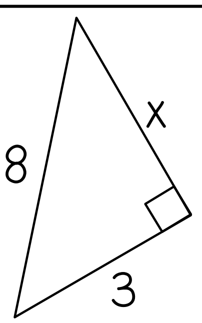
$x^2 + 7^2 = 9^2$

$x^2 + 49 = 81$

$x^2 = 32$

$\boxed{x = 5.7}$

3.



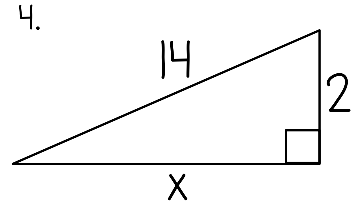
$x^2 + 3^2 = 8^2$

$x^2 + 9 = 64$

$x^2 = 55$

$\boxed{x = 7.4}$

4.



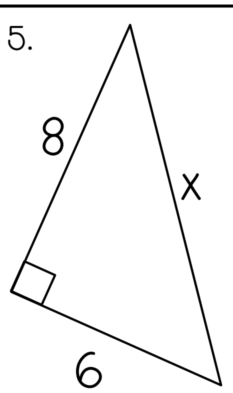
$2^2 + x^2 = 14^2$

$4 + x^2 = 196$

$x^2 = 192$

$\boxed{x = 13.9}$

5.

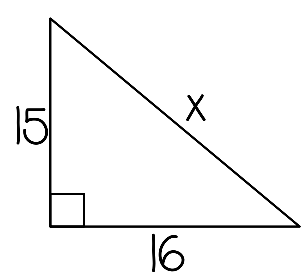


$8^2 + 6^2 = x^2$

$100 = x^2$

$\boxed{10 = x}$

6.

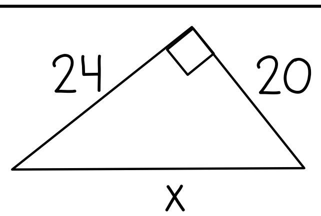


$15^2 + 16^2 = x^2$

$481 = x^2$

$\boxed{21.9 = x}$

7.

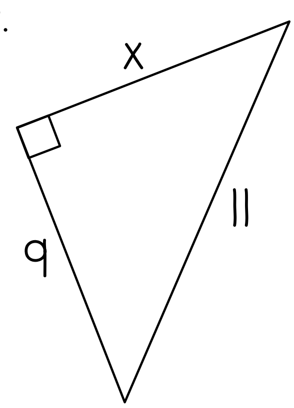


$24^2 + 20^2 = x^2$

$976 = x^2$

$\boxed{31.2 = x}$

8.



$x^2 + 9^2 = 11^2$

$x^2 + 81 = 121$

$x^2 = 40$

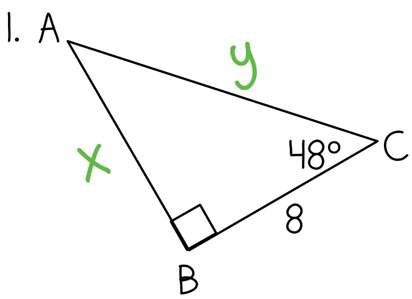
$\boxed{x = 6.3}$

Name:______________________________ Date:_____________ Period:_______

SOLVING RIGHT TRIANGLES *notes*

- Solving a triangle means to find all missing __sides__ and __angles__.
- You can solve a right triangle if you have one __side__ and one acute __angle__ or if you have two __sides__.

Examples: Solve each triangle.

1.


$m\angle A = 42°$
$AB = 8.9$
$AC = 12$

$$\begin{array}{r} 90 \\ -48 \\ \hline 42 \end{array}$$

$\tan(48) = \frac{x}{8}$

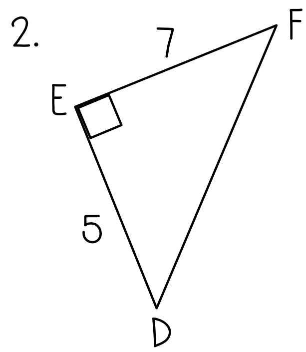
$8 \cdot \tan(48)$

8.9

$\cos(48) = \frac{8}{y}$

$8 \div \cos(48)$

12

2.


$m\angle F = 36°$
$m\angle D = 54°$
$FD = 8.6$

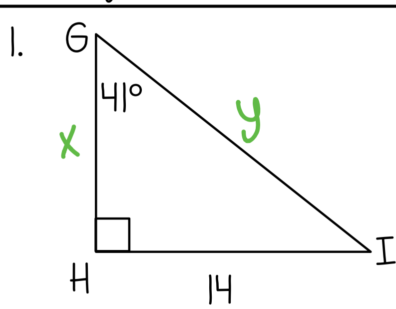
$5^2 + 7^2 = c^2$
$25 + 49 = c^2$
$\sqrt{74} = \sqrt{c^2}$
8.6

$\tan^{-1}(5/7)$

$36°$

$$\begin{array}{r} 90 \\ -36 \\ \hline 54 \end{array}$$

You try:

1.


$m\angle I = 49°$
$GH = 16.1$
$GI = 21.3$

$\tan(41) = \frac{14}{x}$

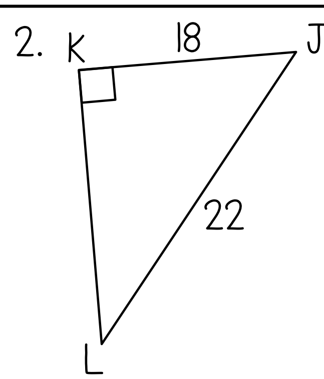
$14 \div \tan(41)$

16.1

$\sin(41) = \frac{14}{y}$

$14 \div \sin(41)$

21.3

2.


$m\angle J = 35°$
$m\angle L = 55°$
$KL = 12.6$

$a^2 + 18^2 = 22^2$
$a^2 + 324 = 484$
$a^2 = 160$
$a = 12.6$

$\cos^{-1}(18/22)$

$35°$

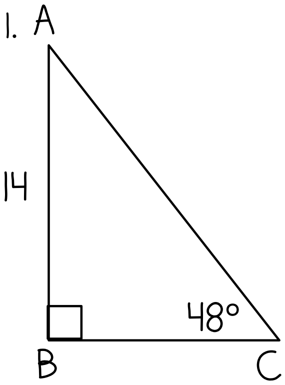
$90 - 35 = 55$

Name:________________________________ Date:____________ Period:______

SOLVING RIGHT TRIANGLES *practice*

Directions: Solve the right triangle. *Triangles may not be drawn to scale.*

1.

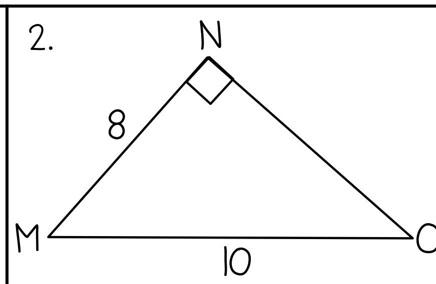


$m\angle A = 42°$
$BC = 12.6$
$AC = 18.8$

$\tan(48) = \frac{14}{x}$

$\sin(48) = \frac{14}{y}$

2.



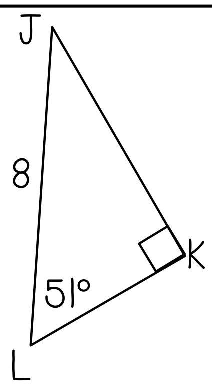
$m\angle O = 53°$
$m\angle M = 37°$
$NO = 6$

$8^2 + b^2 = 10^2$
$b = 6$

$\sin^{-1}(8/10)$
$53°$

$90 - 53 = 37$

3.

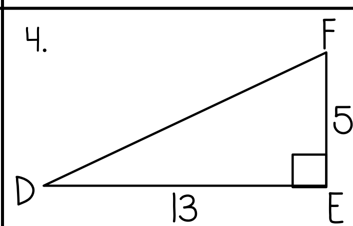


$m\angle J = 39°$
$JK = 6.2$
$LK = 5.0$

$\sin(51) = \frac{x}{8}$

$\cos(51) = \frac{y}{8}$

4.



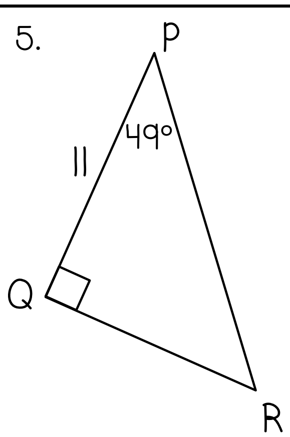
$m\angle F = 69°$
$m\angle D = 21°$
$DF = 13.9$

$5^2 + 13^2 = c^2$
13.9

$\tan^{-1}(13/5)$
$69°$

$90 - 69 = 21$

5.

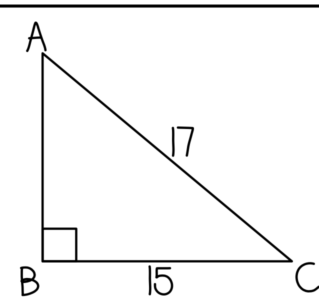


$m\angle R = 41°$
$PR = 16.8$
$QR = 12.7$

$\cos(49) = \frac{11}{x}$

$\tan(49) = \frac{y}{11}$

6.



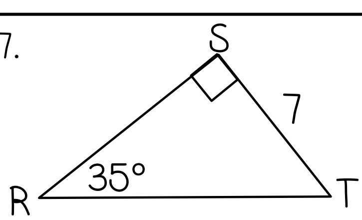
$m\angle A = 62°$
$m\angle C = 28°$
$AB = 8$

$a^2 + 15^2 = 17^2$
$a = 8$

$\sin^{-1}(15/17)$
$62°$

$90 - 62 =$
$28°$

7.

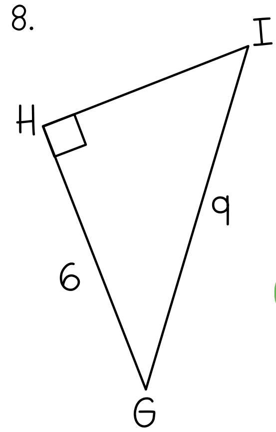


$m\angle T = 55°$
$RS = 10$
$RT = 12.2$

$\tan(35) = \frac{7}{x}$

$\sin(35) = \frac{7}{y}$

8.



$m\angle I = 42°$
$m\angle G = 48°$
$HI = 6.7$

$6^2 + b^2 = 9^2$
6.7

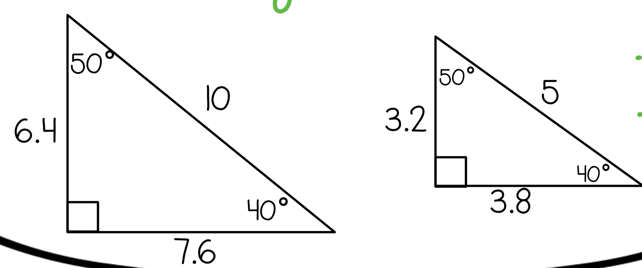
$\sin^{-1}(6/9)$

Name:________________________________Date:_____________Period:_______

TRIG AND SIMILAR TRIANGLES *notes*

Remember...

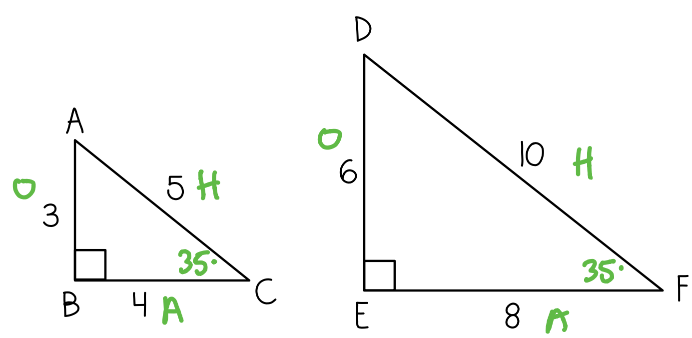
- Similar triangles have congruent angles and proportional sides.



· same shape
· different size

Since similar triangles have congruent angles, the trig. ratios for those angles will also be congruent. **

Let's prove it. △ABC~△DEF. Find the ratios for the cos(C) and the cos(F). Make sure to reduce the fractions. What do you notice?



$\cos(C) = 4/5$

$\cos(F) = 8/10 = 4/5$

they are equal

Now find the sin(C) and the sin(F). Then, find the tan(C) and the tan(F) Make sure to reduce the fractions. What do you notice?

$\sin(C) = 3/5$

$\sin(F) = 6/10 = 3/5$

$\tan(C) = 3/4$

$\tan(F) = 6/8 = 3/4$

they are equal!

Why does this happen?

The angle measures in similar triangles are equal, so the trig. ratios are equal.

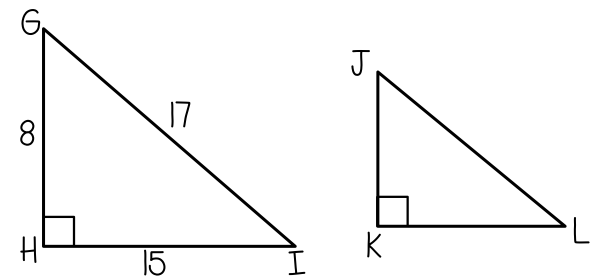
Name:____________________________________ Date:____________ Period:______

TRIG AND SIMILAR TRIANGLES *practice*

1. △ABC~△DEF. If tan(B)=3/8, what is the tan(E)?

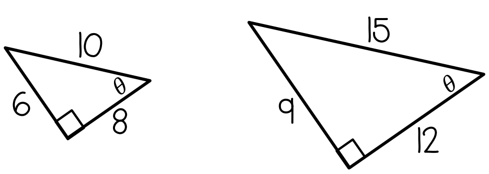
3/8

2. △GHI~△JKL. What is the cos(L)?



15/17

3. Are the triangles similar?



yes SSS~

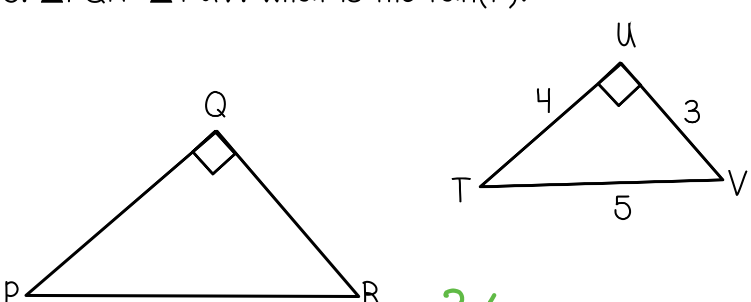
Solve for the two missing angles. What do you notice?

θ = 37° → they are equal!

4. Triangle MNO is similar to triangle PQR. If the sin(R)=12/13, what is the the sin(O)?

12/13

5. △PQR~△TUV. What is the tan(P)?

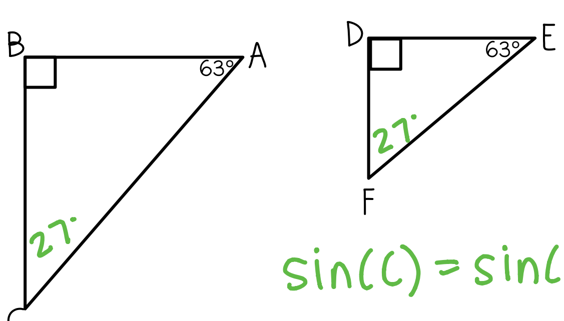


3/4

6. △QRS~△TUV. If cos(R)=0.7, what is the cos(U)?

0.7

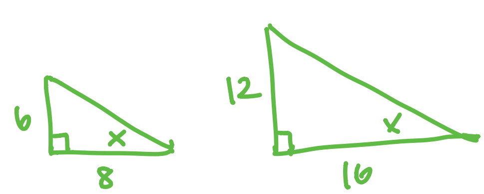
7. What do you know about the sin(C) and the sin(F)? Why?



sin(C) = sin(F)

m∠C = m∠F

8. Tony is 6 ft. tall and has a shadow that is 8 ft. long. At the same time of day, a 12 ft. light post cast shadow that is 16 ft. long. Find the angle of elevation for both triangles.



37°

Name:______________________________ Date:____________ Period:______

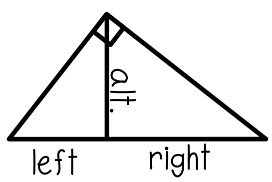
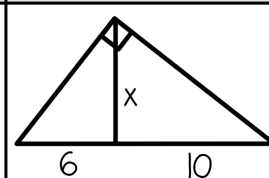
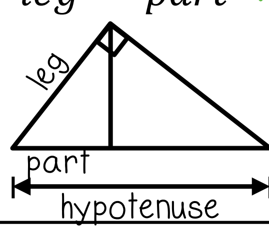
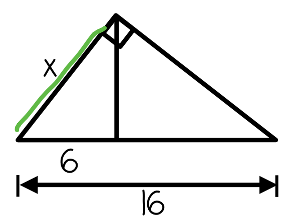
GEOMETRIC MEAN *notes*

Geometric Mean- a special type of _average_ between two numbers found by multiplying them and taking the _square root_.

Example: Find the geometric mean of 10 and 8.

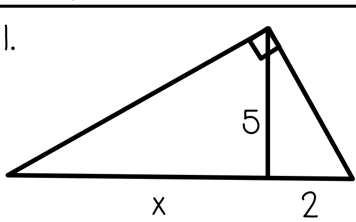
$10 \cdot 8 = 80 \qquad \sqrt{80} = \boxed{8.9}$

The geometric mean can be useful to find missing pieces of right triangles that are split into _similar_ _triangles_ with an _altitude_ (height).

<table>
<tr><th>TYPE</th><th>THEOREM RULE</th><th>EXAMPLE</th></tr>
<tr><td>Altitude Rule</td><td>$\frac{left}{alt.} = \frac{alt.}{right}$
</td><td>
$\frac{6}{x} = \frac{x}{10}$
$\sqrt{x^2} = \sqrt{60}$
$\boxed{x = 7.7}$</td></tr>
<tr><td>Leg Rule</td><td>$\frac{hyp.}{leg} = \frac{leg}{part \to hyp.}$
</td><td>
$\frac{16}{x} = \frac{x}{6}$
$\sqrt{x^2} = \sqrt{96}$
$\boxed{x = 9.8}$</td></tr>
</table>

Examples:

1.

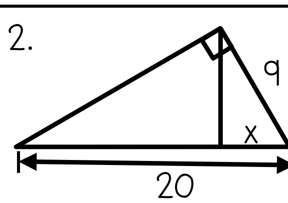


$\frac{x}{5} = \frac{5}{2}$

$\frac{2x}{2} = \frac{25}{2}$

$\boxed{x = 12.5}$

2.



$\frac{20}{9} = \frac{9}{x}$

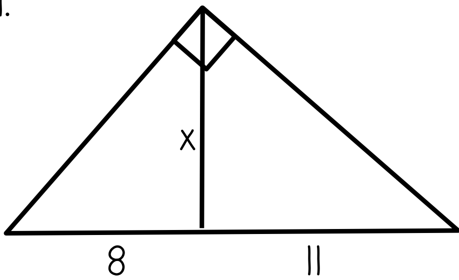
$\frac{20x}{20} = \frac{81}{20}$

$\boxed{x = 4.1}$

Name:____________________________________ Date:____________ Period:______

GEOMETRIC MEAN *practice*

1.

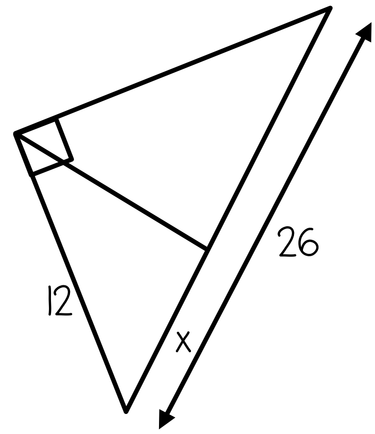


$$\frac{8}{x} = \frac{x}{11}$$

$$x^2 = 88$$

$$\boxed{x = 9.4}$$

2.

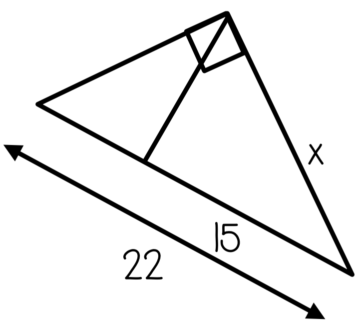


$$\frac{26}{12} = \frac{12}{x}$$

$$26x = 144$$

$$\boxed{x = 5.5}$$

3.

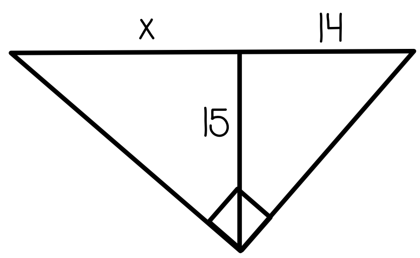


$$\frac{22}{x} = \frac{x}{15}$$

$$x^2 = 330$$

$$\boxed{x = 18.2}$$

4.

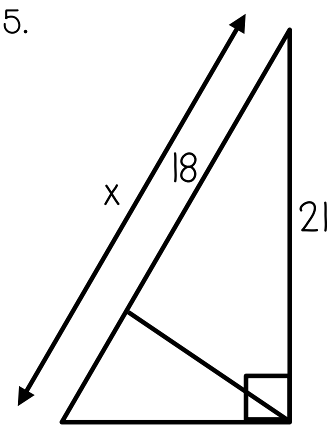


$$\frac{x}{15} = \frac{15}{14}$$

$$14x = 225$$

$$\boxed{x = 16.1}$$

5.

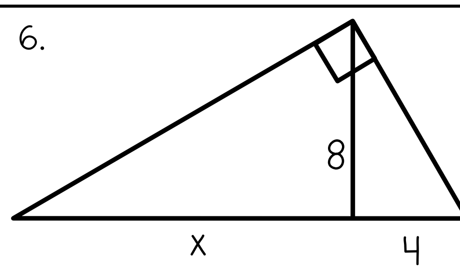


$$\frac{x}{21} = \frac{21}{18}$$

$$18x = 441$$

$$\boxed{x = 24.5}$$

6.

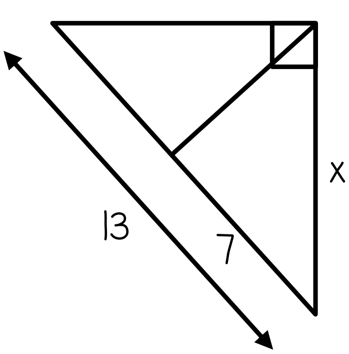


$$\frac{x}{8} = \frac{8}{4}$$

$$4x = 64$$

$$\boxed{x = 16}$$

7.

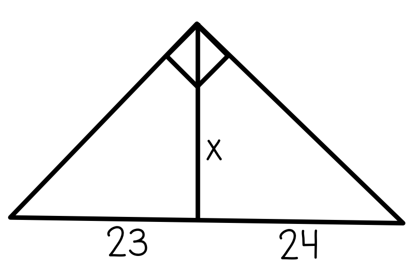


$$\frac{13}{x} = \frac{x}{7}$$

$$x^2 = 91$$

$$\boxed{x = 9.5}$$

8.



$$\frac{23}{x} = \frac{x}{24}$$

$$x^2 = 552$$

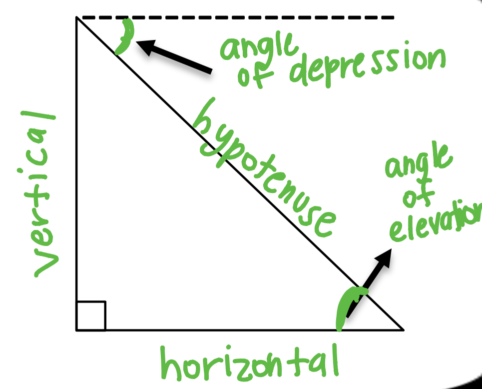
$$\boxed{x = 23.5}$$

Name:_____________________________Date:____________Period:______

TRIG APPLICATION PROBLEMS *notes*

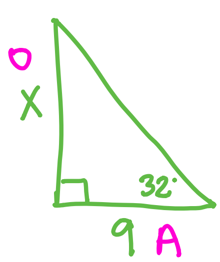
Key Words/Phrases in Application Problems

- Angle of Elevation-from the horizon looking up
- Angle of Depression-equal to the angle of elevation
- "Away from"-horizontal
- "Height"/ "High"/"Tall"-vertical
- "Rises"-vertical
- "Leaning"-hypotenuse
- "Above the ground"-vertical
- Shadows-horizontal
- Kite Strings, Ladders, Wires, Slides, Ramps-hypotenuse



Examples:

1. At a certain time of day, Lindsay's shadow is 9 ft. long. If the angle of elevation of the sun is 32°, how tall is Lindsay?

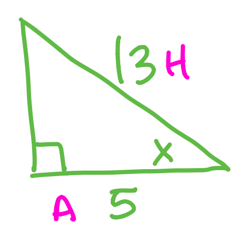


$\tan(32) = \frac{x}{9}$

$x = 5.6$

$\boxed{5.6 \text{ ft}}$

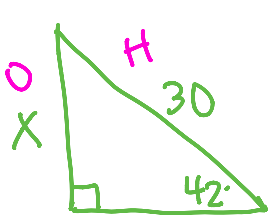
2. A 13 ft. ladder is leaning against a house. The bottom of the ladder is 5 ft. from the base of the house. What angle does the ladder make with the ground?



$\cos^{-1}(5/13)$

$\boxed{67°}$

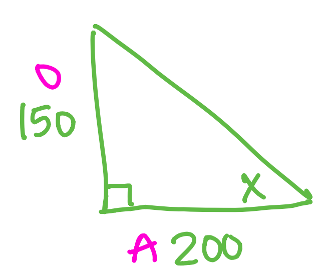
3. Parker is flying a kite. The kite string is 30 yards long. If Parker is sitting on the ground and holding the string at an angle of 42°, what is the height of the kite?



$\sin(42) = \frac{x}{30}$

$\boxed{20.1 \text{ yds}}$

4. A fishing boat is 200 m. from a cliff. A hiker is sitting at the top of the cliff looking down at the boat. If the cliff is 150 m. tall, what is the angle of depression of the hiker down to the boat?



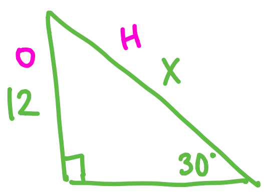
$\tan^{-1}(150/200)$

$\boxed{37°}$

Name:____________________________________ Date:____________ Period:______

TRIG APPLICATION PROBLEMS *practice*

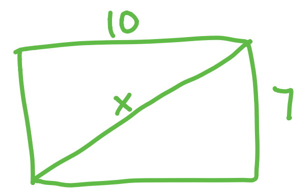
1. A slide is 12 ft. high. If the slides makes a 30° angle with the ground, how long is the slide?



$\sin(30) = \frac{12}{x}$

$\boxed{24\text{ ft}}$

2. A rectangular garden has a length of 10 yards and a width of 7 yards. Sally wants to plant daisies along the diagonal of the garden. How long will the line of daisies be?

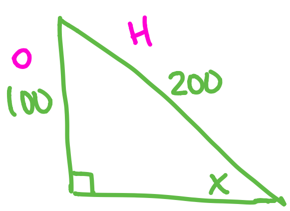


$7^2 + 10^2 = x^2$

$149 = x^2$

$\boxed{12.2\text{ yds}}$

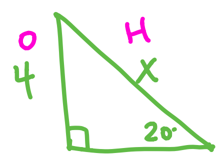
3. A 100 ft. building has a wire that stretches from roof to the ground. If the wire is 200 ft. long, what is measure of the angle it makes with the ground?



$\sin^{-1}(100/200)$

$\boxed{30°}$

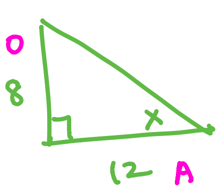
4. A ramp rises 4 ft. and makes a 20° with the ground. How long is the ramp?



$\sin(20) = \frac{4}{x}$

$\boxed{11.7\text{ ft}}$

5. At a certain time of day, an 8 ft. tree creates a 12 ft. shadow. What is the angle of elevation of the sun?



$\tan^{-1}(8/12)$

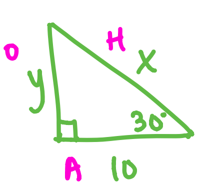
$\boxed{34°}$

6. $\triangle JKL \sim \triangle MNO$. If the cos(J)=4/9, what is the cos(M)? <u>*Why?*</u>

$\cos(M) = 4/9$

If the triangles are ~, corresponding angles are ≅. If the angles are ≅, the cosine ratios of those angles will be =.

7. John is flying a kite at an angle of 30°. If the kite is 10 ft. away from John, how long is the kite string? How high is the kite?



$\cos(30) = \frac{10}{x}$

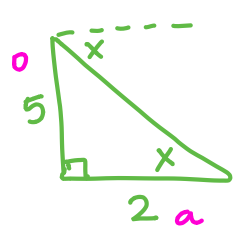
$x = 11.5$

$\tan(30) = \frac{y}{10}$

$y = 5.8$

$\boxed{\begin{array}{l}\text{length} = \\ 11.5\text{ ft} \\ \text{height} = \\ 5.8\text{ ft}\end{array}}$

8. A dog is standing 2 m. from a tree. A cat is 5 m. up the tree looking down at the dog. Find the angle of depression of the cats eyes down to the dog.

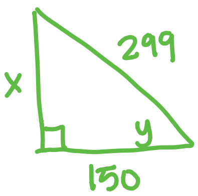


$\tan^{-1}(5/2)$

$\boxed{68°}$

TRIG APPLICATION PROBLEMS *practice* 2

1. A building has a wire that stretches from the roof to the ground. The wire is 299 ft. long and the end of the wire is 150 ft. away from the base of the building. Find the height of the building and the angle the wire makes with the ground.



$x^2 + 150^2 = 299^2$

$\boxed{x = 258.7\text{ ft}}$

$\cos^{-1}(150/299)$

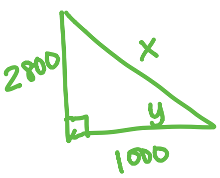
$\boxed{y = 60^\circ}$

2. △ABC~△DEF. If the sin(A)=7/10, what is the sin(D)? <u>*Why?*</u>

$\sin(D) = 7/10$

Similar triangles have equal corresponding angles!

3. A plane is flying at an altitude of 2800 meters. Haley is 1000 m. away from the plane. What is the diagonal distance between her and the plane? What is the angle of elevation Haley's eyes must make to look up at the plane?



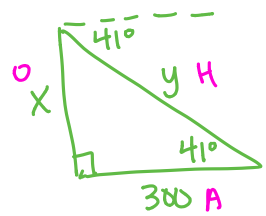
$1000^2 + 2800^2 = x^2$

$\boxed{x = 2973.2\text{ ft}}$

$\tan^{-1}(2800/1000)$

$\boxed{y = 70^\circ}$

4. A boat is 300 m. from a lighthouse. The angle of depression from the lighthouse down to the boat is 41 degrees. How tall is the lighthouse? What is the distance from the boat to the top of the lighthouse?



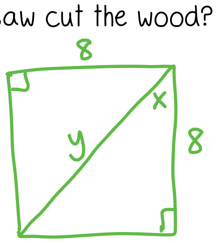
$\tan(41) = \frac{x}{300}$

$\boxed{x = 260.8\text{ ft height}}$

$\cos(41) = \frac{300}{y}$

$\boxed{y = 397.5\text{ ft distance to boat}}$

5. An artist is cutting a square piece of wood in half diagonally to make a 3D sculpture. If the square is 8 inches by 8 inches, what is the length of the diagonal? At what angle will the saw cut the wood?



$8^2 + 8^2 = y^2$

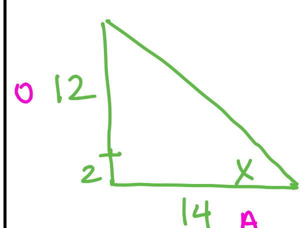
$128 = y^2$

$\boxed{11.3\text{ inches}}$

$\boxed{x = 45^\circ}$

↳ diagonals bisect angles in a square!

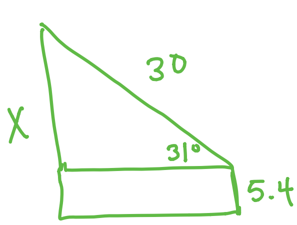
6. A flagpole is 12 ft. tall and is on a small platform 2 ft. high. If the flagpole creates a 14 ft. shadow, what is the angle of elevation of the sun?



$\tan^{-1}(14/14)$

$\boxed{45^\circ}$

7. Jill is flying a kite that has a 30 ft. long string. If Jill is 5.4 ft. tall and her arm is making a 31° with the ground, how high is the kite in the air?

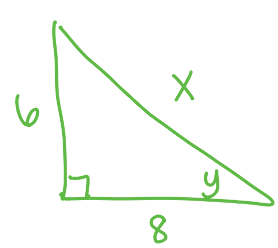


$\sin(31) = \frac{x}{30}$

$15.5 + 5.4$

$\boxed{20.9\text{ ft}}$

8. A ramp rises 6 ft. and has a horizontal length of 8 ft. How long is the ramp and what angle does it make with the ground?



$6^2 + 8^2 = x^2$

$\boxed{10\text{ ft} = x}$

$\tan^{-1}(6/8)$

$\boxed{37^\circ = y}$