Unit 8 Similarity and Trigonometry

Target 8.1: Prove and apply properties of similarity in triangles using AA~, SSS~, SAS~

- ***8.1a – Prove Triangles Similar by AA ~, SSS~, SAS~***
- ***8.1b – Use Proportionality Theorems***

Target 8.2: Solve problems using the Pythagorean Theorem

- ***8.2a – Applying the Pythagorean Theorem***
- ***8.2b – Converse of the Pythagorean Theorem***

Target 8.3: Solve problems using similar right triangles

- ***8.3a– Use Similar Right Triangles***
- ***8.3b– Special Right Triangles (45-45-90 & 30-60-90 Triangles)***

Target 8.4: Apply trigonometric ratios to determine unknown sides and angles

- ***8.4a – Apply Trigonometric Ratios (Set up only)***
- ***8.4b – Apply Trigonometric Ratios (Find the missing side)***
- ***8.4c– Find the Missing Angle and Solve Right Triangle***

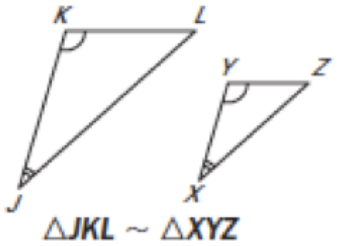
Date	Target	Assignment	Done!
W 1-13	8.1a	8.1a Worksheet	
R 1-14	8.1b	8.1b Worksheet	
F 1-15	8.2	8.2 Worksheet	
M 1-18	Quiz	Quiz 8.1-8.2	
T 1-19	8.3a	8.3a Worksheet	
W 1-20	8.3b	8.3b Worksheet	
R 1-21	8.3c	8.3c Worksheet	
F 1-22	Quiz	Quiz 8.3	
M 1-25	8.4a	8.4a Worksheet	
T 1-26	8.4b	8.4b Worksheet	
W 1-27	8.4c	8.4c Worksheet	
R 1-28	Quiz	Quiz 8.4	
F 1-29	8.5	8.5 Worksheet	
M 2-1	Quiz	Quiz 8.5	
T 2-2	Review	Unit 8 Test Review	
W 2-3	Test	Unit 8 Test (Day 1)	
R 2-4	Test	Unit 8 Test (Day 2)	

8.1a – Prove Triangles Similar by AA ~, SSS~, SAS~

Target 1 – Prove and apply properties of similarity in triangles using AA~, SSS~, SAS~

ANGLE ANGLE (AA) Similarity

If _____ angles of one triangle are _____ to two angles of another triangle, then the two triangles are similar.



$\triangle JKL \sim \triangle XYZ$

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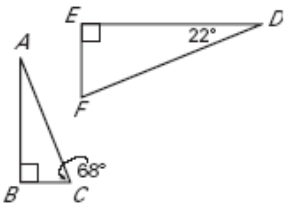
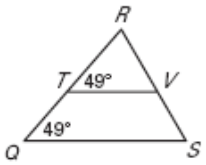
Example 1: Use the AA Similarity Postulate

Determine whether the triangles are similar. If they are, write a similarity statement. *Explain* your reasoning.



Example 2: Show that triangles are similar

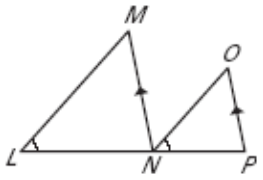
A) Prove: ΔRTV and ΔRQS *are similar*



Statements	Reason
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

Example 2: Show that triangles are similar

B) Prove: ΔLMN and ΔNOP are similar

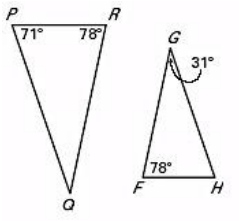


Statements	Reason
1.	1.
2.	2.
3.	3.
4.	4.
5.	5.

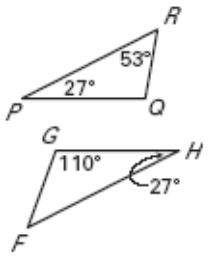
YOU TRY NOW!

Determine whether the triangles are similar. If they are, write a similarity statement.

1)

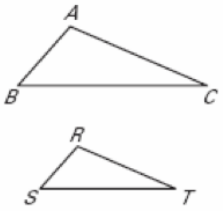


2)



Side-Side-Side (SSS) Similarity

If the _____ side lengths of two triangles are _____, then the triangles are similar.



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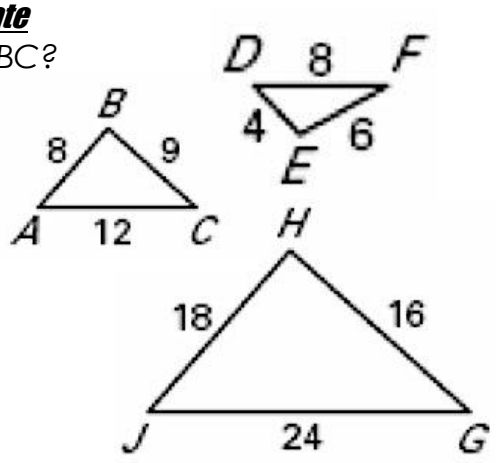
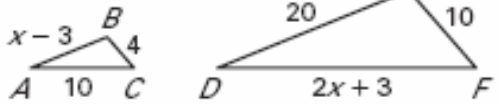
Example 3: Use the SSS Similarity Postulate

Is either ΔDEF or ΔGHJ similar to ΔABC?



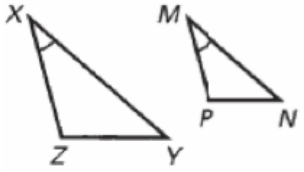
Example 4: Use the SSS Similarity Theorem

Find the value of x that makes ΔABC ~ ΔDEF.



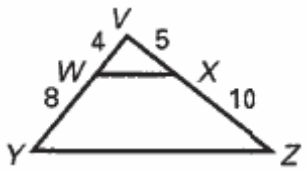
Side-Angle-Side (SAS) Similarity

If an angle of one triangle is _____ to an angle of a second triangle AND the lengths of the sides that include these angles are _____, then the triangles are _____.



Example 5: Similarity in Overlapping Triangles

Show that ΔVYZ ~ ΔVWX.



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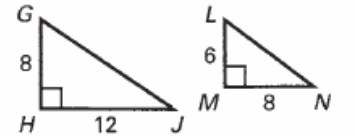
YOU TRY NOW!

Determine whether the triangles are similar. If they are similar, write a similarity statement. Explain using the similarity statements and theorems

1)



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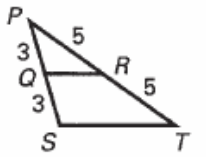

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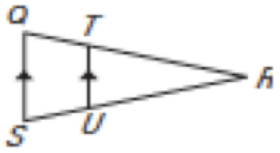
8.1b – Use Proportionality Theorems

Target 1 – Prove and apply properties of similarity in triangles using AA~, SSS~, SAS~

Triangle Proportionality Theorem

If a line parallel to one side of a triangle intersects the other two sides, then it divides the two sides_____.

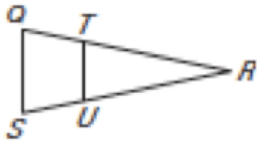
If $TU \| QS$, then _____= _____



Converse Triangle Proportionality Theorem

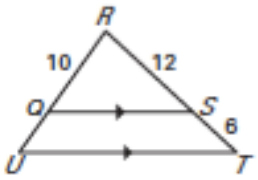
If a line divides two sides of a triangle proportionally, then it is parallel to the _____.

If $\frac{RT}{TQ} = \frac{RU}{US}$, then _____= _____



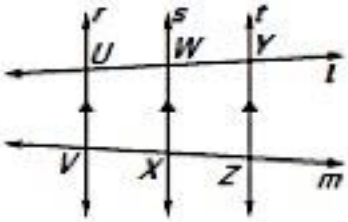
Example 1: Find the length of a segment

In the diagram, $\overline{QS} \parallel \overline{UT}$, RT = 10, RS = 12, and ST = 6. What is the length of $\overline{QU}$?



Three Parallel Lines & Two Transversals

If a line parallel to one side of a triangle intersects the other two sides, then it divides the two sides_____

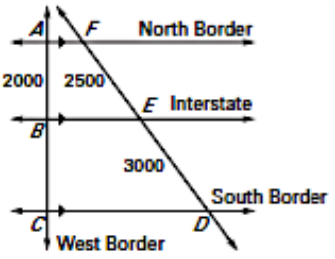


$\frac{UW}{WY} =$

Annotate Here

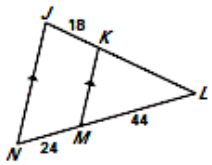
Example 2: Find the length of a segment

A farmer's land is divided by a newly constructed interstate. The distance shown is in meters. Find the distance CA between the North Border and the South Border of the farmer's land.

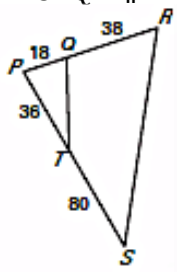


YOU TRY NOW!

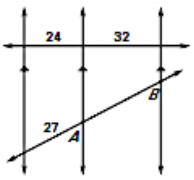
1) Find the length of $\overline{KL}$.



2) Deteremine whether $\overline{QT} \parallel \overline{RS}$.



3) Find the length of $\overline{AB}$.



Take a break

Annotate Here

8.2a – Applying the Pythagorean Theorem

Target 2 – Solve problems using the Pythagorean Theorem

Example 1: Apply the Pythagorean Theorem

A right triangle has a hypotenuse of length 10 and one leg with a length 3. What is the length of the other leg?

Example 2: Apply the Pythagorean Theorem

A 15-foot ladder leans against a wall. If the base of the ladder is 8 feet from the wall, how far up the wall is the top of the ladder? State your answer to the nearest tenth of a foot.

Pythagorean Triples

Vocabulary:

Pythagorean Triple: a set of three integers that satisfy the Pythagorean relationship.

Common Triples

3,4,5	***6, 8, 10***	***9, 12, 15***
5, 12, 13	***10, 24, 26***	***15, 36, 39***
7, 24, 25	***14, 48, 50***	***21, 72, 75***
8, 15, 17	***16, 30, 34***	***24, 45, 51***

Example 3: Apply the Pythagorean Theorem

A new Pythagorean Theorem triple can be formed from sides lengths 9, 12, and 15. Find two other sets.

Annotate Here

YOU TRY NOW!

1. An isosceles triangle has a base measuring 24 meters, and its two congruent sides each measure 15 meters. Find the area of the triangle, to the nearest square meter.

2. A right triangle has two legs, one with length 5 and the other with length 6. What is the perimeter of the triangle?

3. Find two other sets of Pythagorean triples using the given sides of a triangle: 16, 30, 34.

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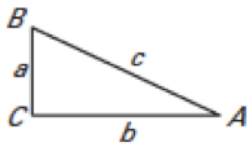
8.2b – Converse of the Pythagorean Theorem

Target 2: Find the side lengths of a right triangle using the Pythagorean Theorem

Converse of the Pythagorean Theorem

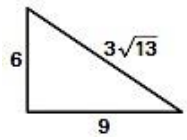


If _____, then _____

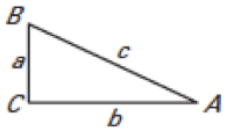
is a _____.

Example 1: Verify right triangles

Tell whether the given triangle is a right triangle.



Classifying a Triangle By Angles Using its Side Lengths

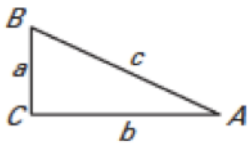


If _____

then _____

and _____ ***is a*** _____

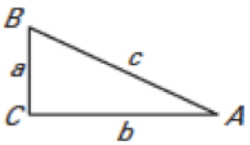
triangle.



If _____

then _____

and _____ ***is an*** _____ ***triangle.***



If _____

then _____

and _____ ***is an*** _____ ***triangle.***

Example 2: Classify triangles

Can segments with lengths of 2.8 feet, 3.2 feet, and 4.2 feet form a triangle? If so, would the triangle be acute, right, or obtuse?

Annotate Here

How is this different than the Pythagorean Theorem?

What is an…
Acute Angle?

Obtuse Angle?

When you're given the lengths of the sides of a triangle, how do you know if they will form a triangle?

YOU TRY NOW!

1) With the given side lengths, $15, 18, 3\sqrt{61}$*, classify the triangle to be acute, obtuse, or right.*

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2. Can segments with lengths 6.1 inches, 9.4 inches, and 11.3 inches form a triangle? If so, would the triangle be acute, right, or obtuse?

---

3. Show that a triangle with side lengths 50 inches, 120 inches, and 130 inches form perpendicular perpendicular lines.

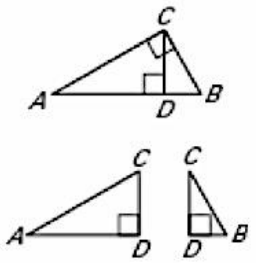
Annotate Here

8.3a– Use Similar Right Triangles

Target 3: Solve problems using similar right triangles

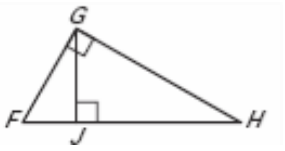
The Attitude of a Right Triangle

If the altitude is drawn to the hypotenuse of a right triangle, then the two triangles formed are _____ to the original triangle AND to each other.



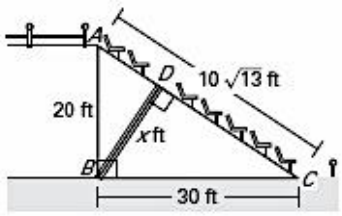
Example 1: Identify similar triangles

Identify similar triangles in the diagram.



Example 2: Find the length of the hypotenuse

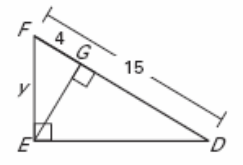
A cross section of a group of seats at a stadium shows a drainage pipe $\overline{BD}$ that leads from the seats to the inside of the stadium. What is length of the drainage pipe?



Annotate Here

Example 3: Use a geometric mean

Find the value of y in the triangle.

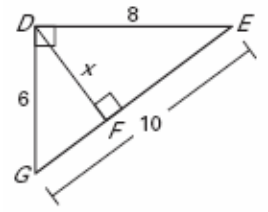


	Short Leg	Long Leg	Hypotenuse
Big Triangle			
Small Triangle			
Medium Triangle			

Annotate Here

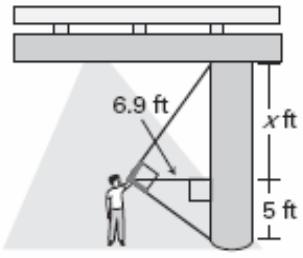
YOU TRY NOW!

1) Find the value of x.



x = 4.8

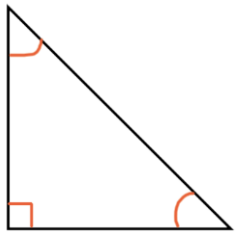
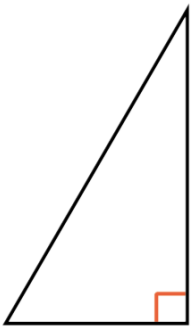
2) To find clearance of an overpass, you need to find the height of the concrete support beam. You use a cardboard square to line up the top and bottom of the beam. Your friend measures the vertical distance from the ground to your eye to be 5 feet, and the distance from you to the beam to be 6.9 feet. Approximate the total height of the beam.



x = 9.522; Total Height: = 14,422 feet

8.3b– Special Right Triangles (45-45-90 & 30-60-90 Triangles)

Target 8.3: Solve problems using similar right triangles

45-45-90 Triangles	30-60-90 Triangles
	

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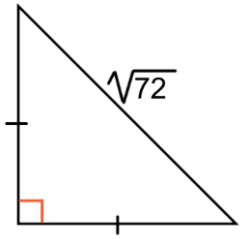
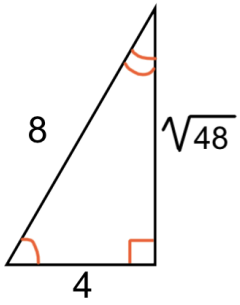
Example 1: Using special right triangles

What are the lengths of the legs of this triangle?



Example 2: Using special right triangles

What are the angles of this triangle?



YOU TRY NOW!

Use special right triangles to solve the following problems

1. A triangle has sides that measure $2, 2\sqrt{3}, \text{and } 4$. What would be best description for this triangle?

2. One leg of an isosceles right triangle measures 1 unit. What is the exact length of the hypotenuse?

3. The leg opposite the 30° angle of a 30-60-90 triangle has a length of 5. What is the length of the hypotenuse?

Annotate Here

8.4a – Apply Trigonometric Ratios (Set up only)

Target 4: Apply trigonometric ratios to determine unknown sides and angles

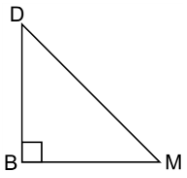
Vocabulary

Trigonometry: _____

_____

Annotate Here

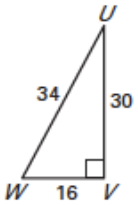
How to use SOH-CAH-TOA



sinD	*cosD*	*tanD*
sinM	*cosM*	*tanM*

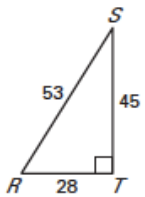
Example 1: Find sine ratios

Find $sinU$ and $sinW$. Write each answer as a decimal rounded to the hundredths place.



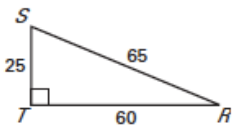
Example 2: Find cosine ratios

Find $cosS$ and $cosR$. Write each answer as a decimal rounded to the hundredths place.



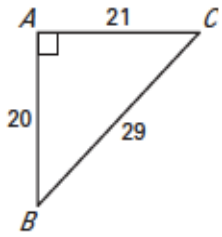
Example 3: Find tangent ratios

Find $tanS$ and $tanR$. Write your answer as a decimal rounded to the hundredths place.



YOU TRY NOW!

1) Find $sinB, sinC, cosB, cosC$. Write each answer as a decimal rounded to the hundredths place.

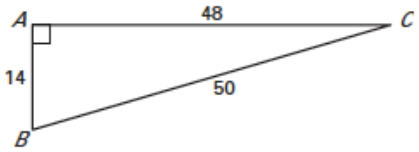


$sinB=$ $sinC =$

$cosB =$ $cosC =$

---

2. Find $tanB$ and $tanC$. Write each answer as a decimal rounded to the hundredths place.



$tanB =$ $tanC =$

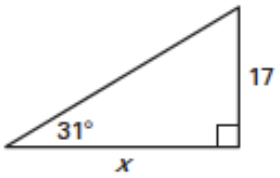
Annotate Here

8.4b – Apply Trigonometric Ratios (Find the missing side)

Target 4: Apply trigonometric ratios to determine unknown sides and angles

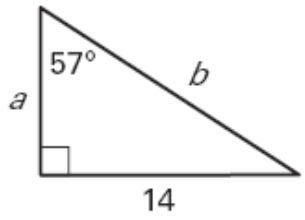
Example 1: Find a missing length

Find the value of x.



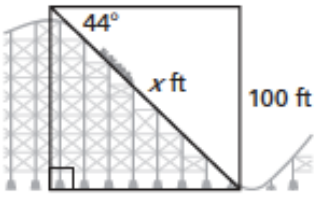
Example 2: Find a missing length

Find the value of a and b.



Example 3: Find a length using an angle of depression

Roller Coaster *You are at the top of a roller coaster 100 feet above the ground. The angle of depression is 44°. About how far do you ride down the hill?*



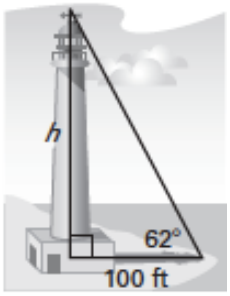
Annotate Here

When solving these problems, where is the best place to start?

Draw a picture that would have an angle of elevation.

YOU TRY NOW!

1) Find the height h of the lighthouse to the nearest foot.



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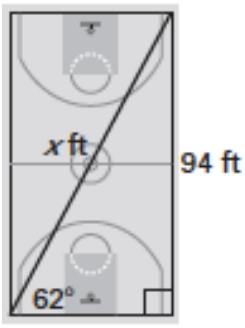
2) You walk from one corner of a basketball court to the opposite corner. Write and solve a proportion using a trigonometric ratio to approximate the distance of the walk.



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3) You are 50 feet from the screen at a drive-in movie. Your eye is on a horizontal line with the bottom of screen and the angle of elevation to the top of the screen is 58⁰. How tall is the screen?

Annotate Here

When solving these problems, where is the best place to start?

Draw a picture that would illustrate this problem.

YOUTRYNOW Answers: 1) $tan62 = \frac{h}{100} \approx 188.0726ft$

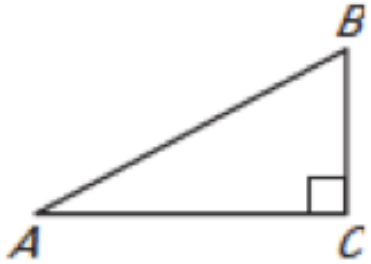
2) $sin62 = \frac{94}{x} \approx 106.46.16ft$ **3)** $tan58 = \frac{x}{50} \approx 80.0167ft$

8.4c– Find the Missing Angle and Solve Right Triangles

Target 4: Apply trigonometric ratios to determine unknown sides and angles

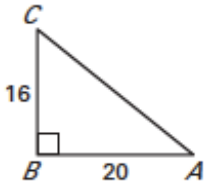
Inverse Trigonometric Ratios

Let $\angle A$ be an acute angle.



Example 1: Use an inverse function to find an angle measure

Measure of $\angle A$ to the nearest tenth of a degree



Example 2: Use an inverse sine and an inverse cosine

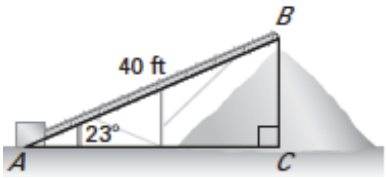
Let $\angle A$ and $\angle B$ be acute angles in two right triangles. Find the measure of angle A and angle B to the nearest tenth of a degree.

a. sin A = $\frac{7}{10}$

b. cos B = $\frac{9}{13}$

Example 3: Solve a right triangle

Solve the right triangle. Round decimal answers to the nearest tenth.

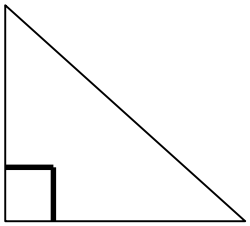


Annotate Here

Make sure your calculator is set in degrees!

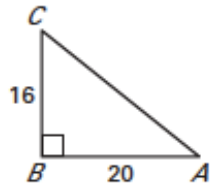
How is "cosB" said verbally? Translate below.

Label each vertex. How many parts of a triangle are there? Name them all in the right triangle below.



YOU TRY NOW!

1) Approximate angle C to the nearest tenth of a degree.



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2) What do we use the "inverse" SIN/COS/TAN function for?

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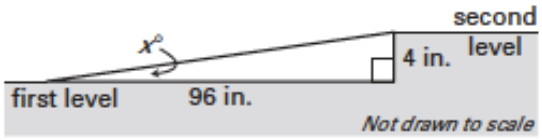
3) You are building a track for a model train. You want the track to incline from the first level to second level, 4 inches higher, in 96 inches. Is the angle of elevation less than 3°?



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4) Solve a right triangle that has a 50°angle and a 15-inch hypotenuse. (Draw a picture)

Annotate Here

YOUTRYNOW Answers: 1) $51.34°$ **2)** $To\ find\ the\ angle\ measure\ inside\ of\ a\ right\ triangle$
3) $Yes, the\ angle\ of\ elevation\ is\ about\ 2.38ft.$
4) $Missing\ Angle = 40°; Leg\ 1 = 11.4907inches; Leg\ 2 = 9.6418inches$