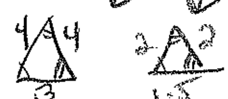
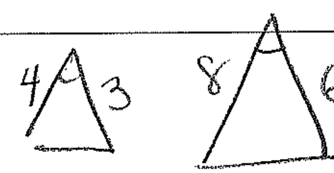
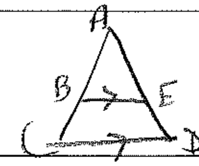
Geometry Unit 6 Vocabulary

Word	Definition	Diagram/other information
dilation	a transformation that produces an image that is the same shape as the original, but a different size	can be an enlargement or reduction
preimage	The figure before the transformation	
image	The figure after the transformation	
Scale factor	The ratio of a length on the image to it's corresponding length on the preimage.	scale factor $= \frac{1}{2}$
Similar Figures	Same shape - different size corresponding lengths are proportional corresponding ∡s are ≅.	
Similar triangles		
SSS~	2 Δs are similar if all 3 pairs of corresponding sides are proportional.	
SAS~	2 Δ's are similar if 2 sets of corresponding sides are proportional and their included ∡s are ≅.	 scale factor = 2
AA~	2 Δ's are similar if 2 sets of corresponding ∡s are ≅.	
ratio	a comparison of 2 numbers using division	$\frac{1}{2}$
Proportion	2 ratios set =	$\frac{1}{2} = \frac{x}{6}$

Triangle proportionality theorem	a line parallel to one side of a Δ, splits the other 2 sides proportionally	 $\frac{AB}{BC} = \frac{AE}{ED}$
Parallel proportionality theorem	another name for	
Right triangle altitude theorem	The altitude to the hypotenuse of a right Δ is the geometric mean of the 2 segments of the hypotenuse	 $y = \sqrt{ab}$
Geometric mean	The square root of the product of 2 #'s	$\sqrt{a \cdot b}$

~~1's = 66~~
~~5's = 115~~
~~10's 30~~

Pg #'s

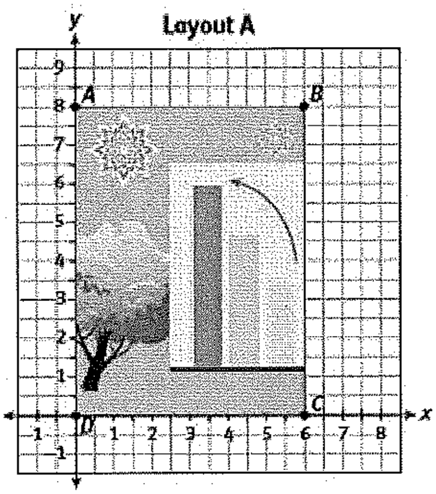
Geometry Unit 6 Day 1 Dilations

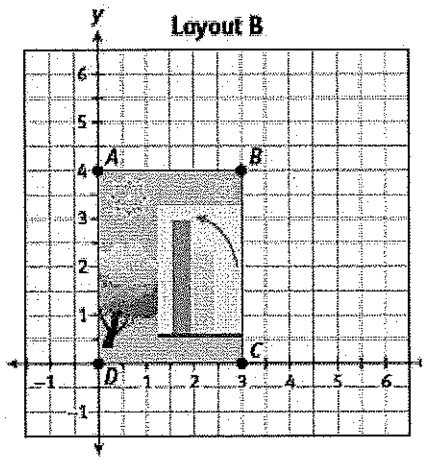
Learning Target - Students will understand dilations.

Graphic artists create visual information for electronic and print media. They use graphic design software in their daily work. For example, a graphic artist can use computer software to design a brochure. The text and art for the pages of the brochure can be moved around or scaled up and down before the actual brochure is printed.

Kate is a graphic artist. She wants to create two different layouts of a brochure for her client to review.

The art for the layouts is shown.





1. What are the coordinates of the vertices of the pre-image shown in Layout A? A(0,8) B(6,8) C(6,0) D(0,0)

2. What are the coordinates of the vertices of the image shown in Layout B? A(0,4) B(3,4) C(3,0) (0,0)

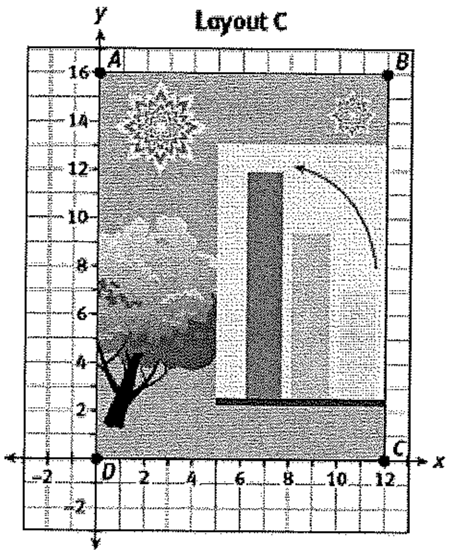
3. What relationship do you notice between the coordinates for Layout A and the coordinates for Layout B?

They are half

4. Express the transformation in Item 3 as a function.

$(x,y) \to (\frac{1}{2}x, \frac{1}{2}y)$

5. Kate created a third layout for the client to review. What are the coordinates of the vertices of the image shown in Layout C?



A (16,0) B(12,16) C(12,0) D(0,0)

6. What relationship do you notice between the coordinates for Layout A and the coordinates for Layout C?

They are doubled

7. Express the relationship in Item 6 as a function.

$(x, y) \rightarrow (2x, 2y)$

A ***dilation*** is a transformation that changes the size of a figure, but not its shape, by a scale factor k. The scale factor determines whether the transformation is a reduction or an enlargement.

8. **a.** What is the scale factor for the transformation of Layout A to Layout B?

$\frac{1}{2}$

b. Is Layout B a reduction or an enlargement of Layout A?

reduction

c. What is the scale factor for the transformation of Layout A to Layout C?

2

d. Is Layout C a reduction or an enlargement of Layout A?

enlargement

9. In general, for what values of scale factor k is a dilation a reduction?

$0 \leq k \leq 1$

10. In general, for what values of scale factor k is a dilation an enlargement?

$k > 1$

11. **Express regularity in repeated reasoning.** How can you find the coordinates of an image point after a dilation with scale factor k if the corresponding pre-image point has the coordinates (a, b)?

$(a,b) \rightarrow (ka, kb)$

multiply a and b by k

12. Express the relationship in Item 11 as a function.

$(a,b) \rightarrow (ka, kb)$

13. Triangle $R(0, 0)$, $S(0, 4)$, $T(3, 0)$ is mapped onto $\triangle R'S'T'$ by a dilation.

a. If $\frac{RS}{R'S'} = \frac{5}{2}$, is $\triangle R'S'T'$ a reduction or an enlargement? Explain.

enlargement b/c the scale factor $K > 1$.

b. The coordinates of $\angle R'$ are $(0, 0)$. What are the coordinates of $\angle S'$?

$(0,0)$

14. Describe a dilation with a scale factor of 1.

They are $\cong$.

23. $\triangle XYZ$ is an isosceles triangle with a base angle of 65°. The triangle is dilated by a factor of $\frac{2}{3}$. What are the measures of the angles of $\triangle X'Y'Z'$? Explain your reasoning.

24. A dilation is centered at point O with a scale factor of $\frac{1}{4}$, such that $OP' = \frac{1}{4}OP$. Write the dilation in function notation.

Geometry Unit 6 day 1 HW

25. Given a triangle and its image under a dilation, explain how you can use a ruler to determine the scale factor. measure the sides + divide them

26. A graphic artist has enlarged a rectangular photograph using a scale factor of 4. The perimeter of the enlargement is 144 in. What is the perimeter of the original photograph? $\frac{144}{4} = 36$

27. A photographer enlarged a picture. If the width of the image is 5 inches and the width of the pre-image was x, what is the scale factor for the dilation in terms of x? x 5 $\frac{5}{x}$

add graph

28. Sketch the pre-image with the given vertices, and sketch the image with the given scale factor and center of dilation at the origin.

$A(2, 4)$, $B(-3, -1)$, $C(0, 1)$; scale factor of 3

29. Sketch the pre-image with the given vertices, and sketch the image with the given scale factor and center of dilation at the origin.

$A(-2, 3)$, $B(2, 3)$, $C(2, -1)$, $D(-2, -1)$; scale factor of $\frac{1}{4}$

30. Sketch the image of a line segment with endpoints $A(-2, -5)$ and $B(1, -1)$ under a dilation centered at the origin with a scale factor of 1.5.

31. Sketch the image of a line segment with endpoints $A(0, 0)$ and $B(5, 4)$ under a dilation centered at the origin with a scale factor of $\frac{1}{2}$.

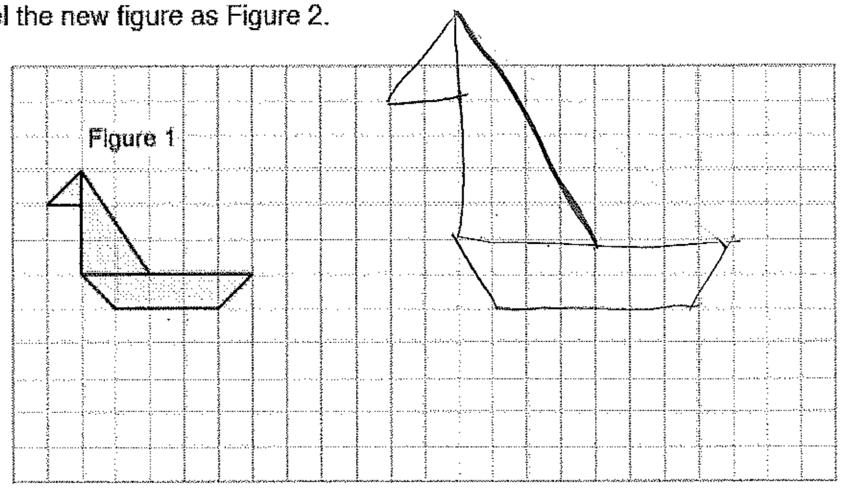
add some that are find the scale factor?

Geometry Unit 6 Day 2 Similar figures

Learning Target – Students will determine when two figures are similar using the definition of similar figures.

1. On the grid below draw an enlargement of Figure 1 by making each length twice as long.

   Label the new figure as Figure 2.



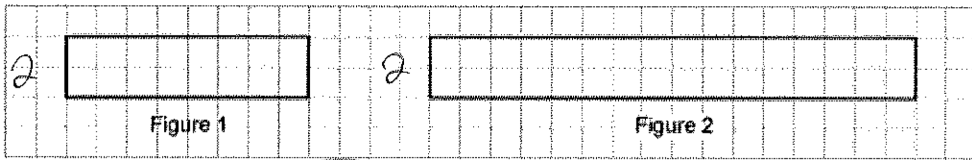
Discuss Figure 1 and Figure 2 with a partner.

What can you say about the two figures? (Write your notes here.)

- They are similar
- The scale factor is 2
- enlargement

2. Look at this pair of figures. Determine whether or not the figures are similar.

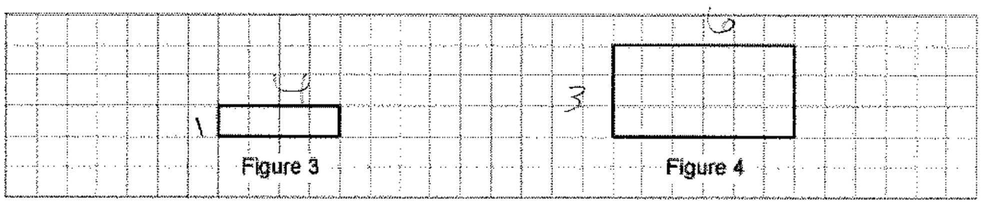
Complete the sentence below:



The two figures are/are not similar because No, the sides do not have the same ratio

3. Look at this pair of figures. Determine whether or not the figures are similar.

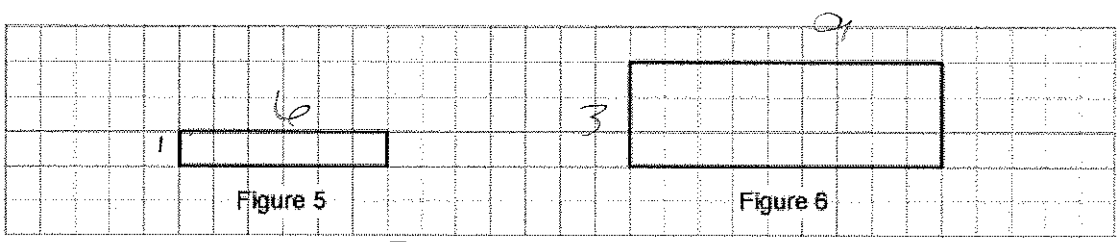
Complete the sentence below:



The two figures are/are not similar because No, the sides do not have the same ratio

4. Look at this pair of figures. Determine whether or not the figures are similar.

Complete the sentence below:

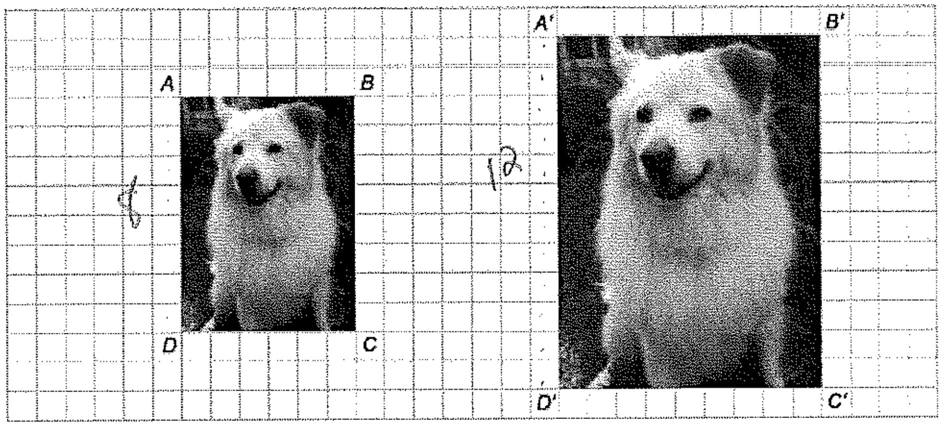


The two figures are/are not similar because

The sides do Not have the same ratio

Corresponding sides, vertices, and angles

1. Two similar photographs of Fred:



The diagram shows a small photograph of Fred that has been enlarged to give the large photograph of Fred.

The two photographs of Fred are similar.

Each part of the smaller photograph corresponds to a part of the larger photograph.

For example, side AB corresponds to side A′B′; Angle A corresponds to Angle A′; and so on.

a. Name the side that corresponds to side CD. C' D'

b. Name the angle that corresponds to Angle D. D'

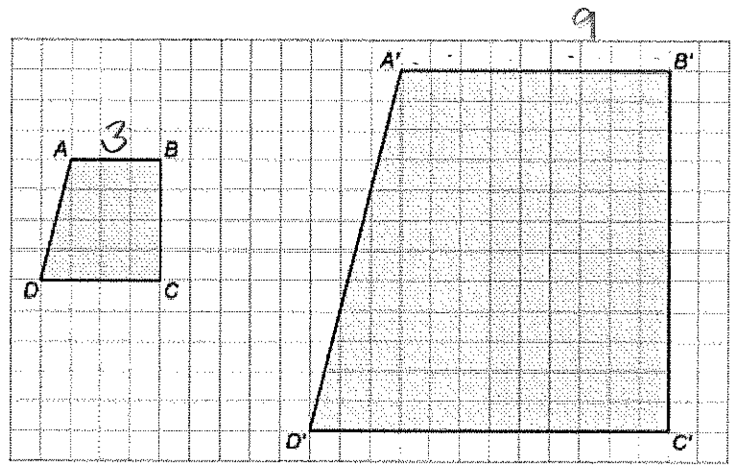
c. Which other corresponding angles can you name? ∠C + ∠C' ∠A + ∠A' ∠B + ∠B'

d. Which other corresponding sides can you name? AD + A'D' AB + A'B' BC + B'C'

e. What is the ratio between each pair of corresponding sides? 12/8 = 3/2

f. What is the ratio between each pair of corresponding angles? 90:90 = 1:1

2. Study this pair of similar quadrilaterals.



These similar quadrilaterals are labeled so that we can identify their corresponding vertices, corresponding sides, and corresponding angles.

a. Identify the angle that corresponds to each of the following angles:

Angle A, A'   Angle B, B'   Angle C, C'   Angle D D'

b. Identify the side that corresponds to each of the following sides:

Side AB, A'B'   Side BC, B'C'   Side CD, C'D'   Side DA D'A'

c. Identify the vertex that corresponds to each of the following vertices:

Vertex A, A'   Vertex B, B'   Vertex C, C'   Vertex D D'

d. What can you say about the ratio of the corresponding side lengths of these two similar quadrilaterals? $9/3 = 3$

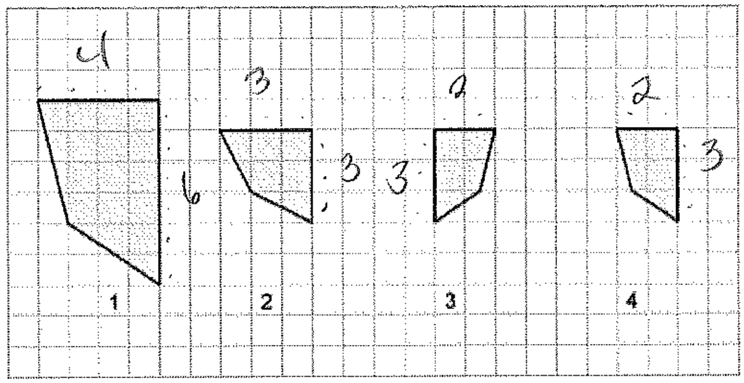
e. What can you say about the corresponding angles of these two similar quadrilaterals?

corresponding ∡s are ≅ so the ratio = 1.

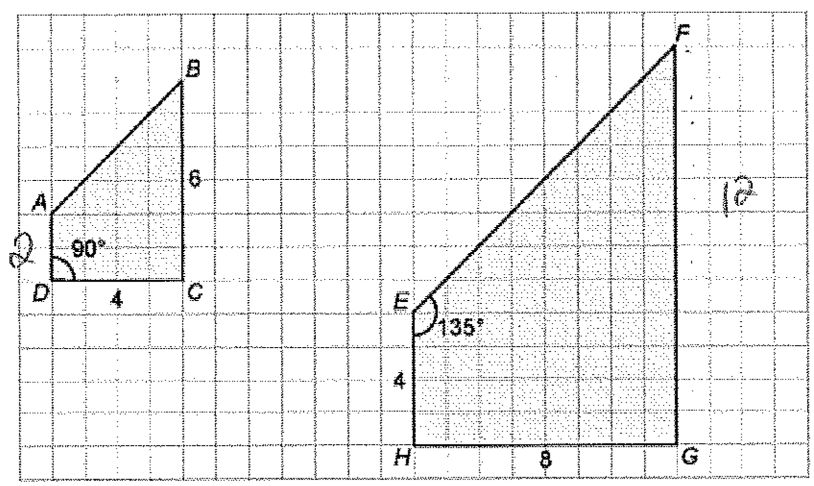
Solving problems involving similar figures

1. Which of quadrilaterals 2, 3, and 4, below, are similar to quadrilateral 1?

3 + 4



2. In the diagram below, quadrilateral ABCD is similar to quadrilateral EFGH.



a. Give the ratio of corresponding side lengths for quadrilaterals ABCD and EFGH. $8/4 = 2$

b. Find the lengths of sides DA and FG. 2 and 12

c. Find the measures of Angle A and Angle H.

135° 90°

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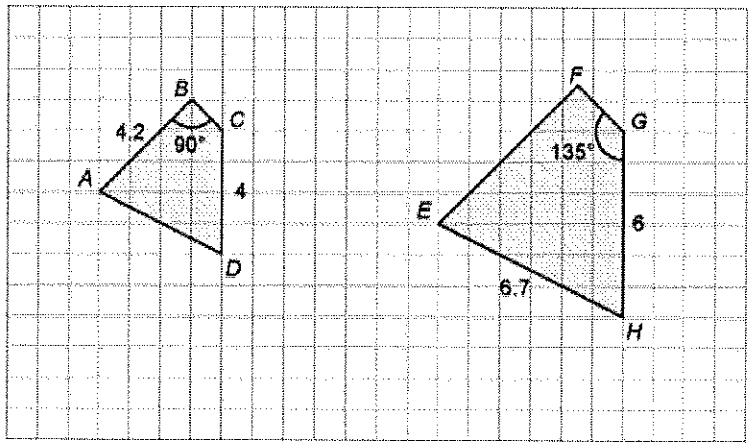
3. In the diagram below, quadrilateral ABCD is similar to quadrilateral EFGH.



a. Give the ratio of corresponding side lengths for quadrilaterals ABCD and EFGH. $\frac{6}{4} = \frac{3}{2}$

b. Find the lengths of sides DA and EF. $\frac{6.7}{DA} = \frac{3}{2}$ $DA = 4.47$ $\frac{EF}{4.2} = \frac{3}{2}$

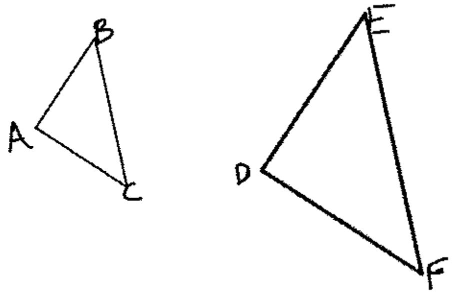
c. Find the measures of Angle C and Angle F.

135° 90° $EF = 6.3$

Geometry Unit 6 Day 3 Conditions for similar triangles

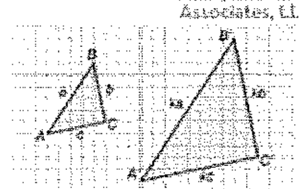
Learning Target – Students will prove triangles are similar.

Similar Triangles – triangles that have all pairs of corresponding angles congruent and all pairs of corresponding side lengths proportional. Similar triangles have the same shape, but not the same size.

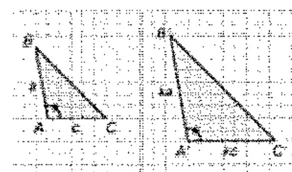


Three conditions for similar triangles:

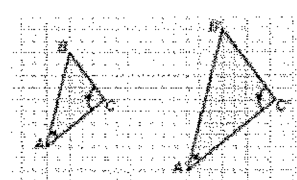
Two triangles are similar if the ratios of the lengths of all 3 pairs of the corresponding sides are equal.



Two triangles are similar if the ratios of the lengths of two pairs of corresponding sides are the same and the corresponding included angles are congruent.



Two triangles are similar if two pairs of corresponding angles are congruent.

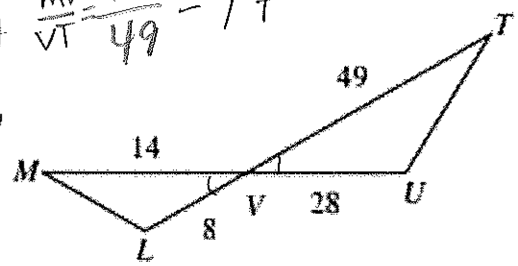


1. Write a similarity statement and use evidence to justify why the triangles are similar. If they are not similar, explain why not.

a.

$\frac{LV}{VU} = \frac{8}{28} = 2/7$ $\frac{MV}{VT} = \frac{14}{49} = 2/7$

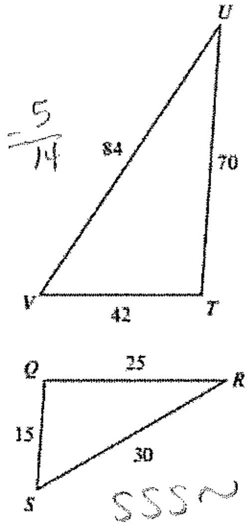
SAS ~



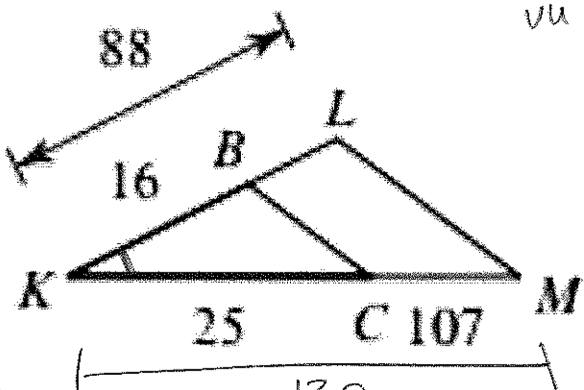
$\frac{QS}{VT} = \frac{15}{42} = \frac{5}{14}$

$\frac{QR}{UT} = \frac{25}{70} = \frac{5}{14}$

$\frac{SR}{VU} = \frac{30}{84} = \frac{5}{14}$



SSS ~



$\frac{KB}{KL} = \frac{16}{88} = \frac{2}{11}$

$\frac{KC}{KM} = \frac{25}{132}$

132

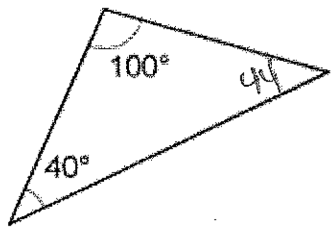
Not similar → ratios of corresponding sides are not the same.

Check Your Understanding

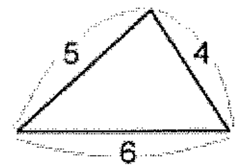
~~8. Are all right isosceles triangles similar? Explain.~~

~~9. Are all equilateral triangles similar? Explain.~~

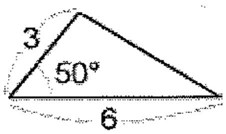
Which pairs of triangles are similar? Which condition did you use to justify your answer?



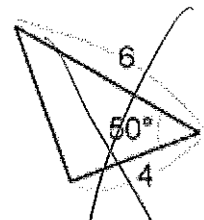
Triangle A



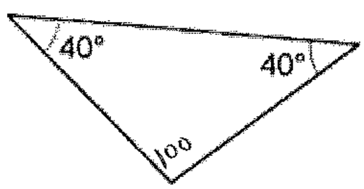
Triangle B

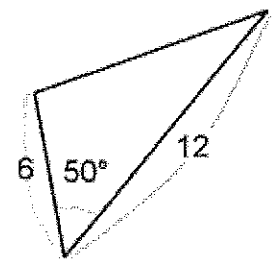


Triangle C



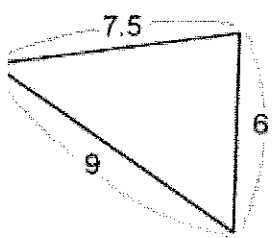
Triangle D

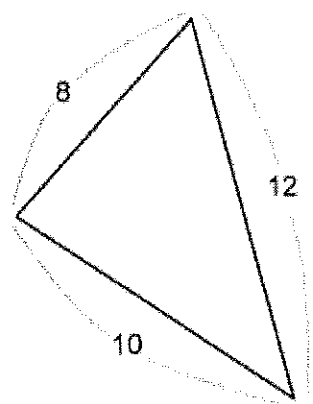




Triangle E

Triangle F





Triangle G

Triangle H

ΔA ~ ΔE by AA~

ΔC ~ ΔF by SAS~

ΔG ~ ΔB ~ ΔH by SAS~

2. For each diagram:
   a. Identify two similar triangles
   b. State the similarity theorem that you used to determine similarity
   c. Give evidence that the triangles are similar.

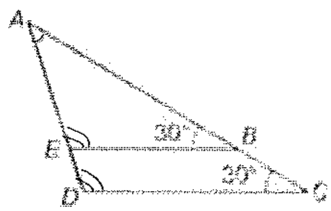


Diagram A

Similarity Statement: $\triangle AEB \sim \triangle ADC$

Theorem: AA~

Evidence: $\measuredangle A \cong \measuredangle A$
$\measuredangle B \cong \measuredangle C$

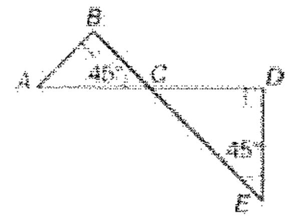


Diagram B

Similarity Statement: $\triangle ABC \sim \triangle CDE$

Theorem: AA~

Evidence:
$\measuredangle B \cong \measuredangle D$
$\measuredangle ACB \cong \measuredangle E$

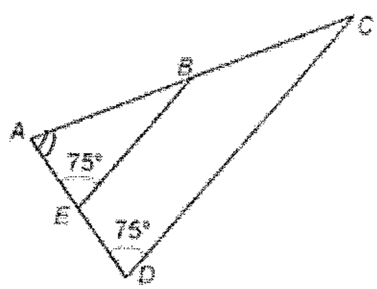


Diagram C

Similarity Statement: $\triangle AEB \sim \triangle ADC$

Theorem: AA~

Evidence:

$\measuredangle A \cong \measuredangle A$
$\measuredangle E \cong \measuredangle D$

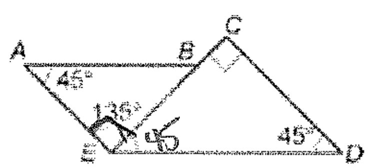


Diagram E

Similarity Statement: $\triangle ABE \sim \triangle DEC$

Theorem: AA~

Evidence:
$\measuredangle A \cong \measuredangle D$
$\measuredangle AEB \cong \measuredangle C$

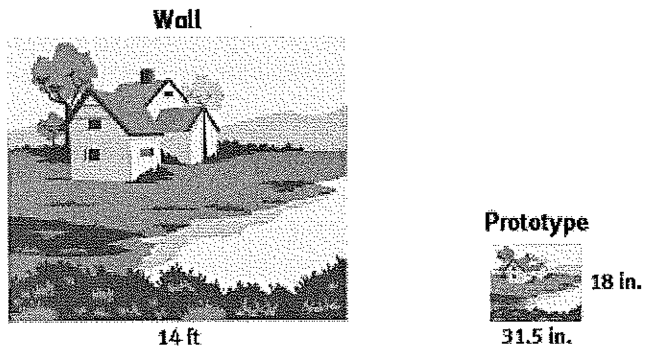
Shorten or lasts Monday's!

Geometry Unit 6 day 4

Learning Target – Students will use similar figures to solve problems.

1.

Kate is about to meet with her final client of the day. She needs to create a wall mural. She can measure the length of the wall but not the height. She has a prototype picture and knows that the wall and the picture are similar rectangles. Kate needs to find the area of the wall.



a. Which sides of the two rectangles are corresponding?

14 ft to 31.5 ft.

write me!

b. Write two different proportions that can be used to find the height of the wall.

$\frac{14}{31.5} = \frac{x}{18}$

c. **Reason abstractly and quantitatively.** Can the proportion $\frac{x}{18} = \frac{31.5}{168}$ be used to find the height of the wall? Explain why or why not.

No, corresponding sides are not matched up.

d. What is the height of the wall? Show your work.

$\frac{14}{31.5} = \frac{x}{18}$ $252 = 31.5x$

$8 ft = x$

e. What is the area of the wall? Show your work.

$14 ft * 8 ft = 112 ft^2$

At times, measuring something directly is impossible, or physically undesirable. When these situations arise, **indirect measurement,** the technique that uses proportions to calculate measurement, can be implemented. Your knowledge of similar triangles can be very helpful in these situations.

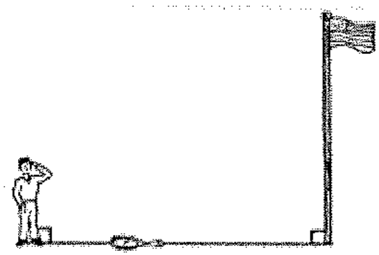
Give some dimensions?

Use the following steps to measure the height of the school flagpole or any other tall object outside. You will need a partner, a tape measure, a marker, and a flat mirror.

Step 1: Use a marker to create a dot near the center of the mirror.

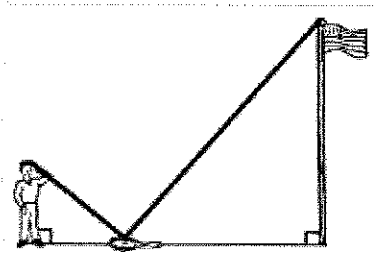
Step 2: Face the object you would like to measure and place the mirror between yourself and the object. You, the object, and the mirror should be collinear.

Step 3: Focus your eyes on the dot on the mirror and walk backward until you can see the top of the object on the dot, as shown.



Step 4: Ask your partner to sketch a picture of you, the mirror, and the object.

Step 5: Review the sketch with your partner. Decide where to place right angles, and where to locate the sides of the two triangles.



Step 6: Determine which segments in your sketch can easily be measured using the tape measure. Describe their locations and record the measurements on your sketch.

1. How can similar triangles be used to calculate the height of the object?

You can write an solve a propation to find the height of the flag pole.

2. Use your sketch to write a proportion to calculate the height of the object and solve the proportion.

3. Compare your answer with others measuring the same object. How do the answers compare?

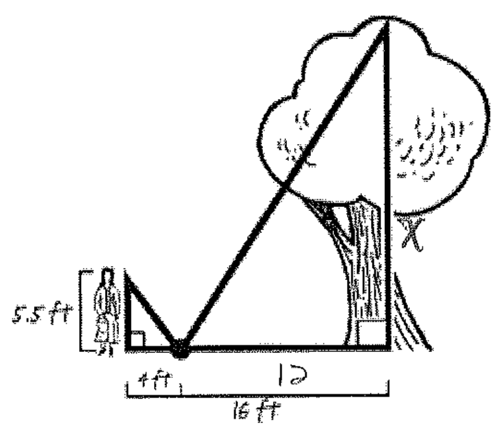
4. What are some possible sources of error that could result when using this method?

1. You go to the park and use the mirror method to gather enough information to calculate the height of one of the trees. The figure shows your measurements. Calculate the height of the tree.

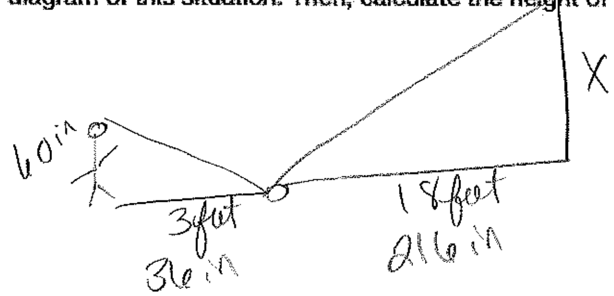
$$\frac{5.5}{4} = \frac{x}{12}$$

$$66 = 4x$$

$$16.5\text{ft} = x$$



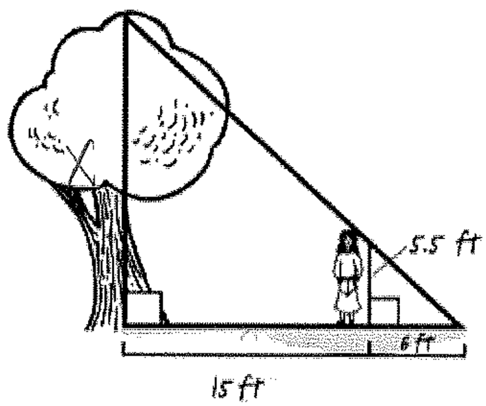
2. Stacey wants to try the mirror method to measure the height of one of her trees. She calculates that the distance between her and the mirror is 3 feet and the distance between the mirror and the tree is 18 feet. Stacey's eye height is 60 inches. Draw a diagram of this situation. Then, calculate the height of this tree.



$$\frac{60}{36} = \frac{X}{216}$$

$$360\text{in} = X$$

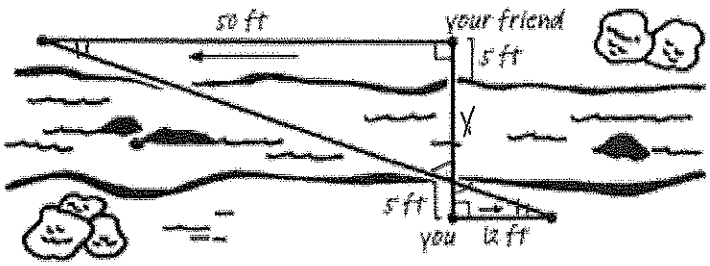
3. Stacey notices that another tree casts a shadow and suggests that you could also use shadows to calculate the height of the tree. She lines herself up with the tree's shadow so that the tip of her shadow and the tip of the tree's shadow meet. She then asks you to measure the distance from the tip of the shadows to her, and then measure the distance from her to the tree. Finally, you draw a diagram of this situation as shown below. Calculate the height of the tree. Explain your reasoning.



$$\frac{5.5}{6} = \frac{X}{15}$$

$$X = 13.75 \text{ feet}$$

1. You stand on one side of the creek and your friend stands directly across the creek from you on the other side as shown in the figure.



Your friend is standing 5 feet from the creek and you are standing 5 feet from the creek. You and your friend walk away from each other in opposite parallel directions. Your friend walks 50 feet and you walk 12 feet.

a. Label any angle measures and any angle relationships that you know on the diagram. Explain how you know these angle measures.

vertical ∠s are ≅
If 2 ∠s of one Δ are ≅ to 2 ∠s of another Δ then the Δs must be ≅.

b. How do you know that the triangles formed by the lines are similar?

AA~

c. Calculate the distance from your friend's starting point to your side of the creek. Round your answer to the nearest tenth, if necessary.

$\frac{50}{x+5} = \frac{12}{5}$

$250 = 12x + 60$

$190 = 12x$

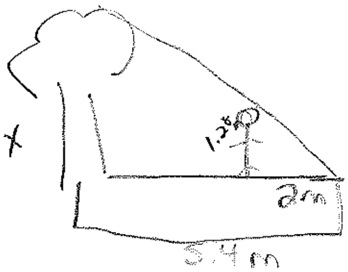
$x = 15.8\overline{3} + 5 = 20.83$

d. What is the width of the creek? Explain your reasoning.

15.83

Geometry Unit 6 Day 4 HW

You want to measure the height of a tree at the community park. You stand in the tree's shadow so that the tip of your shadow meets the tip of the tree's shadow on the ground, 2 meters from where you are standing. The distance from the tree to the tip of the tree's shadow is 5.4 meters. You are 1.25 meters tall. Draw a diagram to represent the situation. Then, determine the height of the tree.



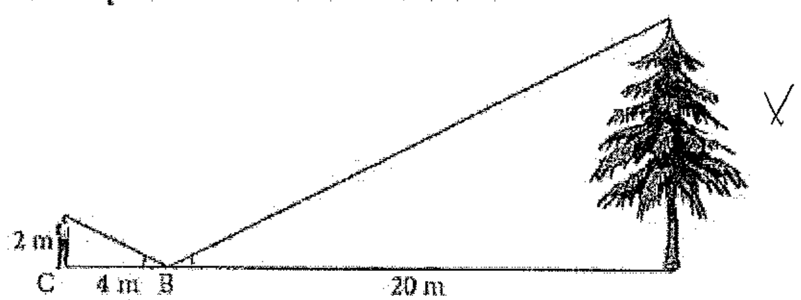
$$\frac{x}{1.25} = \frac{5.4}{2}$$

$$2x = 6.75$$

$$x = 3.375 \text{ m}$$

4.

A hiker, whose eye level is 2 m above the ground, wants to find the height of a tree. He places a mirror horizontally on the ground 20 m from the base of the tree, and finds that if he stands at a point C, which is 4 m from the mirror B, he can see the reflection of the top of the tree. How tall is the tree?

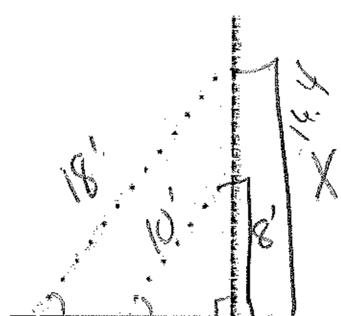


$$\frac{2}{4} = \frac{x}{20}$$

$$x = 10 \text{ m}$$

5.

Two ladders are leaned against a wall so that they make the same angle with the ground. The 10' ladder reaches 8' up the wall. How much further up the wall does the 18' ladder reach?



$$\frac{10}{8} = \frac{18}{x}$$

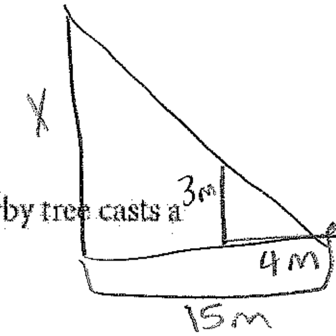
$$10x = 144$$

$$x = 14.4 \text{ feet}$$

$$14.4 - 8 = 6.4 \text{ feet further}$$

5.

A pole 3 m tall casts a shadow 4 m long. A nearby tree casts a 15 m shadow. What is the height of the tree?

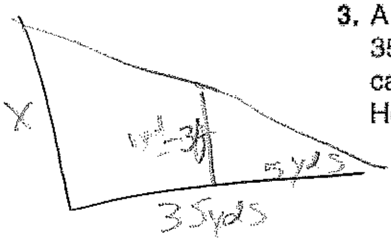


$\frac{x}{3} = \frac{15}{4}$

$4x = 45$

$x = 11.25m$

6.



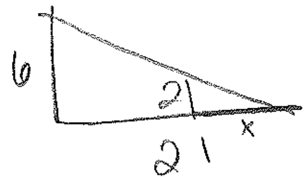
3. A lamppost casts a shadow that is 35 yards long. A 3-foot-tall mailbox casts a shadow that is 5 yards long. How tall is the lamppost?

$\frac{x}{1} = \frac{35}{5}$

$35 = 5x$

7yds $= x$

4. A 6-foot-tall scarecrow in a farmer's field casts a shadow that is 21 feet long. A dog standing next to the scarecrow is 2 feet tall. How long is the dog's shadow?

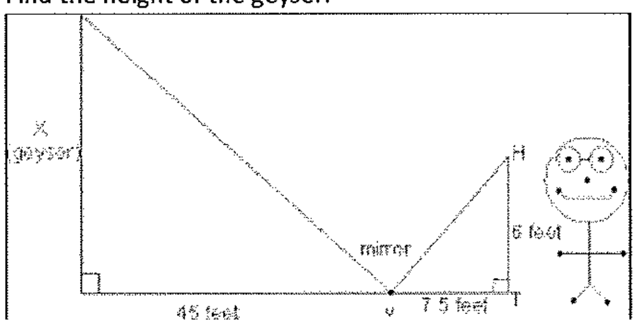


$\frac{2}{x} = \frac{6}{21}$

$42 = 6x$

7ft $= x$

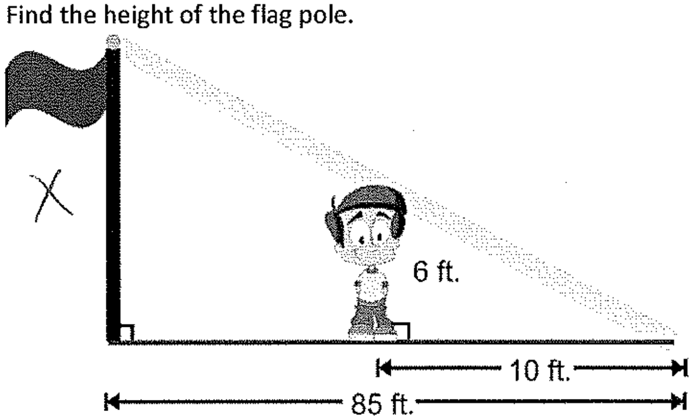
1. Find the height of the geyser.



$\frac{x}{45} = \frac{6}{7.5}$

$x = 36$ feet

2. Find the height of the flag pole.



$\frac{6}{10} = \frac{x}{85}$

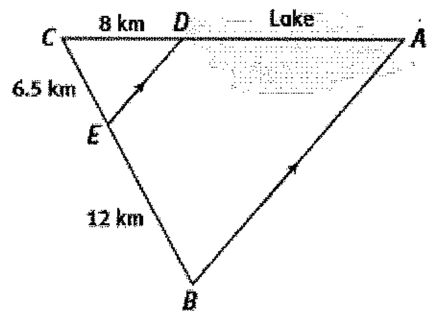
$10x = 510$

$x = 51$ ft

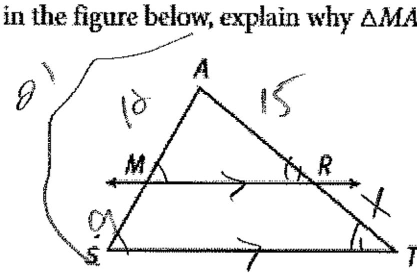
Geometry Unit 6 Day 8 Triangle Proportionality Theorem

Learning Target – Students will use the triangle proportionality theorem to solve problems.

Clarissa needs to find the distance across a lake in the national park. She locates points A, B, C, D, and E and takes the measurements shown. She thinks she can use similar triangles to find the distance.



1. If $\overleftrightarrow{MR} \parallel \overleftrightarrow{ST}$ in the figure below, explain why $\triangle MAR \sim \triangle SAT$.



corresponding ∠'s are ≅ so the Δ's are similar by AA~

2. Knowing that corresponding sides of similar triangles are proportional, complete this proportion:

$$\frac{AM}{AS} = \frac{AR}{?} \quad \overline{AT}$$

3. If $AM = 12$ cm, $MS = 9$ cm, and $AR = 15$ cm, determine RT. Show your work.

$$\frac{12}{21} = \frac{15}{x+15}$$

$315 = 12x + 180$

$135 = 12x$

$x = 11.25$

4. If $MS = 8$ cm, $AR = 25$ cm, and $RT = 10$ cm, determine AM. Show your work.

$$\frac{x}{8+x} = \frac{25}{35}$$

$35x = 200 + 25x$

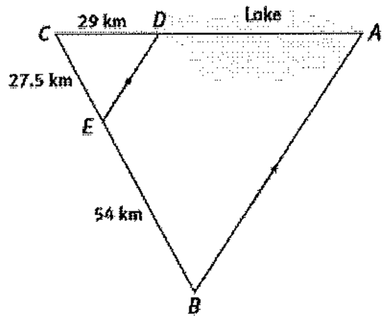
$10x = 200$

$x = 20$

Triangle Proportionality Theorem – If a line parallel to a side of a triangle intersects the other two sides, it divides them proportionally.

Now you can use the theorem to solve the problem from the beginning of the lesson.

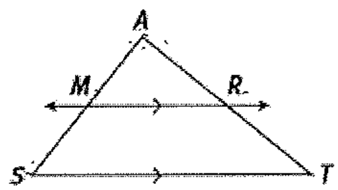
6. Clarissa needs to find the distance across the lake shown. The known measurements are shown. What is the distance *DA*?



$\frac{29}{DA} = \frac{27.5}{54}$

$DA = 56.95$

Consider $\triangle SAT$.



9. Determine if each statement is true or false.

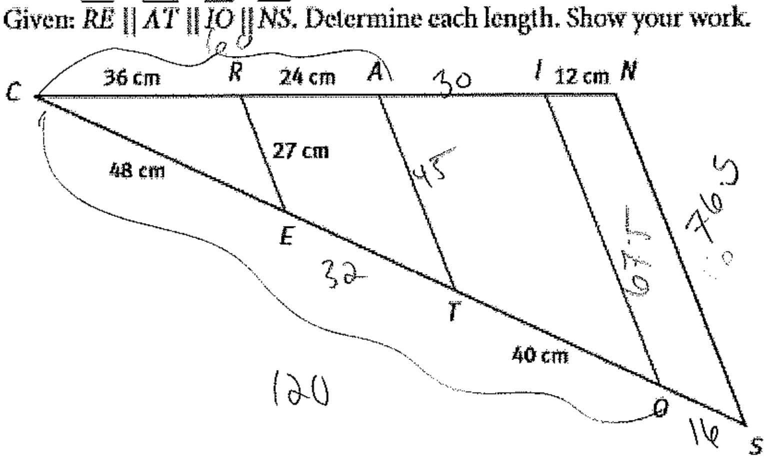
a. $\frac{AM}{MS} = \frac{AR}{RT}$ True b. $\frac{AM}{AS} = \frac{AR}{RT}$ false

10. If $AM = 8$ in., $AR = 12$ in., and $RT = 5$ in., what is *MS*?

$\frac{8}{x} = \frac{12}{5}$ $12x = 40$ $x = 3.\overline{3}$

Parallel proportionality theorem – If two or more lines parallel to a side of a triangle intersect the other two sides of the triangle, they divide them proportionally.

11. Given: $\overline{RE} \parallel \overline{AT} \parallel \overline{IO} \parallel \overline{NS}$. Determine each length. Show your work.



a. *ET*

$\frac{36}{48} = \frac{24}{ET}$

$ET = 32$

b. *AI*

$\frac{36}{48} = \frac{AI}{40}$

$AI = 30$

c. *AT*

$\frac{36}{27} = \frac{60}{AT}$

$AT = 45$

d. *OS*

$\frac{36}{48} = \frac{12}{OS}$

$OS = 16$

e. *IO*

$\frac{48}{120} = \frac{27}{IO}$

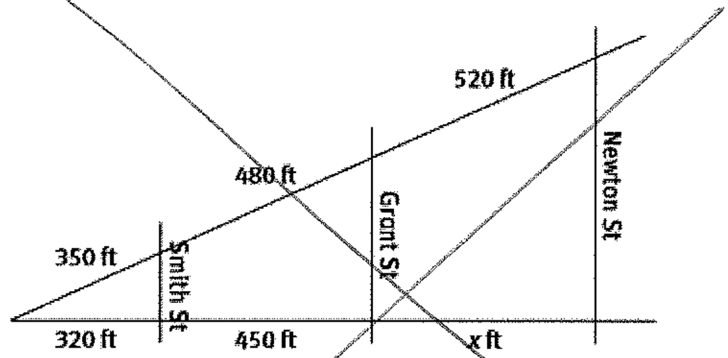
$IO = 67.5$

f. *NS*

$\frac{36}{27} = \frac{102}{NS}$

$NS = 76.5$

12. Attend to precision. A land developer is using a surveyor to measure distances to ensure that the streets in the new community are parallel.



a. If Grant Street and Newton Street are parallel, what is the value of x? Support your answer.

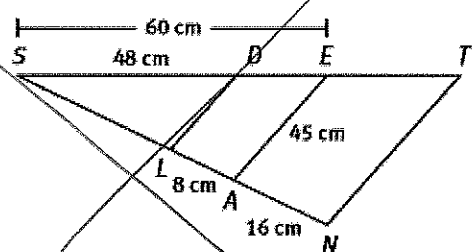
$\frac{350}{320} = \frac{520}{x}$

$x = 475.43$

b. Are Smith Street and Grant Street parallel? Support your answer.

$\frac{350}{320} \neq \frac{480}{450}$ NO

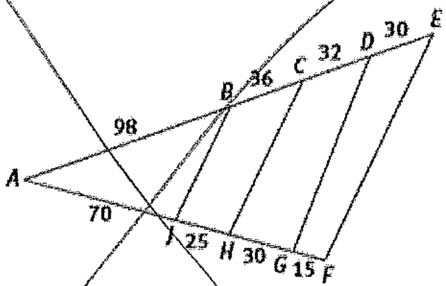
13. Given the diagram with $\overline{LD} \parallel \overline{AE} \parallel \overline{NT}$ and segment measures as shown, determine the following measures. Show your work.



a. SL **b.** LD **c.** ET **d.** NT

Geometry Unit 6 Day 8 HW

16. Reason abstractly. Given the diagram, determine whether the segments are parallel. Show your work.



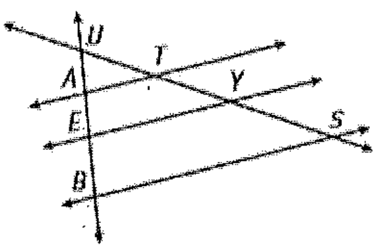
a. $\overline{BJ}$ and $\overline{CH}$

b. $\overline{BJ}$ and $\overline{EF}$

c. $\overline{DG}$ and $\overline{EF}$

d. $\overline{BJ}$ and $\overline{DG}$

Given: $\overleftrightarrow{AT} \parallel \overleftrightarrow{EY} \parallel \overleftrightarrow{SB}$. Complete each proportion with the appropriate measure.

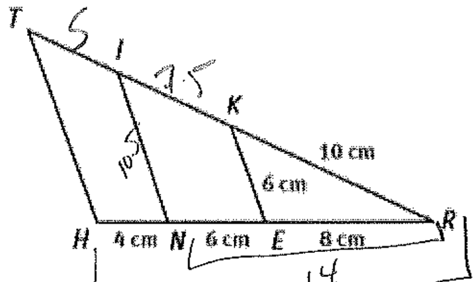


9. $\frac{EA}{BE} = \frac{TY}{?}$ YS

10. $\frac{AT}{?} = \frac{UA}{UB}$ BS

11. $\frac{AB}{UA} = \frac{?}{TU}$ TS

Given the diagram with $\overline{TH} \parallel \overline{IN} \parallel \overline{KE}$ and segment measures as shown.

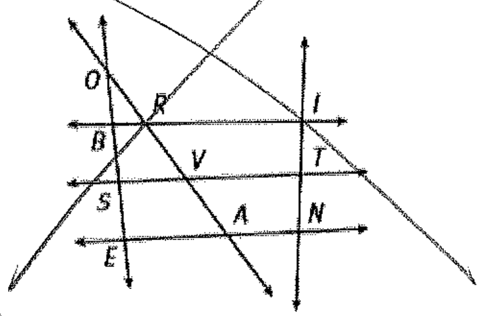


Determine the following measures. Show your work.

12. IK 13. IN

14. IT 15. TH

16. Given the diagram with $\overleftrightarrow{BI} \parallel \overleftrightarrow{ST} \parallel \overleftrightarrow{EN}$, explain how to demonstrate that $\frac{ES}{SB} = \frac{NT}{TI}$.



12) $\frac{10}{8} = \frac{IK}{6}$

$IK = 7.5$

13.) $\frac{8}{6} = \frac{14}{IN}$

$IN = 10.5$

14.) $\frac{10}{8} = \frac{IT}{4}$

$IT = 5$

15.) $\frac{8}{6} = \frac{18}{TH}$

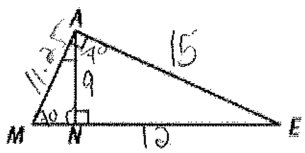
$TH = 13.5$

Geometry Unit 6 Day 9 Right Triangle Altitude Theorem

Learning Target – Students will identify and use relationships that exist when an altitude is drawn to the hypotenuse of a right triangle.

You have investigated properties and relationships of sides and angles in similar triangles. In this section, you examine a special characteristic of right triangles.

Given the figure with right triangle *MAE*, $\overline{AN} \perp \overline{ME}$, $m\angle M = 70°$.



1. Determine these angle measures.

   $m\angle MAN =$ 20° $m\angle EAN =$ 70° $m\angle E =$ 20°

2. Justify that $\triangle MAN \sim \triangle AEN$.

   AA~

3. The large triangle is also similar to the two smaller triangles. Complete the similarity statement, naming the large triangle appropriately.

   $\triangle MAN \sim$ △AEN

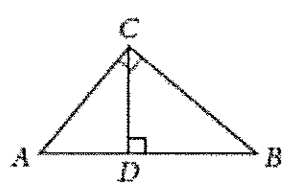
4. Name the type of special segment *AN* is in relation to $\triangle MAE$. altitude

5. Given $AN = 9$ in. and $NE = 12$ in. Use the Pythagorean Theorem and the properties of similar triangles to determine these segment lengths. Show your work.

   $9^2+12^2 = AE^2$
   $AE = 15$

   $AE =$ 15 $MA =$ $\frac{MA}{15} = \frac{9}{12}$ 11.25 $MN =$ $\frac{MN}{9} = \frac{11.25}{15}$ MN = 6.75

Theorem : The altitude to the hypotenuse of a right triangle divides the triangle into two triangles that are similar to the original triangle and to each other.



1.) Which segment in triangle ABC is the altitude? CD
2.) Which segment is the hypotenuse of triangle ABC? AB
3.) Write the similarity statement for the three triangles above based off of the information in the theorem. △ACD ~ △CBD ~ △ABC
4.) Which similarity theorem or postulate makes the above theorem true? Explain.

   AA~

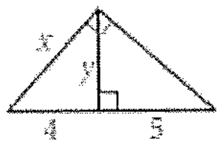
Next page

Definition: The <u>geometric mean</u> of any two numbers is the square root of their product.

5.) Find the geometric mean of 9 and 2. Show all work. Write your answer in simplest radical form. $\sqrt{9 \cdot 2} = \sqrt{18} = 3\sqrt{2}$

Corollary to the Theorem: The length of the altitude to the hypotenuse of a right triangle is the geometric mean of the lengths of the segments of the hypotenuse.

6.) Which variable is the triangle below represents the length of the altitude to the hypotenuse.

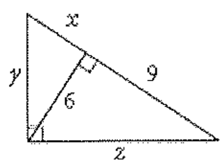


$y = \sqrt{45} = \sqrt{20} = 2\sqrt{5}$

7.) Use the information in the corollary to find the value of that variable. Show all work. Leave your answer in simplest radical form.

You can still use the corollary to solve for one of the segments of the hypotenuse if you know the other segment of the hypotenuse and the length of the altitude.

8.) Use the corollary to find x in the picture below.

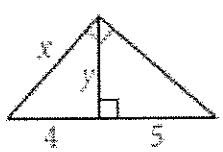


$6 = \sqrt{x \cdot 9}$

$36 = 9x$

$4 = x$

Another Corollary to the Theorem: The altitude to the hypotenuse of a right triangle separates the hypotenuse so that the length of each leg of the triangle is the geometric mean of the length of the adjacent hypotenuse segment and the length of the hypotenuse.



9.) Which segment is the altitude to the hypotenuse? Y

10.) Which labeled segment is a leg of the triangle? X

11.) Which labeled segment is the length of the hypotenuse segment adjacent to that leg? 4

12.) What is the length of the hypotenuse? 9

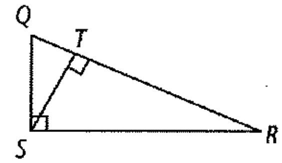
13.) Use the corollary above to find the length of the labeled leg of the triangle. Show all work. Leave your answer in simplest radical form.

$y = \sqrt{4 \cdot 9} = \sqrt{36} = 6$

Geometry Unit 6 Day 9 HW

Honors Geometry Extra Practice 19.2

Identify the following in right ΔQRS.



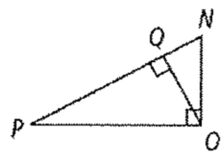
1. the hypotenuse QR

2. the segments of the hypotenuse QT + TR

3. the altitude ST

4. the segment of the hypotenuse adjacent to leg $\overline{QS}$ QT

5. Explain why the three triangles are similar.

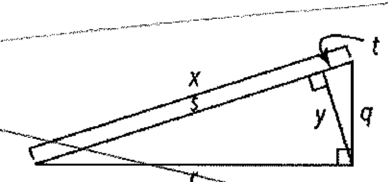


AA~

Use the figure at the right to complete each proportion.

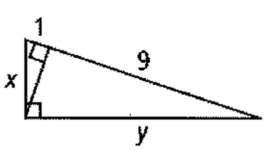
20. $\frac{q}{r}=\frac{\square}{y}$ **21.** $\frac{s}{y}=\frac{\square}{t}$ **22.** $\frac{t}{q}=\frac{q}{\square}$

23. $\frac{q}{x}=\frac{t}{\square}$ **24.** $\frac{s}{r}=\frac{\square}{q}$ **25.** $\frac{\square}{r}=\frac{r}{x}$



Algebra Solve for the value of the variables in each right triangle.

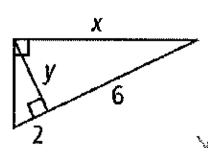
26.



$x=\sqrt{1\cdot 10}=\sqrt{10}$

$y=\sqrt{9\cdot 10}=3\sqrt{10}$

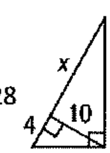
27.



$y=\sqrt{2\cdot 6}$
$=\sqrt{12}$
$=2\sqrt{3}$

$x=\sqrt{6\cdot 8}$
$=\sqrt{48}$
$=4\sqrt{3}$

28

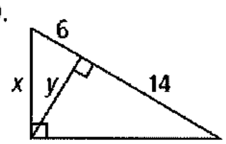


$10=\sqrt{4x}$

$100=4x$

$25=x$

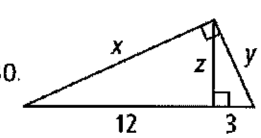
29.



$y=\sqrt{6\cdot 14}=\sqrt{84}$
$=2\sqrt{21}$

$x=\sqrt{6\cdot 20}=\sqrt{120}=4\sqrt{30}$

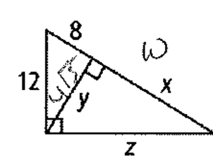
30.



$z=\sqrt{12\cdot 3}=\sqrt{36}=6$

$y=\sqrt{3\cdot 15}=\sqrt{45}=3\sqrt{5}$

$x=\sqrt{12\cdot 15}=\sqrt{180}=6\sqrt{5}$



$8^2+y^2=12^2$

$y^2=80$

$y=4\sqrt{5}$

$4\sqrt{5}=\sqrt{8\cdot x}$

$80=8x$

$10=x$

$10^2+(4\sqrt{5})^2=z^2$

$180=z^2$

$6\sqrt{5}=z$

Geometry Unit 6 Day 11 Perimeter, area and volume of similar figures

Learning Target – Students will compare perimeters, areas and volumes of similar figures.

Perimeters and Areas of Similar Rectangles

- On a piece of grid paper draw a 6-unit by 8-unit rectangle.
- Draw three different rectangles, each similar to the original. One smaller, two larger. Label them I, II and III

1. Use your drawings to complete the following chart:

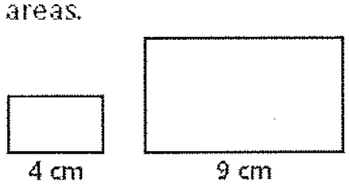
Rectangle	Perimeter	Area
Original		
I		
II		
III		

2. Use the information from the first chart to complete the following chart (simplify the ratios):

Rectangle	Similarity Ratio	Ratio of Perimeters	Ratio of Areas
I to Original		same	(ratio)^2
II to Original			
III to Original			

3. How do the ratios of perimeters and the ratios of areas compare to the similarity ratios?

For the similar rectangles, give the ratios (smaller to larger) of the perimeters and of the areas.



P ratio $\frac{9}{4}$

A ratio $\frac{81}{16}$

The similarity ratio of two regular octagons is 5 : 9. The area of the smaller octagon is 100 in.^{2} Find the area of the larger octagon.

area ratio $= \frac{25}{81} = \frac{100}{x}$

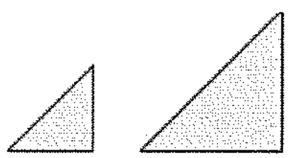
$x = 324$ in^2

Theorem 10-7	**Perimeters and Areas of Similar Figures**

If the similarity ratio of two similar figures is $\frac{a}{b}$, then
(1) the ratio of their perimeters is $\frac{a}{b}$ and
(2) the ratio of their areas is $\frac{a^2}{b^2}$.

The figures in each pair are similar. Compare the first figure to the second. Give the ratio of the perimeters and the ratio of the areas.

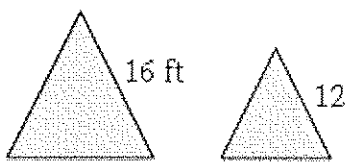
4.



$\frac{15}{25} = \frac{3}{5}$ $\quad \frac{9}{25}$

The figures in each pair are similar. The area of one figure is given. Find the area of the other figure to the nearest whole number.

7.



sim ratio $\frac{12}{16} = \frac{3}{4}$

area ratio $= \frac{9}{16}$

Area of larger triangle = 105 ft^2

$\frac{9}{16} = \frac{x}{105}$

The areas of two similar triangles are 50 cm^2 and 98 cm^2. What is the similarity ratio? What is the ratio of their perimeters?

area $\frac{50}{98} = \frac{25}{49}$ $\quad$ sim $\frac{5}{7}$

10. Decoring An embroidered placemat costs \$2.95. An embroidered tablecloth is similar to the placemat, but four times as long and four times as wide. How much would you expect to pay for the tablecloth?

area is 16x so $2.95 \times 16 = \$47.20$

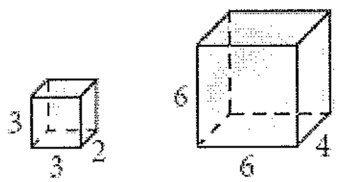
Geometry Unit 6 Day 12 Perimeter, area and volume of similar figures

Learning Target – Students will compare perimeters, areas and volumes of similar figures.

- Similar Solids – Have the same shape and all corresponding sides are proportional.
- The ratio of two corresponding linear dimensions is the similarity ratio of the solids.
- Any two cubes are similar.
- Any two spheres are similar.

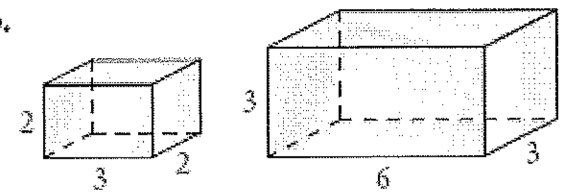
Are the two rectangular prisms similar? If so, give the similarity ratio.

a.



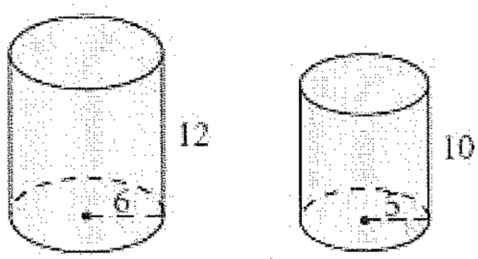
yes 2:1

b.



no

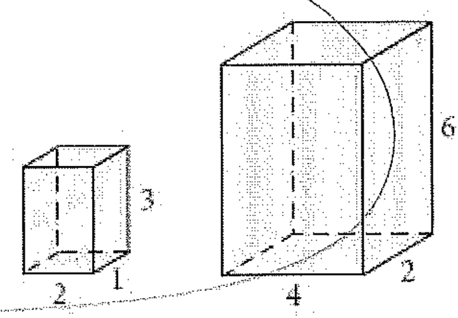
1.



C,

yes $\frac{5}{6}$

2. The two prisms are similar.
- Find the similarity ratio for the two prisms.
- Find the surface area ratio for the two prisms.
- Find the Volume ratio for the two prisms.
- How are the ratios related?



Change

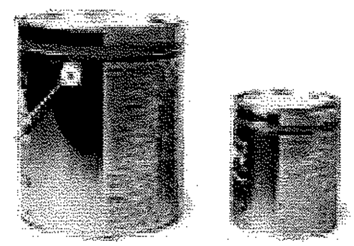
Theorem 11-12 **Areas and Volumes of Similar Solids**

If the similarity ratio of two similar solids is $a : b$, then
(1) the ratio of their corresponding areas is $a^2 : b^2$, and
(2) the ratio of their volumes is $a^3 : b^3$.

3. Find the similarity ratio of two cubes with volumes of 729 cm^3 and 1331 cm^3.

$\frac{\sqrt[3]{729}}{\sqrt[3]{1331}}$ $\frac{9}{11}$ sim ratio

4. **Paint Cans** The lateral areas of two similar paint cans are 1019 cm^2 and 425 cm^2. The volume of the small can is 1157 cm^3. Find the volume of the large can.



$\frac{\sqrt{1019}}{\sqrt{425}} = (1.548)^3 = 3.713$ volume ratio

$1157 * 3.713 = 4295.48$

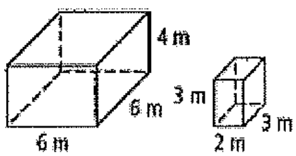
Geometry Unit 6 Day 12 HW

Copy and complete the table for three similar solids.

	Similarity Ratio	Ratio of Surface Areas	Ratio of Volumes
40.	2 : 3	4 : 9	8 : 27
41.	5 : 8	25 : 64	125 : 512
42.	3 : 4	9 : 16	27 : 64

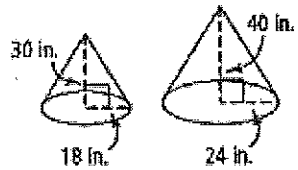
Are the two figures similar? If so, give the similarity ratio.

43.



yes 1/2

44.



yes 4/3

The surface areas of two similar figures are given. The volume of the larger figure is given. Find the volume of the smaller figure.

45. S.A. = 160 ft^2
S.A. = 250 ft^2
V = 600 ft^3

46. S.A. = 121 cm^2
S.A. = 196 cm^2
V = 343 cm^3

47. S.A. = 4 yd^2
S.A. = 4.5 yd^2
V = 8 yd^3

$\sqrt{\frac{160}{250} = \frac{16}{25}} = \frac{4}{5}$

V ratio $= \frac{64}{125} = \frac{x}{600}$ $x = 307.2$

48. How do the surface area and volume of a cylinder change if the radius and height are multiplied by $\frac{3}{4}$?

49. For two similar solids, how are the ratios of their volumes and surface areas related?