High School

Geometry
For Credit
Math Packet

Geometry Packet

Hello Geometry Student!

This packet contains review and enrichment materials for the areas of study in your Geometry course during 3rd Quarter. District teachers from all high schools worked together to create this packet for our students.

We discussed three Modules between January 27 and March 13. This was the time we were in session during 3rd Quarter before the quarantine began. The three Modules included:

- Module 9 - Properties of Quadrilaterals
- Module 11 - Similarity
- Module 12 - Proportional Relationships

Each Module is listed with the priority standard that matches the concepts and skills of that Module. There is also a rubric provided with "I can…" statements to demonstrate mastery and success criteria. Each Module also includes examples, practice, answer keys for the practice, and then a real-life application of the concepts and skills.

If you have any questions about the concepts or skills, please contact your Geometry teacher.

Stay safe and healthy!

Module 9 Properties of Quadrilaterals	**G-CO.C.11** Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.

Rubric

1 (Beginning)	**2 (Developing)**	**3 (Proficient)**	**4 (Advanced)**
Demonstrates some understanding of core skills and concepts. Students minimally meets performance expectations by demonstrating some understanding of core concepts and a partial ability to apply academic knowledge and skills drawn from the majority of course priority standards with gaps in understanding	Developing a basic understanding of core skills and concepts. Students partially meet performance expectations by demonstrating basic understanding of core concepts and the ability to apply academic knowledge and skills drawn from course priority standards in familiar contexts with minor gaps in understanding.	Consistently demonstrates understanding of core skills and concepts. Students consistently meets performance expectations by demonstrating an understanding of core concepts and the ability to apply academic knowledge and skills drawn from course priority standards in familiar contexts.	Consistently demonstrates understanding of complex skills and concepts. Student exceeds performance expectations by demonstrating in-depth understanding of complex concepts and the ability to apply academic knowledge and skills drawn from course priority standards in extended or new contexts.
	● All “I can” statements in “proficient” but the student needs support or makes minor calculation errors	● I can use the properties of parallelograms to solve for missing segment or angle measurements ● I can use the properties of rectangles to solve for missing segment or angle measurements ● I can use the properties of rhombi to solve for missing segment or angle measurements ● I can use the properties of squares to solve for missing segment or angle measurements	● I can compare/contrast the properties of all types of parallelograms ● I can prove that a figure is a parallelogram through justification of properties ● I can apply the properties of all types of parallelograms to solve complex, real-life, (possibly algebraic) problems about segment or angle measurements

Examples and Practice

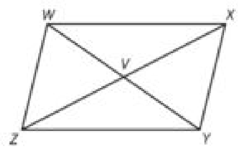
LESSON 9-1

Properties of Parallelograms

Reteach

A parallelogram is a quadrilateral (four-sided figure) with the following properties:

The opposite sides are congruent.
The opposite angles are congruent.
The diagonals bisect each other.



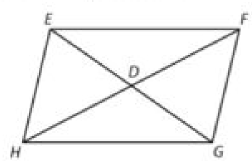
In the figure, $\square WXYZ$ is a parallelogram.

$\overline{WZ} \cong \overline{XY}$ and $\overline{WX} \cong \overline{ZY}$

$\angle ZWX \cong \angle XYZ$ and $\angle WZY \cong \angle WXY$

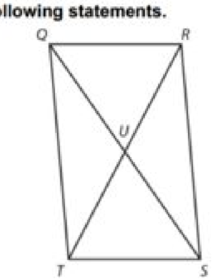
$\overline{WY}$ and $\overline{XZ}$ bisect each other.

In the figure, $\square EFGH$ is a parallelogram. Complete the following statements.



1. $\angle HEF \cong$ _____.
2. $\overline{ED} \cong$ _____.
3. $\overline{HG} \cong$ _____.
4. $\overline{HF}$ bisects _____.

In the figure, $\square QRST$ is a parallelogram. Complete the following statements.



5. $QR = 16$, $TS =$ ______
6. $m\angle QTS = 95°$, $m\angle SRQ =$ ______
7. $QU = 4$, $SU =$ ______
8. $TR = 20$, $TU =$ ______

LESSON 9-2

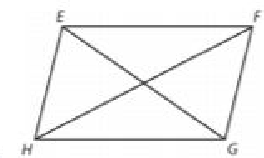
Conditions for Parallelograms

Reteach

There are a number of ways to prove that a quadrilateral is a parallelogram:

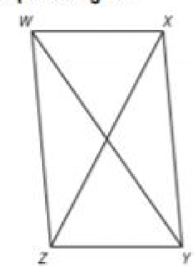
- If the opposite sides are congruent.
- If the opposite angles are congruent.
- If the diagonals bisect each other.

Then the quadrilateral must be a parallelogram.



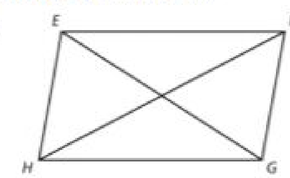
The given figure, *EFGH*, is a quadrilateral. *EFGH* must be a parallelogram if $\overline{EF} \cong \overline{HG}$ and $\overline{EH} \cong \overline{FG}$, or $\angle HEF \cong \angle HGF$ and $\angle EHG \cong \angle EFG$, or $\overline{HF}$ and $\overline{EG}$ bisect each other.

Fill in the missing information that would prove that *WXYZ* is a parallelogram.



1. $\angle WZY \cong$ ______ and $\angle ZWX \cong$ ______
2. $\overline{WX} \cong$ ______ and $\overline{WZ} \cong$ ______
3. $\overline{WY}$ and $\overline{XZ}$ ____________________.

Fill in the missing information that would prove that *WXYZ* is a parallelogram.



4. $EH = 12$ and $GF =$ _____; $EF = 24$ and _____ $= 24$.
5. $m\angle HEF = 100°$ and $m\angle HGF =$ ______;
   $m\angle EHG = 80°$ and $m\angle$ ______ $= 80°$.

LESSON 9-3

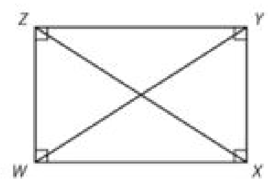
Properties of Rectangles, Rhombuses, and Squares

Reteach

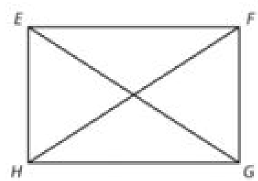
A rectangle is a parallelogram that contains four right angles. The diagonals of a rectangle are congruent.

Remember, all of the properties of parallelograms are true for rectangles. Opposite sides are congruent and parallel.

In the figure, if *WXYZ* is a rectangle, then: $\angle ZWX$, $\angle WXY$, $\angle XYZ$, and $\angle YZW$ are right angles, and $\overline{WY} \cong \overline{XZ}$.



EFGH is a rectangle. Complete the statements that must be true about EFGH.

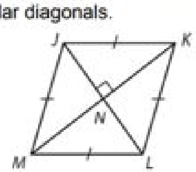


1. $\overline{EG} \cong$ ______

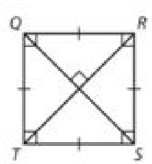
2. $m\angle EHG =$ ______

3. $\overline{EH} \parallel =$ ______

A rhombus is a parallelogram with four congruent sides. A rhombus has perpendicular diagonals.



A square is a rhombus with four congruent sides and four right angles. A square is, therefore, also a parallelogram and a rectangle.



JKLM is a rhombus. Fill in the missing information. Use the figure shown above.

4. If $ML = 32$, $LK =$ _____

5. $m\angle MNL =$ _____

QRST is a square. Fill in the missing information. Use the figure shown above.

6. $\overline{QT} \cong$ _____ $\cong$ _____ $\cong$ _____

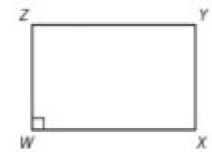
LESSON 9-4

Conditions for Rectangles, Rhombuses, and Squares

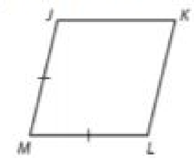
Reteach

Certain conditions of a parallelogram are enough to prove that a parallelogram is a rectangle, a rhombus, or a square.

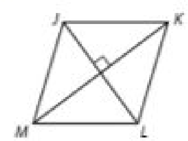
If one angle of a parallelogram is a right angle, the parallelogram is a rectangle.



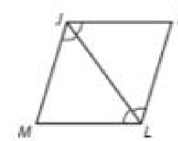
If two consecutive sides of a parallelogram are congruent, the parallelogram is a rhombus.



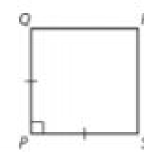
If the diagonals of a parallelogram are perpendicular, it is a rhombus.



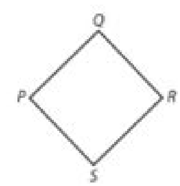
If one diagonal of a parallelogram bisects a pair of opposite angles, it is a rhombus.



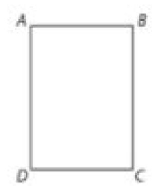
If a parallelogram can be proven to be a rectangle and a rhombus, it is a square.



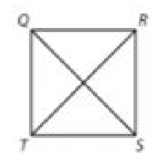
State whether the figure is a rectangle, rhombus, or square. Explain your reasoning. There may be more than 1 answer.



1. $\overline{PQ} \cong \overline{QR}$



2. $m\angle D = 90°$



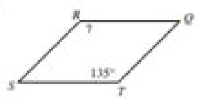
3. $\overline{QS} \perp \overline{TR}$; $\overline{TQ} \cong \overline{QR}$

Properties of Parallelograms

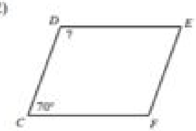
Date________________ Period____

Find the measurement indicated in each parallelogram.

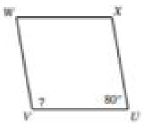
1)



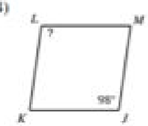
2)



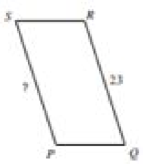
3)



4)



5)



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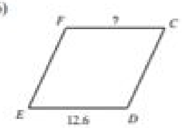
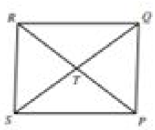
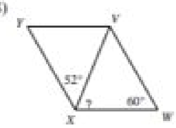


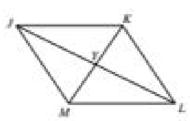
7) $RT = 19.8$
Find RP



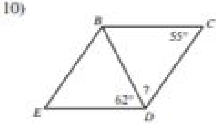
8)



9) $KM = 23.4$
Find YM



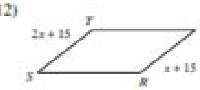
10)



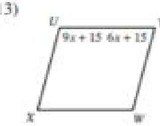
Solve for x. Each figure is a parallelogram.

11)

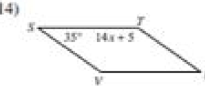
12)



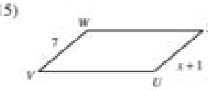
13)



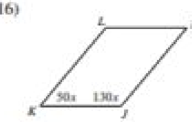
14)



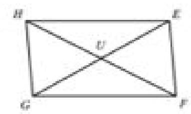
15)



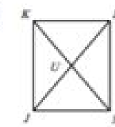
16)



17) $UH = 19$
$FH = 5x - 7$



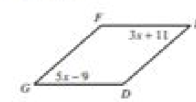
18) $KU = 3x + 3$
$UM = 4x - 4$



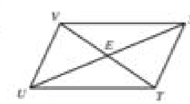
Find the measurement indicated in each parallelogram.

19) Find RQ

20) Find $m\angle G$



21) $TE = 4 + 2x$
$EV = 4x - 4$
Find TE



22) Find $m\angle TSR$

Answer Key for Practice

Reteach 9-1

1. $\angle HGF$
2. $\overline{GD}$
3. $\overline{EF}$
4. $\overline{EG}$
5. 16
6. 95°
7. 4
8. 10

Reteach 9-2

1. $\angle WXY; \angle ZYX$
2. $\overline{YZ}$, $\overline{YX}$
3. bisect each other
4. 12; GH
5. 100°; GFE

Reteach 9-3

1. $\overline{FH}$
2. 90°
3. $\overline{FG}$
4. 32
5. 90°
6. $\overline{TS}$, $\overline{SR}$, $\overline{QR}$

Reteach 9-4

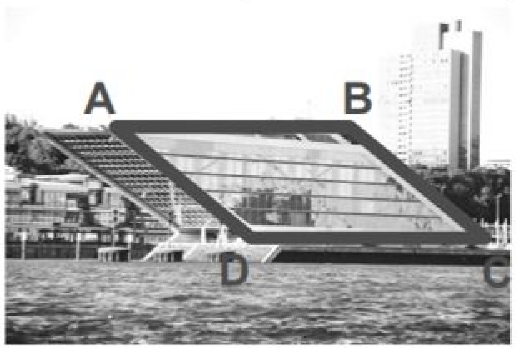
1. *PQRS* is a rhombus, because consecutive sides are congruent.
2. *ABCD* is a rectangle because it contains a right angle.
3. *QRST* is a rhombus. Consecutive sides are congruent, and the diagonals are perpendicular.

Kuta Software Properties of Parallelograms

1. 135°
2. 110°
3. 100°
4. 98°
5. 23
6. 12.6
7. 39.6
8. 68°
9. 11.7
10. 63°
11. 10
12. 0
13. 10
14. 10
15. 6
16. 1
17. 9
18. 7
19. 15
20. 41°
21. 12
22. 55°

Real-Life Application of Properties of Quadrilaterals

The Dockland Building at the Port of Hamburg is a **parallelogram**.



Imagine beams for both diagonals have been added to support the structure, they meet at point M. If diagonal AC = 62 meters and diagonal DB = 35 meters, what is the length of segment AM?

AM = meters

If AB = 5x-15 and DC = x+29, what is the actual length of the Dockland Building?

x =

DC = meters

The baseball field at Miller Park is a **square**.

In major league baseball, the baseline from home plate to 1^{st} base is 90 feet. How far does the catcher have to throw to 2^{nd} base to stop a runner from stealing?

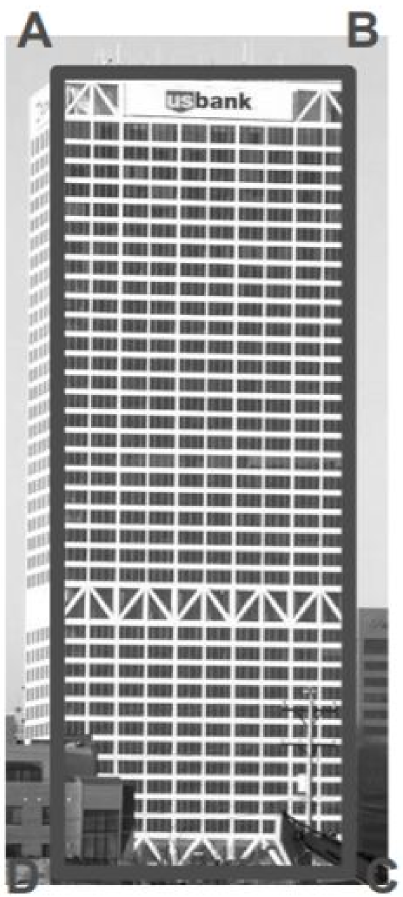
AC = feet

As Christian Yelich runs the bases after hitting a homerun, the angle created as he ran from 2^{nd} base to 3^{rd} base and headed towards home plate is 5h+5

<ADC =

h =

The US Bank building in Milwaukee in a **rectangle**.



If AD = 9x+22 and BC = 5x+102, what is the actual height of the US Bank Building in Milwaukee?

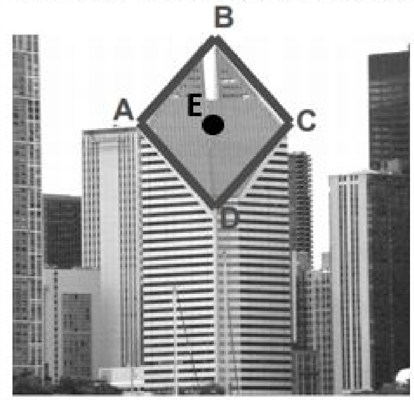
x =

AD = feet

If AD = 601 feet and AB = 300 feet. What would be the length of the steal beam that would be placed diagonally (DB) for support?

DB = feet

The top of the Crain Communications Building in Chicago is a **rhombus**.



The perimeter of the rhombus faced-top of the Crain Communication Building is 692 feet. What is the length of BC?

BC = feet

By connecting opposite vertex angles, the central angles are created. If <BEC = 3k+18, what is the value of k?

<BEC =

k =

Module 11 Similarity	**G-SRT.A.2** Given two figures, use the definition of similarity to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.

Rubric

1 (Beginning)	2 (Developing)	3 (Proficient)	4 (Advanced)
Demonstrates some understanding of core skills and concepts. Students minimally meets performance expectations by demonstrating some understanding of core concepts and a partial ability to apply academic knowledge and skills drawn from the majority of course priority standards with gaps in understanding	Developing a basic understanding of core skills and concepts. Student partially meets performance expectations by demonstrating basic understanding of core concepts and the ability to apply academic knowledge and skills drawn from course priority standards in familiar contexts with minor gaps in understanding.	Consistently demonstrates understanding of core skills and concepts. Students consistently meets performance expectations by demonstrating an understanding of core concepts and the ability to apply academic knowledge and skills drawn from course priority standards in familiar contexts.	Consistently demonstrates understanding of complex skills and concepts. Student exceeds performance expectations by demonstrating in-depth understanding of complex concepts and the ability to apply academic knowledge and skills drawn from course priority standards in extended or new contexts.
	• All “I can” statements in “proficient” but the student needs support or makes minor calculation errors.	• I can identify patterns in concept maps to determine if a transformation is a dilation. • I can find the measure of missing angles of similar triangles by matching corresponding angles. • I can find missing sides of similar triangles by matching up corresponding sides to create 2 equal fractions and then solving that proportion. • I can identify the scale factor of two similar figures by creating a fraction (ratio) of two corresponding sides. • I can prove that figures are similar by identifying one figure can be mapped onto the other figure through one or a series of reflections, translations, rotations or dilations. • I can prove that two triangles are similar to each other by showing two corresponding angles are equal to each other using the AA, SSS, or SAS theorem	• I can prove that figures are similar through justification of properties. • I can apply the properties of similar figures to solve complex, real-life, (possibly algebraic) problems about segment or angle measurements. • I can use dilations, transformations, and reflections to map similar figures.

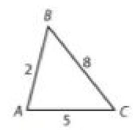
Examples and Practice

LESSON 11-1 Dilations
Reteach

A dilation is a transformation of a figure that changes the size but not the shape of the figure.

$\triangle DEF$ is a dilation of $\triangle ABC$.

$\triangle DEF$ is the same shape as $\triangle ABC$.

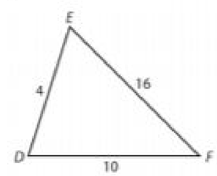


The corresponding angles of $\triangle ABC$ and $\triangle DEF$ are congruent.

$\angle A \cong \angle D$, $\angle B \cong \angle E$, and $\angle C \cong \angle F$

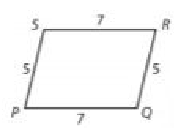
The ratios of the corresponding side lengths are equal.

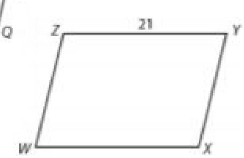
Each side of $\triangle DEF$ has a length that is twice the length of the corresponding side in $\triangle ABC$. So, the *scale factor* of the dilation is 2.



WXYZ is a dilation of PQRS.

1. $m\angle P = 80°$, $m\angle W =$ ________
2. $WZ =$ ________
3. $WX =$ ________
4. What is the scale factor? ________





Is $\triangle DEF$ a dilation of $\triangle ABC$? Explain your answer.

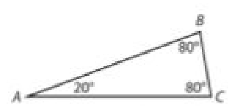
5. ________________________

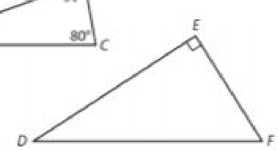
____

____

____

____



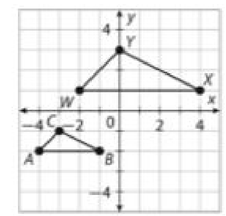


LESSON 11-2 Proving Figures are Similar Using Transformations
Reteach

A similarity transformation is a transformation in which an image can be mapped to a new image that has the same shape.

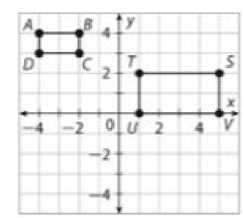
$\triangle ABC$ is similar to $\triangle WXY$ if it can be shown that one of the triangles can be transformed to the other through a series of reflections, translations, rotations, or dilations.

If $\triangle ABC$ is translated 3 units up and 2 units right, and is dilated by a scale factor of 2, it will become $\triangle WXY$. So, $\triangle ABC \sim \triangle WXY$.



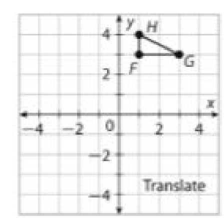
Complete the following transformations that prove that rectangle *ABCD* is similar to rectangle *STUV*.

1. *ABCD* is reflected across the ________.
2. *ABCD* is translated ________ units down and ________ units ________.
3. *ABCD* is dilated by a scale factor of ________.



Triangle *FGH* is transformed into similar triangle *JKL* using the given transformations.

4. Draw *JKL* on the coordinate plane.
   - Translate *FGH* 3 units down and 2 units left.
   - Rotate *FGH* counterclockwise 90 degrees.
   - Dilate *FGH* by a scale factor of 2.



LESSON 11-3

Corresponding Parts of Similar Figures

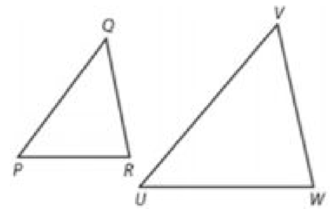
Reteach

Similar figures have certain characteristics:

- The corresponding angles are congruent.
- The corresponding sides are in proportion.

The two triangles shown are similar.

$\triangle PQR \sim \triangle UVW$

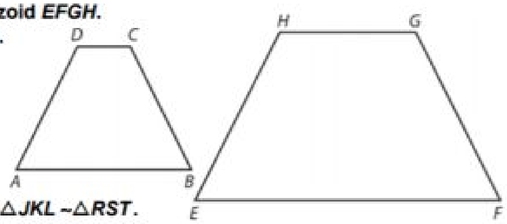


Therefore, the following is true:

$\angle P \cong \angle U \qquad \angle Q \cong \angle V \qquad \angle R \cong \angle W$

$$\frac{PQ}{UV} = \frac{QR}{VW} = \frac{PR}{UW}$$

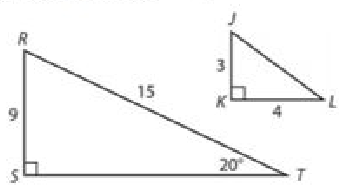
Trapezoid *ABCD* is similar to trapezoid *EFGH*. Complete the following statements.



1. $\angle B \cong \angle$ ____________

2. $\frac{AB}{\_\_\_} = \frac{\_\_\_}{HG} = \frac{CB}{\_\_\_} = \_\_\_$

Find the missing measurements if $\triangle JKL \sim \triangle RST$.



3. $m\angle J =$ ____________

4. $ST =$ ____________

5. $JL =$ ____________

LESSON 11-4

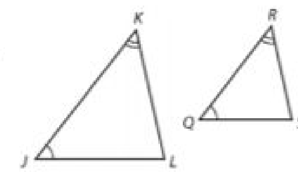
AA Similarity of Triangles

Reteach

If two angles of one triangle are congruent to two corresponding angles of another triangle, then the triangles are similar to each other.

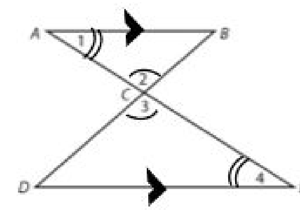
Since $\angle J \cong \angle Q$ and $\angle K \cong \angle R$,

$\triangle JKL \sim \triangle QRS$.



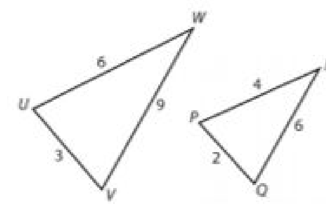
In the figure, $\overline{AB} \parallel \overline{DE}$.
Prove that $\triangle ACB \sim \triangle ECD$.

Statements	Reasons
1. AB || DE	1. Given
2.	2. Vertical $\angle s \cong$
3.	3. Alternate Interior $\angle s \cong$
4. $\triangle ACB \sim \triangle ECD$	4.

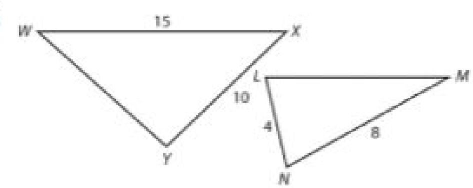


If the corresponding sides of two triangles are proportional, then the triangles are similar.

In the figure, $\triangle ACB \sim \triangle ECD$ since all of the corresponding sides are in the ratio 3 to 2.



$\triangle WXY \sim \triangle LMN$. Find the missing measures in the figure.



5. $WY =$ __________

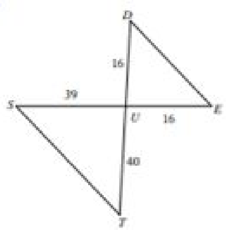
6. $LM =$ __________

Similar Triangles

Date______________ Period____

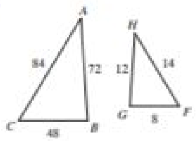
State if the triangles in each pair are similar. If so, state how you know they are similar and complete the similarity statement.

1)



$\Delta UTS \sim$ ______

2)

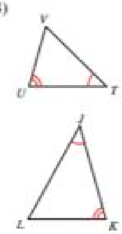


$\Delta CBA \sim$ ______

3)

$\Delta VUT \sim$ ______

4)

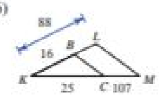


$\Delta JKL \sim$ ______

5)

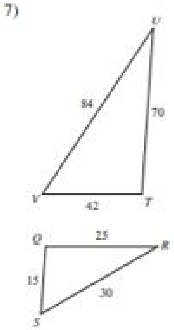
$\Delta STU \sim$ ______

6)



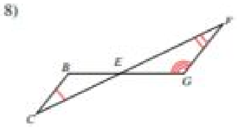
$\Delta KLM \sim$ ______

7)



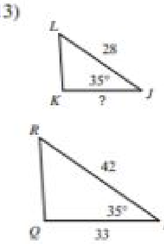
$\Delta TUV \sim$ ______

8)

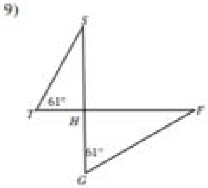


$\Delta EFG \sim$ ______

13)

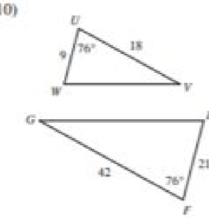


9)



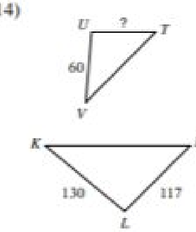
$\Delta HGF \sim$ ______

10)

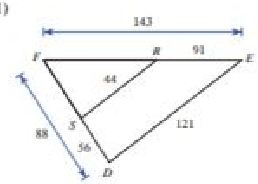


$\Delta FGH \sim$ ______

14)

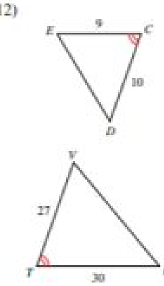


11)



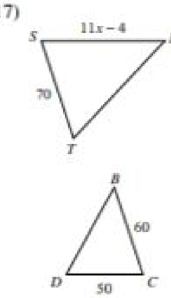
$\Delta FED \sim$ ______

12)



$\Delta TUV \sim$ ______

17)



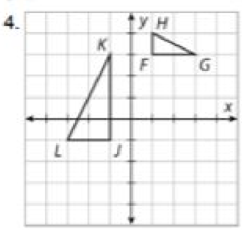
Answer Key for Practice

Reteach 11-1

1. 80°
2. 15
3. 21
4. 3
5. No. The corresponding angles of the two triangles are not congruent.

Reteach 11-2

1. y-axis
2. 3 units down and 1.5 units left
3. 2
4.



Reteach 11-3

1. $\angle F$
2. $\frac{AB}{EF} = \frac{DC}{HG} = \frac{CB}{GF} = \frac{AD}{EH}$
3. 70°
4. 12
5. 5

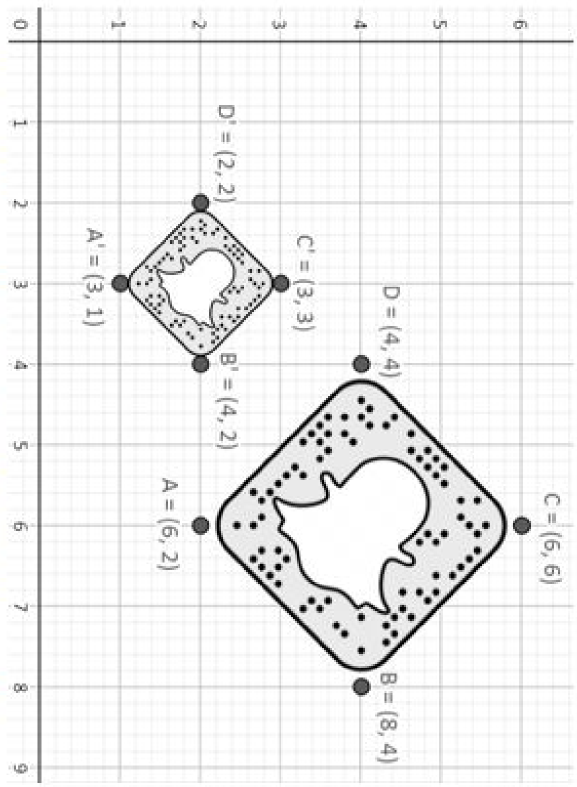
Reteach 11-4

1. $\overline{AB} \parallel \overline{DE}$
2. $\angle 2 \cong \angle 3$
3. $\angle 1 \cong \angle 4$
4. AA
5. 5
6. 12

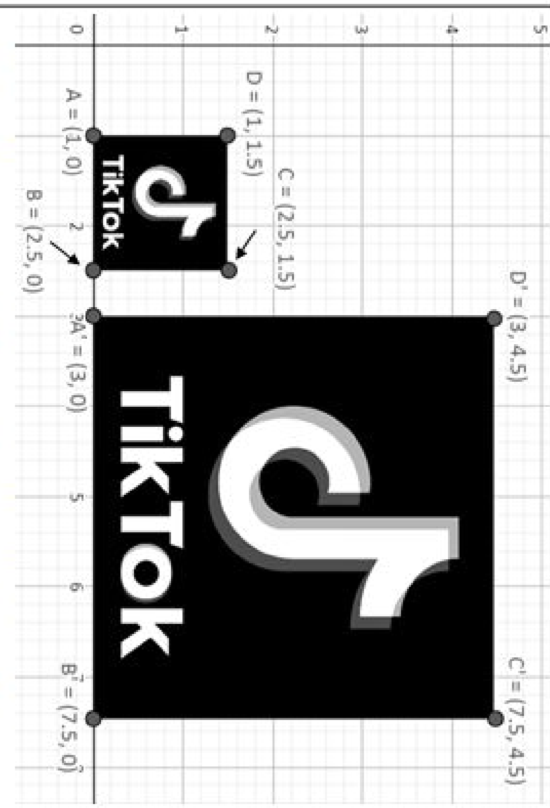
Kuta Software Similar Triangles

1. Not similar
2. Similar, SSS, ΔFGH
3. Similar, SAS, ΔVLM
4. Similar, AA, ΔTUV
5. Not similar
6. Not similar
7. Similar, SSS, ΔQRS
8. Not similar
9. Similar, AA, ΔHTS
10. Similar, SAS, ΔUVW
11. Similar, SSS, ΔFRS
12. Similar, SAS, ΔCDE
13. 22
14. 54
17. 8

Real-Life Application of Similarity

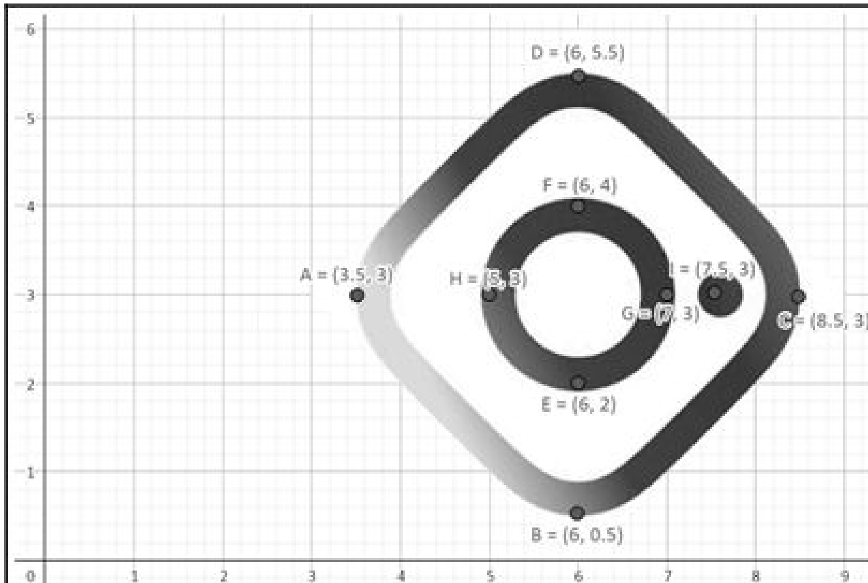


Identify the scale factor for this dilation of the Snapchat Logo



Identify the scale factor for this dilation of the TikTok Logo

Dilate the YouTube Logo by a scale factor of 4



Dilate the Instagram Logo by a scale factor of 1/3

Module 12 Proportional Relationships	**G-SRT.B.5** Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Rubric

1 (Beginning)	**2 (Developing)**	**3 (Proficient)**	**4 (Advanced)**
Demonstrates some understanding of core skills and concepts. Students minimally meets performance expectations by demonstrating some understanding of core concepts and a partial ability to apply academic knowledge and skills drawn from the majority of course priority standards with gaps in understanding	Developing a basic understanding of core skills and concepts. Student partially meets performance expectations by demonstrating basic understanding of core concepts and the ability to apply academic knowledge and skills drawn from course priority standards in familiar contexts with minor gaps in understanding.	Consistently demonstrates understanding of core skills and concepts. Students consistently meets performance expectations by demonstrating an understanding of core concepts and the ability to apply academic knowledge and skills drawn from course priority standards in familiar contexts.	Consistently demonstrates understanding of complex skills and concepts. Student exceeds performance expectations by demonstrating in-depth understanding of complex concepts and the ability to apply academic knowledge and skills drawn from course priority standards in extended or new contexts.
	● All “I can” statements in “proficient” but the student needs support or makes minor calculation errors	● I can find the measure of a segment of a triangle if a segment intersects two sides of a triangle and is parallel to the third side by creating and solving two equal fractions from the four segments that resulted from the segment that cuts through the triangle. ● I can prove that a segment that intersects two sides of a triangle is parallel to the third side by showing that the four segments created by the segment intersecting the two sides are proportional. ● I can find missing segments using indirect measurement to set up and solve two equal fractions (proportion) by matching corresponding parts of the triangles. ● I can find the geometric mean of two similar triangles by setting up and solving a proportion .	● I can use the Triangle Proportionality theorem to find a missing segment. ● I can subdivide a segment into a given ration on a coordinate plane. ● I can use proportional relationships to solve real world problems using shadows and height. ● I can set up and solve a problem using geometric mean in radical form.

Examples and Practice

LESSON 12-1

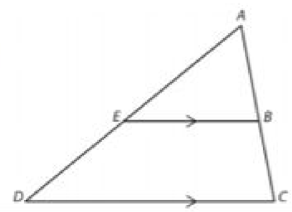
Triangle Proportionality Theorem

Reteach

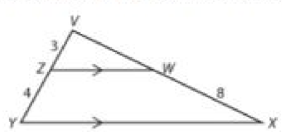
The triangle proportionality theorem states that if a segment intersects two sides of a triangle and is parallel to the third side, it divides the two sides it intersects proportionally.

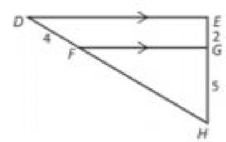
In the figure, $\overline{EB} \parallel \overline{DC}$.

According to the theorem: $\frac{AE}{ED} = \frac{AB}{BC}$.



Find the missing lengths in each of the figures.





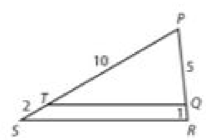
1. $VW =$ ______

2. $HF =$ ______

The converse of the theorem can be proven as well.

If the segments formed by the intersecting line are proportional, then the third side and the intersecting line must be parallel.

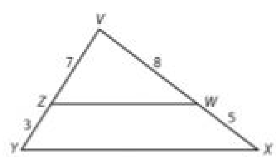
In the figure, since $\frac{PT}{TS} = \frac{PQ}{QR}$, then $\overline{TQ} \parallel \overline{SR}$.



3. In the figure, is $\overline{ZW} \parallel \overline{YX}$? Explain your answer.

____

____



LESSON 12-2

Subdividing a Segment in a Given Ratio

Reteach

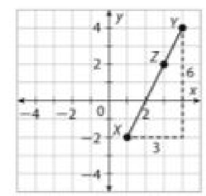
A line segment on the coordinate plane can be divided into smaller segments. To *partition* a segment means to divide it into two segments with a given ratio.

The figure shows the segment $\overline{XY}$ partitioned into a ratio of 2 to 1. The segment $\overline{XZ}$ is $\frac{2}{2+1} = \frac{2}{3}$ of the way from X to Y.

To get from X to Y, the rise is 6 and the run is 3.

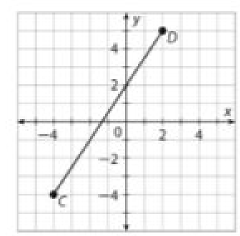
From X, move $\frac{2}{3}$ of the rise $\left(\frac{2}{3} \times 6 = 4\right)$ units,

and move $\frac{2}{3}$ of the run $\left(\frac{2}{3} \times 3 = 2\right)$ units.



Partition $\overline{CD}$ into a 2 to 1 ratio.

1. The coordinates of C are ______.
2. The coordinates of D are ______.
3. The rise from C to D is ______ units.
4. The run from C to D is ______ units.
5. With a 2 to 1 ratio, move ______ of the rise and ______ of the run to get to the point of partition.
6. Add ______ to the x-coordinate of C and ______ to the y-coordinate of C to get to the point of partition.
7. The coordinates of the point of partition are ______.
8. Plot the point of partition and label it X.



LESSON 12-3

Using Proportional Relationships

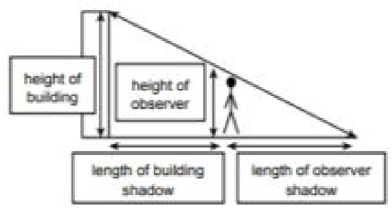
Reteach

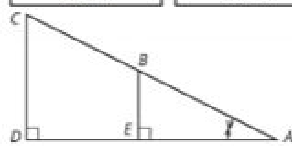
Indirect measurement can be used to find unknown heights and distances using similar triangles and proportional side lengths.

In the figure, the observer is looking up at a building. Both the observer and the building are casting shadows that can be measured. The observer's height can also be measured.

If the figure is labeled with just heights and lengths, notice the similar triangles.

$\triangle ACD \sim \triangle ABE$

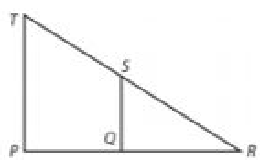




A 6-foot tall man, casting a 2-foot long shadow, is looking up at a building that casts a 22-foot long shadow. Use the figure below to help calculate the height of the building.

1. Which segment represents the height of the building? __________
2. On the figure below, label the segments that represent the height of the man and the shadows with their lengths.
3. What triangles are similar in the figure? __________

   and __________
4. Write a proportion that shows the relation between the corresponding segments in the triangles.
5. How tall is the building? ____________



LESSON 12-4

Similarity in Right Triangles

Reteach

In the proportion $\frac{a}{b} = \frac{b}{c}$, b is called the *geometric mean* of a and c.

The geometric mean of 16 and 4 can be found by setting up the proportion $\frac{16}{b} = \frac{b}{4}$ and solving for b by cross-multiplying.

$$16 \times 4 = b^2 \qquad b = \sqrt{64} = 8$$

Find the geometric mean of the given numbers.

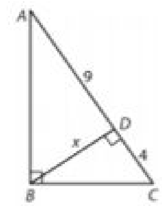
1. 4 and 25
2. 9 and 100
3. 8 and 12

The altitude of a right triangle is the geometric mean of the lengths of the segments of the hypotenuse.

In the figure, $\frac{9}{x} = \frac{x}{4}$

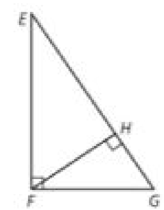
$9 \cdot 4 = x^2$

$x = \sqrt{36} = 6.$



Find the missing length in the right triangle.

4. $EH = 6$, $GH = 3$, $FH =$ __________
5. $EH = 12$, $FH = 6$, $HG =$ __________
6. $EG = 19$, $EH = 15$, $FH =$ __________

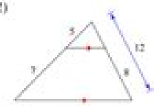


Kuta Software Proportional Relationships

Find the missing length indicated.

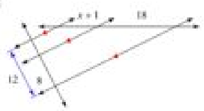
1)

2)

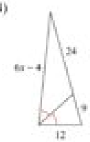


Solve for *x*.

3)

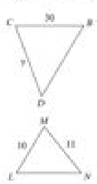


4)

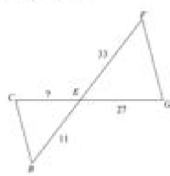


Find the missing length. The triangles in each pair are similar.

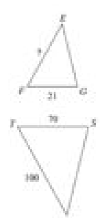
5) $\triangle BCD \sim \triangle LMN$



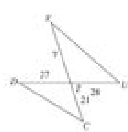
6) $\triangle EFG \sim \triangle EBC$



7) $\triangle STU \sim \triangle GFE$

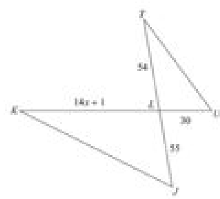


8) $\triangle TUV \sim \triangle TCD$

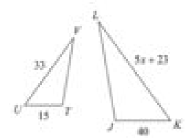


Solve for *x*. The triangles in each pair are similar.

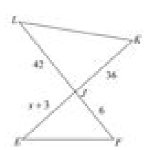
9) $\triangle LKJ \sim \triangle LTU$



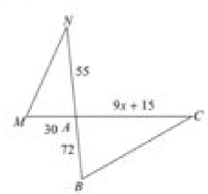
10) $\triangle JKL \sim \triangle TUV$



11) $\triangle JKL \sim \triangle JFE$

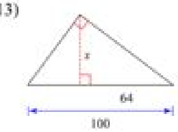


12) $\triangle ABC \sim \triangle AMN$

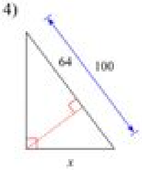


Find the missing length indicated. Leave your answer in simplest radical form.

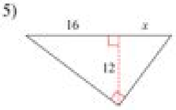
13)



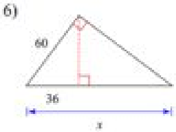
14)



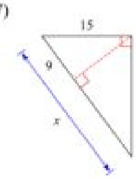
15)



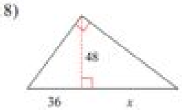
16)



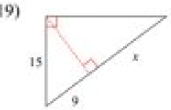
17)



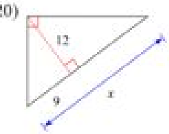
18)



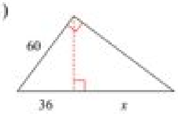
19)



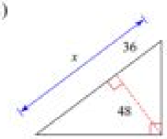
20)



21)



22)



Answer Key for Practice

Reteach 12-1

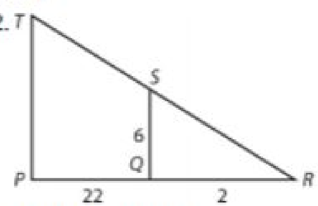
1. 6
2. 10
3. No, because $\frac{YZ}{ZV} \neq \frac{XW}{WV}$

Reteach 12-2

1. (–4, –4)
2. (2, 5)
3. 9
4. 6
5. $\frac{2}{3}, \frac{2}{3}$
6. 4, 6

Reteach 12-3

1. $\overline{PT}$
2.



3. $\Delta QRS \sim \Delta PRT$
4. $\frac{PT}{QS} = \frac{PR}{QR}, \frac{PT}{6} = \frac{24}{2}$
5. 72 feet tall

Reteach 12-4

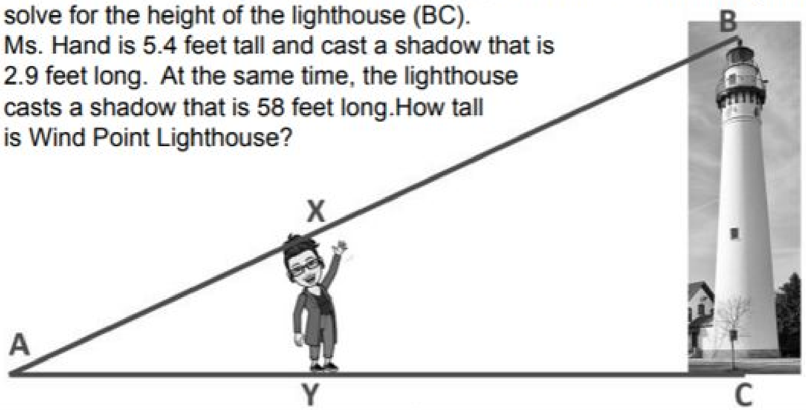
1. 10
2. 30
3. $\sqrt{96} = 4\sqrt{6} \approx 9.8$
4. $\sqrt{18} = 3\sqrt{2} \approx 4.2$
5. 3
6. $\sqrt{60} = 2\sqrt{15} \approx 7.7$

Kuta Software Proportional Relationships

1. 35
2. 10
3. 8
4. 6
5. 33
6. 9
7. 30
8. 36
9. 7
10. 13
11. 4
12. 13
13. 48
14. 60
15. 9
16. 100
17. 25
18. 64
19. 16
20. 25
21. 64
22. 100

Real-Life Application of Proportional Relationships

For today's virtual tour of Racine landmarks, Ms. Hand is visiting the Wind Point Lighthouse, one of the oldest and tallest active lighthouses on the Great Lakes. Since it is too tall to measure, let's create similar triangles to solve for the height of the lighthouse (BC).
Ms. Hand is 5.4 feet tall and cast a shadow that is 2.9 feet long. At the same time, the lighthouse casts a shadow that is 58 feet long.How tall is Wind Point Lighthouse?

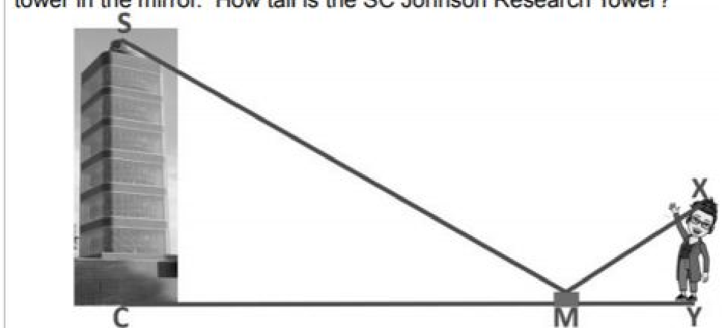


Complete the proportion using segment names below.

$$\frac{AX}{\underline{\quad\quad}} = \frac{\underline{\quad\quad}}{AC}$$

Label the image above. Set up and solve a proportion to solve for the actual height of Wind Point Lighthouse.

Next on Ms. Hand's tour of Racine landmarks is the Frank Lloyd Wright-designed Research Tower at SC Johnson. Again, the structure is too tall to measure, so let's set up similar triangles using a mirror. Ms. Hand places a mirror on the ground 57 feet away from the building. She then stands 2 feet away from the building when she can see the top of the tower in the mirror. How tall is the SC Johnson Research Tower?



Complete the proportion using segment names below.

$$\frac{CM}{\underline{\quad\quad}} = \frac{\underline{\quad\quad}}{MX}$$

Label the image above. Set up and solve a proportion to solve for the actual height of the SC Johnson Research Tower.

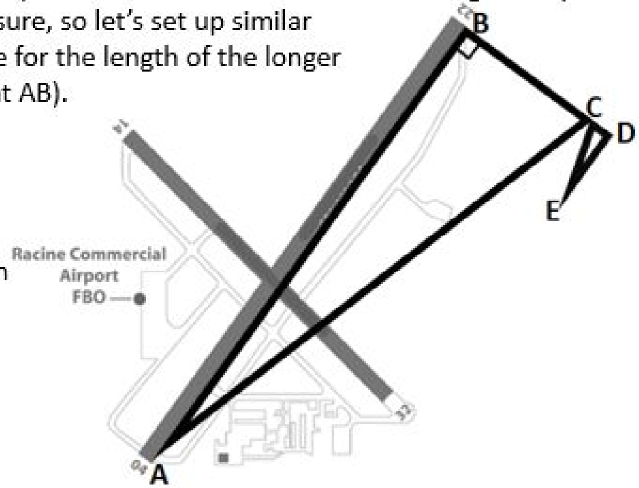
Ms. Hand went to visit the John H Batten Airport. The Racine airport contains to runways for commercial takeoffs and landings. They are too long to measure, so let's set up similar triangles to solve for the length of the longer runway (segment AB).

BC = 1000 feet

CD = 76 feet

ED = 500 feet

How long is the runway at Batten airport?



Set up a proportion using segment name below.

Set up and solve a proportion to solve for the actual length of the longer runway.

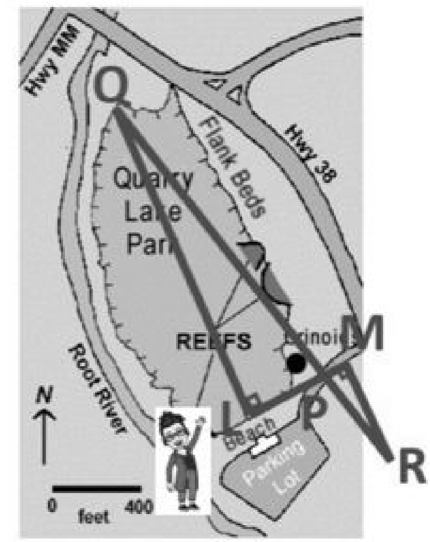
The final stop on Ms. Hand's tour of Racine landmarks is Quarry Lake Park. This former limestone quarry, now offers a spring fed lake for swimming, scuba diving, fishing during the warmer months. The lake is too long to measure, so let's set up similar right triangles along the beach.

LP = 300 feet

PM = 100 feet

MR = 283 feet.

How long is Quarry Lake?



Complete the proportion using segment names below.

$$\frac{QL}{\_\_\_\_} = \frac{\_\_\_\_}{PM}$$

Label the image above. Set up and solve a proportion to solve for the actual length of Quarry Lake.