UNIT 12: SIMILARITY

I can define, identify and illustrate the following terms:

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<th>Similarity</th>
<th>Image</th>
<th>Ratio</th>
<th>Similarity ratio</th>
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<tr>
<td>Dilation</td>
<td>Similarity Statement</td>
<td>Proportion</td>
<td>AA</td>
</tr>
<tr>
<td>Scale Factor</td>
<td>Scale Drawing</td>
<td>Cross products</td>
<td>SAS</td>
</tr>
<tr>
<td>Pre Image</td>
<td>Geometric Mean</td>
<td>Indirect measurement</td>
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Dates, assignments, and quizzes subject to change without advance notice.

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<th>Block Day</th>
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Monday, 11/26

7-1: Ratio and Proportion

- I can write a ratio.
- I can solve a linear proportion.
- I can solve a quadratic proportion.

PRACTICE: Pg 458 #8-15, 24-26, 31-34, 41, 43

Tuesday, 11/27

7-2: Similar Polygons

- I can use the definition of similar polygons to determine if two polygons are similar.
- I can determine the similarity ratio between two polygons.

PRACTICE: Pg 465 #7-17, 19-20, 23, 25, 28, 29

Wednesday, 11/28 or Thursday, 11/29

7-3: Triangle Similarity

- I can use the triangle similarity theorems to determine if two triangles are similar.
- I can use proportions in similar triangles to solve for missing sides.
- I can set up and solve problems using properties of similar triangles.
- I can prove triangles are congruent in a two-column proof.

PRACTICE: Pg 474 #1-4, 11-14, 16, 20-24

Proofs: p 474 #7, 8, 17, 18
Friday, 11/30
Proofs Practice
☐ I can prove triangles are congruent in a two-column proof.

PRACTICE: Similarity Proofs Worksheet

Monday, 12/3
7-4: Applications and Problem Solving
☐ I can use the triangle proportionality theorem and its converse.
☐ I can use the Triangle Angle Bisector Theorem.

PRACTICE: Pg 485 #8-20, 25, 28, 34

Tuesday, 12/4
7-5: Using Proportional Relationships
☐ I can use proportions to determine if a figure has been dilated.
☐ I can use ratios to make indirect measurements.

PRACTICE: Pg 491 #2, 10-12, 18-19, 24-26, 28, 34

Wednesday, 12/5 or Thursday, 12/6
Geometric Mean
☐ I can use geometric mean.

PRACTICE: Geometric Mean Worksheet

Friday, 12/7
➔ QUIZ 2: Similar Triangles (7-3 through 7-5 and Geometric Mean)
☐ I can demonstrate my ability on all previously learned material.

Monday, 12/10
7-6: Dilations & Similarity in the Coordinate Plane
☐ I can use coordinate proof to prove figures similar.
☐ I can apply similarity in the coordinate plan.

PRACTICE: Pg 498 #4-7, 11-14, 21-24

Tuesday, 12/11
Review

PRACTICE: Review Worksheet; Pg 504 – 507 has even MORE practice if you need it.

Wednesday, 12/12 or Thursday, 12/13
➔ Test 12: Similarity
Notes: Similar Figures

What does it mean to be similar?

What do similar figures and congruent figures have in common?

What is different about similar figures and congruent figures?

Example: Identify the pairs of congruent angles and proportional sides in the following figure.

\[ \angle A \cong \ldots \quad \overline{AB} \sim \ldots \]
\[ \angle B \cong \ldots \quad \overline{AD} \sim \ldots \]
\[ \angle K \cong \ldots \quad \overline{JK} \sim \ldots \]
\[ \angle L \cong \ldots \quad \overline{KL} \sim \ldots \]

A similarity statement can be written to show that polygons are similar. Ex: \( \triangle ABC \sim \triangle DEF \)

Example: Write a similarity statement for the figures above.

A similarity ratio is a ratio that compares the ______ of the corresponding sides of two similar polygons. The ratio is written in the same order as the ______________ ______________.

Example: Write a similarity ratio for the figures above.

Example) Determine if each pair of polygons are similar. If so, write the similarity statement and the similarity ratio.

a) \[
\begin{array}{c}
10 \\
16 \\
8 \\
16 \\
35 \\
\end{array}
\]

b) \[
\begin{array}{c}
8 \\
10 \\
20 \\
25 \\
\end{array}
\]
Notes: Similar Triangles

There are 3 ways you can prove triangles similar WITHOUT having to use all sides and angles.

**Angle- Angle Similarity (AA~)** – If two angle of one triangle are ____________ to two corresponding angles of another triangle, then the triangles are similar.

![Angle Angle Similarity Diagram]

**Side- Side- Side Similarity (SSS~)** – If the three sides of one triangle are ________________ to the three corresponding sides of another triangle, then the triangles are similar.

![Side Side Side Similarity Diagram]

**Side-Angle- Side Similarity (SAS~)** – If two sides of one triangle are ________________ to two corresponding sides of another triangle and their included angles are ________________, then the triangles are similar.

![Side Angle Side Similarity Diagram]

**Examples:** Determine if the triangles are similar. If so, tell why and write the similarity statement and similarity ratio.

![Triangle Example 1]

Similar : Y or N Why:_________ Similar : Y or N Why:_________
Similarity Statement :_______~__________ Similarity Statement :_______~__________
Similarity Ratio :__________ Similarity Ratio :__________

![Triangle Example 2]

Similar : Y or N Why:_________ Similar : Y or N Why:_________
Similarity Statement :_______~__________ Similarity Statement :_______~__________
Similarity Ratio :__________ Similarity Ratio :__________
Notes: Proving Triangles are Similar

Given: \( BC = 2(BA) \)
\( BE = 2(BD) \)

Prove: \( \triangle BDA \sim \triangle BEC \)

Proof:

Notes: Properties of Similar Triangles

Ex. 1

Ex. 2

Now that you can write the proportions, you can solve problems.

Ex. 3

Ex. 4

Ex. 5

Ex. 6 Find RV

Ex. 7 Find y
Worksheet: Proving Triangles are Similar (use a separate sheet of paper)

Given: AE is parallel to BD
Prove: \( \triangle CBD \sim \triangle CAE \)

---

Given: \( AB \parallel DC \)
Prove: \( \triangle AEB \sim \triangle CED \)

---

Given: \( 10(GH) = 6(EG) \)
\( 10(IG) = 6(EG) \)
Prove: \( \angle E \cong \angle H \)

---

Given: \( \triangle GHI \) and \( \triangle JKL \)
Verify: \( \triangle GHI \sim \triangle JKL \) in a paragraph proof

---

Given: right \( \triangle ABC; BD \perp AC \)
Prove: \( \triangle ABC \sim \triangle ADB \)

---

Given: \( \ell \parallel k \)
Prove: \( \triangle EFG \sim \triangle IHG \)

---

Given: IE is parallel to VO
Prove: \( \frac{ID}{IV} = \frac{ED}{EO} \)

---

Given: \( \triangle PQR \) and \( \triangle UTS \)
Verify: \( \triangle PQR \sim \triangle UTS \) in a paragraph proof
Proportional Relationships – Extra Practice

_Solve for the variable in each figure._

1. \( y = \_\) 2. \( k = \_\)
   \[ x = \_ \]

3. \( SQ = x \); \( ST = 22 \);
   \( SP = 12 \); \( PR = 4x + 8 \)
   \[ x = \_ \]

4. \( y = \_\)
   \[ x = \_ \]

Given: \( j \parallel k \parallel l \)

5. \( AC = 9; BC = 6; DF = 15 \)
   \[ EF = \_ \]

6. \( AB = 5y; DE = 2y; EF = 12 \)
   \[ BC = \_ \]

7. \( BC = x + 2; BA = 9; EF = x + 3; ED = 12 \)
   \[ x = \_; BC = \_; EF = \_ \]

8. \( AC = 3x; BC = 16; EF = 20; FD = 4x - 2 \)
   \[ x = \_; AC = \_; FD = \_ \]
A publisher is preparing the marketing plan for a new book. The actual cover of the book measures 6 inches by 8 inches, as shown in the figure. The publisher needs to make a reduced image of the book cover for advertisements. Complete Exercises 1–4 to draw the outline of the reduced cover.

1. Use the figure to find the coordinates of each vertex.
   \[ A(______, ______) \quad B(______, ______) \]
   \[ C(______, ______) \quad D(______, ______) \]

2. The publisher wants to make a reduction using a dilation with a scale factor of \( \frac{1}{2} \). Multiply the coordinates by the scale factor to find the coordinates of the reduction.
   \[ A'(______, ______) \quad B'(______, ______) \]
   \[ C'(______, ______) \quad D'(______, ______) \]

3. Plot the coordinates of the reduction and draw the new outline of the book cover.

In the figure, \( \triangle DGH \) is a dilation image of \( \triangle DEF \).

4. Find the scale factor and the coordinates of \( H \).

5. Given that \( \triangle ABC \sim \triangle ADE \), find the scale factor and the coordinates of \( D \).

6. Given that \( \triangle PQR \sim \triangle PST \), find the scale factor and the coordinates of \( S \).

7. \( \triangle FEG \sim \triangle HEJ \). Find the coordinates of \( F \) and the scale factor.
10. Given $E(-2, -6), F(-3, -2), G(2, -2), H(-4, 2),$ and $J(6, 2)$.
Prove: $\triangle EHJ \sim \triangle EFG$.

11. Given $E(-2, -6), F(-3, -2), G(2, -2), H(-4, 2),$ and $J(6, 2)$.
Prove: $\triangle EHJ \sim \triangle EFG$.

12. Given $R(-2, 0), S(-3, 1), T(0, 1), U(-5, 3),$ and $V(4, 3)$.
Prove: $\triangle RST \sim \triangle RUV$.
Notes: Geometric Mean

Sequences:

Arithmetic: 2, 5, 8, 11, 14, _____, _____, ____  What is the common difference?

Geometric: 2, 6, 18, 54, 162, _____, _____, ____  What is the common factor?

1. Starting with the number 1 and using a factor of 4, create 5 terms of a geometric sequence.

2. Starting with the number 5 and using a factor of 3, create 5 terms of a geometric sequence.

3. In the geometric sequence 2, _____, 72, 432, .Find the missing term.

4. In the geometric sequence 6, _____, 24,... Find the missing term.

A term between two terms of a geometric sequence is the ___________________ ________ of the two terms.

The geometric mean of two positive numbers is the positive square root of their products. For \( \frac{a}{x} = \frac{x}{b} \), the x is the geometric mean.

**Examples: Find the geometric mean of the given numbers.**

a. 4 and 9  
b. 6 and 15  
c. 2 and 8

The altitude to the hypotenuse of a right triangle forms two triangles that are ________________ to each other and to the original triangle. In other words, there are ________ similar triangles: a small one, a medium one, and a large one.

**Diagram:**

Take a rectangular sheet of paper and draw the segments shown at right. Cut out the three triangles and align them as shown. If your work is accurate, the triangles should appear similar. In fact, you have demonstrated the following important theorem about right triangles.

1. Draw the three proportional triangles from this sketch:
Examples:

Ex 1: \( m = 2, \ n = 10, \ h = \) _____

Ex 2: \( m = 2, \ n = 10, \ b = \) _____

You draw the similar triangles:

1. \( c = 12; \ m = 6; \ a = \) ?

2. \( m = 4; \ h = 25; \ n = \) ?

3. \( c = 12; \ m = 4; \ h = \) ?
Worksheet: Geometric Mean

What's the next number in the sequence?  1.1, 2.2, 4.4, 8.8, _______

What's the common ratio of the sequence(s) below?

2, 10, 50, 250, 1250, ...  _______
1, -3, 9, -27, 81, -243, ...  _______
1, 4, 7, 10, 13, 16, ...  _______

3 Write two possible answers for the geometric mean of -32 and -2?

For questions 1-5, find the Geometric Mean of the following:

1. 2 and 50
   equation

2. 50 and 1250
   equation

3. 5 and 45
   equation

   \[ x = \text{__________} \quad x = \text{__________} \quad x = \text{__________} \]

4. 45 and 405
   equation

5. 6.4 and 8.8
   equation

   \[ x = \text{__________} \quad x = \text{__________} \]

For questions 6-15, solve for the missing value(s).

6. \[ \begin{align*}
18 \\
\times \quad 2 \\
\end{align*} \]
equation

7. \[ \begin{align*}
x \\
\times \quad 5 \\
\end{align*} \]
equation

8. \[ \begin{align*}
7 \\
\times \quad 28 \\
\end{align*} \]
equation
9. The statue is how tall?

10. Find the length of $AD$.

12. $x = \underline{ \hspace{2cm} }$

13. $x = \underline{ \hspace{2cm} }$

14. $x = \underline{ \hspace{2cm} }$

The statue is how tall?

Find the length of $AD$.

Not drawn to scale