***Chapter 6*** – Similarity

In this chapter we address…Big IDEAS:

1. **Using ratios and proportions to solve geometry problems**
2. **Showing that triangles are similar**
3. **Using indirect measurement and similarity**

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| Section: | **6 – 0 Ratios and Proportions** |
| Essential Question | **What are the properties of proportions?** |

Warm Up:

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Key Vocab:

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| Ratio | A comparison of two numbers.  Written as a fraction (never a decimal) or using a colon.  Should always be written in simplest form  **Examples:**  or |
| Proportion | An equation that states two ratios are equal  **Examples:**  or |
| Extended Proportion | An equation relating three or more ratios  **Examples:** |

Properties:

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| Extremes Means Property | |
| The product of the means is equal to the product of the extremes  Think cross multiply | |
| **If** | **Then** |

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| Properties of Proportions | |
| **If**  you interchange the means (or the extremes), | **Then**  you get an equivalient proportion |
| **If** | **Then  OR** |
| **If**  You take the reciprocals of both the ratios, | **Then**  you get an equivalent proportion |
| **If** | **Then** |
| **If**  you add 1 to both sides | **Then**  you get an equivalient proportion |
| **If** | **Then** |
| In an extended ratio, the ratio of the sum of all the numerators to the sum of all the denominators is equivalent to each of the original ratios | |
| **If** | **Then** |

Show:

Ex 1: Express the ratio in simplest form.

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Ex 2: Find the measure of each angle.

1. Two complementary angles have measure in ratio 2:3

 

1. The measures of the angles of a triangle are in the ratio 2:2:5.

 

1. The perimeter of a triangle is 48 cm and the lengths of the sides are in the ratio 3:4:5. Find the length of each side.

 

Ex 3: Use the properties of proportions to complete each statement.

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| 1. If , then 2*x* = 15 | 1. If , then  = |
| 1. If , then | 1. If , then 3*x* = 28 |
| 1. If , then  *y* : 4 | 1. If , then 32 |

Ex 4: Find the value of *x*.

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| Section: | **6 – 1 Use Similar Polygons** |
| Essential Question | **If two figures are similar, how do you find the length of a missing side?** |

Warm Up:

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Key Vocab:

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| Similar Polygons | Two polygons such that their corresponding angles are congruent and the lengths of corresponding sides are proportional |  |
| Scale Factor | The ratios of the lengths of two corresponding sides of two similar polygons. | The scale factor of *EFGH* to *KLMN* is |

Theorems:

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| Perimeters of Similar Polygons | |
| **If**  two polygons are similar, | **then**  the ratio of their perimeters is equal to the ratios of their corresponding side lengths. |
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Show:

Ex 2: Determine whether the polygons are similar. If they are, write a similarity statement and find the scale factor of *RSTU* to *DEFG.*

**

*RSTU~DEFG*. The scale factor is 

Ex 2: In the diagram, . Find the value of *x.*





Ex 3: In the diagram, . Find the length of the altitude .



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Ex 4: You are constructing a rectangular play area. A playground is rectangular with length 25 meters and width 15 meters. The new area will be similar in shape, but only 10 meters in length.

a.) Find the scale factor of the new play area to the playground.

2:5

b.) Find the perimeter of the playground and the play area.

80 m and 32 m

Closure:

* How do you show that two figures are similar?

Show that all corresponding angles are congruent AND all corresponding sides are in equal proportion.

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| Section: | **6 – 3 Prove Triangles Similar by AA~** |
| Essential Question | How can you show that two triangles are similar? |

Warm Up:

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Postulates:

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| Angle-Angle (AA~) Similarity Postulate | |
| **If**  two angles of one triangle are congruent to two angles of another triangle, | **then**  the two triangles are similar. |
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Show:

Ex1 : Determine whether the triangles are similar. If they are, write a similarity statement. Explain your reasoning.

because right angles are congruent. By the *Triangle Sum Theorem*, , so .  by the *AA Similarity Post.*

Ex2 : Show that the two triangles are similar.

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| **a.)**    , so  Also, .  by the *AA Similarity Post.* | **b.)**    because vertical angles are congruent. Also, since ,  by the *Alternate Interior Angle Theorem.* by the *AA Similarity* |

Ex3 : A school building casts a shadow that is 26 feet long. At the same time a student standing nearby, who is 71 inches tall casts a shadow that is 48 inches long. How tall is the building to the nearest foot?

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| A. 18 ft | B. 33 ft |
| C. 38 ft | D. 131 ft |

Closure:

* Can AA~ be applied to quadrilaterals? Pentagons? Etc.?

No, AA~ ONLY applies to triangles. For any other figure, you must show that all corresponding angles are congruent AND all corresponding sides are in equal proportion.

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| Section: | **6 – 4 Prove Triangles Similar by SSS~ and SAS~** |
| Essential Question | How do you prove that two triangles are similar by SSS~ and SAS~? |

Warm Up:

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Theorems:

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| Side-Side-Side (SSS~) Similarity Theorem | |
| **If**  ALL the corresponding side lengths of two triangles are proportional, | **then**  the triangles are similar. |
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| Side-Angle-Side (SAS~) Similarity Theorem | |
| **If**  an angle of one triangle is congruent to an angle of a second triangle AND the lengths of the included sides are proportional, | **then**  the triangles are similar. |
| AND | 🡪 |

Show:

Ex 1: Is either  similar to ?



 by SSS~

is not similar to .

Ex 2: Is ?.



Yes, by SAS~



Ex 2: If , find the value of *x* that makes .





Ex 5: Write a two-column proof.

Given: 

Prove: 

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| **Steps** | **Reasons** |
|  | 1. Given |
|  | 1. Reflexive Property |
|  | 1. AA~ |
|  | 1. Definition of ~ Triangles (Corresponding sides of ~ figures are proportional) |
|  | 1. Extremes Means Property (Cross Product) |

Ex 6: Write a two-column proof.

Given: 

Prove: 

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| --- | --- |
| **Steps** | **Reasons** |
|  | 1. Given |
|  | 1. Reflexive Property |
|  | 1. SAS~ |
|  | 1. Definition of ~ Triangles (Corresponding sides of ~ figures are proportional) |

Closure:

* What are the three ways to prove that two triangles are similar?

You can show that two triangles are similar using AA~, SSS~, or SAS~

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| Section: | **6 – 5 Use Proportionality Theorems** |
| Essential Question | What conditions allow you to write a proportion in a triangle? |

Warm Up:

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Theorems:

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| Triangle Proportionality Theorem | |
| **If**  a line parallel to one side of a triangle intersects the other two sides, | **then**  it divides the two sides proportionally |
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| Converse of the Triangle Proportionality Theorem | |
| **If**  line divides two sides of a triangle proportionally, | **then**  it is parallel to the third side. |
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| **If**  three parallel lines intersect two transversals | **then**  they divide the transversals proportionally. |
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| **If**  a ray bisects an angle of a triangle, | **then**  it divides the opposite side into segments whose lengths are proportional to the lengths of the other two sides. |
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Show:

Ex 1: In the diagrams, . What is the length of ?





Ex 2: A brace is added to a tree house as shown. Explain how you know the brace is not parallel to the floor.



 so  is not parallel to  and the brace is not parallel to the floor.

20 ft

20 ft

Ex 3: Using the information in the diagram, find the length of *TV*.



 

Main St.

First St.

Second St.

Ex 4: In the diagram,. Use the given side lengths to find the length of 



