Unit 5: Similarity

Content Area: **Mathematics**
Course(s): **Geometry Honors 8**
Time Period: **January**
Length: **3 weeks**
Status: **Published**

Transfer

Previous coursework: explained a proof of the Pythagorean theorem and its converse, applied the pythagorean theorem, extensive work with scale drawings, scale factors, and proportional reasoning

At the end of this unit: Students should think about defining similarity in terms of transformations. Dilations should be constructed on and off the coordinate plane, with the center of dilation occurring anywhere on the coordinate plane. Triangle similarity is addressed in proofs and applied using side splitter and angle bisector theorem- make sure to prove these concepts before solving problems using them.

Instructional strategies:

- This is a great unit to revisit properties of transformations, on and off the coordinate plane, and construction techniques.
- Use previous coursework skills as an introduction to the unit.
- (+) = denotes Honors only skill not on PARCC

Enduring Understandings

Dilations are composed of both a vertical and horizontal stretch using the same scale factor.

Similar triangles can be used to find lengths and distances

Essential Questions

What are the qualities of a transformation the produces similar figures?

How are similar triangles used in real life?

Critical Knowledge and Skills

Vocabulary

Dilations and their Properties

Similar Polygons

Triangle Similarity

Altitude on Hypotenuse/ Geometric Mean

Learning Objectives

Describe the properties of dilation.

Dilate when given a center of dilation and a scale factor.

Determine the center of dilation and the scale factor from a diagram.

Construct a dilation. (+)

Dilate a figure on the coordinate plane rules using any center of dilation.

Identify corresponding angles and sides based on similarity statements.

Write similarity statements for two polygons.

Determine if two triangles are similar based on their corresponding parts.

Describe a sequence of similarity transformations between two similar polygons on the coordinate plane

Describe a sequence of similarity transformations between two similar polygons NOT on the coordinate plane (+)

Prove two triangles to be similar using the minimum requirements of AA, SAS and SSS.

Use the properties of similarity transformations to establish the AA, SAS and SSS criterion for two triangles to be similar.

Prove (the side splitting theorem) that a line parallel to one side of a triangle divides the other two proportionally.

Prove and apply the midsegment (midline) of triangle theorem. (+)

Prove (the angle bisector theorem) that an angle bisector of an angle of a triangle divides the opposite side in two segments that are proportional to the other two sides of the triangle.

Derive the three geometric mean relationships. (+)

Use the geometric mean to solve for sides of triangles.

Prove the Pythagorean Theorem using similarity and the geometric means.

Resources

Pearson Resources:

CB 9-6, 9-7, Ch. 7

Online Resources:

- http://emergentmath.com/2011/02/18/the-pizza-casbah-30-inch-pizza-challenge/
- http://mrpiccmath.weebly.com/blog/3-acts-mmm-juice
- http://map.mathshell.org/materials/lessons.php?taskid=452&subpage=concept
- http://emergentmath.com/2012/11/08/more-math-food-blogging-i-may-need-some-help-from-my-southern-friends/
- http://map.mathshell.org/materials/lessons.php?taskid=429&subpage=problem
- http://illuminations.nctm.org/Lesson.aspx?id=3165

Standards

RST.6-8.4 Determine the meaning of symbols, key terms, and other domain-specific words and phrases as they are used in a specific scientific or technical context relevant to grades 6-8 texts and topics.

RST.6-8.7 Integrate quantitative or technical information expressed in words in a text with a version of that information expressed visually (e.g., in a flowchart, diagram, model, graph, or table).

CRP2. Apply appropriate academic and technical skills.

CRP4. Communicate clearly and effectively and with reason.

CRP11. Use technology to enhance productivity.

9.1.8.A.2 Relate how career choices, education choices, skills, entrepreneurship, and economic conditions affect income.

9.1.8.C.5 Calculate the cost of borrowing various amounts of money using different types of credit (e.g., credit cards, installment loans, mortgages).

9.1.8.D.3 Differentiate among various investment options.

9.1.8.E.6 Compare the value of goods or services from different sellers when purchasing large quantities and small quantities.

9.2.8.B.7 Evaluate the impact of online activities and social media on employer decisions.

8.1.8.A.1 Demonstrate knowledge of a real world problem using digital tools.

8.2.8.C.8 Develop a proposal for a chosen solution that include models (physical, graphical or mathematical) to communicate the solution to peers.

MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.G-SRT.A	Understand similarity in terms of similarity transformations
MA.G-SRT.A.1	Verify experimentally the properties of dilations given by a center and a scale factor:
MA.G-SRT.A.2	Given two figures, use the definition of similarity in terms of similarity transformations 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.
MA.G-SRT.A.3	Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
MA.G-SRT.A.1a	A dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
MA.G-SRT.A.1b	The dilation of a line segment is longer or shorter in the ratio given by the scale factor.
MA.G-SRT.B	Prove theorems involving similarity
MA.G-SRT.B.4	Prove theorems about triangles.
MA.G-SRT.B.5	Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

Mathematically proficient students can apply the mathematics they know to solve problems arising in everyday life, society, and the workplace. In early grades, this might be as simple as writing an addition equation to describe a situation. In middle grades, a student might apply proportional reasoning to plan a school event or analyze a problem in the community. By high school, a student might use geometry to solve a design problem or use a function to describe how one quantity of interest depends on another. Mathematically proficient students who can apply what they know are comfortable making assumptions and approximations to simplify a complicated situation, realizing that these may need revision later. They are able to identify important quantities in a practical situation and map their relationships using such tools as diagrams, two-way tables, graphs, flowcharts and formulas. They can analyze those relationships mathematically to draw conclusions. They routinely interpret their mathematical results in the context of the situation and reflect on whether the results make sense, possibly improving the model if it has not served its purpose.

Mathematically proficient students start by explaining to themselves the meaning of a problem and looking for entry points to its solution. They analyze givens, constraints, relationships, and goals. They make conjectures about the form and meaning of the solution and plan a solution pathway rather than simply jumping into a solution attempt. They consider analogous problems, and try special cases and simpler forms of the original problem in order to gain insight into its solution. They monitor and evaluate their progress and change course if necessary. Older students might, depending on the context of the problem, transform algebraic expressions or change the viewing window on their graphing calculator to get the information they need. Mathematically proficient students can explain correspondences between equations, verbal descriptions, tables, and graphs or draw diagrams of important features and relationships, graph data, and search for regularity or trends. Younger students might rely on using concrete objects or pictures to help conceptualize and solve a problem. Mathematically proficient students check their answers to problems using a different method, and they continually ask themselves, “Does this make sense?” They can understand the approaches of others to solving complex problems and identify correspondences between different approaches.

Mathematically proficient students consider the available tools when solving a mathematical problem. These tools might include pencil and paper, concrete models, a ruler, a protractor, a calculator, a spreadsheet, a computer algebra system, a statistical package, or dynamic geometry software. Proficient students are sufficiently familiar with tools appropriate for their grade or course to make sound decisions about when each of

these tools might be helpful, recognizing both the insight to be gained and their limitations. For example, mathematically proficient high school students analyze graphs of functions and solutions generated using a graphing calculator. They detect possible errors by strategically using estimation and other mathematical knowledge. When making mathematical models, they know that technology can enable them to visualize the results of varying assumptions, explore consequences, and compare predictions with data. Mathematically proficient students at various grade levels are able to identify relevant external mathematical resources, such as digital content located on a website, and use them to pose or solve problems. They are able to use technological tools to explore and deepen their understanding of concepts.