Unit 03-Understanding Similarity

Content Area: **Math**
Course(s):
Time Period: **Full Year**
Length: **5 weeks**
Status: **Published**

General Overview, Course Description or Course Philosophy

In the Understanding Similarity Unit, students will understand the importance of similarity as it relates to the geometry in their environment. Students frequently encounter phenomena that require familiarity with the ideas of enlargement, scale factors, area growth, indirect measurement, and other similarity-related concepts. Similarity is an instance of proportionality, so students will also practice reasoning proportionally. This unit will also help students conceptualize the difference between addition situations and multiplicative situations through the use of proportions and scale factors. Students will investigate and explore similar figures, enlarging and reducing shapes, scaling perimeter and area, and the relationship between similarity and ratios.

OBJECTIVES, ESSENTIAL QUESTIONS, ENDURING UNDERSTANDINGS

Objectives:

Similar Figures:

- Understand what it means for figures to be similar
- Identify similar figures by comparing corresponding sides and angles
- Use scale factors and ratios to describe relationships among the side lengths, perimeters, and areas of similar figures • Generalize properties of similar figures
- Recognize the role multiplication plays in similar relationships
- Recognize the relationship between scale factor and ratio in similar figures
- Use informal methods, scale factors, and geometric tools to construct similar figures (scale drawings)
- Compare similar figures with non-similar figures
- Distinguish algebraic rules that produce similar figures from those that produce non-similar figures
- Use algebraic rules to produce similar figures
- Recognize when a rule shrinks or enlarges a figure
- Explore the effect on the image of a figure if a number is added to the x- or y-coordinates of the figure's vertices

Reasoning With Similar Figures:

- Develop strategies for using similar figures to solve problems
- Use the properties of similarity to find distances and heights that cannot be measured directly

- Predict the ways that stretching or shrinking a figure will affect side lengths, angle measures, perimeters, and areas
- Use scale factors or ratios to find missing side lengths in a pair of similar figures
- Use similarity to solve real-world problems

Essential Questions:

- What does it mean for two figures to be similar?
- How can you decide whether or not two shapes are similar?
- How can you use scale factors to draw similar figures in real-world projects?
- How do certain professions utilize scale drawings?
- How can you use similar triangles to find a distance that is difficult to measure directly?
- How can you use similar triangles to estimate the heights of tall objects?

Enduring Understandings:

- Similar figures have congruent corresponding angles and corresponding sides lengths are in a proportional relationship.
- Applying scale factors less than 1 will shrink a figure.
- Applying scale factors greater than 1 will enlarge a figure.
- The scale factor for two similar figures is established by finding the ratio of a pair of corresponding sides. Scale factor used with other tools allows you to make drawings of similar figures and to compare the perimeters and areas of similar figures.
- If two figures are similar, then you can use a proportional relationship between corresponding sides to find unknown side lengths.

CONTENT AREA STANDARDS

MA.7.G.A.1	Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
MA.7.G.A.2	Draw (with technology, with ruler and protractor, as well as freehand) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle.
MA.7.EE.B.3	Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies.
MA.7.EE.B.4a	Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where p, q, and r are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach.

MA.7.RP.A.2	Recognize and represent proportional relationships between quantities.
MA.7.RP.A.2a	Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin.
MA.K-12.1	Make sense of problems and persevere in solving them.
MA.K-12.2	Reason abstractly and quantitatively.
MA.K-12.3	Construct viable arguments and critique the reasoning of others.
MA.K-12.4	Model with mathematics.
MA.K-12.5	Use appropriate tools strategically.
MA.K-12.6	Attend to precision.
MA.K-12.7	Look for and make use of structure.
MA.K-12.8	Look for and express regularity in repeated reasoning.

RELATED STANDARDS (Technology, 21st Century Life & Careers, ELA Companion Standards are Required)

WRK.K-12.P.5	Utilize critical thinking to make sense of problems and persevere in solving them.
WRK.K-12.P.8	Use technology to enhance productivity increase collaboration and communicate effectively.
WRK.K-12.P.9	Work productively in teams while using cultural/global competence.

STUDENT LEARNING TARGETS

Declarative Knowledge

Students will:

- Understand what it means for two figures to be similar
- Understand how to find the scale factor of two similar figures
- Know what rules and properties create similar and non similar images

Procedural Knowledge

Students will be able to:

- Decide whether two quantities are in a proportional relationship.
- Assess the reasonableness of answers using mental computation and estimation strategies.
- Compare an algebraic solution to an arithmetic solution, identifying the sequence of the

operations in each approach.
- Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form, using tools strategically.
- Reproduce a scale drawing of a geometric figure at a different scale.
- Solve problems involving scale drawings of geometric figures.
- Identify similar figures by comparing corresponding sides and angles
- Recognize the relationship between scale factor and ratios in similar figures
- Use scale factor and ratios to describe relationships among the side lengths of similar figures
- Calculate the new area and perimeter of a figure given the scale factor
- Write and solve proportions to find missing lengths of similar figures
- Use similar triangles to estimate the height of tall objects

EVIDENCE OF LEARNING

Formative Assessments
- MathXL Assignments
- Do Now Check ins
- Formative Assessments - exit tickets, student-friendly proficiency scales, skill checklists ([Google Drive Folder](#))

Summative Assessments
- Summative Assessment [Google Drive Folder](#)
- Oncourse Assessments

RESOURCES (Instructional, Supplemental, Intervention Materials)
Instructional Materials:

- CMP3 - Stretching & Shrinking ([Online link](#) - teacher and student resources)
- Resources for Unit 3 [Google Drive Folder](#)

Supplemental/Intervention Materials:

- Desmos - [Sketchy Dilations](), [Click Battle](), [Scaling Machines]()
- [MathXL]()
- [Khan Academy]()
- [NCTM Illuminations]()
- [Illustrative Math]()
- [Illustrative Math Tasks]()

INTERDISCIPLINARY CONNECTIONS

- Computations
- Architecture
- Construction
- Engineering

ACCOMMODATIONS & MODIFICATIONS FOR SUBGROUPS

See link to Accommodations & Modifications document in course folder.