Orange Public Schools

Office of Curriculum & Instruction
2019-2020 Mathematics Curriculum Guide

7th Grade Mathematics (Accelerated)

Illustrative Mathematics - Unit 8: Dilations, Similarity, and Introducing Slope

March 12, 2020 – April 1, 2020

From the New Jersey State Learning Standards:

In **Accelerated 7th Grade,** instructional time should focus on four critical areas: (1) Rational Numbers and Exponents; (2) Proportionality and Linear Relationships; (3) Introduction to Sampling Inference; (4) Creating, Comparing, and Analyzing Geometric Figures

1. Students develop a unified understanding of number, recognizing fractions, decimals (that have a finite or a repeating decimal representation), and percents as different representations of rational numbers. Students extend addition, subtraction, multiplication, and division to all rational numbers, maintaining the properties of operations and the relationships between addition and subtraction, and multiplication and division. By applying these properties, and by viewing negative numbers in terms of everyday contexts (e.g., amounts owed or temperatures below zero), students explain and interpret the rules for adding, subtracting, multiplying, and dividing with negative numbers. They use the arithmetic of rational numbers as they formulate expressions and equations in one variable and use these equations to solve problems. They extend their mastery of the properties of operations to develop an understanding of integer exponents, and to work with numbers written in scientific notation.

2. Students use linear equations and systems of linear equations to represent, analyze, and solve a variety of problems. Students recognize equations for proportions ($y/x = m$ or $y = mx$) as special linear equations ($y = mx + b$), understanding that the constant of proportionality (m) is the slope, and the graphs are lines through the origin. They understand that the slope (m) of a line is a constant rate of change, so that if the input or x-coordinate changes by an amount A, the output or y-coordinate changes by the amount $m \times A$. Students strategically choose and efficiently implement procedures to solve linear equations in one variable, understanding that when they use the properties of equality and the concept of logical equivalence, they maintain the solutions of the original equation.

3. Students build on their previous work with single data distributions to compare two data distributions and address questions about differences between populations. They begin informal work with random sampling to generate data sets and learn about the importance of representative samples for drawing inferences

4. Students continue their work with area from Grade 6, solving problems involving the area and circumference of a circle and surface area of three-dimensional objects. In preparation for work on congruence and similarity, they reason about relationships among two-dimensional figures using scale drawings and informal geometric constructions, and they gain familiarity with the relationships between angles formed by intersecting lines. Students work with three-dimensional figures, relating them to two-dimensional figures by examining cross sections. They solve real- world and mathematical problems involving area, surface area, and volume of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes and right prisms. Students use ideas about distance and angles, how they behave under translations, rotations, reflections, and dilations, and ideas about congruence and similarity to describe and analyze two-dimensional figures and to solve problems. Students show that the sum of the angles in a triangle is the angle formed by a straight line, and that various configurations of lines give rise to similar triangles because of the angles created when a transversal cuts parallel lines. Students complete their work on volume by solving problems involving cones, cylinders, and spheres.

Yearlong Pacing Guide
Accelerated 7

Grade	SEP	OCT	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
6	Unit 1 6.G	Unit 2 6.RP	Unit 3 6.RP	Unit 4 6.NS		Unit 5 6.NS	Unit 6 6.EE	Unit 7 6.NS	Unit 8 6.SP	
Acc 7	Unit 1 7.RP	Unit 2 7.G / Unit 3 7.RP	Unit 4 7.NS	Unit 5 7.EE	Unit 6 7.G	Unit 7 8.G	Unit 8 8.G / Unit 9 8.EE	Unit 10 8.EE	Unit 11 7.SP	

Unit 1
7.RP: Scale Drawings & Proportional Relationships

Unit 2
7.G: Measuring Circles

Unit 3
7.RP: Proportional Relationships & Percentages

Unit 4
7.NS: Rational Number Arithmetic

Unit 5
7.EE: Expressions, Equations, & Inequalities

Unit 6
7.G: Angles, Triangles and Prisms

Unit 7
8.G: Rigid Transformations & Congruence

Unit 8
8.G: Dilations, Similarity, and Introducing Slope

Unit 9
8.EE: Linear Relationships

Unit 10
8.EE: Exponents and Scientific Notation

Unit 11
7.SP: Probability & Sampling

2019-2020 Accelerated Grade 7 (iM)

Quarter 1			Quarter 2			Quarter 3			Quarter 4	
Unit 1	Unit 2	Unit 3	Unit 4	Unit 5	Unit 6	Unit 7	Unit 8	Unit 9	Unit 10	Unit 11
iM 7.1 iM 7.2	iM 7.3	iM 7.4	iM 7.5	iM 7.6	iM 7.7	iM 8.1	iM 8.2	iM 8.3	iM 8.7	iM 7.8
7.G.1(A) 7.RP.2a(M) 7.RP.2b(M) 7.RP.2c(M) 7.RP.2d(M)	7.G.4(A)	7.RP.1(M) 7.RP.3(M)	7.NS.1(M) 7.NS.2(M) 7.NS.3(M)	7.EE.3(M) 7.EE.4(M) 7.EE.2(M) 7.EE.1(M)	7.G.5(A) 7.G.2(A) 7.G.3(A) 7.G.6(A)	8.G.1(M) 8.G.2(M) 8.G.5(M)	8.G.4(M) 8.G.3(M) 8.EE.6(M)	8.EE.5(M) 8.F.4(S) 8.EE.8(M)	8.EE.1(M) 8.EE.3(M) 8.EE.4(M)	7.SP.6(S) 7.SP.5(S) 7.SP.7(S) 7.SP.8(S) 7.SP.1(S) 7.SP.2(S) 7.SP.3(S) 7.SP.4(S)
20 Days	8 Days	11 Days	14 Days	18 Days	12 Days	13 Days	12 Days	12 Days	11 Days	15 Days
Oct. 9	Oct. 24	Nov. 15	Dec. 12	Jan. 22	Feb. 12	Mar. 11	Apr. 1	Apr. 29	May. 18	June 11

Major Work Supporting Content Additional Content

Table of Contents

References

"Illustrative Mathematics" *Open Up Resources.* 2018
<https://auth.openupresources.org/register/complete>

I. Unit Overview

In this unit, students study pairs of scaled copies that have different rotation or mirror orientations, examining how one member of the pair can be transformed into the other, and describing these transformations.

Through activities students use and extend their knowledge of geometry and geometric measurement. Students begin the first lesson of the unit by looking at cut-out figures, first comparing them visually to determine if they are scaled copies of each other, then representing the figures in a diagram, and finally representing them on a circular grid with radial lines. They encounter the term "scale factor" and the new terms "dilation" and "center of dilation." In the next lesson, students again use a circular grid with radial lines to understand that under a dilation the image of a circle is a circle and the image of a line is a line parallel to the original. During the rest of the unit, students draw images of figures under dilations on and off square grids and the coordinate plane. In describing correspondences between a figure and its dilation, they use the terms "corresponding points," "corresponding sides," and "image." Students learn that angle measures are preserved under a dilation, but lengths in the image are multiplied by the scale factor. They learn the definition of "similar" and use properties of similar figures to justify claims of similarity or non-similarity and to reason about similar figures (MP3). Using these properties, students conclude that if two triangles have two angles in common, then the triangles must be similar. Students also conclude that the quotient of a pair of side lengths in a triangle is equal to the quotient of the corresponding side lengths in a similar triangle. This conclusion is used in the lesson that follows: students learn the terms "slope" and "slope triangle," and use the similarity of slope triangles on the same line to understand that any two distinct points on a line determine the same slope (MP7). In the following lesson, students use their knowledge of slope to find an equation for a line. They will build on this initial work with slope in a subsequent grade 8 unit on linear relationships.

In this unit, several lesson plans suggest that each student have access to a geometry toolkit. Each toolkit contains tracing paper, graph paper, colored pencils, scissors, ruler, protractor, and an index card to use as a straightedge or to mark right angles, giving students opportunities to develop their abilities to select appropriate tools and use them strategically to solve problems (MP5). Note that even students in a digitally enhanced classroom should have access to such tools; apps and simulations should be considered additions to their toolkits, not replacements for physical tools.

Essential Questions

- How can transformations be used to determine congruence and similarity?
- What effects do dilations have on two-dimensional geometric figures?
- What is the meaning of the slope of a line, in the context of the situation?
- How is slope connected to similarity of triangles?

Enduring Understanding

- Congruence of corresponding angles determines similarity only for triangles.
- You must show that there is a sequence of similarity transformations that map one figure to the other. Sequences of geometric transformations can be used to create similar shapes.
- Slope can be represented as a unit rate, and the knowledge of right triangles can be applied to represent slope.
- The concept of slope can be represented visually as a set of right triangles that are similar for each line.

II. Pacing Guide

Activity	New Jersey State Learning Standards (NJSLS)	Estimated Time (Blocks)
Unit 8 Pre-Unit Assessment *Optional*	6.NS.C.8, 7.RP.A.2, 7.RP.A.2.d, 6.NS.A.1, 7.G.A.1	½
Lesson 1: Projecting, Scaling, and Circular Grid	8.G.A	1
Lesson 2: Dilations	8.G.A	1
Lesson 3: Dilations with Similarity	8.G.A, 8.G.A.3, 8.G.A.2, 8.G.A.4	1
Lesson 4: Similar Polygons	8.G.A.2, 8.G.A.4	1
Lesson 5: Similar Polygons and Triangles	8.G.A.2, 8.G.A.4	1
Lesson 6: Side Length Quotients in Similar Triangles	8.G.A, 8.G.A.4	1
Lesson 7: Meet Slope	8.EE.B.6	1
Lesson 8: Writing Equations for Lines	8.EE.B.6, 8.G.A	1
Lesson 9: Using Equations for Lines	8.EE.B.6	1
Lesson 10: The Shadow Knows	8.EE.B.6	1
Performance Task *(Project Based Learning)*	8.G.A.4	½
Unit 8 End of Unit Assessment *Optional*	8.G.A, 8.G.A.5, 8.EE.B.6, 8.G.A.4	**1**
Accelerated Grade 7 Interim Assessment 3	7.NS.1a, 7.NS.1b, 7.NS.1c, 7.NS.2a, 7.NS.2b, 7.NS.2c	**1**
Total Time		**13 Blocks**

Major Work Supporting Content Additional Content

III. Scope & Sequence

Accelerated Unit Lesson	Accelerated Lesson Name	Original Unit Lesson	Activity Name
8.1	Projecting, Scaling, and Circular Grid	8.2.1	Sorting Rectangles
		8.2.1	Scaled Rectangles
		8.2.2	Notice and Wonder: Concentric Circles
		8.2.2	A Droplet on the Surface
		8.2.2	Quadrilateral on a Circular Grid
8.2	Dilations	8.2.3	Dilation Obstacle Course
		8.2.3	Getting Perspective
		8.2.4	Dilations on a Grid w/o coordinates
		8.2.4	Card Sort: Matching Dilations on a Coordinate Grid
		8.2.4	A Dilated Image
8.3	Dilations and Similarity	8.2.5	Many Dilations of a Triangle
		8.2.5	Info Gap: Dilations
		8.2.5	Identifying a Dilation
		8.2.6	Similarity Transformations Part One
8.4	Similar Polygons	8.2.6	Similarity Transformations Part Two
		8.2.6	Methods For Translations and Dilations
		8.2.7	All, Some, None: Congruence and Similarity
8.5	Similar Polygons and Triangles	8.2.7	Find Someone Similar
		8.2.7	How do You Know?
		8.2.8	Making Pasta Angles and Triangles
		8.2.8	Applying Angle-Angle Similarity
8.6	Side Length Quotients in Similar Triangles	8.2.9	Two-three-four and Four-five-six
		8.2.9	Quotients of Sides Within Similar Triangles
		8.2.9	Using Side Quotients to Determine Side Lengths of Similar Triangles
		8.2.9	Similar Sides
8.7	Meet Slope	8.2.10	Equal Quotients
		8.2.10	Similar Triangles on the Same Line
		8.2.10	Multiple Lines with the Same Slope
		8.2.10	Different Slopes of Different Lines
		8.2.10	Finding Slope and Graphing Lines
8.8	Writing Equations for Lines	8.2.11	Coordinates and Lengths in the Coordinate Plane
		8.2.11	What We Mean by an Equation of a Line
		8.2.11	Writing Relationships from Slope Triangles
		8.2.11	Matching Relationships to Graphs
8.9	Using Equations for Lines	8.2.12	Missing center
		8.2.12	Writing Relationships from Two Points
		8.2.12	Dilations and Slope Triangles
		8.2.12	Is the Point on the Line?
8.10	The Shadow Knows	8.2.13	Notice and Wonder: Long Shadows and Short Shadows
		8.2.13	Objects and Shadows
		8.2.13	Justifying the Relationship

IV. Pacing Calendar

Please complete the pacing calendar based on the suggested pacing (*see Pacing Guide on page 3)*.

MARCH

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
1	2	3	4	5	6	7
8	9	10	11	12	13	14
15	16	17	18	19	20	21
22	23	24	25	26	27	28
29	30	31				

Please complete the pacing calendar based on the suggested pacing (*see Pacing Guide on page 3*).

APRIL

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			1	2	3	4
5	6	7	8	9	10	11
12	13	14	15	16	17	18
19	20	21	22	23	24	25
26	27	28	29	30		

V. NJSLA Assessment Evidence Statements

Type I   Type II   Type III

NJSLS	Evidence Statement	Clarification	Math Practices	Calculator ?
8.G.1.a	Verify experimentally the properties of rotations, reflections, and translations: a. Lines are taken to lines, and line segments to line segments of the same length.	i) Tasks may or may not have context	MP. 3 MP. 5 MP. 8	No
8.G.1.b	Verify experimentally the properties of rotations, reflections, and translations: b. Angles are taken to angles of the same measure.	i) Tasks may or may not have context	MP. 3 MP. 5 MP. 8	No
8.G.1.c	Verify experimentally the properties of rotations, reflections, and translations: c. Parallel lines are taken to parallel lines.	i) Tasks may or may not have context	MP. 3 MP. 5 MP. 8	No
8.G.2	Understand that a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations; given two congruent figures, describe a sequence that exhibits the congruence between them.	i) Tasks do not have a context. ii) Figures may be drawn in the coordinate plane, but do not include the use of coordinates. iii) Tasks require students to make connections between congruence and transformations.	MP. 2 MP. 7	No
8.G.3	Describe the effect of dilations, translations, rotations, and reflections on two dimensional figures using coordinates.	i) Tasks have "thin context" to no context. ii) Tasks require the use of coordinates in the coordinate plane. iii) For items involving dilations, tasks must state center of dilation. iv) Centers of dilation can be the origin, the center of the original shape or the vertices of the original shape.	MP. 2 MP. 3 MP. 5	No

8.G.4	Understand that a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations, reflections, translations, and dilations; given two similar two-dimensional figures, describe a sequence that exhibits the similarity between them.	i) Tasks do not have a context. ii) Figures may be drawn in the coordinate plane, but do not include the use of coordinates. iii) Tasks require students to make connections between similarity and transformations.	MP. 2 MP. 7	No
8.EE.6	Use similar triangles to explain why the slope m is the same between any two distinct points on a non-vertical line in the coordinate plane.	i) Tasks do not have a context. ii) Given a non-vertical line in the coordinate plane, tasks might for example require students to choose two pairs of points and record the rise, run, and slope relative to each pair and verify that they are the same. iii) For the explain aspect of 8.EE.6, see 8.C.5.1. iv) Tasks may assess simple graphing of lines from a linear equation in slope-intercept form.	MP. 2 MP. 7	No
8.C.1.1	Base reasoning on the principle that the graph of an equation in two variables is the set of all its solutions plotted in the coordinate plane. Content Scope: Knowledge and skills articulated in 8.EE.6	i) Tasks require students to derive the equation $y=mx$ for a line through the origin and the equation $y=mx+b$ for a line intersecting the vertical axis at b.	MP. 2 MP. 3 MP. 7 MP. 8	Yes
8.C.3.2	Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures. Content Scope: Knowledge and skills articulated in 8.G.2, 8.G.4	-	MP. 3 MP. 5 MP. 6	Yes

8.C.3.3	Construct, autonomously, chains of reasoning that will justify or refute propositions or conjectures. Content Scope: Knowledge and skills articulated in 8.G.5	-	MP. 3 MP. 5 MP. 6	Yes
8.C.5.1	Apply geometric reasoning in a coordinate setting, and/or use coordinates to draw geometric conclusions. Content Scope: Knowledge and skills articulated in 8.EE.6	-	MP. 2 MP. 3 MP. 5	Yes
8.C.5.2	Apply geometric reasoning in a coordinate setting, and/or use coordinates to draw geometric conclusions. Content Scope: Knowledge and skills articulated in 8.G.2, 8.G.4	-	MP. 2 MP. 3 MP. 5	Yes

VI. Differentiated Instruction

Supporting English Language Learners

The purpose of this document is to nudge the field forward by offering support to the next generation of mathematics learners and by challenging persistent assumptions about how to support and develop students' disciplinary language. The goal is to provide guidance to mathematics teachers for recognizing and supporting students' language development processes in the context of mathematical sense making. UL/SCALE provides a framework for organizing strategies and special considerations to support students in learning mathematics practices, content, and language. The framework is intended to help teachers address the specialized academic language demands in math when planning and delivering lessons, including the demands of reading, writing, speaking, listening, conversing, and representing in math (Aguirre & Bunch, 2012). Therefore, while the framework can and should be used to support all students learning mathematics, it is particularly well-suited to meet the needs of linguistically and culturally diverse students who are simultaneously learning mathematics while acquiring English.

For more information, click the link below:

[Supporting ELL Learners](#)

Supporting Students with Disabilities

The philosophical stance that guided the creation of these materials is the belief that with proper structures, accommodations, and supports, all children can learn mathematics. Lessons are designed to maximize access for all students and include additional suggested supports to meet the varying needs of individual students. While the suggested supports are designed for students with disabilities, they are also appropriate for many children who struggle to access rigorous, grade-level content. Teachers should use their professional judgment about which supports to use and when, based on their knowledge of the individual needs of students in their classroom.

For more information, click the link below:

[Supporting Students with Disabilities](#)

VII. Vocabulary

Dilation

A dilation with center O and positive scale factor r takes a point P along the line OP to another point whose distance is r times further away from O than P is. If $r<1$ then the new point is really closer to O, not further away.

The triangle DEF is a dilation of the triangle ABC with center O and with scale factor 3. So D is 3 times further away from O than A is, E is 3 times further away from O than B is, and F is 3 times further away from O than C is.
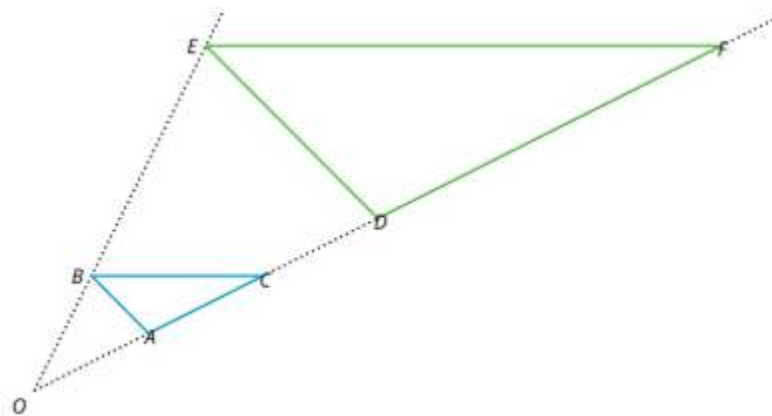
Slope:

The slope of a line is the quotient of the vertical distance and the horizontal distance between any two points on the line.
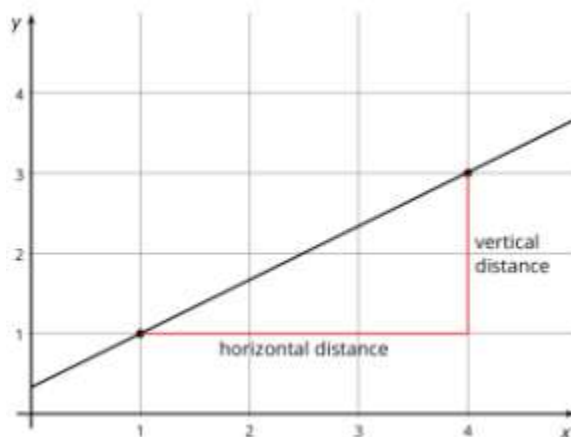
Similarity: One figure is similar to another if there is a sequence of rigid transformations and dilations that moves the first figure so that it fits exactly over the second.

Triangle *ABC* is similar to triangle *DEF* because a rotation about *B* followed by a dilation with center *O* takes the first triangle to the second.
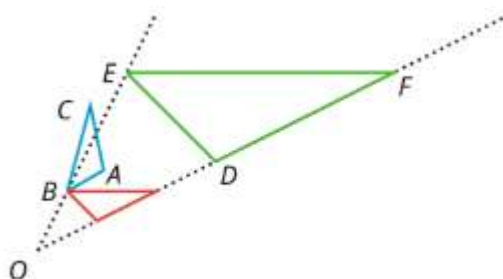
VIII. Assessment Framework

Unit 8 Assessment Framework				
Assessment	**NJSLS**	**Estimated Time**	**Format**	**Graded ?**
Pre-Unit Diagnostic Assessment (Beginning of Unit – Optional) *Illustrative Mathematics*	6.NS.C.8, 7.RP.A.2, 7.RP.A.2.d, 6.NS.A.1, 7.G.A.1	½ Block	Individual	Yes (No Weight)
End-of-Unit Assessment (End of Unit – Optional) *Illustrative Mathematics*	8.G.A, 8.G.A.5, 8.EE.B.6, 8.G.A.4	1 Block	Individual	Yes
Accelerated Grade 7 Interim Assessment 3 (Late March) *iReady Standards Mastery*	7.NS.1a, 7.NS.1b, 7.NS.1c, 7.NS.2a, 7.NS.2b, 7.NS.2c	1 Block	Individual	Yes

Unit 8 Performance Assessment Framework				
Assessment	**NJSLS**	**Estimated Time**	**Format**	**Graded ?**
Unit 8 Performance Task 1 (Early November) *Creating Similar Triangles*	8.G.A.4	½ Block	Individual	Yes; Rubric
Unit 8 Performance Task Option 1 (Optional) *Are They Similar?*	8.G.A.4	Teacher Discretion	Teacher Discretion	Yes, if administered
Extended Constructed Response (ECR)* (click here for access)	Dependent on unit of study & month of administration	Up to 30 minutes	Individual	Yes; Rubric

* Use the following links to access ECR protocol and district assessment scoring documents:
  - *Assessment & Data in Mathematics Bulletin*
  - *Extended Constructed Response Protocol*
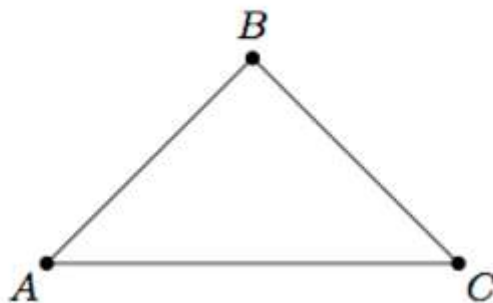
Name _____   Block _____   Date _____

Creating Similar Triangles (8.G.A.4)

In triangle ABC below, ∠B is a right angle and |AB|=|BC|:

Draw a line segment joining one of the vertices of △ABC to the opposite side so that it divides △ABC into two triangles which are both similar to △ABC. Explain, using rigid motions and dilations, why the triangles are similar.

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Accelerated 7th Grade Creating Similar Triangles   Name: _____   Date: _____

NJSLS: 8.G.A.4   Type:_____ Teacher: _____

| SOLUTION |
|---|
| a. Student draws a line segment from the vertex B that is perpendicular to the line AC. |
| b. Student accurately dilates and rotates the new triangle to show that the triangles are similar. |
| c. Student accurately justifies their findings by explaining that the rigid motions do not change the angle measures. Since the angle measurements of both triangles are 45, 45, 90, they are in fact similar. |

Level 5: Distinguished Command	Level 4: Strong Command	Level 3: Moderate Command	Level 2: Partial Command	Level 1: No Command
Clearly constructs and communicates a complete response based on concrete referents provided in the prompt or constructed by the student such as diagrams that are connected to a written (symbolic) method, number line diagrams or coordinate plane diagrams, including: • a logical approach based on a conjecture and/or stated assumptions • a logical and complete progression of steps • complete justification of a conclusion with minor computational error	Clearly constructs and communicates a complete response based on concrete referents provided in the prompt or constructed by the student such as diagrams that are connected to a written (symbolic) method, number line diagrams or coordinate plane diagrams, including: • a logical approach based on a conjecture and/or stated assumptions • a logical and complete progression of steps • complete justification of a conclusion with minor conceptual error	Clearly constructs and communicates a complete response based on concrete referents provided in the prompt or constructed by the student such as diagrams that are connected to a written (symbolic) method, number line diagrams or coordinate plane diagrams, including: • a logical, but incomplete, progression of steps • minor calculation errors • partial justification of a conclusion • a logical, but incomplete, progression of steps	Constructs and communicates an incomplete response based on concrete referents provided in the prompt such as: diagrams, number line diagrams or coordinate plane diagrams, which may include: • a faulty approach based on a conjecture and/or stated assumptions • An illogical and Incomplete progression of steps • major calculation errors • partial justification of a conclusion	The student shows no work or justification.

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Solution

Since △ABC is a right triangle, for our two smaller triangles to be similar to it, they will also need to be right triangles. Our line must start from vertex B, and our line segment must be the one starting at B and perpendicular to line AC. In this example we have labeled the point on line AC as B so that line BD is perpendicular to line AC, shown below:
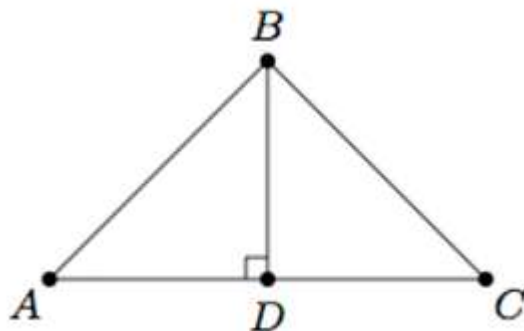
We can show that △ADB is similar to △ABC (the argument for △CDB is much the same). We can translate D to B and then rotate counterclockwise about B so that the right angle ADB matches up with the right angle CBA. We can then dilate the rotated triangle about B. We can move vertex D to match up with vertex B by translating along segment DB. The effect of this is pictured below, with the translated image of △ADB being denoted △A'D'B':
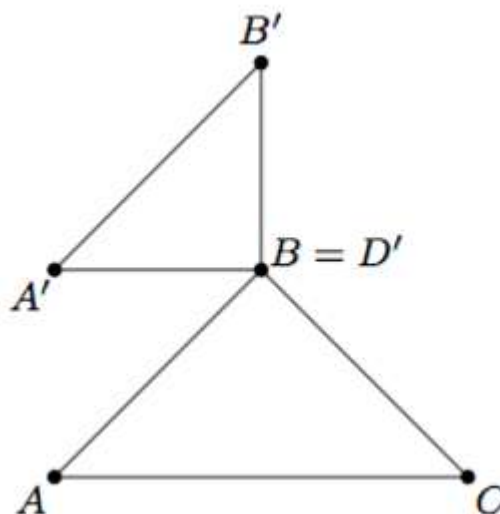
Next we apply a rotation, about B, through angle A'BC. We denote the image of △A'D'B' under the rotation as △A''D''B''. The rotation will send line segment D'A' to BC as shown below:

$$B'$$

$$A'$$

$$B = D'$$

$$A$$

$$C$$
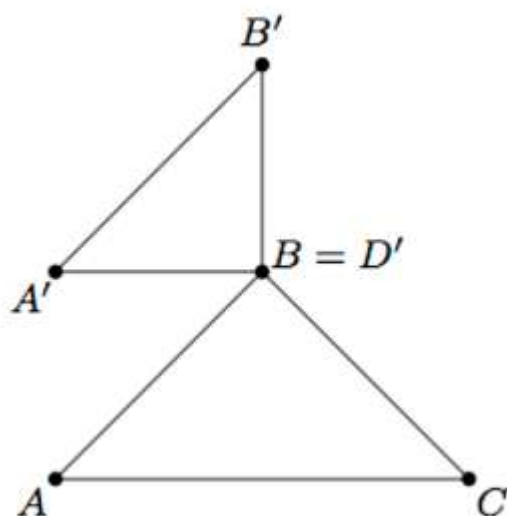
We now apply a dilation with center B which maps A″ to C and B″ to A, which finishes the argument.
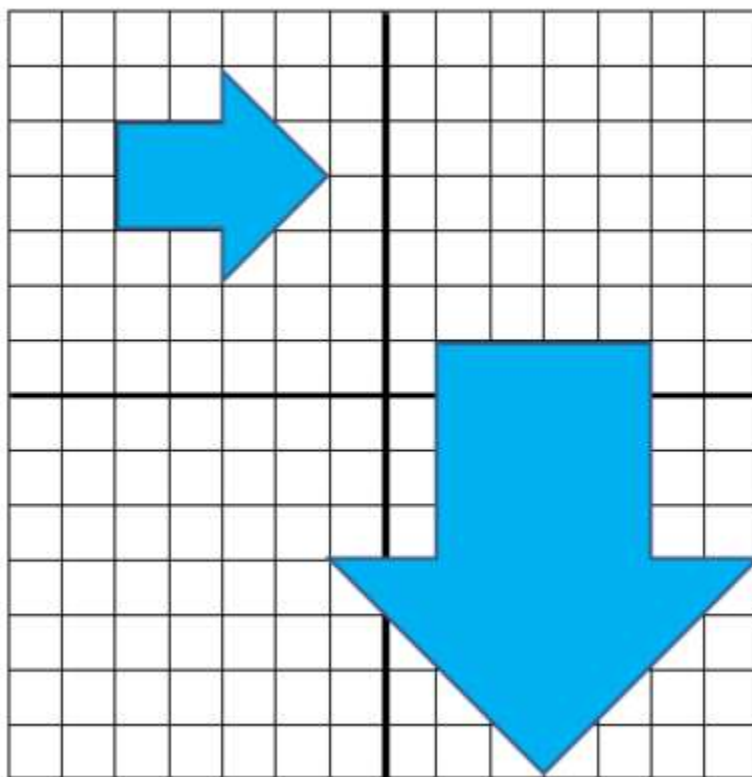
Name _____   Block _____   Date _____

Are They Similar? (8.G.A.4)

Determine, using rotations, translations, reflections, and/or dilations, whether the two polygons below are similar.

The intersection of the dark lines on the coordinate plane represents the origin (0,0) in the coordinate plane.

X. Modifications

Special Education/ 504:	English Language Learners:
-Adhere to all modifications and health concerns stated in each IEP. -Give students a MENU options, allowing students to pick assignments from different levels based on difficulty. -Accommodate Instructional Strategies: reading aloud text, graphic organizers, one-on-one instruction, class website (Google Classroom), handouts, definition list with visuals, extended time -Allow students to demonstrate understanding of a problem by drawing the picture of the answer and then explaining the reasoning orally and/or writing , such as Read-Draw-Write -Provide breaks between tasks, use positive reinforcement, use proximity -Assure students have experiences that are on the Concrete- Pictorial- Abstract spectrum by using manipulatives -Implement supports for students with disabilities (click here) - Make use of strategies imbedded within lessons -Common Core Approach to Differentiate Instruction: Students with Disabilities (pg 17-18) - Strategies for students with 504 plans	- Use manipulatives to promote conceptual understanding and enhance vocabulary usage - Provide graphic representations, gestures, drawings, equations, realia, and pictures during all segments of instruction - During i-Ready lessons, click on "Español" to hear specific words in Spanish - Utilize graphic organizers which are concrete, pictorial ways of constructing knowledge and organizing information - Use sentence frames and questioning strategies so that students will explain their thinking/ process of how to solve word problems - Utilize program translations (if available) for L1/ L2 students - Reword questions in simpler language - Make use of the ELL Mathematical Language Routines (click here for additional information) -Scaffolding instruction for ELL Learners -Common Core Approach to Differentiate Instruction: Students with Disabilities (pg 16-17)
Gifted and Talented:	Students at Risk for Failure:

- Elevated contextual complexity
- Inquiry based or open ended assignments and projects
- More time to study concepts with greater depth
- Promote the synthesis of concepts and making real world connections
- Provide students with enrichment practice that are imbedded in the curriculum such as:
    ●   Application / Conceptual Development
    ●   Are you ready for more?
- Provide opportunities for math competitions
- Alternative instruction pathways available
- Common Core Approach to Differentiate Instruction: Students with Disabilities (pg. 20)
	- Assure students have experiences that are on the Concrete- Pictorial- Abstract spectrum
	- Modify Instructional Strategies, reading aloud text, graphic organizers, one-on-one instruction, class website (Google Classroom), inclusion of more visuals and manipulatives, Peer Support
	- Constant parental/ guardian contact
	- Provide academic contracts to students & guardians
	- Create an interactive notebook with samples, key vocabulary words, student goals/ objectives.
	- Plan to address students at risk in your learning tasks, instructions, and directions. Anticipate where the needs will be, then address them prior to lessons.
	-Common Core Approach to Differentiate Instruction: Students with Disabilities (pg 19)

21st Century Life and Career Skills:

Career Ready Practices describe the career-ready skills that all educators in all content areas should seek to develop in their students. They are practices that have been linked to increase college, career, and life success. Career Ready Practices should be taught and reinforced in all career exploration and preparation programs with increasingly higher levels of complexity and expectation as a student advances through a program of study.
https://www.state.nj.us/education/cccs/2014/career/9.pdf

- **CRP1**. Act as a responsible and contributing citizen and employee.
- **CRP2**. Apply appropriate academic and technical skills.
- **CRP3**. Attend to personal health and financial well-being.
- **CRP4**. Communicate clearly and effectively and with reason.
- **CRP5**. Consider the environmental, social and economic impacts of decisions.
- **CRP6**. Demonstrate creativity and innovation.

- **CRP7**. Employ valid and reliable research strategies.
- **CRP8**. Utilize critical thinking to make sense of problems and persevere in solving them.
- **CRP9**. Model integrity, ethical leadership and effective management.
- **CRP10**. Plan education and career paths aligned to personal goals.
- **CRP11**. Use technology to enhance productivity.
- **CRP12**. Work productively in teams while using cultural global competence.

Students are given an opportunity to communicate with peers effectively, clearly, and with the use of technical language. They are encouraged to reason through experiences that promote critical thinking and emphasize the importance of perseverance. Students are exposed to various mediums of technology, such as digital learning, calculators, and educational websites.

Technology Standards:

All students will be prepared to meet the challenge of a dynamic global society in which they participate, contribute, achieve, and flourish through universal access to people, information, and ideas.
https://www.state.nj.us/education/cccs/2014/tech/

8.1 Educational Technology:	**8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:**
All students will use digital tools to access, manage, evaluate, and synthesize information in order to solve problems individually and collaborate and to create and communicate knowledge.	All students will develop an understanding of the nature and impact of technology, engineering, technological design, computational thinking and the designed world as they relate to the individual, global society, and the environment.

8.1 Educational Technology:

A. **Technology Operations and Concepts:** Students demonstrate a sound understanding of technology concepts, systems and operations.
B. **Creativity and Innovation:** Students demonstrate creative thinking, construct knowledge and develop innovative products and process using technology.
C. **Communication and Collaboration:** Students use digital media and environments to communicate and work collaboratively, including at a distance, to support individual learning and contribute to the learning of others.
D. **Digital Citizenship:** Students understand human, cultural, and societal issues related to technology and practice legal and ethical behavior.
E. **Research and Information Fluency:** Students apply digital tools to gather, evaluate, and use of information.
F. **Critical thinking, problem solving, and decision making:** Students use critical thinking skills to plan and conduct research, manage projects, solve problems, and make informed decisions using appropriate digital tools and resources.

8.2 Technology Education, Engineering, Design, and Computational Thinking - Programming:

A. **The Nature of Technology: Creativity and Innovation-** Technology systems impact every aspect of the world in which we live.
B. **Technology and Society:** Knowledge and understanding of human, cultural, and societal values are fundamental when designing technological systems and products in the global society.
C. **Design:** The design process is a systematic approach to solving problems.
D. **Abilities in a Technological World:** The designed world in a product of a design process that provides the means to convert resources into products and systems.
E. **Computational Thinking: Programming-** Computational thinking builds and enhances problem solving, allowing students to move beyond using knowledge to creating knowledge.

Interdisciplinary Connections:	
English Language Arts:	
L.7.3	Use knowledge of language and its conventions when writing, speaking, reading, or listening.
SL.7.1	Engage effectively in a range of collaborative discussions (one-on-one, in groups, and teacher-led) with diverse partners on *grade 7 topics and texts*, building on others' ideas and expressing their own clearly.
W.7.1	Write opinion pieces on topics or texts, supporting a point of view with reasons and information.

X. Core Instruction & Supplemental Resources
<u>Core Instruction</u>

ILLUSTRATIVE MATHEMATICS V. 2019
(OPEN UP RESOURCES)

GRADE	TEACHER RESOURCES	STUDENT RESOURCES
6	• **Teacher Edition: Unit 1-9** • Online Course Guide	• Student Workbook Set: Unit 1-9 • Online Student Access (Digital Applets)
7	• **Teacher Edition: Unit 1-9** • Online Course Guide	• Student Workbook Set: Unit 1-9 • Online Student Access (Digital Applets)
8	• **Teacher Edition: Unit 1-9** • Online Course Guide	• Student Workbook Set: Unit 1-9 • Online Student Access (Digital Applets)

5 Practices for Orchestrating Productive Mathematics Discussions

Anticipate Consider how students might mathematically interpret a problem, the array of strategies—both correct and incorrect—that they might use to tackle it, and how those strategies and interpretations might relate to the mathematical concepts, representations, procedures, and practices that you would like the students to learn.

- Solve the problem yourself first. If possible work with colleagues.
- Ask yourself the following questions:
  - What strategies have students used in the past?
  - What representations are students most likely to use?
  - What incorrect or unproductive strategies are students likely to try?
  - What things might get in the way of students being able to engage with the problem? How can you remove those barriers?
  - What questions will you ask those who struggle?

Monitor Pay close attention to students' mathematical thinking and solution strategies as they work on the task.

- Create a list of strategies the students may produce.
- Circulate the room. Watch and listen to students as they work.
- If any students use strategies you anticipated, write their name or group number on your list.
- Ask questions that will help students make their thinking visible.
- Ask questions that will help students clarify their thinking.
- Press students to consider aspects of the task to which they need to attend.

Select Select particular students to share their work with the rest of the class to get specific mathematics into the open for discussion. The selection of particular students and their solutions is guided by the previously anticipated strategies and your assessment of how each approach will contribute to that goal.

- Based on the previously anticipated strategies and the mathematical goal of the activity, decide which student strategies to highlight.
- Select students who will share their work with the class.

Sequence Make purposeful choices about the order in which students' work is shared to maximize the chances of achieving the mathematical goals for the discussion.

- Based on the mathematical goal, decide on the purpose for the sequence of work. For example: least efficient to most efficient, concrete to abstract, misconceptions to conceptions, or building representations.
- Decide in which order students will present their work.

Connect Help students draw connections between their solutions and other students' solutions as well as the key mathematical ideas in the lesson. Help students to make judgments about the consequences of different approaches for the range of problems that can be solved, one's likely accuracy and efficiency in solving them, and the kinds of mathematical patterns that can be most easily discerned. Know where you want the discussion to "land" and make choices that are likely to get you there. If necessary, you may have to demonstrate an approach that students didn't come up with themselves.

- As students share, ask questions to elicit and clarify student thinking.
- After each student shares, ask questions to connect it to previously shared work or ask a student to summarize what another student said in their own words.
- Ask students to compare and contrast strategies or representations during the discussion.
- If students did not come up with an approach that you need them to see in order for the discussion to "land," demonstrate this approach and connect it to the work that students did.

IDEAL MATH BLOCK

Whole Group Instruction	55min	**INSTRUCTION (Grades 3 – 8)** Daily Routine: Mathematical Content or Language Routine (7 – 10 min) Anchor Task: Anticipate, Monitor, Select, Sequence, Connect Tech Integration: Digital applets embedded within lessons designed to enhance student learning Collaborative Work* Guided Learning/Guided Practice Independent Work (Demonstration of Student Thinking) Additional Activities / Let's Practice

Rotation Stations (Student Notebooks & Chromebooks Needed)	1-2X 30 min	**STATION 1:** Focus on current Grade Level Content **STUDENT EXPLORATION*** Independent or groups of 2-3 Emphasis on MP's 3, 6 (Reasoning and Precision) And MP's 1 & 4 (Problem Solving and Application) **TOOLS/RESOURCES** Practice Problems Extra Practice/Enrichment Are you ready for more? Put Your Thinking Cap On	**STATION 2:** Focus on Student Needs **TECH STATION** Independent **TECH INTEGRATION** iReady - *i-Ready* delivers online lessons driven by student data to provide tailored instruction that meets students where they are in their learning trajectory. Dreambox (ELL) – Adaptive online learning platform.	**TEACHER STATION:** Focus on Grade Level Content; heavily scaffolded to connect deficiencies **TARGETED** **INSTRUCTION** 4 – 5 Students **TOOLS/ RESOURCES** Homework Manipulatives Reteach Workbook Transition Guide *all students seen in 2 weeks

Closure	5 min	**INSTRUCTION** Exit Ticket (Demonstration of Student Thinking) **TOOLS/RESOURCES** Notebooks or Exit Ticket Slips

* Promotes discourse and collaboration

<u>Supplemental Resources</u>

Achieve the Core

Tasks - https://achievethecore.org/category/416/mathematics-tasks

Coherence Map - https://achievethecore.org/page/1118/coherence-map

Embarc

https://embarc.online/

Engage NY

https://www.engageny.org/ccss-library/?f%5B0%5D=field_subject%253Aparents_all%3A13601

iReady Digital Platform

https://login.i-ready.com/

Illustrative Mathematics

Content Standard Tasks - https://tasks.illustrativemathematics.org/content-standards

Practice Standard Tasks - https://tasks.illustrativemathematics.org/practice-standards

Open Up Resources - https://access.openupresources.org/sign_in

iM Additional Resources - https://bit.ly/imshare

Khan Academy

https://www.khanacademy.org/math/illustrative-math

NJDOE Digital Item Library

https://nj.digitalitemlibrary.com/home?subject=Math

Ready Teacher Toolbox

https://teacher-toolbox.com/