Understand congruence and similarity using physical models, transparencies, or geometry software (8.G.1-5)	
Standard 8.G.1: 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. **b.** Angles are taken to angles of the same measure. **c.** Parallel lines are taken to parallel lines.	
Concepts and Skills to Master (This is student's first exposure to transformations in the Utah Core)	
• Basic understanding of rotation (about a point), reflection (about a line), and translation (in a given direction). • Verify that congruence of line segments and angles is maintained through rotation, reflection, and translation. • Verify that lines remain lines through rotation, reflection, and translation. • Verify that when parallel lines are rotated, reflected, or translated, each in the same way, they remain parallel lines.	
Related Standards: Current Course	Related Standards: Future Courses
8.G.2, 8.G.3, 8.G.4, 8.G.5	All congruence standards, including: I.G.CO.1, I.G.CO.2, I.G.CO.3, I.G.CO.4, I.G.CO.5, I.G.CO.6, I.G.CO.7, I.G.CO.8, I.G.CO.12, I.G.CO.13, II.G.CO.9, II.G.CO.10, II.G.CO.11

Support for Teachers

Critical Background Knowledge (Access Background Knowledge)
• Draw angles, segments, lines, and parallel lines (4.G.1) and measure angles using a protractor (4.MD.6) • Classify two dimensional figures based on parallel lines (4.G.2) • Draw geometric shapes (7.G.2)
Academic Vocabulary
Transformation, rotation, reflection, translation, angle of rotation, center of rotation, line of reflection, image, pre-image, angle, segment, parallel line
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5180#71440

Understand congruence and similarity using physical models, transparencies, or geometry software (8.G.1-5)	
Standard 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.	
Concepts and Skills to Master (This is student's first exposure to congruence in the Utah Core)	
• Understand that the congruency of two dimensional figures is maintained while undergoing rigid transformations. • Describe the transformation of a figure as a rotation, reflection, translation or a combination of transformations. • Understand congruence via transformations using physical models, transparencies, or geometry software.	
Related Standards: Current Course	Related Standards: Future Courses
8.G.1, 8.G.3, 8.G.4	All congruence standards, including: I.G.CO.1, I.G.CO.2, I.G.CO.3, I.G.CO.4, I.G.CO.5, I.G.CO.6, I.G.CO.7, I.G.CO.8, I.G.CO.12, I.G.CO.13, II.G.CO.9, II.G.CO.10, II.G.CO.11

Support for Teachers

Critical Background Knowledge (Access Background Knowledge)
• Verify experimentally the properties of rotations, reflections, and translations (8.G.1) • Draw geometric shapes (7.G.2)
Academic Vocabulary
Congruent, rotation, reflection, translation, rigid motion, center of rotation, line of reflection, angle of rotation, image, pre-image
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5180#71440

Understand congruence and similarity using physical models, transparencies, or geometry software (8.G.1-5)	
Standard 8.G.3: Observe that orientation of the plane is preserved in rotations and translations, but not with reflections. Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	
Concepts and Skills to Master	
• Observe that orientation of the plane is preserved in rotations and translations, but not with reflections. • Understand characteristics of dilations, translations, rotations, and reflections of two-dimensional figures on the coordinate plane (describing transformations as functions takes place in Secondary Mathematics I). • Effects of transformations might include: size/shape does not change in translations, reflections and rotations; orientation changes with reflections.	
Related Standards: Current Course	Related Standards: Future Courses
8.G.1, 8.G.2, 8.G.4	All congruence standards, including: I.G.CO.1, I.G.CO.2, I.G.CO.3, I.G.CO.4, I.G.CO.5, I.G.CO.6, I.G.CO.7, I.G.CO.8, I.G.CO.12, I.G.CO.13, II.G.CO.9, II.G.CO.10, II.G.CO.11

Support for Teachers

Critical Background Knowledge (Access Background Knowledge)
• Plot or identify points on the coordinate plane (6.G.3) • Scale drawings (7.G.1) • Verify experimentally the properties of rotations, reflections, and translations (8.G.1)
Academic Vocabulary
transformation, coordinate, dilation, rotation, reflection, translation, image, center of rotation, line of reflection, angle of rotation
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5180#71440

Understand congruence and similarity using physical models, transparencies, or geometry software (8.G.1-5)	
Standard 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.	
Concepts and Skills to Master	
• Understand that any combination of rotations, reflections, translations, and dilations will result in a similar figure. • Describe the sequence of transformations needed to show how one figure is similar to another. • Perform transformations using physical models, transparencies, or geometry software. (Rigid motion transformations will be addressed in Secondary Mathematics I.) • Understand similarity using physical models, transparencies, or geometry software. (Properties of dilations given by a center and a scale factor will be addressed in Secondary Mathematics II).	
Related Standards: Current Course	Related Standards: Future Courses
8.G.1, 8.G.2, 8.G.3, 8.G.5	II.G.SRT.1, II.G.SRT.2, II.G.SRT.3, II.G.SRT.4, II.G.SRT.5, II.G.SRT.6, II.G.C.1, and I.G.CO.1, I.G.CO.2, I.G.CO.12

Support for Teachers

Critical Background Knowledge (Access Background Knowledge)
• Verify experimentally the properties of rotations, translations, reflections, and dilations (8.G.1) • Understand congruence using rotations, reflections, and translations (8.G.2) • Describe effect of dilations, rotations, reflections, and translations (8.G.3) • Understand proportions (7.RP)
Academic Vocabulary
similar, similarity, dilation, rotation, reflection, translation, transformation
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5180#71440

Understand congruence and similarity using physical models, transparencies, or geometry software (8.G.1-5)	
Standard 8.G.5: Use informal arguments to establish facts about the angle sum and exterior angle of triangles, about the angles created when parallel lines are cut by a transversal, and the angle-angle criterion for similarity of triangles. *For example, arrange three copies of the same triangle so that the sum of the three angles appears to form a line, and give an argument in terms of transversals why this is so.*	
Concepts and Skills to Master	
• Use informal arguments (proofs occur in Secondary Mathematics II) to establish facts about: ○ the angle sum of triangles. ○ exterior angle of triangles. ○ about the angles created when parallel lines are cut by a transversal. ○ the angle-angle criterion for similarity of triangles.	
Related Standards: Current Course	Related Standards: Future Courses
8.G.2, 8.G.4, 8.EE.6	II.G.CO.9, II.G.CO.10, II.G.SRT.3, II.G.SRT.4, II.G.SRT.5, II.G.SRT.6

Support for Teachers

Critical Background Knowledge (Access Background Knowledge)
• Understand that a two dimensional figure is congruent/similar to another if the second can be obtained from the first by a sequence of rotations, reflections, and translations/and dilations (8.G.2: congruence/8.G.4: similarity) • Use facts about supplementary, complementary, adjacent, and vertical angles (7.G.5) • Know how to measure angles (4.MD.6)
Academic Vocabulary
Transversal, corresponding angles, alternate interior angles, alternate exterior angles, consecutive interior angles, supplementary pairs, vertical pairs, linear pairs, adjacent, non-adjacent, exterior angle of a triangle, remote interior angles of a triangle
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5180#71440

Understand and apply the Pythagorean Theorem and its converse (8.G.6-8)	
Standard 8.G.6: Explore and explain proofs of the Pythagorean Theorem and its converse.	
Concepts and Skills to Master	
• Know that in a right triangle $a^2 + b^2 = c^2$ (the Pythagorean Theorem). • Explore proofs of the Pythagorean Theorem (for example, by decomposing a square in different ways) and be able to explain a proof of the Pythagorean Theorem. • Understand and explain a proof of the converse of the Pythagorean Theorem.	
Related Standards: Current Course	Related Standards: Future Courses
8.NS.1, 8.NS.2, 8.NS.3, 8.EE.2, 8.EE.6, 8.G.7, 8.G.8	I.G.GPE.4, I.G.GPE.7, II.G.GPE.1, II.G.SRT.4, II.G.SRT.8, II.F.TF.8, III.A.APR.4

Support for Teachers

Critical Background Knowledge (Access Background Knowledge)
• Understand concepts of area and relate area to multiplication and addition (3.MD.5-7) • Recognize right triangles (4.G.2) • Solve and model problems with area (4.MD.3, 5.NBT.6, 5.NF.4, 6.G.1, 6.G.2, 7.G.4, 7.G.6) • Write and evaluate expressions involving whole number exponents (6.EE.1) • Evaluate expressions at specific values of their variables, including those involving whole number exponents (6.EE.2c)
Academic Vocabulary
leg, hypotenuse, square, Pythagorean Theorem, converse
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5180#71440

Understand and apply the Pythagorean Theorem and its converse (8.G.6-8)	
Standard 8.G.7: Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world and mathematical problems in two and three dimensions.	
Concepts and Skills to Master	
• Use the Pythagorean Theorem to solve for a missing side of a right triangle given the other two sides. • Use the Pythagorean Theorem to solve and model problems in real-world and mathematical problems. • Use the Pythagorean Theorem to solve and model problems involving three-dimensional contexts (cones, diagonals of rectangular prisms, etc.). • Recognize that applying the Pythagorean Theorem can result in rational and irrational numbers (this could be the first time students encounter irrational numbers).	
Related Standards: Current Course	Related Standards: Future Courses
8.NS.1, 8.NS.2, 8.NS.3, 8.EE.1, 8.EE.2, 8.EE.6, 8.G.6, 8.G.8, 8.G.9	I.G.GPE.4, I.G.GPE.7, II.G.GPE.1, II.G.SRT.4, II.G.SRT.8, II.F.TF.8, III.A.APR.4, III.G.GMD.4

Support for Teachers

Critical Background Knowledge (Access Background Knowledge)
• Recognize right triangles (4.G.2) • Write and evaluate expressions involving whole number exponents (6.EE.1) • Evaluate expressions at specific values of their variables, including those involving whole number exponents (6.EE.2c) • Explore the Pythagorean Theorem (8.G.6) • Identify right triangles in 3-D objects (cross sections) (7.G.3)
Academic Vocabulary
leg, hypotenuse, Pythagorean Theorem, square, square root
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5180#71440

Understand and apply the Pythagorean Theorem and its converse (8.G.6-8)	
Standard 8.G.8: Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	
Concepts and Skills to Master	
• Calculate the distance between two points in a coordinate system using the Pythagorean Theorem.	
Related Standards: Current Course	Related Standards: Future Courses
8.NS.1, 8.NS.2, 8.NS.3, 8.EE.1, 8.EE.2, 8.EE.6, 8.G.6, 8.G.8, 8.G.9	I.G.GPE.4, I.G.GPE.7, II.G.GPE.1, II.G.SRT.4, II.G.SRT.8, II.F.TF.8, III.A.APR.4, III.G.GMD.4

Support for Teachers

Critical Background Knowledge (Access background knowledge)
• Recognize right triangles (4.G.2)
• Graph ordered pairs on the coordinate plane (5.OA.3) in all four quadrants (6.NS.8)
• Write and evaluate expressions involving whole number exponents (6.EE.1)
• Evaluate expressions at specific values of their variables, including those involving whole number exponents (6.EE.2c)
• Find horizontal and vertical distances on a coordinate plane (6.NS.8) and draw polygons on coordinate plane and find horizontal and vertical side lengths (6.G.3)
• Explore the Pythagorean Theorem (8.G.6) and find unknown side lengths (8.G.7)
Academic Vocabulary
leg, hypotenuse, Pythagorean Theorem, square, square root
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5180#71440

Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres (8.G.9)	
Standard 8.G.9: Know the formulas for the volumes of cones, cylinders, and spheres, and use them to solve real-world and mathematical problems.	
Concepts and Skills to Master	
• Understand when and how to use formulas for volume of cones, cylinders, and spheres. • Use the Pythagorean Theorem to find heights of oblique and right cones and cylinders. • Apply volume formulas to real-world problems.	
Related Standards: Current Course	Related Standards: Future Courses
8.NS.1, 8.NS.2, 8.NS.3, 8.EE.2, 8.G.6, 8.G.7	II.G.GMD.1, II.G.GMD.3, III.G.GMD.4, III.G.MG.1, III.G.MG.2, III.G.MG.3, IIH.G.GMD.2

Support for Teachers

Critical Background Knowledge (Access Background Knowledge)
• Represent rational approximations of irrational numbers (8.NS.1 and 8.NS.2) • Use the Pythagorean Theorem to find unknown side lengths in three dimensions (8.G.7) • Understand that volume is measured in cubic units (5.MD.3a and 8.EE.1) • Find the area of a circle (7.G.4) • Evaluate expressions at specific values of their variables, including those involving whole number exponents (6.EE.2)
Academic Vocabulary
slant height, oblique, sphere, Base area
Resources
Curriculum Resources: http://www.uen.org/core/core.do?courseNum=5180#71440