SD Common Core State Standards Disaggregated Math Template

Domain:	Geometry	**Cluster:**	Understand congruence and similarity using physical models, transparencies, or geometry software	**Grade level:**	8

Correlating Standard in Previous Year	Number Sequence & Standard	Correlating Standard in Following Year
7.G.2 Draw (freehand, with ruler and protractor, and with technology) geometric shapes with 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.	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.	9-12.G-CO.5. Given a geometric figure and a rotation, reflection, or translation, draw the transformed figure using, e.g., graph paper, tracing paper, or geometry software. Specify a sequence of transformations that will carry a given figure onto another

Student Friendly Language:

I can experiment with rotations, reflections, and translations.
I can rotate, reflect, and translate lines keeping them the same length.
I can rotate, reflect, and translate line segments keeping them the same length.
I can rotate, reflect and translate angles keeping their measures the same.
I can rotate, reflect, and translate parallel lines keeping them parallel.

Know (Factual)	Understand (Conceptual) The students will understand that:	Do (Procedural, Application, Extended Thinking)
• Properties of rotations • Properties of reflections • Properties of translations	It is important to be able to experiment with rotations.	Explain what a rotation is.
	It is important to be able to experiment with reflections.	Explain what a reflection is.
	It is important to be able to experiment with translations.	Explain what a translation is.
	A line segment can be rotated, reflected, and translated and remain the same length.	Rotate, reflect, and translate a line segment of the same length.
	Angles can be rotated, reflected, and translated and still have the same measure.	Rotate, reflect, and translate an angle that has the same measure.
	Parallel lines can be rotated, reflected, and translated and still remain parallel.	Rotate, reflect, and translate parallel lines.

Key Vocabulary:

Properties	Rotations	Reflections	Translations	Lines	Line segments
Angle	Parallel lines	Experiment	Verify	Rigid	Transformations

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?

At home/Real-World: Having a student explain to their parent why when you look in a mirror, everything is the opposite of what it seems.

Students will measure the distance from the ceiling to two certain spots on the wall to hang a picture straight.

Students will understand that the angle measures of their rooms corners are all the same.

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Correlating Standard in Previous Year	Number Sequence & Standard	Correlating Standard in Following Year
None	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.	9-12.G-CO.6. Use geometric descriptions of rigid motions to transform figures and to predict the effect of a given rigid motion on a given figure; given two figures, use the definition of congruence in terms of rigid motions to decide if they are congruent

Student Friendly Language:

I can draw congruent two-dimensional figures.
I can explain what a two-dimensional figure is.
I can describe a sequence that exhibits congruence when given two congruent figures.

Know (Factual)	Understand (Conceptual) The students will understand that:	Do (Procedural, Application, Extended Thinking)
• Congruent two-dimensional figures • Rotations of congruent two-dimensional figures • Reflections of congruent two-dimensional figures • Translations of congruent two-dimensional figures • Sequence of congruent figures	Two-dimensional figures are congruent if corresponding sides and angles are equal. A two-dimensional figure is congruent to another if the second one can be obtained from the first by a sequence of rotations. A two-dimensional figure is congruent to another if the second one can be obtained from the first by a sequence of reflections. A two-dimensional figure is congruent to another if the second one can be obtained from the first by a sequence of translations. A two-dimensional figure is congruent to another if the second one can be obtained from the first by a sequence of rotations, reflections, or translations. When given two congruent figures, they can describe a sequence that exhibits the congruence between them.	Explain that congruent figures have the same shape and size. Explain how a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of rotations. Explain how a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of reflections. Explain how a two-dimensional figure is congruent to another if the second can be obtained from the first by a sequence of translations. Describe a sequence that exhibits congruence.

Key Vocabulary:

Two-dimensional figures	Congruent	Congruent figures	Sequence
Rotations	Reflections	Translation	Congruence

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?

At home/Real-World: Having your child use the tools necessary to draw a two-dimensional figure, such as a dog house or television.

Once your child has drawn a two-dimensional figure, have them show you a rotation, reflection, and translation of the figure.

Have your students construct two congruent figures.

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Domain:	Geometry	**Cluster:**	Understand congruence and similarity using physical models, transparencies, or geometry software	**Grade level:**	8

Correlating Standard in Previous Year	**Number Sequence & Standard**	**Correlating Standard in Following Year**
7.G.2.1 Students are able to demonstrate ways that shapes can be transformed.	8.G.3 Describe the effect of dilations, translations, rotations, and reflections on two-dimensional figures using coordinates.	9-12.G.CO.2 Represent transformations in the plane using, e.g., transparencies and geometry software; describe transformations as functions that take points in the plane as inputs and give other points as outputs. Compare transformations that preserve distance and angle to those that do not (e.g., translation versus horizontal stretch).

Student Friendly Language:
I can describe the effect of dilations on two-dimensional figures using coordinates. I can describe the effect of translations on two-dimensional figures using coordinates. I can describe the effect of rotations on two-dimensional figures using coordinates. I can describe the effect of reflections on two-dimensional figures using coordinates.

Know (Factual)	**Understand (Conceptual) The students will understand that:**	**Do (Procedural, Application, Extended Thinking)**
• Dilations of two-dimensional figures using coordinates • Translations of two-dimensional figures using coordinates • Rotations of two-dimensional figures using coordinates • Reflection of two-dimensional figures using coordinates	It is important to be able to describe the effect of dilations on two-dimensional figures using coordinates. It is important to be able to describe the effect of translations on two-dimensional figures using coordinates. It is important to be able to describe the effect of rotations on two-dimensional figures using coordinates. It is important to be able to describe the effect of reflections on two-dimensional figures using coordinates.	Explain what a dilation is. Explain what a translation is. Explain what a rotation is. Explain what a reflection is. Create a dilation of a two-dimensional figure using coordinates. Create a translation of a two-dimensional figure using coordinates. Create a rotation of a two-dimensional figure using coordinates. Create a reflection of a two-dimensional figure using coordinates.

Key Vocabulary:					
Dilation	Translations	Rotations	Reflections	Two-dimensional figures	Coordinates

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question “why do I have to learn this”?

At home/Real-World: When going on the ferris wheel at Valley Fair, a student can explain to their parents that the ride is a rotation.

Draw a waterslide and describe to fellow classmates how the waterslide is a translation.

SD Common Core State Standards Disaggregated Math Template

Domain:	Geometry	**Cluster:**	Understand congruence and similarity using physical models, transparencies, or geometry software	**Grade level:**	8

Correlating Standard in Previous Year	Number Sequence & Standard	Correlating Standard in Following Year
7.G.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.	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.	9-12.G.SRT.4 Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.

Student Friendly Language:

I can draw two similar two-dimensional figures.
I can explain what rotations are.
I can explain what reflections are.
I can explain what translations are.
I can explain what dilations are.
I can describe a sequence that exhibits the similarity between two similar two-dimensional figures.

Know (Factual)	Understand (Conceptual) The students will understand that:	Do (Procedural, Application, Extended Thinking)
• Similar two-dimensional figures • Rotations of similar two-dimensional figures • Reflections of similar two-dimensional figures • Translations of similar two-dimensional figures • Dilations of similar two-dimensional figures • A sequence that describes similar two-dimensional figures	Two-dimensional figures are similar if corresponding sides are proportional and corresponding angles are congruent. A two-dimensional figure is similar to another if the second one can be obtained from the first by a sequence of rotations. A two-dimensional figure is similar to another if the second one can be obtained from the first by a sequence of reflections. A two-dimensional figure is similar to another if the second one can be obtained from the first by a sequence of translations. a two-dimensional figure is similar to another if the second one can be obtained from the first by a sequence of dilations. A two-dimensional figure is similar to another if the second one can be obtained from the first by a sequence of rotations, reflections, translations, and/or dilations. When given two similar figures, you can describe a sequence that exhibits the similarity between them.	Understand similar two-dimensional figures. Explain how a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of rotations. Explain how a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of reflections. Explain how a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of translations. Explain how a two-dimensional figure is similar to another if the second can be obtained from the first by a sequence of dilations. Explain how 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/or dilations. Draw two similar two-dimensional figures, and then describe a sequence that exhibits similarity between them.

Key Vocabulary:

Two-dimensional figures	Similar	Similar figures	Congruent	Proportional	Sequence
Rotations	Reflections	Translations	Dilations	Similarity	

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?

At home/Real-World: A student will show his classmates his pupils while standing in the lit classroom. He will then walk into a dark room for a minute, and come back out, quickly showing his classmates the current size of his pupils (demonstrating dilation).

SD Common Core State Standards Disaggregated Math Template

Domain:	Geometry	**Cluster:**	Understand congruence and similarity using physical models, transparencies, or geometry software	**Grade level:**	8

Correlating Standard in Previous Year	Number Sequence & Standard	Correlating Standard in Following Year
7.G.2 Draw (freehand, with ruler and protractor, and with technology) 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. 7.G.5 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.	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.	9-12.G-SRT.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. 9-12.G.SRT.4 Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.

Student Friendly Language:

I can find the measure of any angle in a triangle if I know the measure of the other two angles.
I can find the measure of any exterior angle of a triangle if I know the measure of the adjacent interior angle.
I can find the measure of any exterior angle of a triangle if I know the measures of the two interior angles of the triangle.
I can identify corresponding, alternate interior, and alternate exterior angles that are formed when two parallel lines are cut by a transversal.
I can recognize that angle pairs have the same measure (are congruent).
I can recognize that two triangles with two pairs of congruent angles will be similar to each other.

Know (Factual)	Understand (Conceptual) The students will understand that:	Do (Procedural, Application, Extended Thinking)
• Interior angles of triangles • Exterior angles of triangles • Triangle Sum Theorem • Exterior Angle Theorem • A transversal cuts parallel lines • Corresponding angles • Alternate interior angles • Alternate exterior angles • Congruent angle pairs • Angle-Angle Similarity Theorem	Given two interior angle measurements for any triangle, you can find all interior and exterior angle measurements for that triangle. The sum of the measures of the three angles in any triangle is 180 degrees. The measure of an exterior angle of a triangle is equal to the sum of the measures of the other two interior angles. A transversal is the line that cuts two parallel lines. Parallel lines that are cut by a transversal form corresponding angles. Parallel lines that are cut by a transversal line form alternate interior angles. Parallel lines that are cut by a transversal line form alternate exterior angles. Parallel lines that are cut by a transversal line form congruent corresponding angles, alternate interior angles, and alternate exterior angles. When two angles of one triangle are congruent to two angles of another, the triangles are similar	Construct various triangles and find the measure of the interior and exterior angles. Find the measure of missing angles in a triangle. Find the measure of an exterior angle of a triangle given the measure of its adjacent interior angle or the measure of the two nonadjacent interior angles. Make conjectures about the relationship between the measure of an exterior angle and the other two interior angles of a triangle. Identify a transversal. Construct a transversal line of two parallel lines, and classify the angles as corresponding, alternate interior, or alternate exterior. Identify pairs of alternate interior angles, alternate exterior angles, and corresponding angles when parallel lines are cut by a transversal. Find the measures of all angles formed when a pair of lines is cut by a transversal when given the measure of one of the angles. Determine if two triangles are similar when given the measure of two interior angles of each.

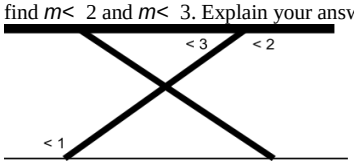
Key Vocabulary:

Vertical angles Adjacent angles Congruent Interior angles Exterior angles
Parallel lines Transversal Alternate interior angles Alternate exterior angles Vertical angles
Supplementary angles Complementary angles Adjacent angles Similarity Similar triangles

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?

Example 1:

You are building a bench for a picnic table. The top of the bench will be parallel to the ground. If *m* < 1 = 148°, find *m*< 2 and *m*< 3. Explain your answer.



Solution:

Angle 1 and angle 2 are alternate interior angles, giving angle 2 a measure of 148º. Angle 2 and angle 3 are supplementary. Angle 3 will have a measure of 32º so the *m* < 2 + *m*< 3 = 180º

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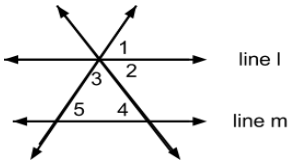
Example 2:

Show that *m*<3 + *m*< 4 + *m* <5 = 180º if line *l* and *m* are parallel lines and *t*1 and *t*2 are transversals.

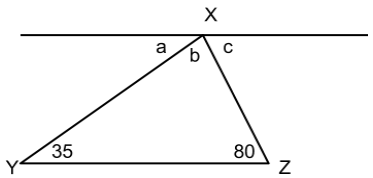


Solution:

1 + 2 + 3 = 180°
<5 congruent <1 ------- corresponding angles are congruent therefore 1 can be substituted for 5
<4 congruent <2 ------- alternate interior angles are congruent therefore 4 can be substituted for 2
Therefore <3 + <4 + <5 = 180°
Students can informally conclude that the sum of the angles in a triangle is 180º (the angle-sum theorem) by applying their understanding of lines and alternate interior angles.

Example 3:

In the figure below Line *X* is parallel to Line *YZ* . Prove that the sum of the angles of a triangle is 180º.

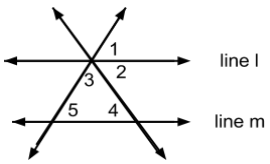


Solution:

Angle *a* is 35º because it alternates with the angle inside the triangle that measures 35º. Angle *c* is 80º because it alternates with the angle inside the triangle that measures 80º. Because lines have a measure of 180º, and angles *a* + *b* + *c* form a straight line, then angle *b* must be 65 º ----->180 – (35 + 80) = 65. Therefore, the sum of the angles of the triangle is 35º + 65º + 80º.

Example 4:

What is the measure of angle 5 if the measure of angle 2 is 45º and the measure of angle 3 is 60º?



Solution:

Angles 2 and 4 are alternate interior angles, therefore the measure of angle 4 is also 45º. The measure of angles 3, 4 and 5 must add to 180º. If angles 3 and 4 add to 105º the angle 5 must be equal to 75º.

Students construct various triangles having line segments of different lengths but with two corresponding congruent angles. Comparing ratios of sides will produce a constant scale factor, meaning the triangles are similar. Students solve problems with similar triangles.

SD Common Core State Standards Disaggregated Math Template

Domain:	Geometry	**Cluster:**	Understand and apply the Pythagorean Theorem	**Grade level:**	8

Correlating Standard in Previous Year	Number Sequence & Standard	Correlating Standard in Following Year
None	8.G.6 Explain a proof of the Pythagorean Theorem and its converse.	9-12.G.SRT.4 Prove theorems about triangles. Theorems include: a line parallel to one side of a triangle divides the other two proportionally, and conversely; the Pythagorean Theorem proved using triangle similarity.

Student Friendly Language:
I can prove the Pythagorean Theorem. I can prove the converse of the Pythagorean Theorem.

Know (Factual)	Understand (Conceptual) The students will understand that:	Do (Procedural, Application, Extended Thinking)
• Leg • Hypotenuse • Pythagorean Theorem • Pythagorean Theorem Converse • Pythagorean Triple	The sides that form the right angle are called legs. The side opposite the right angle, which is always the longest side, is the hypotenuse. For any right triangle, the sum of the squares of the lengths of the legs equals the square of the length of the hypotenuse. If $a^2+b^2=c^2$, then the triangle is a right triangle. A Pythagorean triple is a set of three positive integers a, b, and c such that $a^2+b^2=c^2$. Given the length of any two sides of a right triangle they can calculate the third side using the Pythagorean theorem.	Identify the legs of a right triangle. Identify the hypotenuse of a right triangle. Distinguish right triangles from non-right triangles using the relationship among the side lengths. Find the unknown length of a right triangle. Prove the relationship between the three sides of a right triangle. Use the converse of the Pythagorean to state whether a triangle with given side lengths is a right triangle. Determine whether the 3 numbers form a Pythagorean triple. Find the perimeter and area of a right triangle that has an unknown leg. Calculate the areas of the squares for the sides of a right triangle.

Key Vocabulary:				
Leg	Hypotenuse	Pythagorean Theorem	Pythagorean Triple	Pythagorean Theorem Converse
Right Triangle		Square	Square Root	Area

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?

Example 1:
The distance from Jonestown to Maryville is 180 miles, the distance from Maryville to Elm City is 300 miles, and the distance from Elm City to Jonestown is 240 miles. Do the three towns form a right triangle? Why or why not?

***Solution*:**
If these three towns form a right triangle, then 300 would be the hypotenuse since it is the greatest distance.
$180^2 + 240^2 = 300^2$
32400 + 57600 = 90000
90000 = 90000 ✓
These three towns form a right triangle.

Example 2:
A rectangular swimming pool has a length of 41 feet and a width of 11 feet. Tina swims the diagonal distance across the pool. About how far does she swim? Round your answer to the nearest tenth?
***Solution*:**
Use Pythagorean Theorem to find the unknown length which is the hypotenuse. $a^2+b^2=c^2$
$41^2+11^2=c^2$
$1681 + 121 = c^2$
$1802 = c^2$
42.4499 = c
C = 42.4 feet

Example 3:
Right triangle ABC has side lengths of 3 inches, 4 inches, and 5 inches. Triangle DEF had double the side lengths of triangle ABC. Triangle TUV has triple the side lengths of triangle ABC.
Make a table of the side lengths, perimeter, and areas of the three triangles. Compare the results.
***Solution*:**

	LEG	LEG	HYPOTENUSE	PERIMETER	AREA
ΔABC	**3 in.**	**4 in.**	**5 in.**	**12 in.**	**6 in^2**
ΔDEF	**6 in.**	**8 in.**	**10 in.**	**24 in.**	**24 in^2**
ΔTUV	**9 in.**	**12 in.**	**15 in.**	**36 in.**	**54 in^2**

You can see that the perimeters are two and three times the original triangle, but the areas are more than two or three times the original area.

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Domain:	Geometry	**Cluster:**	Understand and apply the Pythagorean Theorem	**Grade level:**	8

Correlating Standard in Previous Year	**Number Sequence & Standard**	**Correlating Standard in Following Year**
None	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.	9-12.G.SRT.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

Student Friendly Language:
I can determine unknown side lengths of right triangles in two dimensions. I can determine unknown side lengths of right triangles in three dimensions.

Know (Factual)	**Understand (Conceptual) The students will understand that:**	**Do (Procedural, Application, Extended Thinking)**
• Leg • Hypotenuse • Pythagorean Theorem	Given the length of any two sides of a right triangle they can calculate the third side using the Pythagorean theorem.	Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in mathematical problems in two and three dimensions. Apply the Pythagorean Theorem to determine unknown side lengths in right triangles in real-world situations in two and three dimensions.

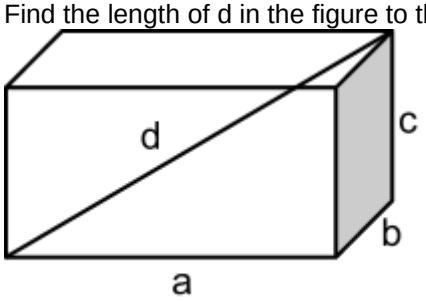
Key Vocabulary:						
Pythagorean Theorem	Legs	Hypotenuse	Right triangle	Square	Square root	Area

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?

<u>Example 1:</u>
The Irrational Club wants to build a tree house. They have a 9-foot ladder that must be propped diagonally against the tree. If the base of the ladder is 5 feet from the bottom of the tree, how high will the tree house be off the ground?

<u>Solution:</u>
$a^2 + 5^2 = 9^2$
$a^2 + 25 = 81$
$a^2 = 56$
$a = \sqrt{56}$ or ~ 7.5

Example 2:
Find the length of d in the figure to the right if a = 8 in., b = 3 in. and c = 4in.



Solution:
First find the distance of the hypotenuse of the triangle formed with legs a and b.
$8^2 + 3^2 = c^2$
$642 + 92 = c^2$
$73 = c^2$
$\sqrt{73}$in. = c

The $\sqrt{73}$ is the length of the base of a triangle with c as the other leg and d is the hypotenuse.
To find the length of d:
€
$(\sqrt{73})^2 + 4^2 = d^2$
$73 + 16 = d^2$
$89 = d^2$
$\sqrt{89}$in. = d
Based on this work, students could then find the volume or surface area.

SD Common Core State Standards Disaggregated Math Template

Domain:	Geometry	**Cluster:**	Understand and apply the Pythagorean Theorem	**Grade level:**	8

Correlating Standard in Previous Year	Number Sequence & Standard	Correlating Standard in Following Year
None	8.G.8 Apply the Pythagorean Theorem to find the distance between two points in a coordinate system.	9-12.G.SRT.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.

Student Friendly Language:
I can graph points on a coordinate plane. I can find the distance between two points on a coordinate graph.

Know (Factual)	Understand (Conceptual) The students will understand that:	Do (Procedural, Application, Extended Thinking)
• Pythagorean Theorem	The horizontal distance between two points is the absolute value of the difference between the x values. The vertical distance between two points is the absolute value of the difference between the y values. They can use the Pythagorean Theorem to find the distance between two points that are not horizontal or vertical distances apart.	Find the distance between two horizontal points on a coordinate plane. Find the distance between two vertical points on a coordinate plane. Find the distance between two points that are not horizontal or vertical distances apart.

Key Vocabulary:			
Pythagorean Theorem	x-coordinate	y-coordinate	Absolute value

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?

1. On the coordinate grid, graph point A at (-2, 0), point B at (0, 5)and point C at (0, 0). Make sure to label the points A, B, and C. Find the length of each side of the triangle.

2. On the coordinate graph, identify the points named by each coordinate pair. Connect points P, Q, and R to make a closed figure. Make sure to label the points.
P (0, 4) Q (-3, 1) R (0, -2)
Find the length of the sides of figure. Show all your work.

3. The driving distance from Spearfish to Pierre can be plotted on a coordinate graph. Spearfish is (0, 0) and Pierre is (212, 38). What is the distance by air?

SD Common Core State Standards Disaggregated Math Template

Domain:	Geometry	**Cluster:**	Solve real-world and mathematical problems involving volume of cylinders, cones, and spheres	**Grade level:**	8

Correlating Standard in Previous Year	Number Sequence & Standard	Correlating Standard in Following Year
7.G.7.3 Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids. 7.G.7.4 Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle. 7.G.7.6 Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.	8.G.9 Know the formulas for the volumes of cones, cylinders, and spheres and use them to solve real-world and mathematical problems.	9-12.G.GMD.1. Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. Use dissection arguments, Cavalieri's principle, and informal limit arguments. G.GMD.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.

Student Friendly Language:
I can find the volume of a cylinder. I can find the volume of a cone. I can find the volume of a sphere.

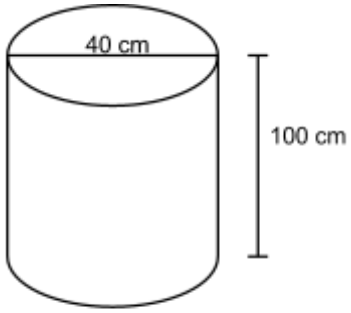
Know (Factual)	Understand (Conceptual) The students will understand that:	Do (Procedural, Application, Extended Thinking)
• Volume of a cylinder • Volume of a cone. • Volume of a sphere	Volume is measured in cubic units. The volume of a cylinder = $\Pi r^2 h$. There is a relationship between the volumes of cylinders, cones, and spheres. The volume of a cone is ⅓ of the volume of a cylinder, V= 1/3 $\Pi r^2 h$. The volume of a sphere is ⅔ the volume of a cylinder V=4/3Πr^3.	Find the volume of a cylinder Find the volume of a cone Find the volume of a sphere Find the volume of a cone that has the same radius and height of a cylinder. Find the volume of a sphere that has the same radius and height of a cylinder.

Key Vocabulary:									
Volume	Area	Circle	Cone	Cylinder	Sphere	Cubic Units	Radius	Height	Pi

Relevance and Applications: How might the grade level expectation be applied at home, on the job or in a real-world, relevant context? Include at least one example stem for the conversation with students to answer the question "why do I have to learn this"?

Example 1:

Lisa wanted to plant daisies in her new planter. She wondered how much potting soil she should buy to fill it. Use the measurements in the diagram below to determine the planter's volume.



cylindrical planter

***Solution*:**

$V = \Pi r^2 h$

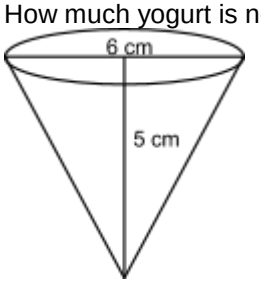
$V = \Pi(20^2)(100)$

$V = 3.14(400)(100)$

$V = 125{,}600\ cm^3$

Example 2:

How much yogurt is needed to fill the cone? Express your answer in terms of pi.



Solution:

$V = \frac{1}{3}\Pi r^2 h$

$V = \frac{1}{3}\Pi(3^2)(5)$

$V = \frac{1}{3}\Pi(3^2)(5)$

$V = \frac{1}{3}\Pi(9)(5)$

$V = 15\Pi\ cm^3$

Example 3:

Approximately how much air would be needed to fill a soccer ball with a radius of 14cm?

Solution:

$V = 4/3\Pi r^3$

$V = 4/3(3.14)(14)^3$

$V = 11488.2133\ cm^3$

$V = 11488\ cm^3$