Geometry Bridge

U-46 Curriculum Scope and Sequence

Reporting Strand	Instructional Focus	CCSS	Semester
Geometric Transformations	1.1 Explore the building blocks of geometry	**G.CO.1**	1
	2.1 Explore with transformations	G.CO.2, G.CO.3, G.CO.4, G.CO.5, 8.G.1	
	2.2 Investigate and apply congruence definitions	G.CO.6, G.CO.7	
Coordinate Plane & Intersecting Lines	1.2 Explore in the coordinate plane	G.GPE.4, G.GPE.6, G.GPE.7, 8.EE.5, 8.EE.6	1
	1.3 Explore congruence constructions	G.CO.12, .G.GPE.4	
	3.1 Explore parallel and perpendicular lines	G.CO.12, **G.GPE.5**	
	3.2 Prove theorems about lines and angles	G.GPE.4, **G.CO.9**, 8.EE.7	
Triangle Geometry (Congruence)	4.1 Prove congruence theorems	G.CO.8, **G.CO.10**, **G.SRT.5**, 8.EE7	1
	4.2 Construct special triangles and angles	G.CO.9, G.CO.12, G.CO.13	
Similarity	5.1 Use dilations to show figures similar.	G.SRT.1, G.SRT.2 5.NF.4, 5.NF.5, 6.NS.1	1
	5.2 Explain and prove similarity theorems	**G.CO.10,** G.SRT.3, **G.SRT.4, G.SRT.5**, G.MG.3, 8.EE.7, 7.RP.3	
Trigonometry	6.1 Investigate right triangle trigonometry	**G.SRT.6, G.SRT.7 , G.SRT.8**,	2
Circles	7.1/7.2 Investigate circles and apply formulas	G.C.1, **G.C.2**, G.C.4, **G.C.5**, G.GMD.1, 8.EE.7	2
	7.3 Investigate and interpret circle equations	**G.GPE.1**, G.GPE.4	
	8.1 Investigate concurrency in triangles	**G.CO.10, G.C.3**	
Quadrilaterals & Other Polygons	9.1 Construct and explore polygons	G.CO.13, **G.C.3**	2
	9.2 Prove and apply theorems about quadrilaterals	G.CO.11, G.GPE.4, 8.EE.7	
3-D Figures	10.1 Investigate cross-sections and rotations	G.GMD.4, G.MG.1, G.MG.3	2
	10.2 Develop and apply volume formulas	G.MG.1, **G.MG.2**, G.MG.3, G.GMD.1, G.GMD.2, **G.GMD.3**	

Standards that are **bolded and underlined** are the essential "power standards" for SAT

Geometric Transformations

1.1 Explore the building blocks of geometry

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Definitions of lines and angles (G.CO.1)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Describe the following terms using points, lines, distance for **all** of the following: • Angles • Perpendicular Lines • Parallel Lines • Line Segments	Describe the following terms using points, lines, distance for **3** of the following: • Angles • Perpendicular Lines • Parallel Lines • Line Segments	Describe the following terms using points, lines, distance for **2** of the following: • Angles • Perpendicular Lines • Parallel Lines • Line Segments	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1

G.CO.1 Know precise definitions of angle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line and distance along a line.

This standard may be reassessed in other reporting strands, as concepts are developed and taught.

Geometric Transformations

2.1 Explore with transformations

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Represent, describe and compare transformations (G.CO.2, G.CO.5, 8.G.1)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Graph coordinates (image) on the coordinate plane and write the ordered pairs for the new points after **multiple** transformations (reflections, translations, rotations) Given the image and the pre-image describe **a sequence of** reflections, translations, and rotations that maps one figure onto the other **Compare** transformations that preserve distance and angles to those that do not	Graph coordinates (image) on the coordinate plane and write the ordered pairs for the new points after one transformation (reflections, translations, and **rotations**) Given the image and the pre-image describe reflections, translations, and **rotations** that maps one figure onto the other **Describe** transformations that preserve distance and angles to those that do not	Graph coordinates on the coordinate plane and write the ordered pairs for the new points after one transformation (**reflections and translations**) Given an image and its pre-image, describe **reflections and translations**, that maps one figure onto the other **Identify** transformations that preserve distance and angles to those that do not	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Describe symmetry (G.CO.3)		**Describe** all the lines of symmetry as the lines of reflection of a rectangle, parallelogram, trapezoid, or regular polygon that carry each figure onto itself **Describe** the angle of rotation as the rotational symmetry of a rectangle, parallelogram, trapezoid, or regular polygon that carry each figure onto itself	Identify a line of symmetry of a rectangle, parallelogram, trapezoid, or regular polygon **and** Identify the angle of rotational symmetry of a rectangle, parallelogram, trapezoid, or regular polygon	Identify a line of symmetry of a rectangle, parallelogram, trapezoid, or regular polygon **or** Identify the angle of rotational symmetry of a rectangle, parallelogram, trapezoid, or regular polygon	
Develop definitions of transformations (G.CO.4)		Develop the definition **of all the terms** rotations, reflections and translations in terms of: • Angles • Perpendicular lines • Parallel lines • Line segments.	Develop the definition **for 4 of the terms** rotations, reflections and translations in terms of: • Angles • Perpendicular lines • Parallel lines • Line segments.	Develop the definition **for 2 of the terms** rotations, reflections and translations in terms of: • Angles • Perpendicular lines • Parallel lines • Line segments.	

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).

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.

G.CO.3 Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself.

G.CO.4 Develop definitions of rotations, reflections, and translations in terms of angles, perpendicular lines, parallel lines, and line segments.

8.G.1 Verify experimentally the properties of rotations, reflections, and translations

Geometric Transformations

2.2 Investigate and apply congruence definitions

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Predict and decide congruency (G.CO.6) **Corresponding sides and angles** (G.CO.7)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Informally prove why two images are congruent using **multiple transformations** Use the definition of congruence in terms of rigid motions to: • Decide if two given figures are congruent • **Prove (two column, paragraph, etc.)** that corresponding sides are congruent and corresponding angles are congruent in a pair of congruent triangles	Identify **multiple transformations** that show two images are congruent Use the definition of congruence in terms of rigid motions to: • Decide if two given figures are congruent • **Find missing sides or angles to show** that corresponding sides are congruent and corresponding angles are congruent in a pair of congruent triangles	Identify **the singular transformation** that shows two images are congruent Use the definition of congruence in terms of rigid motions to: • Decide if two given figures are congruent • **Identify** that corresponding sides are congruent and corresponding angles are congruent in a pair of congruent triangles	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1

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.

G.CO.7 Use the definition of congruence in terms of rigid motions to show that two triangles are congruent if and only if corresponding pairs of sides and corresponding pairs of angles are congruent.

Coordinate Plane & Intersecting Lines

1.2 Explore in the coordinate plane

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Foundations of graphing linear equations (8.EE.5, 8.EE.6)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	**Given two coordinates** derive the equation y=mx+b for a line Graph an equation from the form **ax+by=c (using a table or converting to y=mx+b)**	Given the graph of a line, **derive the equation y=mx+b for a line** Graph an equation **from the form y=mx+b (using a table or the y-intercept and the slope)**	Given the graph of a line, **identify the y intercept as a coordinate and the slope** Graph a line **given the y-intercept and the slope**	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Find the point (G.GPE.6)		Find the point on a line segment, given two endpoints that divide **the segment into a given ratio.**	Find the point on a line segment, given two endpoints, that divides a **horizontal or vertical segment into a given ratio**.	Find the point on a line segment, given two endpoints, that divides the **segment in half.**	
Prove using formulas (G.GPE.4) **Perimeter and area** (G.GPE.7)		Using coordinate geometry and the Pythagorean, slope, distance and midpoint formulas to do both of the following • find the perimeter of polygons. • find the area **of polygons using** triangles and rectangles	Using coordinate geometry and the Pythagorean, slope, distance and midpoint formulas to do **both** of the following • find the perimeter of polygons. • find the area of triangles and rectangles	Using coordinate geometry and the Pythagorean, slope, distance and midpoint formulas to do **one** of the following • find the perimeter of polygons. • find the area of triangles and rectangles	

G.GPE.4 Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; ~~prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).~~

G.GPE.7 Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula.★

G.GPE.6 Find the point on a directed line segment between two given points that partitions the segment in a given ratio.

8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

8.EE.6 Derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.

Embedded standard not summatively assessed.

G.CO.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

Coordinate Plane & Intersecting Lines

1.3 Explore congruence constructions

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Construction of lines and angles (G.CO.12)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing •Connecting •Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Use a variety of tools to perform both of the following **with precision:** • copy a segment • copy an angle	Use a variety of tools to perform **both** of the following: • copy a segment • copy an angle	Use a variety of tools to perform **1** of the following: • copy a segment • copy an angle	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Prove using formulas (G.GPE.4)		Using coordinate geometry and the slope, distance and midpoint formulas to prove **all** of the following • Segments on a coordinate plane are congruent • Segments on a coordinate plane are perpendicular • Segments on a coordinate plane are parallel	Using coordinate geometry and the slope, distance and midpoint formulas to prove **two** of the following • Segments on a coordinate plane are congruent • Segments on a coordinate plane are perpendicular • Segments on a coordinate plane are parallel	Using coordinate geometry and the slope, distance and midpoint formulas to prove **one** of the following • Identify if segments on a coordinate plane are congruent • Identify If segments on a coordinate plane are perpendicular • Segments on a coordinate plane are parallel	

G.CO.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.

G.GPE.4 Use coordinates to prove simple geometric theorems algebraically.

Embedded standards, can be reassessed.

8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

8.EE.6 Derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.

Coordinate Plane & Intersecting Lines

3.1 Explore parallel and perpendicular lines

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Construction of lines and angles (G.CO.12)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Use a variety of tools and methods to perform both of the following **with precision:** • Construct perpendicular lines • Construct a line parallel to a given line through a point not on the line.	Use a variety of tools and methods to perform **both** of the following: • Construct perpendicular lines • Construct a line parallel to a given line through a point not on the line.	Use a variety of tools and methods to perform **one** of the following: • Construct perpendicular lines • Construct a line parallel to a given line through a point not on the line.	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Prove and use parallel and perpendicular lines (G.GPE.5)		Prove **a pair of lines** are parallel or perpendicular using slope Write the equation of a line that is parallel **and** perpendicular to a given line that passes through a given point	**Given the slope of 1 line**, prove if a pair of lines are parallel or perpendicular **Write** the equation of a line that is parallel **or** perpendicular to a given line that passes through a given point	**Given the slope of a pair of lines**, identify the lines are parallel or perpendicular **Identify** the equation of a line that is parallel or perpendicular to a given line that passes through a given point	

G.CO.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.

G.GPE.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

Embedded standards , can be reassessed

G.CO.1 Know precise definitions of angle, circle, perpendicular line, parallel line, and line segment, based on the undefined notions of point, line, distance along a line, and distance around a circular arc.

8.EE.5 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

8.EE.6 Derive the equation y = mx for a line through the origin and the equation y = mx + b for a line intercepting the vertical axis at b.

Coordinate Plane & Intersecting Lines

3.2 Prove theorems about lines and angles

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Prove lines and angles (G.CO.9, G.GPE.4, 8.EE.7)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	**Algebraically solve multistep equations involving** the following theorems: • Vertical angles are congruent. • When a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent	**Algebraically solve one and two step equations involving** the following theorems: • Vertical angles are congruent. • When a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent	**Identify** all of the following • Vertical angles are congruent. • When a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1

G.GPE.4 Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; ~~prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).~~

G.CO.9 Prove theorems about lines and angles. Theorems include: vertical angles are congruent; when a transversal crosses parallel lines, alternate interior angles are congruent and corresponding angles are congruent; points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.

8.EE.7 Solve linear equations in one variable. a - Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers). b - Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Embedded standard not summatively assessed. This concept can be used as a reassessment opportunity.

G.GPE.5 Prove the slope criteria for parallel and perpendicular lines and use them to solve geometric problems (e.g., find the equation of a line parallel or perpendicular to a given line that passes through a given point).

Triangle Geometry

4.1 Prove congruence theorems

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Explain triangle congruence (G.CO.8)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	**Prove (two column, paragraph, etc.)** SSS, SAS, and ASA triangle congruence using rigid motion.	**Find missing sides or angles to show** SSS, SAS, and ASA triangle congruence using rigid motion.	**Identify** SSS, SAS, and ASA triangle congruence using rigid motion.	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Prove triangle theorems (G.CO.10, G.SRT.5, 8.EE.7)		Show mathematically for problems about triangles with rational numbers, that require both distributing and combining like terms **in both** of the following theorems • measures of interior angles of a triangle sum to 180° • base angles of isosceles triangles are congruent Prove (informally) **both** of the following theorems about triangles • measures of interior angles of a triangle sum to 180° • base angles of isosceles triangles are congruent	**Show mathematically** for problems about triangles **with rational numbers and that require both distributing or combining like terms in one** of the following theorems • measures of interior angles of a triangle sum to 180° • base angles of isosceles triangles are congruent Prove (informally) **one** of the following theorems about triangles • measures of interior angles of a triangle sum to 180° • base angles of isosceles triangles are congruent	**Show numerically** for problems about triangles • measures of interior angles of a triangle sum to 180° • base angles of isosceles triangles are congruent	

G.CO.8 Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions.

G.CO.10 Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; ~~the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.~~

G.SRT.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.

8.EE.7 Solve linear equations in one variable. a - Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers). b - Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Triangle Geometry

4.2 Construct special triangles and angles

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Construction of lines and angles (G.CO.12, G.CO.13, G.CO.9)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Use a variety of tools to **perform all** of the following: • Bisect a segment • Bisect an angle • Construct the perpendicular bisector of a segment • Construct an equilateral triangle	Use a variety of tools to **perform 3** of the following: • Bisect a segment • Bisect an angle • Construct the perpendicular bisector of a segment • Construct an equilateral triangle	Use a variety of tools to **perform 2** of the following: • Bisect a segment • Bisect an angle • Construct the perpendicular bisector of a segment • Construct an equilateral triangle	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1

G.CO.9 Prove theorems about lines and angles: points on a perpendicular bisector of a line segment are exactly those equidistant from the segment's endpoints.

G.CO.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

G.CO.12 Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Copying a segment; copying an angle; bisecting a segment; bisecting an angle; constructing perpendicular lines, including the perpendicular bisector of a line segment; and constructing a line parallel to a given line through a point not on the line.

Similarity

5.1 Use dilations to show figures similar

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Dilations (5.NF.4, 5.NF.5, 6.NS.1, G.SRT.1)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Given **the image and a rational scale factor, find the pre-image** Given a pre-image and image, **determine the scale factor to prove a dilation (centered at the origin) is a reduction or enlargement**	Given a rational scale factor, dilate a pre-image **from any point** Given a **scale factor and no images, explain what type of dilation occurred**	Given a rational scale factor, dilate a pre-image **from the origin** Given a pre-image and image, **determine if it is an enlargement or reduction**	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Properties of Dilations (G.SRT.1) **Explain similarity** (G.SRT.2)		**Verify** that when a side passes through the center of dilation, **the side and its image lie on the same line.** Verify that corresponding sides of the pre-image and images are **parallel and** proportional after dilation. Explain **using transformations** if two figures are similar by verifying ● corresponding angles are congruent ● corresponding sides are proportional	Given an image and the pre-image, **determine the center of dilation** Verify that corresponding sides of the pre-image and images are **proportional by finding the scale factor.** **Explain** if two figures are similar by verifying ● corresponding angles are congruent ● corresponding sides are proportional	**Perform dilation** with a given center and scale factor on a figure in the coordinate plane. **Show mathematically** if two figures are similar by verifying ● corresponding angles are congruent ● corresponding sides are proportional	

5.NF.5 Interpret multiplication as scaling (resizing), Comparing the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. Explaining why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case); explaining why multiplying a given number by a fraction less than 1 results in a product smaller than the given number; and relating the principle of fraction equivalence $a/b = (n \times a)/(n \times b)$ to the effect of multiplying a/b by 1.

5.NF.4 Apply and extend previous understandings of multiplication to multiply a fraction or whole number by a fraction.

G.SRT.1 Verify experimentally the properties of dilations given by a center and a scale factor:

a. dilation takes a line not passing through the center of the dilation to a parallel line, and leaves a line passing through the center unchanged.
b. the dilation of a line segment is longer or shorter in the ratio given by the scale factor.

G.SRT.2 Given two figures, use the definition of similarity in terms of similarity transformations to decide if they are similar; explain using similarity transformations the meaning of similarity for triangles as the equality of all corresponding pairs of angles and the proportionality of all corresponding pairs of sides.

Similarity

5.2 Explain and prove similarity theorems

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Prove similar triangles (G.SRT.3)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Prove, algebraically (multistep equations) for **all** using transformations of the following theorems: • Angle-Angle (AA) criterion for two triangles to be similar • SAS for two triangles to be similar • SSS for two triangles to be similar	Solve algebraically (one and two step) for **2** of the following theorem: • AA criterion for two triangles to be similar • SAS for two triangles to be similar • SSS for two triangles to be similar	**Identify** if triangles are similar by: • AA~ • SAS~ • SSS~	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Solve and prove relationships (G.SRT.5, G.MG.3, 8.EE.7, 7.RP.3)		Solve **and prove (by justifying proportionality and angle congruence)** geometric problems using congruence and similarity (include expressions with variables)	Solve **real world** geometric problems using angle congruence and proportionality **(include expressions with variables)**	Solve **mathematical** geometric problems using angle congruence **and** proportionality (numeric values only)	
Prove triangle theorems (G.SRT.4, G.CO.10, G.SRT.5, 8.EE.7)		**Prove (informal, explanation, etc.) all** of the following theorems: • A line parallel to one side of a triangle divides the other two proportionally • **If a line divides two sides of a triangle proportionally; then it is parallel to the third side.** • Pythagorean Theorem proved using triangle similarity	Solve geometric problems **(involving expressions)** using congruence and similarity for the following theorems: • A line parallel to one side of a triangle divides the other two proportionally • Pythagorean Theorem proved using triangle similarity	Solve geometric problems **(numerical)** using congruence and similarity for the following theorems: • A line parallel to one side of a triangle divides the other two proportionally • Pythagorean Theorem proved using triangle similarity	

G.SRT.3 Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar.
G.SRT.5 Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures.
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.
G.CO.10 Prove theorems about triangles. Theorems include: ~~measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent~~; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length~~; the medians of a triangle meet at a point~~
G.MG.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).★
7.RP.3 Use proportional relationships to solve multi-step ratio ~~and percent~~ problems.
8.EE.7 Solve linear equations in one variable. a - Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers). b - Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Trigonometry

6.1 Investigate right triangle trigonometry

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Understand side ratios (G.SRT.6) **Use sine and cosine** (G.SRT.7)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Use properties of similar right triangles to **form the definitions** of • sine • cosine • tangent **Explain and use the relationship between the sine of an acute angle and the cosine of its complement.**	**Use side ratios** to prove angles are congruent between triangles leading to similar triangles.	**Find the trig ratios** of a given right triangle.	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Use Trig Ratios (G.SRT.8)		Use trigonometric ratios and the Pythagorean Theorem in applied problems to find • unknown sides • unknown angles	**Given an image**, use trigonometric ratios **and the Pythagorean Theorem in applied problems** to find • unknown sides • unknown angles	**Given an image**, solve right triangles using trigonometric ratios for: • unknown sides • unknown angles	

G.SRT.6 Understand that by similarity, side ratios in right triangles are properties of the angles in the triangle, leading to definitions of trigonometric ratios for acute angles.

G.SRT.7 Explain and use the relationship between the sine and cosine of complementary angles.

G.SRT.8 Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems.★

Circles

7.1/7.2 Investigate circles and apply formulas

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Circle relationships (G.C.2, 8.EE.7)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Describe the formula and use the relationship to calculate values (including variable expressions) for **all of the following:** • Central angle • Inscribed angle • Circumscribed angle • Inscribed angles on a diameter • Angle formed by the radius of a circle and a tangent	**Describe** the formula and use the relationship to calculate values (**including variable expressions**) for 4 of the following: • Central angle • Inscribed angle • Circumscribed angle • Inscribed angles on a diameter • Angle formed by the radius of a circle and a tangent	Use the relationship to calculate values (numerical only) for **3 of the following**: • Central angle • Inscribed angle • Circumscribed angle • Inscribed angles on a diameter • Angle formed by the radius of a circle and a tangent	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Prove and explain (G.C.1, G.C.5)		Use similarity **to prove**: • Circles are similar using transformations • The length of the arc intercepted by an angle is proportional to the radius **Derive and explain the formula** for the area of a sector	Use similarity to do **all** of the following: • Prove circles are similar using transformations • Calculate the length of an arc Given the area of a sector**, find the radius**	Use similarity to do **one** of the following: • Prove circles are similar using transformations • Calculate the length of an arc **Find the area** of a sector	
Explain circumference and area (G.GMD.1)		Give an informal argument for the formulas for the circumference of a circle **and** area of a circle	Give an informal argument for the formulas for the circumference of a circle **or** area of a circle	Use formulas for circumference and area of a circle to solve problems	
Constructions (G.C.4)		Construct a tangent line from a point outside a given circle to a circle **with precision.**	Construct a tangent line **from a point outside a given circle to a circle.**	Construct a tangent line **from a point on a circle**.	

G.C.1 Prove that all circles are similar.

G.C.2 Identify and describe relationships among inscribed angles, radii, and chords. *Include the relationship between central, inscribed, and circumscribed angles; inscribed angles on diameter are right angles; the radius of a circle is perpendicular to the tangent where the radius intersects the circle.*

G.C.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.

G.C.4 Construct a tangent line from a point outside a given circle to the circle.

G.C.5 Derive using similarity the fact that the length of the arc intercepted by an angle is proportional to the radius, ~~and define the radian measure of the angle as the constant of proportionality;~~ derive the formula for the area of a sector.

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

8.EE.7 Solve linear equations in one variable. a - Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers). b - Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

Circles

7.3 Investigate and interpret circle equations.

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Derive the equation (G.GPE.1, GPE.4)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Use the Pythagorean theorem to find the **equation** of a circle **Justify** whether a point lies on a circle given the center **and a point on the circle**. Given the equation of a circle, sketch a graph of the circle	Use the Pythagorean theorem to find the **radius** of a circle **Determine** whether a point lies on a circle given the center of the circle **and the radius**.	**Given the equation,** determine whether a point lies on a circle. Identify the radius and center of a circle given an equation. Write the equation of a circle given the radius and center.	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1

G.GPE.1 Derive the equation of a circle of given center and radius using the Pythagorean Theorem; complete the square to find the center and radius of a circle given by an equation.

G.GPE.4 Use coordinates to prove simple geometric theorems algebraically. ~~*For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle;*~~ *prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).*

Circles

8.1 Concurrency in Triangles

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Concurrency in Triangles (G.CO.10)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	**Prove** the medians of a triangle meet at a point.	**Use constructions to show** the medians of a triangle meet at a point.	**Identify** the properties of a centroid	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Constructions (G.C.3)		Construct **both** of the following: • the inscribed circle of a triangle. • the circumscribed circle of a triangle.	Construct **one** of the following: • the inscribed circle of a triangle. • the circumscribed circle of a triangle.	**Identify** the following: • incenter is the intersection of the angle bisectors • circumcenter is the intersection perpendicular bisectors	

G.C.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.

G.CO.10 Prove theorems about triangles. Theorems include: measures of interior angles of a triangle sum to 180°; base angles of isosceles triangles are congruent; the segment joining midpoints of two sides of a triangle is parallel to the third side and half the length; the medians of a triangle meet at a point.

Quadrilaterals & Other Polygons

9.1 Construct and explore polygons

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Construct triangles and hexagons (G.CO.13)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Construct an inscribed regular hexagon **and** an inscribed square	Construct an **inscribed regular hexagon or an inscribed square**	Construct a square given a side	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Prove quadrilateral properties (G.C.3)		**Prove** properties of angles for a quadrilateral inscribed in a circle.	**Show mathematically** properties of angles for a quadrilateral inscribed in a circle.	**Identify** properties of angles for a quadrilateral inscribed in a circle.	

G.CO.13 Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle.

G.C.3 Construct the inscribed and circumscribed circles of a triangle, and prove properties of angles for a quadrilateral inscribed in a circle.

Quadrilaterals & Other Polygons

9.2 Prove theorems about quadrilaterals

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Prove parallelogram theorems (G.CO.11, 8.EE.7)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Show mathematically for problems about parallelograms with rational numbers and variables on both sides, **that require both distributing and combining like terms** all of the following theorems • opposite sides are congruent, • opposite angles are congruent, • the diagonals of a parallelogram bisect each other, • rectangles are parallelograms with congruent diagonals **Prove algebraically** two of the following theorems about parallelograms • opposite sides are congruent, • opposite angles are congruent, • the diagonals of a parallelogram bisect each other, • rectangles are parallelograms with congruent diagonals	**Show mathematically** for problems about parallelograms with rational numbers and **variables on both sides**, that require distributing **or** combining like terms all of the following theorems • opposite sides are congruent, • opposite angles are congruent, • the diagonals of a parallelogram bisect each other, • rectangles are parallelograms with congruent diagonals **Prove algebraically** one of the following theorems about parallelograms • opposite sides are congruent, • opposite angles are congruent, • the diagonals of a parallelogram bisect each other, • rectangles are parallelograms with congruent diagonals	**Identify all and solve linear equations with rational numbers and variable(s) on one side for two** of the following theorems about parallelograms • opposite sides are congruent, • opposite angles are congruent, • the diagonals of a parallelogram bisect each other, • rectangles are parallelograms with congruent diagonals	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Prove with coordinates (G.GPE.4)		Using coordinate geometry and the Pythagorean, slope, distance, and midpoint formulas to **prove the types of quadrilaterals**	Using coordinate geometry and the Pythagorean, slope, distance, and midpoint formulas to **identify the types of quadrilaterals**	Using coordinate geometry and the Pythagorean, slope, distance, and midpoint formulas to **identify properties of quadrilaterals**	

G.CO.11 Prove theorems about parallelograms. Theorems include: opposite sides are congruent, opposite angles are congruent, the diagonals of a parallelogram bisect each other, and conversely, rectangles are parallelograms with congruent diagonals.

G.GPE.4 Use coordinates to prove simple geometric theorems algebraically. For example, prove or disprove that a figure defined by four given points in the coordinate plane is a rectangle; prove or disprove that the point (1, √3) lies on the circle centered at the origin and containing the point (0, 2).

8.EE.7 Solve linear equations in one variable. a - Give examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form x = a, a = a, or a = b results (where a and b are different numbers). b - Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms.

3-D Figures

10.1 Investigate cross-sections and rotations

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Identify objects (G.GMD.4)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Identify the shapes of two dimensional cross sections of three dimensional objects **and** identify three dimensional objects generated by rotations of two dimensional objects.	Identify the shapes of two dimensional cross sections of three dimensional objects **or** identify three dimensional objects generated by rotations of two dimensional objects.		Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Use shapes to solve design problems (G.MG.3, G.MG.1~~)~~		Describe objects in context of a situation using geometric shapes their measures, and properties **and use them to solve problems related to**	Describe objects in context of a situation using geometric shapes, **their measures, and properties**	Describe objects in context of a situation using geometric shapes	

G.GMD.4 Identify the shapes of two dimensional cross sections of three dimensional objects, and identify three dimensional objects generated by rotations of two dimensional objects.

G.MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).★

G.MG.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).★

3-D Figures

10.2 Develop and apply volume formulas

CCSS	4 – Mastery	3 – Proficient	2 - Basic	1 – Below Basic	0 – No Evidence
Use Shapes and apply density concepts (G.MG.1, G.MG.2) **Solve design problems** (G.MG.3)	Can extend thinking beyond the standard, including tasks that may involve one of the following: • Designing • Connecting • Synthesizing • Applying • Justifying • Critiquing • Analyzing • Creating • Proving	Describe objects in context of a situation using geometric shapes and use them to solve problems related to ● **<u>density based</u>** on area and volume ● design problems **(ie. maximum volume, minimum cost, etc.)**	Describe objects in context of a situation using geometric shapes and use them to solve problems related to ● area and volume ● **<u>design problems</u>**	Describe objects in context of a situation using geometric shapes and use them to solve problems related to • **<u>area and volume</u>**	Little evidence of reasoning or application to solve the problem Does not meet the criteria in a level 1
Explain Formulas (G.GMD.1) **Use Volume Formulas** (G.GMD.3)		Explain the formulas for **<u>all of the following</u>** ● volume of a cylinder ● volume of a pyramid ● volume of a cone using dissection arguments, cross sections of three dimensional objects, and Cavalieri's principle Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems in context of a situation.	Explain the formulas for **<u>2 of the following</u>** ● volume of a cylinder ● volume of a pyramid ● volume of a cone using dissection arguments, cross sections of three dimensional objects, and Cavalieri's principle Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems **<u>in context of a situation.</u>**	Explain the formulas **<u>for 21 of the following</u>** ● volume of a cylinder ● volume of a pyramid ● volume of a cone using dissection arguments, cross sections of three dimensional objects, and Cavalieri's principle **<u>Use volume formulas</u>** for cylinders, pyramids, cones, and spheres to solve problems	

G.MG.1 Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder).★

G.MG.2 Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot).★

G.MG.3 Apply geometric methods to solve design problems (e.g., designing an object or structure to satisfy physical constraints or minimize cost; working with typographic grid systems based on ratios).★

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.2 (+) Give an informal argument using Cavalieri's principle for the formulas for the volume of a sphere and other solid figures.

G.GMD.3 Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems.★