

Maryland Tutorials are designed specifically for the Maryland College and Career-Ready Standards to prepare students for the PARCC assessment, the Maryland School Assessment (MSA), and the Maryland High School Assessment (HSA).

Math Tutorials offer targeted instruction, practice and review designed to develop computational fluency, deepen conceptual understanding, and apply mathematical practices. They automatically identify and address learning gaps down to elementary-level content, using adaptive remediation to bring students to grade-level no matter where they start. Students engage with the content in an interactive, feedback-rich environment as they progress through standards-aligned modules. By constantly honing the ability to apply their knowledge in abstract and real world scenarios, students build the depth of knowledge and higher order skills required to demonstrate their mastery when put to the test.

In each module, the Learn It and Try It make complex ideas accessible to students through focused content, modeled logic and process, multi-modal representations, and personalized feedback as students reason through increasingly challenging problems. The Review It offers a high impact summary of key concepts and relates those concepts to students' lives. The Test It assesses students' mastery of the module's concepts, providing granular performance data to students and teachers after each attempt. To help students focus on the content most relevant to them, unit-level pretests and posttests can quickly identify where students are strong and where they're still learning.

### Unit 1: Points, Lines, and Figures

- **POINTS, RAYS, LINE SEGMENTS, LINES, AND FIGURES**

- G.CO.1.A: Congruence, Proof, and Constructions Experiment with transformations in the plane 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. Ability to fluently use mathematical vocabulary accurately

- **PARALLEL AND PERPENDICULAR LINES**

- G.CO.1.A: Congruence, Proof, and Constructions Experiment with transformations in the plane 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. Ability to fluently use mathematical vocabulary accurately
- G.GPE.5.A: Connecting Algebra and Geometry Through Coordinates Use coordinates to prove simple geometric theorems algebraically 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). See the skills and knowledge that are stated in the Standard.

### Unit 2: Lines and Angles

- **PARALLEL LINES AND ANGLE RELATIONSHIPS**

- G.CO.9.A: Congruence, Proof, and Constructions Prove geometric theorems Prove theorems about lines and angles. Ability to construct a proof using one of a variety of methods
- G.CO.1.A: Congruence, Proof, and Constructions Experiment with transformations in the plane 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. Ability to fluently use mathematical vocabulary accurately

- **PERPENDICULAR BISECTOR AND ANGLE BISECTOR THEOREMS**

- G.CO.1.A: Congruence, Proof, and Constructions Experiment with transformations in the plane 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. Ability to fluently use mathematical vocabulary accurately
- G.CO.9.A: Congruence, Proof, and Constructions Prove geometric theorems Prove theorems about lines and angles. Ability to construct a proof using one of a variety of methods
- G.CO.10.A: Congruence, Proof, and Constructions Prove geometric theorems Prove theorems about triangles. Ability to construct a proof using one of a variety of methods
- G.SRT.4.A: Similarity, Proof and Trigonometry Prove theorems involving similarity Prove theorems about triangles. Ability to construct a proof using one of a variety of methods

### Unit 3: Triangles

- **TRIANGLE ANGLE THEOREMS**

- G.CO.10.A: Congruence, Proof, and Constructions Prove geometric theorems Prove theorems about triangles. Ability to construct a proof using one of a variety of methods
- G.SRT.4.A: Similarity, Proof and Trigonometry Prove theorems involving similarity Prove theorems about triangles. Ability to construct a proof using one of a variety of methods

- **TRIANGLE BISECTORS**

- G.CO.9.A: Congruence, Proof, and Constructions Prove geometric theorems Prove theorems about lines and angles. Ability to construct a proof using one of a variety of methods
- G.CO.10.A: Congruence, Proof, and Constructions Prove geometric theorems Prove theorems about triangles. Ability to construct a proof using one of a variety of methods
- G.SRT.4.A: Similarity, Proof and Trigonometry Prove theorems involving similarity Prove theorems about triangles. Ability to construct a proof using one of a variety of methods
- G.SRT.5.A: Similarity, Proof and Trigonometry Prove theorems involving similarity Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. Ability to use information given in verbal or pictorial form about geometric figures to set up a proportion that accurately models the situation

- **MEDIANS AND ALTITUDES OF TRIANGLES**

- G.CO.10.A: Congruence, Proof, and Constructions Prove geometric theorems Prove theorems about triangles. Ability to construct a proof using one of a variety of methods
- G.SRT.4.A: Similarity, Proof and Trigonometry Prove theorems involving similarity Prove theorems about triangles. Ability to construct a proof using one of a variety of methods

#### Unit 4: Quadrilaterals and Constructions

- **PARALLELOGRAMS AND RECTANGLES**

- G.CO.11.A: Congruence, Proof, and Constructions Prove geometric theorems Prove theorems about parallelograms. Ability to construct a proof using one of a variety of methods

- **SQUARES AND RHOMBI**

- G.CO.11.A: Congruence, Proof, and Constructions Prove geometric theorems Prove theorems about parallelograms. Ability to construct a proof using one of a variety of methods

- **CONSTRUCTIONS**

- G.C.4.A: Circles With and Without Coordinates Understand and apply theorems about circles Construct a tangent line from a point outside a given circle to the circle. See the skills and knowledge that are stated in the Standard.
- G.CO.12.A: Congruence, Proof, and Constructions Make geometric constructions Make formal geometric constructions with a variety of tools and methods (compass and straightedge, string, reflective devices, paper folding, dynamic geometric software, etc.). Ability to use understanding of geometric concepts to establish a rationale for the steps/procedures used in completing a construction
- G.CO.13.A: Congruence, Proof, and Constructions Make geometric constructions Construct an equilateral triangle, a square, and a regular hexagon inscribed in a circle. Ability to use understanding of geometric concepts to establish a rationale for the steps/procedures used in completing a construction

#### Unit 5: Geometric Transformations

- **TRANSFORMATIONS ON THE COORDINATE PLANE**

- G.CO.2.B: Congruence, Proof, and Constructions Experiment with transformations in the plane 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). Knowledge that rigid transformations preserve the shape of a figure
- G.CO.3.A: Congruence, Proof, and Constructions Experiment with transformations in the plane Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. Ability to use appropriate vocabulary to describe rotations and reflections
- G.CO.4.A: Congruence, Proof, and Constructions Experiment with transformations in the plane Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. Ability to construct a definition for each term based upon a synthesis of experiences

- G.CO.5.B: Congruence, Proof, and Constructions Experiment with transformations in the plane 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. Ability to accurately use geometric vocabulary to describe the sequence of transformations that will carry a given figure onto another
- G.CO.6.C: Congruence, Proof, and Constructions Understand congruence in terms of rigid motions 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. Ability to use the definition of congruence as a test to see if two figures are congruent
- G.SRT.1.b.1: Similarity, Proof and Trigonometry Understand similarity in terms of similarity transformations Verify experimentally the properties of dilations given by a center and a scale factor: The dilation of a line segment is longer or shorter in the ratio given by the scale factor. Ability to develop a hypothesis based on observations
- G.CO.5.A: Congruence, Proof, and Constructions Experiment with transformations in the plane 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. Ability to interpret and perform a given sequence of transformations and draw the result
- G.SRT.2.A: Similarity, Proof and Trigonometry Understand similarity in terms of similarity transformations 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. Ability to make connections between the definition of similarity and the attributes of two given figures
- **DILATIONS, TRANSLATIONS, ROTATIONS, AND REFLECTIONS**
  - G.CO.3.A: Congruence, Proof, and Constructions Experiment with transformations in the plane Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. Ability to use appropriate vocabulary to describe rotations and reflections
  - G.CO.5.B: Congruence, Proof, and Constructions Experiment with transformations in the plane 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. Ability to accurately use geometric vocabulary to describe the sequence of transformations that will carry a given figure onto another
  - G.CO.3.B: Congruence, Proof, and Constructions Experiment with transformations in the plane Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. Ability to use the characteristics of a figure to determine and then describe what happens to the figure as it is rotated (such as axis of symmetry, congruent angles or sides.)
  - G.CO.4.A: Congruence, Proof, and Constructions Experiment with transformations in the plane Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular

lines, parallel lines, and line segments. Ability to construct a definition for each term based upon a synthesis of experiences

- G.CO.5.A: Congruence, Proof, and Constructions Experiment with transformations in the plane 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. Ability to interpret and perform a given sequence of transformations and draw the result
- G.CO.6.C: Congruence, Proof, and Constructions Understand congruence in terms of rigid motions 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. Ability to use the definition of congruence as a test to see if two figures are congruent
- G.SRT.1.a.1: Similarity, Proof and Trigonometry Understand similarity in terms of similarity transformations 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. Ability to connect experiences with dilations and orientation to experiences with lines
- G.SRT.1.b.1: Similarity, Proof and Trigonometry Understand similarity in terms of similarity transformations Verify experimentally the properties of dilations given by a center and a scale factor: The dilation of a line segment is longer or shorter in the ratio given by the scale factor. Ability to develop a hypothesis based on observations
- G.SRT.2.A: Similarity, Proof and Trigonometry Understand similarity in terms of similarity transformations 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. Ability to make connections between the definition of similarity and the attributes of two given figures
- G.CO.2.B: Congruence, Proof, and Constructions Experiment with transformations in the plane 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). Knowledge that rigid transformations preserve the shape of a figure

## Unit 6: Introduction to Congruence

### • TRIANGLES AND CONGRUENCE TRANSFORMATIONS

- G.CO.8.A: Congruence, Proof, and Constructions Understand congruence in terms of rigid motions Explain how the criteria for triangle congruence (ASA, SAS, and SSS) follow from the definition of congruence in terms of rigid motions. Ability to recognize why particular combinations of corresponding parts establish congruence and why others do not
- G.CO.6.C: Congruence, Proof, and Constructions Understand congruence in terms of rigid motions 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. Ability to use the definition of congruence as a test to see if two figures are congruent

- G.CO.10.A: Congruence, Proof, and Constructions Prove geometric theorems Prove theorems about triangles. Ability to construct a proof using one of a variety of methods
- G.SRT.4.A: Similarity, Proof and Trigonometry Prove theorems involving similarity Prove theorems about triangles. Ability to construct a proof using one of a variety of methods
- G.CO.3.A: Congruence, Proof, and Constructions Experiment with transformations in the plane Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. Ability to use appropriate vocabulary to describe rotations and reflections
- G.CO.3.B: Congruence, Proof, and Constructions Experiment with transformations in the plane Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. Ability to use the characteristics of a figure to determine and then describe what happens to the figure as it is rotated (such as axis of symmetry, congruent angles or sides.)
- G.CO.6.A: Congruence, Proof, and Constructions Understand congruence in terms of rigid motions 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. Ability to recognize the effects of rigid motion on orientation and location of a figure
- G.CO.6.B: Congruence, Proof, and Constructions Understand congruence in terms of rigid motions 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. Ability to use rigid motions to map one figure onto another
- G.CO.7.A: Congruence, Proof, and Constructions Understand congruence in terms of rigid motions 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. Knowledge of vocabulary corresponding parts and the connection to the given triangles
- G.CO.7.B: Congruence, Proof, and Constructions Understand congruence in terms of rigid motions 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. Ability to identify the corresponding parts of two triangles
- **CONGRUENCE OF OTHER POLYGONS**
  - G.CO.6.C: Congruence, Proof, and Constructions Understand congruence in terms of rigid motions 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. Ability to use the definition of congruence as a test to see if two figures are congruent
  - G.CO.2.B: Congruence, Proof, and Constructions Experiment with transformations in the plane 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). Knowledge that rigid transformations preserve the shape of a figure

- G.CO.3.A: Congruence, Proof, and Constructions Experiment with transformations in the plane Given a rectangle, parallelogram, trapezoid, or regular polygon, describe the rotations and reflections that carry it onto itself. Ability to use appropriate vocabulary to describe rotations and reflections
- G.CO.5.A: Congruence, Proof, and Constructions Experiment with transformations in the plane 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. Ability to interpret and perform a given sequence of transformations and draw the result
- G.CO.5.B: Congruence, Proof, and Constructions Experiment with transformations in the plane 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. Ability to accurately use geometric vocabulary to describe the sequence of transformations that will carry a given figure onto another
- G.CO.6.A: Congruence, Proof, and Constructions Understand congruence in terms of rigid motions 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. Ability to recognize the effects of rigid motion on orientation and location of a figure
- G.CO.6.B: Congruence, Proof, and Constructions Understand congruence in terms of rigid motions 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. Ability to use rigid motions to map one figure onto another

## Unit 7: Introduction to Similarity

### • TRIANGLES AND SIMILARITY TRANSFORMATIONS

- G.CO.10.A: Congruence, Proof, and Constructions Prove geometric theorems Prove theorems about triangles. Ability to construct a proof using one of a variety of methods
- G.SRT.2.A: Similarity, Proof and Trigonometry Understand similarity in terms of similarity transformations 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. Ability to make connections between the definition of similarity and the attributes of two given figures
- G.SRT.3.A: Similarity, Proof and Trigonometry Understand similarity in terms of similarity transformations Use the properties of similarity transformations to establish the AA criterion for two triangles to be similar. Ability to recognize why particular combinations of corresponding parts establish similarity and why others do not

- G.SRT.4.A: Similarity, Proof and Trigonometry Prove theorems involving similarity Prove theorems about triangles. Ability to construct a proof using one of a variety of methods
- G.SRT.2.B: Similarity, Proof and Trigonometry Understand similarity in terms of similarity transformations 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. Ability to set up and use appropriate ratios and proportions
- G.SRT.5.A: Similarity, Proof and Trigonometry Prove theorems involving similarity Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. Ability to use information given in verbal or pictorial form about geometric figures to set up a proportion that accurately models the situation
- **SIMILARITY OF OTHER POLYGONS**
  - G.SRT.2.A: Similarity, Proof and Trigonometry Understand similarity in terms of similarity transformations 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. Ability to make connections between the definition of similarity and the attributes of two given figures
  - G.SRT.2.B: Similarity, Proof and Trigonometry Understand similarity in terms of similarity transformations 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. Ability to set up and use appropriate ratios and proportions
  - G.SRT.5.A: Similarity, Proof and Trigonometry Prove theorems involving similarity Use congruence and similarity criteria for triangles to solve problems and to prove relationships in geometric figures. Ability to use information given in verbal or pictorial form about geometric figures to set up a proportion that accurately models the situation

## Unit 8: Triangles and Trigonometry

- **PYTHAGOREAN THEOREM**
  - G.CO.10.A: Congruence, Proof, and Constructions Prove geometric theorems Prove theorems about triangles. Ability to construct a proof using one of a variety of methods
  - G.SRT.8.A: Similarity, Proof and Trigonometry Define trigonometric ratios and solve problems involving right triangles Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. See the skills and knowledge that are stated in the Standard.
  - G.SRT.4.A: Similarity, Proof and Trigonometry Prove theorems involving similarity Prove theorems about triangles. Ability to construct a proof using one of a variety of methods
- **TRIGONOMETRIC RATIOS**
  - G.SRT.7.A: Similarity, Proof and Trigonometry Define trigonometric ratios and solve problems involving right triangles Explain and use the relationship between the sine and cosine of



complementary angles. See the skills and knowledge that are stated in the Standard.

- G.SRT.6.A: Similarity, Proof and Trigonometry Define trigonometric ratios and solve problems involving right triangles 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. Ability to generalize that side ratios from similar triangles are equal and that these relationships lead to the definition of the six trigonometric ratios
- G.SRT.8.A: Similarity, Proof and Trigonometry Define trigonometric ratios and solve problems involving right triangles Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. See the skills and knowledge that are stated in the Standard.

### Unit 9: Applications of Trigonometry

#### • LAWS OF SINE AND COSINE

- G.SRT.9.A: Similarity, Proof and Trigonometry Apply trigonometry to general triangles Derive the formula  $A = \frac{1}{2} ab \sin(C)$  for the area of a triangle by drawing an auxiliary line from a vertex perpendicular to the opposite side. Ability to make connections between the formula  $A = \frac{1}{2} (\text{base}) (\text{height})$  and right triangle trigonometry
- G.SRT.10.A: Similarity, Proof and Trigonometry Apply trigonometry to general triangles Prove the Laws of Sines and Cosines and use them to solve problems. Ability to recognize when it is appropriate to use the Law of Sines and the Law of Cosines
- G.SRT.11.A: Similarity, Proof and Trigonometry Apply trigonometry to general triangles Understand and apply the Law of Sines and the Law of Cosines to find unknown measurements in right and non-right triangles (e.g., surveying problems, resultant forces). See the skills and knowledge that are stated in the Standard.

#### • RADIANS AND THE UNIT CIRCLE

- G.C.5.A: Circles With and Without Coordinates Find arc lengths and areas of sectors of circles 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. See the skills and knowledge that are stated in the Standard.
- G.SRT.8.A: Similarity, Proof and Trigonometry Define trigonometric ratios and solve problems involving right triangles Use trigonometric ratios and the Pythagorean Theorem to solve right triangles in applied problems. See the skills and knowledge that are stated in the Standard.

### Unit 10: Circles I

#### • CIRCLE BASICS

- G.CO.1.A: Congruence, Proof, and Constructions Experiment with transformations in the plane 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. Ability to fluently use mathematical vocabulary accurately
- G.C.2.A: Circles With and Without Coordinates Understand and apply theorems about circles Identify and describe relationships among inscribed angles, radii, and chords. See the skills and knowledge

that are stated in the Standard.

- **CENTRAL ANGLES, INSCRIBED ANGLES, AND CHORDS**

- G.CO.9.A: Congruence, Proof, and Constructions Prove geometric theorems Prove theorems about lines and angles. Ability to construct a proof using one of a variety of methods
- G.C.2.A: Circles With and Without Coordinates Understand and apply theorems about circles Identify and describe relationships among inscribed angles, radii, and chords. See the skills and knowledge that are stated in the Standard.

### Unit 11: Circles II

- **SECANTS, ANGLES, AND INTERCEPTED ARCS**

- G.CO.9.A: Congruence, Proof, and Constructions Prove geometric theorems Prove theorems about lines and angles. Ability to construct a proof using one of a variety of methods
- G.C.2.A: Circles With and Without Coordinates Understand and apply theorems about circles Identify and describe relationships among inscribed angles, radii, and chords. See the skills and knowledge that are stated in the Standard.

- **TANGENTS, ANGLES, AND INTERCEPTED ARCS**

- G.CO.9.A: Congruence, Proof, and Constructions Prove geometric theorems Prove theorems about lines and angles. Ability to construct a proof using one of a variety of methods
- G.C.2.A: Circles With and Without Coordinates Understand and apply theorems about circles Identify and describe relationships among inscribed angles, radii, and chords. See the skills and knowledge that are stated in the Standard.

### Unit 12: Measuring Circles

- **CIRCUMFERENCE AND ARC LENGTH**

- G.GMD.1.A: Extending to Three Dimensions Explain volume formulas and use them to solve problems Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. See the skills and knowledge that are stated in the Standard.
- G.MG.1.A: Extending to Three Dimensions Apply geometric concepts in modeling situations Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). Ability to connect experiences with this standard as it related to the two dimensional shapes studied in Unit 2 to threedimensional shapes

- **AREA OF CIRCLES AND SECTORS**

- G.C.5.A: Circles With and Without Coordinates Find arc lengths and areas of sectors of circles 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. See the skills and knowledge that are stated in the Standard.
- G.MG.1.A: Extending to Three Dimensions Apply geometric concepts in modeling situations Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree

trunk or a human torso as a cylinder). Ability to connect experiences with this standard as it related to the two dimensional shapes studied in Unit 2 to threedimensional shapes

- G.GMD.1.A: Extending to Three Dimensions Explain volume formulas and use them to solve problems Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. See the skills and knowledge that are stated in the Standard.

### Unit 13: Properties of Circles

- **CONGRUENT AND SIMILAR CIRCLES**

- G.C.1.A: Circles With and Without Coordinates Understand and apply theorems about circles Prove that all circles are similar. See the skills and knowledge that are stated in the Standard.
- G.SRT.2.A: Similarity, Proof and Trigonometry Understand similarity in terms of similarity transformations 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. Ability to make connections between the definition of similarity and the attributes of two given figures
- G.CO.4.A: Congruence, Proof, and Constructions Experiment with transformations in the plane Develop definitions of rotations, reflections, and translations in terms of angles, circles, perpendicular lines, parallel lines, and line segments. Ability to construct a definition for each term based upon a synthesis of experiences
- G.CO.6.C: Congruence, Proof, and Constructions Understand congruence in terms of rigid motions 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. Ability to use the definition of congruence as a test to see if two figures are congruent
- G.GPE.4.A: Circles With and Without Coordinates Use coordinates to prove simple geometric theorems algebraically Use coordinates to prove simple geometric theorems algebraically. Ability to connect experience with coordinate proofs from Unit 4 to circles

- **CIRCLES**

- G.CO.1.A: Congruence, Proof, and Constructions Experiment with transformations in the plane 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. Ability to fluently use mathematical vocabulary accurately
- G.GPE.1.A: Circles With and Without Coordinates Translate between the geometric description and the equation for a conic section 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. See the skills and knowledge that are stated in the Standard.

### Unit 14: Lines in the Coordinate Plane

- **SLOPE**

- G.GPE.4.A: Circles With and Without Coordinates Use coordinates to prove simple geometric theorems algebraically Use coordinates to prove simple geometric theorems algebraically. Ability to connect experience with coordinate proofs from Unit 4 to circles
- G.GPE.6.A: Connecting Algebra and Geometry Through Coordinates Use coordinates to prove simple geometric theorems algebraically Find the point on a directed line segment between two given points that partitions the segment in a given ratio. Ability to use the slope formula
- G.GPE.5.A: Connecting Algebra and Geometry Through Coordinates Use coordinates to prove simple geometric theorems algebraically 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). See the skills and knowledge that are stated in the Standard.
- **SLOPE-INTERCEPT FORM OF A LINEAR EQUATION**
  - G.CO.1.A: Congruence, Proof, and Constructions Experiment with transformations in the plane 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. Ability to fluently use mathematical vocabulary accurately
  - G.GPE.5.A: Connecting Algebra and Geometry Through Coordinates Use coordinates to prove simple geometric theorems algebraically 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). See the skills and knowledge that are stated in the Standard.

## Unit 15: Coordinate Geometry

- **LENGTH AND THE DISTANCE FORMULA**
  - G.GPE.4.A: Connecting Algebra and Geometry Through Coordinates Use coordinates to prove simple geometric theorems algebraically Use coordinates to prove simple geometric theorems algebraically. Ability to use distance, slope and midpoint formulas
  - G.GPE.7.A: Connecting Algebra and Geometry Through Coordinates Use coordinates to prove simple geometric theorems algebraically Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. See the skills and knowledge that are stated in the Standard.
- **MIDPOINT FORMULA ON THE COORDINATE PLANE**
  - G.GPE.4.A: Connecting Algebra and Geometry Through Coordinates Use coordinates to prove simple geometric theorems algebraically Use coordinates to prove simple geometric theorems algebraically. Ability to use distance, slope and midpoint formulas
- **CONJECTURES IN COORDINATE GEOMETRY**
  - G.CO.10.A: Congruence, Proof, and Constructions Prove geometric theorems Prove theorems about triangles. Ability to construct a proof using one of a variety of methods
  - G.GPE.4.A: Circles With and Without Coordinates Use coordinates to prove simple geometric theorems algebraically Use coordinates to prove simple geometric theorems algebraically. Ability to connect experience with coordinate proofs from Unit 4 to circles

## Unit 16: Perimeter and Area

### • PERIMETER ON THE COORDINATE PLANE

- G.GPE.7.A: Connecting Algebra and Geometry Through Coordinates Use coordinates to prove simple geometric theorems algebraically Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. See the skills and knowledge that are stated in the Standard.
- G.MG.1.A: Circles With and Without Coordinates Apply geometric concepts in modeling situations Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). Ability to connect experiences from Unit 2 and Unit 3 with two-dimensional and three-dimensional shapes to circles

### • AREA ON THE COORDINATE PLANE

- G.GPE.4.A: Connecting Algebra and Geometry Through Coordinates Use coordinates to prove simple geometric theorems algebraically Use coordinates to prove simple geometric theorems algebraically. Ability to use distance, slope and midpoint formulas
- G.MG.1.A: Extending to Three Dimensions Apply geometric concepts in modeling situations Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). Ability to connect experiences with this standard as it related to the two dimensional shapes studied in Unit 2 to threedimensional shapes
- G.GPE.7.A: Connecting Algebra and Geometry Through Coordinates Use coordinates to prove simple geometric theorems algebraically Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. See the skills and knowledge that are stated in the Standard.

## Unit 17: Three-Dimensional Figures I

### • RELATING TWO-DIMENSIONAL FIGURES TO THREE-DIMENSIONAL SOLIDS

- G.GMD.4.A: Extending to Three Dimensions Visualize relationships between two-dimensional and three-dimensional objects Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. Ability to make connections between two-dimensional figures such as rectangles, squares, circles, and triangles and threedimensional figures such as cylinders, spheres, pyramids and cones
- G.GPE.7.A: Connecting Algebra and Geometry Through Coordinates Use coordinates to prove simple geometric theorems algebraically Use coordinates to compute perimeters of polygons and areas of triangles and rectangles, e.g., using the distance formula. See the skills and knowledge that are stated in the Standard.
- G.MG.1.A: Circles With and Without Coordinates Apply geometric concepts in modeling situations Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). Ability to connect experiences from Unit 2 and Unit 3 with two-dimensional and three-dimensional shapes to circles

### • VOLUME OF PRISMS AND PYRAMIDS

- G.GMD.3.A: Extending to Three Dimensions Explain volume formulas and use them to solve problems Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. See the skills and knowledge that are stated in the Standard.
- G.GMD.4.A: Extending to Three Dimensions Visualize relationships between two-dimensional and three-dimensional objects Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. Ability to make connections between two-dimensional figures such as rectangles, squares, circles, and triangles and threedimensional figures such as cylinders, spheres, pyramids and cones
- G.GMD.1.A: Extending to Three Dimensions Explain volume formulas and use them to solve problems Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. See the skills and knowledge that are stated in the Standard.

### Unit 18: Three-Dimensional Figures II

- **VOLUME OF CYLINDERS AND CONES**

- G.GMD.1.A: Extending to Three Dimensions Explain volume formulas and use them to solve problems Give an informal argument for the formulas for the circumference of a circle, area of a circle, volume of a cylinder, pyramid, and cone. See the skills and knowledge that are stated in the Standard.
- G.GMD.3.A: Extending to Three Dimensions Explain volume formulas and use them to solve problems Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. See the skills and knowledge that are stated in the Standard.
- G.GMD.4.A: Extending to Three Dimensions Visualize relationships between two-dimensional and three-dimensional objects Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. Ability to make connections between two-dimensional figures such as rectangles, squares, circles, and triangles and threedimensional figures such as cylinders, spheres, pyramids and cones

- **MODELING SITUATIONS WITH GEOMETRY**

- G.MG.2.A: Similarity, Proof and Trigonometry Apply geometric concepts in modeling situations Apply concepts of density based on area and volume in modeling situations (e.g., persons per square mile, BTUs per cubic foot). See the skills and knowledge that are stated in the Standard.
- G.GMD.4.A: Extending to Three Dimensions Visualize relationships between two-dimensional and three-dimensional objects Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. Ability to make connections between two-dimensional figures such as rectangles, squares, circles, and triangles and threedimensional figures such as cylinders, spheres, pyramids and cones
- G.MG.3.A: Similarity, Proof and Trigonometry Apply geometric concepts in modeling situations 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). See the skills and knowledge that are stated in the Standard.

### Unit 19: Surface Area

- **SURFACE AREA AND VOLUME OF SPHERES**

- G.GMD.4.A: Extending to Three Dimensions Visualize relationships between two-dimensional and three-dimensional objects Identify the shapes of two-dimensional cross-sections of three-dimensional objects, and identify three-dimensional objects generated by rotations of two-dimensional objects. Ability to make connections between two-dimensional figures such as rectangles, squares, circles, and triangles and threedimensional figures such as cylinders, spheres, pyramids and cones
- G.GMD.3.A: Extending to Three Dimensions Explain volume formulas and use them to solve problems Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. See the skills and knowledge that are stated in the Standard.
- **SURFACE AREA OF COMPOSITE SOLIDS**
  - G.MG.1.A: Circles With and Without Coordinates Apply geometric concepts in modeling situations Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). Ability to connect experiences from Unit 2 and Unit 3 with two-dimensional and three-dimensional shapes to circles
- **SURFACE AREA OF SIMILAR SOLIDS**
  - G.SRT.2.A: Similarity, Proof and Trigonometry Understand similarity in terms of similarity transformations 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. Ability to make connections between the definition of similarity and the attributes of two given figures
  - G.SRT.2.B: Similarity, Proof and Trigonometry Understand similarity in terms of similarity transformations 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. Ability to set up and use appropriate ratios and proportions
  - G.MG.1.A: Extending to Three Dimensions Apply geometric concepts in modeling situations Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). Ability to connect experiences with this standard as it related to the two dimensional shapes studied in Unit 2 to threedimensional shapes
  - G.MG.1.A: Circles With and Without Coordinates Apply geometric concepts in modeling situations Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). Ability to connect experiences from Unit 2 and Unit 3 with two-dimensional and three-dimensional shapes to circles

## Unit 20: Volume of Similar and Composite Shapes

- **VOLUME OF COMPOSITE SOLIDS**
  - G.GMD.3.A: Extending to Three Dimensions Explain volume formulas and use them to solve problems Use volume formulas for cylinders, pyramids, cones, and spheres to solve problems. See the skills and knowledge that are stated in the Standard.
- **VOLUME OF SIMILAR SOLIDS**

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- G.SRT.2.B: Similarity, Proof and Trigonometry Understand similarity in terms of similarity transformations 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. Ability to set up and use appropriate ratios and proportions
  - G.MG.1.A: Circles With and Without Coordinates Apply geometric concepts in modeling situations Use geometric shapes, their measures, and their properties to describe objects (e.g., modeling a tree trunk or a human torso as a cylinder). Ability to connect experiences from Unit 2 and Unit 3 with two-dimensional and three-dimensional shapes to circles
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