CURRICULUM GUIDE

Geometry

Providence Schools

Printed by students at the Providence Career and Technical Academy

Background

Providence Schools teachers and administrators worked collaboratively with consultants from the Charles A. Dana Center at the University of Texas at Austin to develop the mathematics and science curriculum frameworks. The curriculum frameworks encompass two critical questions:

- Content Standards that establish clearly defined expectations for all students, helping to answer the question, ***What do students have to learn?***
- Performance Standards that determine performance expectations for content standards, helping to answer the question, ***How well do the students have to learn it?***

The curriculum framework provides a work plan that directs the instruction delivered in every classroom in every school in the district. Instruction—the way the curriculum is presented to students—will focus on the needs of students.

Purpose and Use of Curriculum Guides

Curriculum Guides for the curriculum for each grade and subject outline the approximate number of days that each unit in the curriculum will be taught; describe the content to be learned; and list the essential questions that students should be able to answer by the end of the unit.

Parents should become familiar with the Curriculum Guides. You should know when your child is being taught different topics. You should also know the essential questions that your child should be able to answer by the end of each unit.

It is important that you understand that you do not have to be familiar with the content that your child is learning in order to help them with their studies. There are basic questions that you can ask to determine if your child understands the content.

Ask your child what she is learning in each subject

Does she understand the topic? Is the unit exciting or boring? What specifically does she like or dislike about the topic? Does she understand how the topic relates to the real world?

You know your child better than anyone. You will be able to tell if she or he is benefiting from the instruction and understanding the content of the material by the way they answer you. Speak to your child's teacher if you suspect there is a problem.

Ask your child about his assignments

What is the required work? Has he finished the work on time? Is he having difficulty? If he is having difficulty, why?

Encourage your child to talk to her teachers if she is having difficulty understanding a concept or completing an assignment. If your child continues to experience difficulty, speak to the teacher yourself so that the two of you can work together to support your child.

Even if you do not understand the content that your child is learning, the fact that you are showing interest in his or her school work and believe that it is important that he or she does well sends a powerful message.

Sharon Contreras
Chief Academic Officer
Providence Public School Department

QUARTER 1

Content students will be learning	Essential questions students should be able to answer by end of unit
Unit 1.1 - Points, Lines, and Planes (10 days) • Make and verify conjectures about relationships among points, lines, and planes, including intersecting lines and planes. • Determine segment lengths, including appropriate measurement with a ruler, interpreting diagrams, and applying the Segment Addition Postulate. • Use appropriate units of measure to explain and justify classifications of angles. • Understand angle relationships, including congruent angles, angle bisectors, and perpendicular lines. • Apply angle relationships to find angle measures and solve meaningful problems.	» How are points, lines, and planes related in a Euclidean space? » What angle relationships could you use to justify how you found a particular angle measure? » How are angle relationships determined? » How can you use constructions to create congruent angles, bisect angles, or generate a perpendicular segment?
Unit 1.2 - Distance and Midpoints (5 days) • Extend the notion of segment length from the previous unit to one- and two-dimensional coordinate systems. • Use concrete models to verify the Pythagorean theorem and investigate the distance and midpoint formulas. • Extend the Pythagorean theorem to develop the distance formula for a two-dimensional coordinate plane, and then apply the distance formula to solve real-world problems. • Develop midpoint formulas for one- and two-dimensional coordinate systems and apply those formulas to solve real-world problems.	» How does finding the length of a segment in one dimension compare to finding the length of a segment in two dimensions? » How does finding the midpoint of a segment in one dimension compare to finding the midpoint of a segment in two dimensions? » In what real-world situations might finding the midpoint or length of a segment be required?
Unit 1.3 - Perpendicular and Parallel Lines (14 days) • Use concrete models to explore and explain the angle relationships created by parallel lines and a transversal. • Understand and explain the relationships among angles that are created by parallel lines and a transversal, such as congruent angles and supplementary angles. • Understand, explain, and apply relationships among the measures of angles that are created by parallel lines and a transversal, including congruent and supplementary angle relationships. • Make and verify conjectures about patterns of slopes of parallel and perpendicular lines using multiple methods, including technology such as graphing calculators or dynamic geometry software.	» Where can you find parallel and perpendicular lines in the world outside the classroom? » How can professionals use and apply the properties of parallel and perpendicular lines? » How can you verify whether two lines are parallel or perpendicular? » If you know the measure of one angle in a set of parallel lines crossed by a transversal, how can you find the measures of the other angles?

QUARTERS 1 & 2

Content students will be learning	Essential questions students should be able to answer by end of unit
Unit 1.4 - Triangle Congruence (15 days) • Use geometric properties to solve problems involving side and angle relationships within and among triangles, including real-world applications. • Prove triangles to be congruent using a variety of methods of proof, both formal and informal. • Develop properties of isosceles and equilateral triangles using concrete models and technology as appropriate, and then apply those properties to solve real-world problems. • Construct and investigate special segments of triangles, including angle bisectors, perpendicular bisectors, medians, and altitudes. • Investigate and apply triangle inequalities, including the triangle inequality theorem.	» How can you show that two triangles are congruent? » How can you determine angle measures in different types of triangles? » How can you determine side lengths of different types of triangles? » How do the intersection points of special segments of triangles compare for acute, right, and obtuse triangles? » What real-world applications of triangle inequalities are there?
QUARTER 2	**QUARTER 2**
Unit 2.1 - Polygons (15 days) • Understand and apply interior and exterior angle relationships in polygons in order to construct geometric arguments and solve problems. • Develop and use properties and relationships of quadrilaterals to justify conclusions and solve problems.	» How do the interior angle measures and exterior angle measures of a regular polygon compare? » Given the coordinates of the vertices of a quadrilateral, how can you classify the quadrilateral? » How can you determine whether or not a quadrilateral is a parallelogram? » How do different types of parallelograms compare to one another? For example, how are a square and a rhombus alike or different?
Unit 2.2 - Similarity (20 days) • Apply properties of similar geometric figures to solve problems and justify conclusions. • Prove that two triangles are similar. • Apply properties of figures with proportional parts to solve meaningful problems and justify conclusions. • Investigate and apply dilations, using technology where appropriate.	» How do you use the properties of similarity to solve practical problems? » How are ratio and proportion used to solve problems involving similar polygons? » How is similarity verified? » How are similarity and congruence related? » If two triangles are similar, what can you say about the corresponding parts of the two triangles? » How do dilations compare to congruence transformations?

QUARTERS 2 & 3	
Content students will be learning	**Essential questions students should be able to answer by end of unit**
Unit 2.3 - Transformations on the Coordinate Plane (11 days) • Make and verify conjectures about transformations, including reflections, translations, rotations, and dilations. • Apply concepts and procedures of congruence to solve problems involving reflections, translations, and rotations. • Apply concepts and procedures of similarity to solve problems involving dilations.	» How do reflections, translations, and rotations relate to congruence and symmetry? » How do dilations relate to similarity? » How do numeric, symbolic, and graphical representations of transformations compare? » How does combining transformations affect the final result? » How could you use transformations to verify congruence or similarity between two figures?
QUARTER 3	**QUARTER 3**
Unit 3.1 - Area and Perimeter (20 days) • Identify, classify, and describe polygons and circles by their component parts. • Develop and apply formulas for areas of circles, polygons, and composite figures in order to solve meaningful problems. • Make geometric connections to the algebraic representations of area formulas.	» How does finding the area of a parallelogram compare to finding the area of a rectangle? » How can you tell whether a problem is asking you to find the perimeter of a figure or the area of a figure? » How can you find the area of an irregular or composite figure? » How does finding the area of a rhombus compare to finding the area of a kite? How are they different?
Unit 3.2 - Geometric Probability (5 days) • Understand the use of geometric models (length and area only) to solve problems involving theoretical and experimental probability.	» What is the difference between experimental and theoretical probability? » How can you find the probability of an event occurring in a geometric context such as area? » What is the difference between an independent event and a dependent event?
Unit 3.3 - Pythagorean Theorem (10 days) • Connect the Pythagorean theorem's algebraic representation to a variety of geometric representations. • Use the Pythagorean theorem to solve real world problems in a variety of contexts. • Make and defend conjectures in order to generalize Pythagorean relationships, including Pythagorean triples and Pythagorean inequalities from tables of data and number patterns. • Explore and describe properties of special right triangles as extensions of similar triangles.	» How can you represent the Pythagorean theorem geometrically? » How can you use the Pythagorean theorem to classify a triangle as acute, right, or obtuse? » How does a 30-60-90 right triangle compare to an equilateral triangle? » How does a 45-45-90 right triangle compare to a square?

QUARTER 4

Content students will be learning	Essential questions students should be able to answer by end of unit
QUARTER 4	**QUARTER 4**
Unit 4.1 - Spatial Visualization and Surface Area and Volume (23 days) • Use appropriate tools and visualizations to represent three-dimensional objects using two-dimensional sketches. • Determine and apply surface area and volume of prisms, cylinders, pyramids, cones, spheres, and composite solids in order to solve realworld problems. • Use ratios and scale factors to identify and describe similar solids and then use similar solids to solve real-world problems.	» How does an isometric drawing represent a three-dimensional object? » What is the difference between the volume of a three-dimensional figure and the surface area of a three-dimensional figure? » How do the lateral area and the surface area of a three-dimensional figure compare? » How can you determine whether a problem is asking you to find the surface area or the volume?
Unit 4.2 - Circles (20 days) • Determine the angular measure and length of a variety of types of arcs. • Use of methods, including technology, to develop and apply relationships between arcs and chords, inscribed angles and polygons, tangent segments and circumscribed polygons, angle measures created by intersecting secants and tangent segments, and segment lengths created by intersecting secants and tangent segments. • Use a variety of methods of proof, both formal and informal, to justify conjectures about properties and attributes of circles and their component parts.	» What are the differences between arc length and arc measure? » How do the relationships among the angles between two intersecting secants compare when the intersection point is inside the circle, on the circle, or outside the circle? » What special relationships are there among the angles of an inscribed polygon? » How does a circumscribed polygon compare to an inscribed polygon?
Unit 4.3 - Trigonometry (13 days) • Use concrete models or technology to develop the concept of trigonometric ratios (sine,cosine, and tangent) using similar triangles and number patterns. • Apply trigonometric ratios to determine missing angle measures and side lengths of right triangles. • Use trigonometric ratios to solve real-world indirect measurement problems, including the use of angles of elevation and angles of depression.	» How do the three trigonometric ratios relate to similar triangles? » How can you tell when a problem is asking you to determine a missing angle measure or a missing side length? » How can you distinguish between the two legs of a right triangle in order to use trigonometric ratios? » How can you use angles of elevation or angles of depression to determine distances that are difficult or impossible to directly measure?

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