CURRICULUM GUIDE

Math - Grade 7

Providence Schools

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

Printed by students at the Providence Career and Technical Academy

QUARTER 1

Content students will be learning	Essential questions students should be able to answer by end of unit
Unit 1.1 - Adding and Subtracting Integers (5 days) • Understand how to order and compare integers. • Develop and use algorithms for adding and subtracting integers. • Model addition and subtraction of integers using distance/direction on a number line and a chip model. • Observe that the commutative property holds for addition of rational numbers but not for subtraction of rational numbers. • Understand and use the relationship between addition and subtraction to simplify computation. • Recognize and solve problems involving addition and subtraction of integers. • Extend coordinate graphing to all four quadrants.	» How do you decide which of two numbers is greater when both numbers are positive? » How do you decide which of two numbers is greater when both numbers are negative? » How do you decide which of two numbers is greater when one number is positive and one number is negative? » How can you decide if the sum of two numbers is positive, negative, or zero without actually calculating the sum? » How can you decide if the difference of two numbers is positive, negative, or zero without actually calculating the difference? » How can any difference $a - b$ of two numbers be restated as an equivalent addition statement?
Unit 1.2 - Integer Operations and Properties of Operations (9 days) • Use a number line/motion model to develop the relationship between repeated addition and multiplication with integers. • Develop and use algorithms for multiplying and dividing integers. • Examine number patterns to confirm the algorithm for multiplication. • Explore division of integers using the relationship between multiplication and division found in fact families. • Develop skill at multiplying and dividing integers in order to solve problems. • Understand and apply properties of numbers, field properties and order of operations, particularly as related to integer operations.	» How do negative and positive numbers help in describing the situation? » How can you describe an algorithm for multiplying and dividing integers? » How can you describe the sequence of operations that should be used to simplify a mathematical expression? » What will addition, subtraction, multiplication, or division of positive and negative numbers tell you about the problem? » What model(s) for positive and negative numbers would help in showing the relationships in the problem situation?
Unit 1.3 - Variables, Tables, and Coordinate Graphs (8 days) • Understand patterns and relationships as represented in tables and graphs. • Develop methods for representing relationships using tables, graphs, and verbal descriptions. • Develop an informal understanding of slope and constant rate of change. • Explore and understand the limitations of various representations of relationships.	» What steps would you take in making a graph to show the relationship between two related variables? » How do you decide which variable should be on the x-axis and which should be on the y axis? » What are the advantages and disadvantages of representing a relationship between variables in a table?

UNIT CONTINUES ON NEXT PAGE

UNIT CONTINUES ON NEXT PAGE

QUARTERS 1 & 2

Content students will be learning	Essential questions students should be able to answer by end of unit
UNIT 1.3 - VARIABLES, TABLES, AND COORDINATE GRAPHS (CONTINUED)	**UNIT 1.3 - VARIABLES, TABLES, AND COORDINATE GRAPHS (CONTINUED)**
• Develop strategies for setting up coordinate graphs—scale, independent and dependent variable, etc.	» What are the advantages and disadvantages of representing a relationship between variables in a graph? » What are the advantages and disadvantages of representing a relationship between variables in a written report?
Unit 1.4 - Analyzing Graphs and Tables (5 days) • Understand relationships involving both constant and varying rates of change as represented in tables, graphs, and verbal descriptions. • Develop strategies for using patterns in data to make predictions about values between and beyond given data values. • Collect, organize, and display data in a coordinate graph in order to solve problems and study relationships.	 » What does the word *variable* mean in mathematics? » What does it mean to say that two variables are related? » If the *y*-values increase as the *x*-values increase, what would the table of data look like? » If the *y*-values increase as the *x*-values increase, what would the graph look like? » Suppose the *y*-values decrease as the *x*-values increase. How is this indicated in a table? How is this indicated in a graph? » In a coordinate graph of two related variables, when does it make sense to connect the points?
Unit 1.5 - Rules and Equations (5 days) • Develop an understanding of how to write equations to represent relationships between variables. • Describe how a linear pattern of change shows up in a table, a graph, or an equation. • Use tables, graphs, and equations to answer questions and solve problems. • Understand how change in one variable relates to change in another variable for linear relationships. • Understand how to translate a problem-solving situation into an algebraic expression or equation.	 » What decisions do you need to make when you write an equation to represent a relationship between variables? » In what ways are equations useful? » What are some advantages and disadvantages of using tables, graphs, and equations to represent relationships?
QUARTER 2	**QUARTER 2**
Unit 2.1 - Enlarging and Reducing Shapes (4 days) • Develop an initial understanding of mathematical similarity. • Compare approximate measurements of corresponding parts in similar figures. • Determine which features of similar figures are different and which are the same. • Make accurate comparisons of measurements of similar figures.	 » When you enlarge or reduce a figure, what features stay the same? » When you enlarge or reduce a figure, what features change? » Rubber-band stretchers, copy machines, overhead projectors, and movie projectors all make images that are similar to the original shapes. What does it mean for two shapes to be similar?

QUARTER 2 (CONTINUED)

Content students will be learning	Essential questions students should be able to answer by end of unit
Unit 2.2 - Similar Figures (5 days) • Understand the use of algebraic rules to produce similar figures and translations on a coordinate grid. • Contrast similar figures with nonsimilar figures. • Develop more formal understandings of the concept of similarity, including the vocabulary of scale factor. • Understand the relationships of angles, side lengths, perimeters, and areas of similar polygons. • Understand what types of transformations of a figure will result in a congruent figure.	» How can you determine if two figures are mathematically similar? » What types of algebraic rules will produce similar figures? Explain. » What types of algebraic rules will produce figures that are not similar? Explain. » When a figure is transformed to make a similar figure, some features change and some stay the same. What does the scale factor tell you about how the figure changes?
Unit 2.3 - Similar Polygons (9 days) • Understand how scaling in similar figures affects the areas of polygons. • Connect the ratio of the areas of two similar figures to the scale factor. • Generalize the relationship between scale factor and area. • Explore how to find missing measures in similar figures using scale factor. • Understand reflections and rotations in the coordinate plane.	» How can you tell if two polygons are similar? » If two polygons are similar, how can you find the scale factor from one polygon to the other? Show specific examples. » Describe how you find the scale factor from the smaller figure to the enlarged figure. Then describe how you find the scale factor from the larger figure to the smaller figure. » For a–c below, what does the scale factor between two similar figures tell you about the given measurements? A) Side lengths B) Perimeters C) Areas » How can you rotate or reflect a figure?
Unit 2.4 - Geometry: Angle Relationships (6 days) • Explore and understand the patterns among angles created when two or more parallel lines are cut by another line. • Develop a more sophisticated understanding of parallel lines and parallelograms. • Determine relationships between the number of sides and the angle sum of a regular polygon. • Decide whether any three side lengths will make a triangle. • Understand that the sum of two side lengths of a triangle must be greater than the third side length.	» What does it mean for two lines to be parallel? » If two parallel lines are intersected by a transversal, what patterns can you expect to find in the measures of the angles formed? » In what ways can you find the measure of each interior angle of a regular polygon? » As the number of sides in a regular polygon increases, what happens to the measure of an interior angle? » How can you tell whether three line segments will form a triangle? » If it is possible to build one triangle, is it also possible to build a different triangle with the same three segments? Explain.

QUARTER 2 (CONTINUED)

Content students will be learning	Essential questions students should be able to answer by end of unit
Unit 2.5 - Making Sense of Measures of Center (Mean and Median) (6 days) • Understand and interpret bar graphs and line plots in order to make predictions and justify conclusions. • Understand how measures of central tendency (mean, median, mode), spread, and dispersion can be used to analyze data. • Collect, organize, display, and interpret data. • Understand how to make and use hypotheses about data sets.	» Are there clusters in the distribution? If so, what do those clusters of data indicate about the data set? » When the mean and the median are the same or very similar, what does this indicate about the shape of the distribution? » When the mean and median are more different than similar, what does this indicate about the shape of the distribution? » How can I use the mean or median and range to help me understand and describe a data distribution? » What strategies can I use to compare two different data sets?
Unit 2.6 - Comparing Distributions: Equal Numbers of Data Values (7 days) • Understand and interpret bar graphs, line plots, and circle graphs to make predictions and justify conclusions. • Understand how measures of central tendency (mean, median, mode), spread, and dispersion can be used to analyze data. • Collect, organize, display, and interpret data. • Understand how to make and test hypotheses about data sets. • Develop and use strategies for comparing equal-sized data sets to solve problems.	» When comparing two or more distributions, does it help to have each distribution on the same or a different graph? Why? » How are bar graphs and line plots similar and different? » How can you use fractions, percents, and ratios to make comparisons of sets of data?
Unit 2.7 - Making Comparisons (7 days) • Develop strategies for presenting quantitative comparisons of information. • Develop strategies for making judgments and choices when given comparative statements about quantities. • Analyze and create comparison statements from given data. • Formalize understandings of rational numbers, rates, and percents by reasoning proportionally in problem-solving contexts. • Understand how equivalent ratios can be used to make more sophisticated comparisons in order to answer questions and solve problems.	» How can you make comparisons using ratios? Give an example. » How can you make comparisons using percents? Give an example. » How can you make comparisons using fractions? Give an example. » How can you make comparisons using differences? Give an example.

QUARTERS 2 & 3

Content students will be learning	Essential questions students should be able to answer by end of unit
Unit 2.8 - Comparing and Scaling Rates (6 days) • Examine and connect the idea of unit rates to what students already know about ratios and linear relationships. • Further develop understanding of unit rates and how to compute and interpret them. • Introduce and formalize the meaning of unit rate and computation strategies for computing unit rates. • Relate unit rate to the slope of the line representing the equation of the underlying relationship. • Understand what it means to divide in rate situations.	» Describe a process for finding unit rates. » How can you use a unit rate in writing an equation? » When making a price comparison, how do you decide whether the larger unit rate or the smaller unit rate is the better buy?
QUARTER 3	QUARTER 3
Unit 3.1 - Making Sense of Proportions (6 days) • Set up and solve proportions that arise in a variety of contexts—similarity, rates, percents, comparisons. • Develop strategies, such as the use of ratios and scaling up or scaling down (finding equivalent ratios), to find the missing value in a proportion. • Develop insight and flexibility in choosing strategies for solving problems requiring proportional reasoning.	» How can you use proportions to solve problems? Give an example. » When comparing prices at two different stores, how can you use proportions or rates to decide which store offers the better deal? Give an example.
Unit 3.2 - Walking Rates (6 days) • Understand the patterns of change between the independent and dependent variables for linear relationships. • Understand and translate among the various representations of linear relationships—tables, graphs, equations, and/or verbal descriptions. • Explore how change in the value of one variable relates to change in the value of a second variable.	» For a given situation, how can you determine if the relationship is linear? » What patterns in the problem suggest that it is linear? » How can the linear relationship be represented in a problem, in a table, in a graph, or with an equation? » How do changes in one variable affect changes in a related variable? » How are these changes (in the variables) represented in a table, graph, or equation?
Unit 3.3 - Exploring Linear Functions with Graphs and Tables (6 days) • Understand connections between the representations of linear relationships (tables, graphs, equations) by identifying rate of change and intercepts.	» Do the variables in this problem have a linear relationship to each other?
UNIT CONTINUES ON NEXT PAGE	UNIT CONTINUES ON NEXT PAGE

QUARTERS 3 & 4

Content students will be learning	Essential questions students should be able to answer by end of unit
UNIT 3.3 - EXPLORING LINEAR FUNCTIONS WITH GRAPHS AND TABLES (CONTINUED)	UNIT 3.3 - EXPLORING LINEAR FUNCTIONS WITH GRAPHS AND TABLES (CONTINUED)
• Translate information about linear relations given in a table, a graph, or an equation to one of the other forms. • Understand how the *y*-intercept appears in tables and equations. • Write equations for linear relationships and describe what information the variables and numbers represent.	» What patterns in the problem suggest that it is linear? » How can the linear relationship be represented in a problem, in a table, in a graph, or with an equation? » How are the changes (in the variables) represented in a table, graph, or equation? » What information do the coefficient of *x* and the *y*-intercept tell you? » How do the coordinates of a point *(x, y)* relate to an equation that contains that point?
Unit 3.4 - Solving Equations (6 days) • Develop more formal understanding of connections between the representations of linear relationships (tables, graphs, equations) by identifying rate of change and intercepts. • Translate information about linear relations given in a table, a graph, or an equation to one of the other forms. • Understand the connections between the solutions in graphs and tables and the solutions of equations. • Understand how the *y*-intercept appears in tables and equations. • Write equations for linear relationships and describe what information the variables and numbers represent.	» How is the coefficient of x in a linear equation related to the steepness of the line represented by the equation? » How can we calculate the slope of a line from a table, graph, or equation?
Unit 3.5 - Exploring Slope (5 days) • Explore the concept of slope as the ratio of vertical change to horizontal change between two points on a line or ratio of rise over run. • Understand the connection between slope and rate of change. • Understand how to determine slope from a variety of representations—tables, graphs, two given points, etc. • Explore patterns among lines that have the same slope (parallel lines) or that have slopes that are negative reciprocals of each other (perpendicular lines).	» How can you calculate the slope of a line from a table or a graph? » How can you sketch two different lines that have the same slope? » How can you decide if two lines are parallel or perpendicular by looking at their equations?
QUARTER 4	QUARTER 4
Unit 4.1 - Exponent Applications (5 days) • Understand how the area of a square and its side length are related.	» What do you know about the length of the side in relation to the area of each square?
UNIT CONTINUES ON NEXT PAGE	UNIT CONTINUES ON NEXT PAGE

QUARTER 4 (CONTINUED)

Content students will be learning	Essential questions students should be able to answer by end of unit
UNIT 4.1 - EXPONENT APPLICATIONS (CONTINUED)	**UNIT 4.1 - EXPONENT APPLICATIONS (CONTINUED)**
• Use the relationship between side length and area of a square to develop a working definition of square root. • Use perfect squares to develop techniques for estimating square roots to the nearest whole number. • Develop an understanding of scientific notation as a method for representing very large and very small numbers.	» Does the side length of a square have to be a whole number? Why or why not? » If you know that a square has an area of 9 and another square has an area of 16, what do you know about the length of a side of a square with an area between 9 and 16? » What do you do to write numbers in scientific notation? » Explain which expression is written in scientific notation: 1.235×10^5 or 0.1235×10^6. » Why would you write some numbers in scientific notation? » What is the purpose of the exponent?
Unit 4.2 - Introduction of Surface Area Through Nets (6 days) • Review area of polygons. • Understand how to find the area of circle. • Understand how nets relate to the surface area of a prism. • Understand strategies for determining volume of prisms. • Understand the relationship between the dimensions of a rectangular prism and its surface area. • Develop a strategy for finding the surface area of a rectangular prism.	» Suppose several nets are made for a given rectangular prism. What will all the nets have in common? How will they be different? » How can you find the total area of all the faces of a rectangular prism? » How can you determine the dimensions of a rectangular prism? » How are these dimensions related to the faces of the prism? » What is the base of the prism and what are its dimensions? » Can you describe a strategy for determining how many unit cubes it takes to fill a rectangular prism?
Unit 4.3 - Developing Formulas for Surface Area and Volume of Rectangular Prisms (4 days) • Connect the dimensions of a rectangular prism to its volume and surface area. • Understand that rectangular prisms may have the same volume but quite different surface areas. • Predict which rectangular prism of those with a common volume will have the smallest surface area. • Refine a strategy for finding the surface area of a rectangular prism. • Understand that prisms can be filled systematically in identical layers and that this layering leads to the formula for volume. • Develop a formula for finding the volume of a rectangular prism.	» In what ways can you find the surface area of a rectangular prism? » If you change the position of the rectangular prism, such as by laying it down on its side, does that change its volume? » If two prisms have the same volume, will the prisms also have the same surface area? Explain why or why not. » How does the overall shape of a rectangular prism affect its surface area? » Describe how you can find the surface area of a rectangular prism using words and symbols. » Describe how you can find the volume of a rectangular prism using words and symbols.

QUARTER 4 (CONTINUED)

Content students will be learning	Essential questions students should be able to answer by end of unit
Unit 4.4 - Surface Area and Volume of Prisms and Cylinders (5 days) • Develop understanding of volume and surface area of prisms. • Develop a strategy for finding the volume of a cylinder using its dimensions. • Connect this strategy to the idea of layers in rectangular and other prisms. • Develop a strategy for finding the surface area of a cylinder. • Apply understanding of volume to solve problems. • Understand that a variety of different three-dimensional figures can have the same volume but different surface areas.	» How can you determine how many cubes will fit in the base layer of a rectangular prism? » How do you determine how many layers there are in a rectangular prism? » What information do you need to know to find the volume of a prism? » How is finding the volume of a cylinder similar to finding the volume of a prism? » What are the dimensions of a cylinder and what do they represent? » What would a net of a cylinder look like?
Unit 4.5 - Experimental and Theoretical Probability (6 days) • Review, understand, and apply basic probability concepts, such as fair game, experimental probability, theoretical probability, and fraction notation for expressing probabilities. • Apply counting techniques to determine the number of possible outcomes in probability situations. • Understand uses of experimental and theoretical probability in problem-solving situations. • Understand how payoff is considered in determining the fairness of a game.	» How can you find the experimental probability of an event? How can you find the theoretical probability of an event? » How do the experimental probabilities based on the class data compare to the theoretical probabilities? Will these two probabilities always be the same/different? Explain. » As the number of trials increases, what would you expect the experimental probability to look like? » How can you construct an organized list of all the possible outcomes in a probability situation? Is each event equally likely to occur? » How can you use probabilities (experimental and theoretical) to determine if an event or game is fair or unfair? » If the game is not fair, what makes it not fair? How can the game be changed so that it is a fair game? » How can you use probabilities to predict how many times a given outcome will occur if an event is repeated any number of times (e.g., spin the spinner 100 times)? » What are the strategies used to find theoretical probabilities?
Unit 4.6 - Finding Probabilities Using Area Models (5 days) • Explore how an area model can be used to analyze the theoretical probabilities for two-stage outcomes.	» Give examples of probability situations that involve two or more actions (compound probability).

UNIT CONTINUES ON NEXT PAGE

UNIT CONTINUES ON NEXT PAGE

QUARTER 4 (CONTINUED)

Content students will be learning	Essential questions students should be able to answer by end of unit
UNIT 4.6 - FINDING PROBABILITIES USING AREA MODELS (CONTINUED)	**UNIT 4.6 - FINDING PROBABILITIES USING AREA MODELS (CONTINUED)**
• Explore ways to simulate and analyze probability situations involving two-stage outcomes. • Distinguish between equally likely and nonequally likely outcomes by collecting data and analyzing experimental probabilities. • Continue to use counting techniques to count the number of outcomes in probability situations. • Understand strategies for comparing experimental and theoretical probability.	» How can you construct an organized list of all the possible outcomes? » What are the strategies used to find theoretical probabilities? » What is the difference between theoretical and experimental probability? » How can you use an area model to help you analyze a probability situation? » How can we simulate a particular event? What models/tools have we used before to simulate an event? » Are the outcomes equally likely? Explain.
Unit 4.7 - Probability and Counting Techniques (7 days) • Understand the difference between the probability of an outcome and the long-term average of many trials in a situation with a payoff. • Explore ways to determine the expected value in a probability situation. • Use probability to make predictions and use simulations to test them. • Use counting techniques and the Fundamental Counting Principal in problem-solving situations.	» What strategy did you use to find all the possible outcomes? » What method could you use to simulate this situation? Justify why your method simulates this situation. » How does your experimental probability compare to the theoretical probability? » Explain why expected value can be referred to as long-term average? » What is the average payoff for each situation? » How do you calculate expected value? » Why is expected value important to understand?

Providence Schools

797 Westminster Street
Providence, RI 02903
www.providenceschools.org