# WGSD Curriculum – Math 7th Grade

In Grade 7, instructional time will focus on four critical areas: (1) developing understanding of and applying proportional relationships; (2) developing understanding of operations with rational numbers and working with expressions and linear equations; (3) solving problems involving scale drawings and informal geometric constructions, and working with two- and three-dimensional shapes to solve problems involving area, surface area, and volume and (4) drawing inferences about populations based on samples.

While the content learning goals describe the mathematics students should be able to understand and do, the first eight learning goals (The Standards for Mathematical Practice) describe how students should engage with these mathematical concepts and skills as they grow in mathematical maturity and expertise. Teachers will connect the mathematical practices to mathematical content in all mathematics instruction. These learning goals merit the most time, resources, innovation, and focus necessary to qualitatively improve the instruction, assessment, and student achievement in mathematics.

# WGSD Curriculum – Math 7th Grade
## *Mathematical Practices*

**High Priority Standards**
CCSS.Math.Practice.MP1

| **Learning Goal** | **Proficiency Scale** |
|---|---|
| Students will be able to make sense of problems and persevere in solving them. | 4: In addition to score 3.0 performance, the student demonstrates an in-depth inference or advanced application, or innovates with the learning goal.<br><br>3: Student demonstrates mastery with the learning goal as evidenced by:<br>● Discussing, explaining, and solving a problem with multiple representations and in multiple ways.<br>● Struggling with various attempts over time.<br>● Learning from previous solution attempts.<br>● Checking answers using a different method or strategy.<br><br>2: Student demonstrates they are nearing proficiency by:<br>● Explaining his/her thought processes when solving a problem and representing it in several ways.<br>● Trying several approaches in find a solution and seeking hints only if stuck.<br><br>1: Student demonstrates a limited understanding or skill with the learning goal by:<br>● Explaining their thought processes when solving a problem one way.<br>● Staying with a challenging problem for more than one attempt. |

**Learning Targets**

- Explain the meaning of a problem and look for efficient ways to solve it
- Use concrete objects or pictures to help conceptualize and solve problems
- Check their thinking by asking themselves, “Does this make sense?”
- Listens to the strategies of others and tries different approaches
- Uses a different strategies to check answers
- Takes time to thoughtfully consider problems

**Learning Design**

- Provides time and facilitates discussion in problem solutions
- Facilitates discourse in the classroom so that students UNDERSTAND the approaches of others
- Provides opportunities for students to explain themselves, the meaning of a problem, etc.
- Provides opportunities for students to connect concepts to “their” world
- Provides students TIME to think and become “patient” problem solvers
- Facilitates and encourages students to check their answers using different methods (not calculators)
- Provides problems that focus on relationships and are “generalizable”

# WGSD Curriculum – Math 7th Grade
## *Mathematical Practices*

**High Priority Standards**
CCSS.Math.Practice.MP2

| **Learning Goal** | **Proficiency Scale** |
|---|---|
| Students will be able to reason abstractly and quantitatively. | 4: In addition to score 3.0 performance, the student demonstrates an in-depth inference or advanced application, or innovates with the learning goal.<br><br>3: Student demonstrates mastery with the learning goal as evidenced by:<br>● Converting situations into symbols to solve problems.<br>● Converting mathematical equations into meaningful situations.<br><br>2: Student demonstrates they are nearing proficiency by translating situations into symbols to solve problems.<br><br>1: Student demonstrates a limited understanding or skill with the learning goal by reasoning with models or pictorial representations to solve problems. |

**Learning Targets**

- Recognize that a number represents a specific quantity
- Connect the quantity to written symbols and create a logical representation of the problem at hand
- Consider both the appropriate units involved and the meaning of quantities
- Write simple expressions that record calculations with numbers and symbols
- Represent or round numbers using place value concepts

**Learning Design**

- Provides a range of representations of math problem situations and encourages various solutions
- Provides opportunities for students to make sense of quantities and their relationships in problem situations
- Provides problems that require flexible use of properties of operations and objects
- Emphasizes quantitative reasoning which entails habits of creating a coherent representation of the problem at hand; considering the units involved; attending to the meaning of quantities, not just how to compute them and/or rules; and knowing and flexibly using different properties of operations and objects

# WGSD Curriculum – Math 7th Grade
## *Mathematical Practices*

**High Priority Standards**
CCSS.Math.Practice.MP3

| **Learning Goal** | **Proficiency Scale** |
|---|---|
| Students will be able to construct viable arguments and critique the reasoning of others. | 4: In addition to score 3.0 performance, the student demonstrates an in-depth inference or advanced application, or innovates with the learning goal.<br><br>3: Student demonstrates mastery with the learning goal as evidenced by:<br>● Justifying and explaining, with accurate language and vocabulary, why his/her solution is correct.<br>● Comparing his/her strategy to other students' strategies, asking questions, and making connections with his/her own thinking.<br>● Explaining the reasoning of others.<br><br>2: Student demonstrates they are nearing proficiency by:<br>● Explaining his/her thinking and the thinking of others with accurate vocabulary.<br>● Explaining other students' solutions and identifying strengths and weaknesses of the strategy.<br><br>1: Student demonstrates a limited understanding or skill with the learning goal by:<br>● Explaining his/her solution.<br>● Discussing other ideas, approaches, and strategies. |

**Learning Targets**

- Construct arguments using concrete referents, such as objects, pictures, and drawings
- Refine their mathematical communication skills by answering questions like "How do you know?" and "Can you show me another way?"
- Refine their mathematical communication skills by asking others questions like "How do you know?" and "How did you get that?"
- Explain their thinking to others and respond to others' thinking

**Learning Design**

- Provides ALL students opportunities to understand and use stated assumptions, definitions, and previously established results in constructing arguments
- Provides ample time for students to make conjectures and build a logical progression of statements to explore the truth of their conjectures
- Provides opportunities for students to construct arguments and critique arguments of peers
- Facilitates and guides students in recognizing and using counterexamples
- Encourages and facilitates students justifying their conclusions, communicating, and responding to the arguments of others
- Asks useful questions to clarify and/or improve students' arguments

# WGSD Curriculum – Math 7th Grade
## *Mathematical Practices*

**High Priority Standards**

CCSS.Math.Practice.MP4, TILS 5.C.a: Recognize that there are a variety of ways to share information, TILS 5.C.c: Effectively share information

**Learning Goal**

Students will be able to model with mathematics.

**Proficiency Scale**

4: In addition to score 3.0 performance, the student demonstrates an in-depth inference or advanced application, or innovates with the learning goal.

3: Student demonstrates mastery with the learning goal as evidenced by:

- Recognizing math in everyday situations.
- Using a variety of models, symbolic representations, and technology tools to represent the solution to a problem and accurately explain the solution representation.

2: Student demonstrates they are nearing proficiency by:

- Recognize math in everyday situations, when prompted.
- Using models and symbols to represent and solve a problem.

1: Student demonstrates a limited understanding or skill with the learning goal by using models to represent and solve a problem with teacher support.

**Learning Targets**

- Represents problem situations in multiple ways including numbers, words (mathematical language), drawing pictures, using objects, acting out, making a chart, list, or graph, creating equations, etc. and use all of these representations as needed
- Connect different representations and explain the connections
- Evaluate results in the context of the situation and reflect on whether the results make sense
- Evaluate the utility of models to determine which models are most useful and efficient to solve problems

**Learning Design**

- Provides problem situations that apply to everyday life
- Provides rich tasks that focus on conceptual understanding, relationships, etc.

# WGSD Curriculum – Math 7th Grade
## *Mathematical Practices*

<table>
<tr><td colspan="2"><u>High Priority Standards</u><br>CCSS.Math.Practice.MP5</td></tr>
<tr><td><u>Learning Goal</u><br><br>Students will be able to use appropriate tools strategically.</td><td><u>Proficiency Scale</u><br>4: In addition to score 3.0 performance, the student demonstrates an in-depth inference or advanced application, or innovates with the learning goal.<br><br>3: Student demonstrates mastery with the learning goal as evidenced by combining various tools to explore and solve a problem as well as justifying his/her tool selection and problem solution.<br><br>2: Student demonstrates they are nearing proficiency by selecting from a variety of provided tools the ones that can be used to solve a problem and explaining his/her reasoning for the selection.<br><br>1: Student demonstrates a limited understanding or skill with the learning goal by using the appropriate tool, when provided, to find a solution.</td></tr>
<tr><td colspan="2"><u>Learning Targets</u><br>● Consider the available tools (including, but not limited to estimation, graph paper, manipulatives, table, list, etc.) when solving a mathematical problem and decide when certain tools might be helpful<br>● For example, they may use unit cubes to fill a rectangular prism and a ruler to measure the dimensions<br>● Use graph paper to accurately create graphs and solve problems or make predictions from real world data</td></tr>
<tr><td colspan="2"><u>Learning Design</u><br>● Provides a variety of tools and technology for students to explore to deepen their understanding of math concepts<br>● Provides problem solving tasks that require students to consider a variety of tools for solving (Tools might include pencil/paper, concrete models, manipulatives, ruler, protractor, calculator, spreadsheet, computer algebra system, statistical package, or dynamic geometry software, etc.)</td></tr>
</table>

# WGSD Curriculum – Math 7th Grade
## *Mathematical Practices*

<table>
<tr><td colspan="2"><u>High Priority Standards</u><br>CCSS.Math.Practice.MP6</td></tr>
<tr><td><u>Learning Goal</u><br><br>Students will be able to attend to precision.</td><td><u>Proficiency Scale</u><br>4: In addition to score 3.0 performance, the student demonstrates an in-depth inference or advanced application, or innovates with the learning goal.<br><br>3: Student demonstrates mastery with the learning goal as evidenced by using appropriate symbols, vocabulary, and labeling to communicate effectively and exchange ideas.<br><br>2: Student demonstrates they are nearing proficiency by incorporating appropriate vocabulary and symbols in most mathematical communications.<br><br>1: Student demonstrates a limited understanding or skill with the learning goal by communicating his/her reasoning and solution to others, with support.</td></tr>
<tr><td colspan="2"><u>Learning Targets</u><br>● Use clear and precise language in their discussions with others and in their own reasoning<br>● Specify units of measure and state the meaning of the symbols used<br>● Report answers that appropriately address the context of a problem</td></tr>
<tr><td colspan="2"><u>Learning Design</u><br>● Facilitates, encourages and expects precision in communication<br>● Provides opportunities for students to explain and/or write their reasoning to others</td></tr>
</table>

# WGSD Curriculum – Math 7th Grade
## *Mathematical Practices*

<table>
<tr><td colspan="2"><u>High Priority Standards</u><br>CCSS.Math.Practice.MP7</td></tr>
<tr><td><u>Learning Goal</u><br><br>Students will be able to look for and make use of structure.</td><td><u>Proficiency Scale</u><br>4: In addition to score 3.0 performance, the student demonstrates an in-depth inference or advanced application, or innovates with the learning goal.<br><br>3: Student demonstrates mastery with the learning goal as evidenced by:<br>● Noticing mathematical expressions as component parts.<br>● Using mathematical generalizations to identify the most efficient solution to mathematical tasks.<br><br>2: Student demonstrates they are nearing proficiency by composing and decomposing number situations and relationships in order to simplify solutions.<br><br>1: Student demonstrates a limited understanding or skill with the learning goal by looking for structure or patterns within mathematics to help him/her solve problems efficiently.</td></tr>
<tr><td colspan="2"><u>Learning Targets</u><br>● Look closely to discover a pattern or structure<br>○ For instance, students use properties of operations as strategies to add, subtract, multiply and divide with whole numbers, fractions, and decimals.<br>● Examine numerical patterns and relate them to a rule or a graphical representation</td></tr>
<tr><td colspan="2"><u>Learning Design</u><br>● Provides opportunities and time for students to explore patterns and relationships to solve problems<br>● Provides rich tasks and facilitates pattern seeking and understanding of relationships in numbers rather than following a set of steps and/or procedures</td></tr>
</table>

# WGSD Curriculum – Math 7th Grade
## *Mathematical Practices*

**High Priority Standards**
CCSS.Math.Practice.MP8

| **Learning Goal** | **Proficiency Scale** |
|---|---|
| Students will be able to look for and express regularity in repeated reasoning. | 4: In addition to score 3.0 performance, the student demonstrates an in-depth inference or advanced application, or innovates with the learning goal.<br><br>3: Student demonstrates mastery with the learning goal as evidenced by:<br>● Connecting prior knowledge to an unfamiliar mathematical situation.<br>● Creating a model or equation that unifies the various aspects of a problem.<br>● Noticing patterns, making generalizations, and predicting patterns.<br><br>2: Student demonstrates they are nearing proficiency by finding and explaining patterns.<br><br>1: Student demonstrates a limited understanding or skill with the learning goal by connecting prior knowledge to new situations and noticing patterns with prompting from a teacher or peer. |

**Learning Targets**

- Notice repetitive actions in computation and look for more shortcut methods
- Use repeated reasoning to understand algorithms and make generalizations about patterns

**Learning Design**

- Provides problem situations that allow students to explore regularity and repeated reasoning
- Provides rich tasks that encourage students to use repeated reasoning to form generalizations and provides opportunities for students to communicate these generalizations

# WGSD Curriculum – Math 7th Grade
## *Number Sense and Operations*

**High Priority Standards**

7.NS.A.1 Apply and extend previous understandings of numbers to add and subtract rational numbers. a. Add and subtract rational numbers. b. Represent addition and subtraction on a horizontal or vertical number line. c. Describe situations and show that a number and its opposite have a sum of 0 (additive inverses). d. Understand subtraction of rational numbers as adding the additive inverse. e. Determine the distance between two rational numbers on the number line is the absolute value of their difference. f. Interpret sums and differences of rational numbers.
7.NS.A.2 Apply and extend previous understandings of numbers to multiply and divide rational numbers. a. Multiply and divide rational numbers. b. Determine that a number and its reciprocal have a product of 1 (multiplicative inverse). c. Understand that every quotient of integers (with non-zero divisor) is a rational number. d. Convert a rational number to a decimal. e. Understand that all rational numbers can be written as fractions or decimal numbers that terminate or repeat. f. Interpret products and quotients of rational numbers by describing real-world contexts.
7.NS.A.3 Solve problems involving the four arithmetic operations with rational numbers.

**Learning Goal**

Students will be able to solve problems using addition, subtraction, multiplication, and division of rational numbers.

**Proficiency Scale**

4: In addition to score 3.0 performance, the student demonstrates an in-depth inference or advanced application, or innovates with the learning goal.

3: Student demonstrates mastery with the learning goal as evidenced by:

- Solving mathematical and real-world problems using the four operations on rational numbers.
- Converting between fractions and decimals.
- Apply understanding of subtraction as the same as adding the additive inverse.
- Describing addition as a movement of a specific distance on a number line in either direction depending on the sign of the number being added.

2: Student demonstrates they are nearing proficiency by:

- Recognizing and recalling specific vocabulary, such as: absolute value, opposite, rational number, additive inverse, multiplicative inverse, distributive property, integer.
- Performing processes such as:
    - Applying and extending previous understandings and properties of addition and subtraction to add and subtract with rational numbers.
    - Identifying the absolute value of a rational number and understanding when opposites combine to make 0.
    - Determining that a number and its reciprocal have a product of 1 (multiplicative inverse).
    - Converting between familiar fractions and decimals.

1: Student demonstrates a limited understanding or skill with the learning goal by:

- Adding, subtracting, multiplying, and dividing nonnegative rational numbers.
- Adding, subtracting, multiplying, and dividing rational numbers with a number line or other manipulative.

**Learning Targets**

- Apply and extend previous understandings of addition and subtraction to add and subtract rational numbers; represent addition and subtraction on a horizontal or vertical number line diagram
    - Describe situations in which opposite quantities combine to make 0
        - *For example, a hydrogen atom has 0 charge because its two constituents are oppositely charged*
    - Understand $p + q$ as the number located a distance $|q|$ from$p$, in the positive or negative direction depending on whether $q$ is positive or negative Show that a number and its opposite have a sum of 0 (are additive inverses). Interpret sums of rational numbers by describing real-world contexts
    - Understand subtraction of rational numbers as adding the additive inverse, $p – q = p + (–q)$. Show that the distance between two rational numbers on the number line is the absolute value of their difference, and apply this principle in real-world contexts
    - Apply properties of operations as strategies to add and subtract rational numbers
- Apply and extend previous understandings of multiplication and division and of fractions to multiply and divide rational numbers
    - Understand that multiplication is extended from fractions to rational numbers by requiring that operations continue to satisfy the properties of operations, particularly the distributive property, leading to products such as (–1)(–1) = 1 and the rules for multiplying signed numbers. Interpret products of rational numbers by describing real-world contexts
    - Understand that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If $p$ and $q$ are integers, then $–(p/q) = (–p)/q = p/(–q)$. Interpret quotients of rational numbers by describing real-world contexts
    - Apply properties of operations as strategies to multiply and divide rational numbers
    - Convert a rational number to a decimal using long division; know that the decimal form of a rational number terminates in 0s or eventually repeats
- Solve real-world and mathematical problems involving the four operations with rational numbers[1]

**Learning Design**

**http://robertkaplinsky.com/work/temperature-drop/**

[1] Computations with rational numbers extend the rules for manipulating fractions to complex fractions.

**High Priority Standards**

7.EEI.A.1 Apply properties of operations to simplify and to factor linear algebraic expressions with rational coefficients.
7.EEI.A.2 Understand how to use equivalent expressions to clarify quantities in a problem.

**Learning Goal**

Students will be able to use properties of operations to generate equivalent expressions.

**Proficiency Scale**

4: In addition to score 3.0 performance, the student demonstrates an in-depth inference or advanced application, or innovates with the learning goal.

3: Student demonstrates mastery with the learning goal as evidenced by:

- Applying properties of operations as strategies to factor and expand linear expressions with rational coefficients.
- Rewriting an expression to shed light on how quantities are related in a familiar problem-solving context.

2: Student demonstrates they are nearing proficiency by:

- Recognizing and recalling specific vocabulary, such as: coefficient, expression, equation, linear.
- Performing processes such as:
  - Applying properties of operations as strategies to factor and expand linear expressions with integer coefficients.
  - Adding and subtracting linear expressions with rational coefficients.

1: Student demonstrates a limited understanding or skill with the learning goal by applying properties of operations as strategies to add and subtract linear expressions with integer coefficients.

**Learning Targets**

- Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients
- Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related
  - *For example, a + 0.05a = 1.05a means that "increase by 5%" is the same as "multiply by 1.05."*

**Learning Design**

# WGSD Curriculum – Math 7th Grade
## *Expressions, Equations and Inequalities*

**High Priority Standards**

7.EEI.B.3 Solve multi-step problems posed with rational numbers. a. Convert between equivalent forms of the same number. b. Assess the reasonableness of answers using mental computation and estimation strategies.
7.EEI.B.4 Write and/or solve linear equations and inequalities in one variable. a. Write and/or solve equations of the form x+p = q and px = q in which p and q are rational numbers. b. Write and/or solve two-step equations of the form px + q = r and p(x + q) = r, where p, q and r are rational numbers, and interpret the meaning of the solution in the context of the problem. c. Write, solve and/or graph inequalities of the form px + q > r or px + q < r, where p, q and r are rational numbers.

**Learning Goal**

Students will be able to represent and solve real-life and mathematical problems using numerical and algebraic expressions, equations, and inequalities.

**Proficiency Scale**

4: In addition to score 3.0 performance, the student demonstrates an in-depth inference or advanced application, or innovates with the learning goal.

3: Student demonstrates mastery with the learning goal as evidenced by:

- Solving and graphing solution sets to inequalities with one variable.
- Using variables to represent and reason with quantities in real-world and mathematical situations.
- Constructing equations and inequalities with variables to solve problems.
- Interpreting the meaning of a solution in the context of the problem.

2: Student demonstrates they are nearing proficiency by:

- Recognizing and recalling specific vocabulary, such as: inequality, expression, equation, coefficient.
- Performing processes such as:
    - Solving multi-step problems with rational numbers and solving equations in the form of px + q = r or p(x + q) = r, where p, q, and r are rational numbers.
    - Using variables to represent quantities in familiar real-world and mathematical situations.
    - Constructing equations with variables to solve familiar problems with help.

1: Student demonstrates a limited understanding or skill with the learning goal by:

- Solving multi-step problems with integers or common fractions with denominators of 2 through 10, 25, 50, or 100 and decimals to the hundredths place.
- Solving equations in the form of px + q = r, where p, q, and r are integers
- Distinguishing between inequalities and equations with integer coefficients with or without real-world context.

**Learning Targets**

- Solve multi-step real-life and mathematical problems posed with positive and negative rational numbers in any form (whole numbers, fractions, and decimals), using tools strategically. Apply properties of operations to calculate with numbers in any form; convert between forms as appropriate; and assess the reasonableness of answers using mental computation and estimation strategies
    - *For example: If a woman making $25 an hour gets a 10% raise, she will make an additional 1/10 of her salary an hour, or $2.50, for a new salary of $27.50. If you want to place a towel bar 9 3/4 inches long in the center of a door that is 27 1/2 inches wide, you will need to place the bar about 9 inches from each edge; this estimate can be used as a check on the exact computation*
- Use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities
    - Solve word problems leading to equations of the form $px + q = r$ and $p(x + q) = r$, where $p$, $q$, and $r$ are specific rational numbers. Solve equations of these forms fluently. Compare an algebraic solution to an arithmetic solution, identifying the sequence of the operations used in each approach
        - *For example, the perimeter of a rectangle is 54 cm. Its length is 6 cm. What is its width?*
    - Solve word problems leading to inequalities of the form $px + q > r$ or $px + q < r$, where $p$, $q$, and $r$ are specific rational numbers. Graph the solution set of the inequality and interpret it in the context of the problem
        - *For example: As a salesperson, you are paid $50 per week plus $3 per sale. This week you want your pay to be at least $100. Write an inequality for the number of sales you need to make, and describe the solutions*

**Learning Design**

http://mathisvisual.com/two-step-equations/

# WGSD Curriculum – Math 7th Grade
## *Ratios & Proportional Relationships*

**High Priority Standards**

7.RP.A.1 Compute unit rates, including those that involve complex fractions, with like or different units.
7.RP.A.2 Recognize and represent proportional relationships between quantities. a. Determine when two quantities are in a proportional relationship. b. Identify and/or compute the constant of proportionality (unit rate). c. Explain what a point (x, y) on the graph of a proportional relationship means in terms of the situation. d. Recognize that the graph of any proportional relationship will pass through the origin.
7.RP.A.3 Solve problems involving ratios, rates, percentages and proportional relationships.

**Learning Goal**

Students will be able to analyze proportional relationships and use them to solve real-world and mathematical problems.

**Proficiency Scale**

4: In addition to score 3.0 performance, the student demonstrates an in-depth inference or advanced application, or innovates with the learning goal.

3: Student demonstrates mastery with the learning goal as evidenced by:

- Solving real-world problems involving proportional relationships and measurement conversions that involve identifying relationships. Problems and solutions are presented in various formats (e.g., verbal, table, graph).
- Identifying, representing, and analyzing proportional relationships in various formats.
- Finding unit rates associated with ratios of fractions.
- Using unit rates to solve one-step problems involving rational numbers.
- Analyzing a graph of a proportional relationship in order to explain what the points (x, y) and (1, r) represent, where r is the unit rate, and using this information to solve problems.

2: Student demonstrates they are nearing proficiency by:

- Recognizing and recalling specific vocabulary, such as: ratio, proportion, unit rate, proportional relationship.
- Performing processes such as:
    - Finding whole number unit rates in relationships presented in graphs, tables, or verbal formats in familiar contexts.
    - Identifying proportional relationships presented in equation formats and finding unit rates involving whole numbers.
    - Solving problems involving ratios and percentages such as simple interest, tax markups and markdowns, gratuities and commissions, fees,percent increase and decrease and percent error.

1: Student demonstrates a limited understanding or skill with the learning goal by:

- Identifying proportional relationships presented in graphs, tables, or verbal formats in familiar contexts.

**Learning Targets**

- Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different units
    - *For example, if a person walks 1/2 mile in each 1/4 hour, compute the unit rate as the complex fraction $^{1/2}/_{1/4}$ miles per hour, equivalently 2 miles per hour*
- Recognize and represent proportional relationships between quantities
    - Decide whether two quantities are in a proportional relationship, e.g., by testing for equivalent ratios in a table or graphing on a coordinate plane and observing whether the graph is a straight line through the origin
    - Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships
    - Represent proportional relationships by equations
        - *For example, if total cost t is proportional to the number n of items purchased at a constant price p, the relationship between the total cost and the number of items can be expressed as t = pn*
    - Explain what a point (*x*, *y*) on the graph of a proportional relationship means in terms of the situation, with special attention to the points (0, 0) and (1,*r*) where r is the unit rate
- Use proportional relationships to solve multistep ratio and percent problems. Examples: simple interest, tax, markups and markdowns, gratuities and commissions, fees, percent increase and decrease, percent error

**Learning Design**

Click battle Desmos Activity

# WGSD Curriculum – Math 7th Grade
## *Geometry and Measurement*

**High Priority Standards**

7.RP.A.3 Solve problems involving ratios, rates, percentages and proportional relationships.
7.GM.A.1 Solve problems involving scale drawings of real objects and geometric figures, including computing actual lengths and areas from a scale drawing and reproducing the drawing at a different scale.
7.GM.A.2 Use a variety of tools to construct geometric shapes. a. Determine if provided constraints will create a unique triangle through construction. b. Construct special quadrilaterals given specific parameters.
7.GM.A.3 Describe two-dimensional cross sections of pyramids, prisms, cones and cylinders.

**Learning Goal**

Students will be able to draw, construct, and describe geometrical figures and the relationships between them.

**Proficiency Scale**

4: In addition to score 3.0 performance, the student demonstrates an in-depth inference or advanced application, or innovates with the learning goal.

3: Student demonstrates mastery with the learning goal as evidenced by:

- Computing actual lengths and areas from a scale drawing.
- Reproducing a scale drawing using a different scale.
- Describing two-dimensional cross sections of pyramids, prisms, cones and cylinders.
- Determining whether or not a set of any three given angles or side-length measures can result in a unique triangle, more than one triangle, or no triangle at all.

2: Student demonstrates they are nearing proficiency by:

- Recognizing and recalling specific vocabulary, such as: plane, prism, pyramid, cone, sphere, cylinder, scale factor, scale drawing, similar.
- Performing processes such as:
    - Describing geometric shapes with given conditions and Describing the relationship between a geometric figure and its scale drawing by finding the scale factor between them.
    - Describing the two-dimensional figures that result from slicing prisms and pyramids by planes that are parallel to a face.
    - Constructing special quadrilaterals given specific parameters about angles or sides (kite, trapezoid, rhombus, parallelogram, rectangle, and square)
    -

1: Student demonstrates a limited understanding or skill with the learning goal by drawing or constructing geometric shapes with given conditions using freehand, ruler, protractor, and/or technology.

**Learning Targets**

- Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale
- Draw (freehand, with ruler and protractor, and with technology) geometric shapes with given conditions. Focus on constructing triangles from three measures of angles or sides, noticing when the conditions determine a unique triangle, more than one triangle, or no triangle
- Describe the two-dimensional figures that result from slicing three-dimensional figures, as in plane sections of right rectangular prisms and right rectangular pyramids

# WGSD Curriculum – Math 7th Grade
## *Geometry and Measurement*

**High Priority Standards**

7.GM.A.4 Understand concepts of circles. a. Analyze the relationships among the circumference, the radius, the diameter, the area and Pi in a circle. b. Know and apply the formulas for circumference and area of circles to solve problems.
7.GM.B.5 Use angle properties to write and solve equations for an unknown angle.
7.GM.B.6 Understand the relationship between area, surface area and volume. a. Find the area of triangles, quadrilaterals and other polygons composed of triangles and rectangles. b. Find the volume and surface area of prisms, pyramids and cylinders.

**Learning Goal**

Students will be able to solve real-life and mathematical problems involving angle measure, area, surface area, and volume.

**Proficiency Scale**

4: In addition to score 3.0 performance, the student demonstrates an in-depth inference or advanced application, or innovates with the learning goal.

3: Student demonstrates mastery with the learning goal as evidenced by:

- Using supplementary, complementary, vertical, and adjacent angles to solve multi-step problems with angle measures expressed as variables in degrees.
- Knowing and applying formulas for the area and circumference of a circle to solve problems.
- Describing the relationships among the radius, diameter, and circumference and area of a circle and the relationship with $\pi$.
- Solving problems involving the area of triangles, quadrilaterals and and other polygons composed of triangles and rectangles.
- Solving problems involving surface area and volume of cubes, right triangular prisms and pyramids, right rectangular prisms and pyramids, and cylinders.

2: Student demonstrates they are nearing proficiency by:

- Recognizing and recalling specific vocabulary, such as: supplementary angles, complementary angles, vertical angles, adjacent angles, volume, surface area, circumference, radius, and diameter.
- Performing processes such as:
    - Using supplementary, complementary, vertical, or adjacent angles to solve problems with angles expressed as numerical measurements in degrees.
    - Calculating the circumference of a circle.
    - Calculating the area of circles, triangles, and quadrilaterals.
    - Calculating the volume of right rectangular prisms.

1: Student demonstrates a limited understanding or skill with the learning goal by:

- Identifying appropriate formulas for the area and circumference of a circle.

| | |
|---|---|
| | ● Calculating the area of triangles and rectangles and the volume of cubes.<br>● Classifying pairs of angles as supplementary, complementary, vertical, or adjacent.<br>● Measuring angles with appropriate tools. |

**Learning Targets**

- Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle
- Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure
- Solve real-world and mathematical problems involving area, volume and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms

**Learning Design**

**High Priority Standards**

7.DSP.A.1 Understand that statistics can be used to gain information about a population by examining a sample of the population. a. Understand that a sample is a subset of a population. b. Understand that generalizations from a sample are valid only if the sample is representative of the population. c. Understand that random sampling is used to produce representative samples and support valid inferences.
7.DSP.A.2 Use data from multiple samples to draw inferences about a population and investigate variability in estimates of the characteristic of interest.

| **Learning Goal** | **Proficiency Scale** |
|---|---|
| Students will be able to use random sampling to draw inferences about a population. | 4: In addition to score 3.0 performance, the student demonstrates an in-depth inference or advanced application, or innovates with the learning goal.<br><br>3: Student demonstrates mastery with the learning goal as evidenced by:<br>● Using data from a random sample to draw inferences about a population with an unknown characteristic of interest presented in an unfamiliar context.<br>● Generating multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions.<br><br>2: Student demonstrates they are nearing proficiency by:<br>● Recognizing and recalling specific vocabulary, such as: population, sample, random sample, biased sample, unbiased sample, inference.<br>● Performing processes such as:<br>○ Determining whether or not a sample is random.<br>○ Describing how random samples of an appropriate population are representative samples that support valid results.<br>○ Using data from a random sample to draw obvious inferences about a population presented in a familiar context.<br><br>1: Student demonstrates a limited understanding or skill with the learning goal by:<br>● Describing what a representative sample involves.<br>● Identifying biased and unbiased samples of a population. |

**Learning Targets**

- Understand that statistics can be used to gain information about a population by examining a sample of the population; generalizations about a population from a sample are valid only if the sample is representative of that population. Understand that random sampling tends to produce representative samples and support valid inferences.

- Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples (or simulated samples) of the same size to gauge the variation in estimates or predictions
    - *For example, estimate the mean word length in a book by randomly sampling words from the book; predict the winner of a school election based on randomly sampled survey data. Gauge how far off the estimate or prediction might be*

# WGSD Curriculum – Math 7th Grade
## *Data Analysis, Statistics and Probability*

**High Priority Standards**

7.DSP.B.3 Analyze different data distributions using statistical measures.
7.DSP.B.4 Compare the numerical measures of center, measures of frequency and measures of variability from two random samples to draw inferences about the population.

**Learning Goal**

Students will be able to draw informal comparative inferences about two populations.

**Proficiency Scale**

4: In addition to score 3.0 performance, the student demonstrates an in-depth inference or advanced application, or innovates with the learning goal.

3: Student demonstrates mastery with the learning goal as evidenced by:

- Assessing informally the degree of visual overlap of two numerical data distributions with similar variability, measuring the difference between the centers in any context.
- Making multiple comparisons between two sets of data based on a graphic representation using measures of center.
- Using measures of variability for numerical data from random samples to draw informal comparative inferences about two populations.

2: Student demonstrates they are nearing proficiency by:

- Recognizing and recalling specific vocabulary, such as: mean, median, mode, range, outlier, visual overlap, interquartile range, variability, measures of center, mean absolute deviation.
- Performing processes such as:
  - Using range to draw comparisons about two different populations.
  - Making one or two comparisons between two sets of data based on a graphic representation.

1: Student demonstrates a limited understanding or skill with the learning goal by:

- Using the mean to compare and draw inferences about two different populations.

**Learning Targets**

- Informally assess the degree of visual overlap of two numerical data distributions with similar variabilities, measuring the difference between the centers by expressing it as a multiple of a measure of variability
  - *For example, the mean height of players on the basketball team is 10 cm greater than the mean height of players on the soccer team, about twice the variability (mean absolute deviation) on either team; on a dot plot, the separation between the two distributions of heights is noticeable*
- Use measures of center and measures of variability for numerical data from random samples to draw informal comparative inferences about two populations
  - *For example, decide whether the words in a chapter of a seventh-grade science book are generally longer than the words in a chapter of a fourth-grade science book*

**High Priority Standards**

7.DSP.C.5 Investigate the probability of chance events. a. Determine probabilities of simple events. b. Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring.
7.DSP.C.6 Investigate the relationship between theoretical and experimental probabilities for simple events. a. Predict outcomes using theoretical probability. b. Perform experiments that model theoretical probability. c. Compare theoretical and experimental probabilities.
7.DSP.C.7 Explain possible discrepancies between a developed probability model and observed frequencies. a. Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events. b. Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process.
7.DSP.C.8 Find probabilities of compound events using organized lists, tables, tree diagrams and simulations. a. Represent the sample space of a compound event. b. Design and use a simulation to generate frequencies for compound events.

**Learning Goal**

Students will investigate chance processes and develop, use, and evaluate probability models.

**Proficiency Scale**

4: In addition to score 3.0 performance, the student demonstrates an in-depth inference or advanced application, or innovates with the learning goal.

3: Student demonstrates mastery with the learning goal as evidenced by:

- Finding probabilities of compound events using organized lists, tables, tree diagrams, and simulation.
- Comparing theoretical and experimental results from a probability experiment.
- Designing, describing, and constructing a simulation experiment to generate frequencies for compound events.
- Explaining what might account for differences between theoretical and experimental results and evaluating the associated probability model.

2: Student demonstrates they are nearing proficiency by:

- Recognizing and recalling specific vocabulary, such as: compound events, equally likely, theoretical probability, experimental probability, relative frequency, simulation.
- Performing processes such as:
    - Approximating the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency.
    - Predicting the approximate relative frequency given the probability.

1: Student demonstrates a limited understanding or skill with the learning goal by:

- Determining the theoretical probability of a simple event.
- Explaining how probabilities are numbers between 0 (impossible) and 1 (always) and that a probability around 1/2 indicates an event that is neither unlikely nor likely.

**Learning Targets**

- Understand that the probability of a chance event is a number between 0 and 1 that expresses the likelihood of the event occurring. Larger numbers indicate greater likelihood. A probability near 0 indicates an unlikely event, a probability around 1/2 indicates an event that is neither unlikely nor likely, and a probability near 1 indicates a likely event
- Approximate the probability of a chance event by collecting data on the chance process that produces it and observing its long-run relative frequency, and predict the approximate relative frequency given the probability
    - *For example, when rolling a number cube 600 times, predict that a 3 or 6 would be rolled roughly 200 times, but probably not exactly 200 times*.
- Develop a probability model and use it to find probabilities of events. Compare probabilities from a model to observed frequencies; if the agreement is not good, explain possible sources of the discrepancy
    - Develop a uniform probability model by assigning equal probability to all outcomes, and use the model to determine probabilities of events
        - *For example, if a student is selected at random from a class, find the probability that Jane will be selected and the probability that a girl will be selected*
    - Develop a probability model (which may not be uniform) by observing frequencies in data generated from a chance process
        - *For example, find the approximate probability that a spinning penny will land heads up or that a tossed paper cup will land open-end down. Do the outcomes for the spinning penny appear to be equally likely based on the observed frequencies?*
- Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation
    - Understand that, just as with simple events, the probability of a compound event is the fraction of outcomes in the sample space for which the compound event occurs
    - Represent sample spaces for compound events using methods such as organized lists, tables and tree diagrams. For an event described in everyday language (e.g., “rolling double sixes”), identify the outcomes in the sample space which compose the event
    - Design and use a simulation to generate frequencies for compound events
        - *For example, use random digits as a simulation tool to approximate the answer to the question: If 40% of donors have type A blood, what is the probability that it will take at least 4 donors to find one with type A blood?*

**Learning Design**

# WGSD Curriculum – Math 7th Grade

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