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| **Prerequisite Skills**  **(Grade 4)** | **Unit Two Standards**  **Grade 5** | **Looking Ahead**  **(Grade 6)** |
| Identify arithmetic patterns (including patterns in the addition and multiplication table) and explain those patterns using properties of operations. | Operations and Algebraic Thinking 3: Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the* *rule “Add 3” and the starting number 0, and given the rule “Add 6” and the* *starting number 0, generate terms in the resulting sequences, and observe* *that the terms in one sequence are twice the corresponding terms in the* *other sequence. Explain informally why this is so.*   * I can generate two numerical patterns using two given rules and explain the relationship between corresponding terms in the two numerical patterns. * I can form ordered pairs consisting of corresponding terms for the two patterns. * I can graph ordered pairs on a coordinate plane in the first quadrant. | Use variables to represent two quantities that change in relationship to each other.  Write an equation to independent and dependent variables. |
| This is the first time students are working with coordinate planes, and only in the first quadrant. It is important that students create the coordinate grid themselves. This can be related to two number lines and reliance on previous experiences with moving along a number line. | Geometry 1: Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate).   * I can identify the x- and y-axis, and locate the origin on the coordinate system. * I can identify coordinates of a point on a coordinate system. * I can recognize and describe the connection between the ordered pair and the x- and y-axis (from the origin). | Draw polygons in the coordinate plane when given the coordinates for the vertices.  Use coordinates to determine the length of a side. |
| Geometry 2: Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.   * I can interpret coordinate points in real world and mathematical problems and represent them by graphing points in the first quadrant. |
| Draw and identify lines and angles, and classify shapes by properties of their lines and angles. | Geometry 3: Understand that attributes belonging to a category of two dimensional figures also belong to all subcategories of that category. *For example, all rectangles have four right angles and squares are* *rectangles, so all squares have four right angles.*  Geometry 4: Classify two-dimensional figures in a hierarchy based on properties.   * I can recognize two-dimensional shapes can be classified into one or more categories by its attributes. | Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes.  Represent three-dimensional figures using nets made  up of rectangles and triangles, and use the nets to find the surface area of these figures. |

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| **Prerequisite Skills**  **(Grade 4)** | **Unit Two Standards (Continued)**  **Grade 5** | **Looking Ahead**  **(Grade 6)** |
| \*These standards represent the first time that students begin exploring the concept of volume. Their prior experiences with volume were restricted to liquid volume. In third grade, students begin working with area and  covering spaces. | Measurement and Data 3: Recognize volume as an attribute of solid figures and understand concepts of volume measurement.  a. A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume.  b. A solid figure which can be packed without gaps or overlaps using “*n* unit cubes” is said to have a volume of “*n* cubic units”.  Measurement and Data 4: Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units.   * I can use unit cubes to measure the volume of three-dimensional shapes and label it as cubic units (cm, in, ft., etc.). | Find the volume of a right rectangular prism with  fractional edge lengths by packing it with unit cubes of  the appropriate unit fraction edge lengths, and show that  the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas V = l w  h and V = b h to find volumes of right rectangular prisms  with fractional edge lengths in the context of solving real world and mathematical problems  Find the area of right triangles, other triangles, and polygons by composing into rectangles or decomposing into triangles or other shapes.  Represent 3-D figures with nets made of rectangles and triangles. |
| Measurement and Data 5a + 5b: Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.  a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication.   * I can find the volume of a right rectangular prism by multiplying its length, width and height and prove it is the same as filling it with this amount of unit cubes.   b. Apply the formulas *V* = *l* × *w* × *h* and *V* = *B* × *h* for rectangular prisms to find volumes of right rectangular prisms with whole number edge lengths in the context of solving real world and mathematical problems.   * I can apply volume formulas to right rectangular prisms to solve real world problems (“B” is the area of the base and can be determined by multiplying length times width):   + Volume = length x width x height   + Volume = area of base (B) x height |
| Measurement and Data 5c: Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.  c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems.   * I can find the total volume of two right rectangular prisms to solve real world problems. |

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| |  |  | | --- | --- | | **Standard** | **Learner Objectives** | | Operations and Algebraic Thinking 3:  Generate two numerical patterns using two given rules. Identify apparent relationships between corresponding terms. Form ordered pairs consisting of corresponding terms from the two patterns, and graph the ordered pairs on a coordinate plane. *For example, given the* *rule “Add 3” and the starting number 0, and given the rule “Add 6” and the* *starting number 0, generate terms in the resulting sequences, and observe* *that the terms in one sequence are twice the corresponding terms in the* *other sequence. Explain informally why this is so.* | * I can generate two numerical patterns using two given rules and explain the relationship between corresponding terms in the two numerical patterns. * I can form ordered pairs consisting of corresponding terms for the two patterns. * I can graph ordered pairs on a coordinate plane in first quadrant. |  |  |  |  | | --- | --- | --- | | **What does this standard mean the students will know and be able to do?** | | | | This standard extends the work from Fourth Grade, where students generate numerical patterns when they are given one rule. In Fifth Grade, students are given two rules and generate two numerical patterns. The graphs that are created should be line graphs to represent the pattern. This is a linear function which is why we get the straight lines. The Days are the independent variable, Fish are the dependent variables, and the constant rate is what the rule identifies in the table. | | | | **Example:**  **Since Terri catches 4 fish each day, and Sam catches 2 fish, the amount of Terri’s fish is always greater. Terri’s fish is also always twice as much as Sam’s fish. Today, both Sam and Terri have no fish. They both go fishing each day. Sam catches 2 fish each day. Terri catches 4 fish each day. How many fish do they have after each of the five days?** | | | | **Step One**  **Make a chart to represent the number of fish that Sam and Teri catch.** | **Step Two**  **Plot the points on a coordinate plane and make a line graph.** | **Step Three**  **Interpret the graph and describe the pattern.** | | |  |  |  | | --- | --- | --- | | **Days** | **Sam’s Total Number of Fish** | **Terri’s Total Number of Fish** | | 0 | 0 | 0 | | 1 | 2 | 4 | | 2 | 4 | 8 | | 3 | 6 | 12 | | 4 | 8 | 16 | | 5 | 10 | 20 | |  | My graph shows that Terri always has more fish than Sam. Terri’s fish increases at a higher rate since she catches  4 fish every day. Sam only catches 2 fish every day, so his number of fish increases at a smaller rate than Terri.  Important to note as well that the lines become increasingly further apart. Identify apparent relationships between corresponding terms. Additional relationships: The two lines will never intersect; there will not be a day in which  boys have the same total of fish. |  |  |  |  | | --- | --- | --- | | **Lessons and Resources for Operations in Algebraic Thinking 3** | | | | Expressions: Unit 8/Lesson 6 - Activity 1 (Page 845)  Activity Card (Intervention/On-Level) | Expressions: Unit 10/Lesson 2 (Page 985) | Expressions: Unit 10/Lesson 4 (Page 999) | | Expressions: Unit 8, Lesson 5, Activities 1 – 3 (Page 838) | Expressions: Unit 11/Lesson 1 (Page 1009) |  |  |  |  | | --- | --- | | **Emphasized Standards for Mathematical Practice** | | | [2. Reason abstractly and quantitatively.](http://elementarymath.dmschools.org/2-reason-abstractly-and-quantitatively3.html) | [7. Look for and make use of structure.](http://elementarymath.dmschools.org/7-look-for-and-make-use-of-structure.html) | |

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| |  |  | | --- | --- | | **Standard** | **Learner Objectives** | | Geometry 1:  Use a pair of perpendicular number lines, called axes, to define a coordinate system, with the intersection of the lines (the origin) arranged to coincide with the 0 on each line and a given point in the plane located by using an ordered pair of numbers, called its coordinates. Understand that the first number indicates how far to  travel from the origin in the direction of one axis, and the second number indicates how far to travel in the direction of the second axis, with the convention that the names of the two axes and the coordinates correspond (e.g., *x*-axis and *x*-coordinate, *y*-axis and *y*-coordinate). | * I can identify the x- and y-axis, and locate the origin on the coordinate system. * I can identify coordinates of a point on a coordinate system. * I can recognize and describe the connection between the ordered pair and the x- and y-axis (from the origin. |  |  |  | | --- | --- | | **What does this standard mean the students will know and be able to do?** | | | This standard deals with only the first quadrant (positive numbers) in the coordinate plane. Although students can often “locate a point,” these understandings are beyond simple skills. For example, initially, students often fail to distinguish between two different ways of viewing the point (2, 3),say, as instructions: “right 2, up 3”; and as the point defined by being a distance 2 from the y-axis and a distance 3 from the x-axis. In these two descriptions the 2 is first associated with the x-axis, then with the y-axis.  Students need to understand the underlying structure of the coordinate system and see how axes make it possible to locate points anywhere on a coordinate plane. This is the first time students are working with coordinate planes, and only in the first quadrant. It is important that students create the coordinate grid themselves. This can be related to two number lines and reliance on previous experiences with moving along a number line. | | | **Examples** | | | **Connect these points in order on the coordinate grid below:**  **(2, 2) (2, 4) (2, 6) (2, 8) (4, 5) (6, 8) (6, 6) (6, 4) and (6, 2).**    **What letter is formed on the grid?**  *(Solution: “M” is formed.)* | **Plot these points on a coordinate grid.**  **Point A: (2,6) Point B: (4,6) Point C: (6,3) Point D: (2,3)**  **Connect the points in order. Make sure to connect Point D back to Point A.**  **1. What geometric figure is formed? What attributes did you use to identify it?**  **2. What line segments in this figure are parallel?**  **3. What line segments in this figure are perpendicular?**  *(Solutions: trapezoid, line segments AB and DC are parallel, segments AD and*  *DC are perpendicular)* |  |  |  |  | | --- | --- | --- | | **Lessons and Resources for Geometry 1** | | | | Expressions: Unit 8/Lesson 7 (Page 853) | Expressions: Unit 8, Lesson 6, Activity 1 (Page 846) | Illuminations: [Generate the Graph](http://illuminations.nctm.org/Lessons/DescribetheGraph/DescribetheGraphAS.pdf) |  |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Emphasized Standards for Mathematical Practice** | | | | | | [1. Make sense of problems and persevere in solving them.](http://elementarymath.dmschools.org/1-make-sense-of-problems-and-persevere-in-solving-them5.html) | [4. Model with mathematics.](http://elementarymath.dmschools.org/4-model-with-mathematics.html) | [5. Use appropriate tools strategically.](http://elementarymath.dmschools.org/5-use-appropriate-tools-strategically5.html) | [6. Attend to precision.](http://elementarymath.dmschools.org/6-attend-to-precision3.html) | [7. Look for and make use of structure.](http://elementarymath.dmschools.org/7-look-for-and-make-use-of-structure.html) | |

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| |  |  | | --- | --- | | **Standard** | **Learner Objectives** | | Geometry 2:  Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation. | * I can interpret coordinate points in real world and mathematical problems and represent them by graphing points in the first quadrant. |  |  |  |  | | --- | --- | --- | | **What does this standard mean the students will know and be able to do?** | | | | This standard references real-world and mathematical problems, including the traveling from one point to another and identifying the coordinates of missing points in geometric figures, such as squares, rectangles, and parallelograms.  Present real-world and mathematical problems and have students graph points in the first quadrant of the coordinate plane. Gathering and graphing data is a valuable experience for students. It helps them to develop an understanding of coordinates and what the overall graph represents. Students also need to analyze the graph by interpreting the coordinate values in the context of the situation. | | | | **Examples:** | | | | **Using the coordinate grid, which ordered pair represents the location of the School?**  **Explain a possible path from the school to the library.** | **Barb has saved $20. She earns $8 for each hour she works.** | **Use the graph below to determine how much money Barb makes after working exactly**  **9 hours.** | |  | 1. If Barb saves all of her money, how much will she have after working 3 hours? 5 hours? 10 hours? 2. Create a graph that shows the relationship between the hours Barb worked and the amount of money she has saved. 3. What other information do you know from analyzing the graph? |  |  |  |  | | --- | --- | | **Lessons and Resources for Geometry 2** | | | Expressions: Unit 8/Lesson 5 - Activity 1/2/3 (Page 837) | Expressions: Activity Card (Intervention) |  |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | | **Emphasized Standards for Mathematical Practice** | | | | | | | [1. Make sense of problems and persevere in solving them.](http://elementarymath.dmschools.org/1-make-sense-of-problems-and-persevere-in-solving-them5.html) | [2. Reason abstractly and quantitatively.](http://elementarymath.dmschools.org/2-reason-abstractly-and-quantitatively3.html) | [4. Model with mathematics.](http://elementarymath.dmschools.org/4-model-with-mathematics.html) | [5. Use appropriate tools strategically.](http://elementarymath.dmschools.org/5-use-appropriate-tools-strategically5.html) | [6. Attend to precision.](http://elementarymath.dmschools.org/6-attend-to-precision3.html) | [7. Look for and make use of structure.](http://elementarymath.dmschools.org/7-look-for-and-make-use-of-structure.html) | |

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| |  |  | | --- | --- | | **Standard** | **Learner Objective** | | Geometry 3:  Understand that attributes belonging to a category of two dimensional figures also belong to all subcategories of that category. *For example, all rectangles have four right angles and squares are* *rectangles, so all squares have four right angles.* | * I can recognize two-dimensional shapes can be classified into one or more categories by its attributes. |  |  |  |  |  |  | | --- | --- | --- | --- | --- | | **What does this standard mean the students will know and be able to do?** | | | | | | This standard calls for students to reason about the attributes (properties) of shapes. Student should have experiences discussing the property of shapes and explaining their reasoning. Geometric properties include properties of sides (parallel, perpendicular, congruent), properties of angles (type, measurement, congruent), and properties of symmetry (point and line).  Students can use graphic organizers such as flow charts or T-charts to compare and contrast the attributes of geometric figures. Have students create a T-chart with a shape on each side. Have them list attributes of the shapes, such as number of side, number of angles, types of lines, etc. they need to determine what’s alike or different about the two shapes to get a larger classification for the shapes and be able to explain these properties.  Pose questions such as, ―Why is a square always a rectangle? and ―Why is a rectangle not always a square? Expect students to use precision in justifying and explaining their reasoning. | | | | | | **Sample Questions:** | | | | | | Examine whether all quadrilaterals have right angles. Give examples and nonexamples. | A parallelogram has 4 sides with both sets of opposite sides parallel. What types of quadrilaterals are parallelograms? Explain. | Regular polygons have all of their sides and angles congruent. Name or draw some regular polygons. Explain your drawings. | All rectangles have 4 right angles. Squares have 4 right angles so they are also rectangles. True or False? Explain your reasoning. | A trapezoid has 2 sides parallel so it must be a parallelogram. True or False? Explain your reasoning. |  |  |  |  | | --- | --- | --- | | **Lessons and Resources for Geometry 3** | | | | Unit 4, Lesson 3 (Page 375) | [Quantiles: Analyzing Quadrilaterals (Activity 2 only)](https://sharepoint.dmps.k12.ia.us/sites/divisions/curr/Public%20Curriculum%20Documents/Mathematics/Elementary%20Math%202013%20-%202014/5th%20Grade/Unit%202/Analyzing%20Quandrilaterals.pdf) | Quantiles: [Sorting and Classifying Quadrilaterals](https://sharepoint.dmps.k12.ia.us/sites/divisions/curr/Public%20Curriculum%20Documents/Mathematics/Elementary%20Math%202013%20-%202014/5th%20Grade/Unit%202/Sorting%20and%20Classifying%20Quadrilaterals.pdf) |  |  |  |  | | --- | --- | --- | | **Emphasized Standards for Mathematical Practice** | | | | [2. Reason abstractly and quantitatively.](http://elementarymath.dmschools.org/2-reason-abstractly-and-quantitatively3.html) | [6. Attend to precision.](http://elementarymath.dmschools.org/6-attend-to-precision3.html) | [7. Look for and make use of structure.](http://elementarymath.dmschools.org/7-look-for-and-make-use-of-structure.html) | |

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| |  |  | | --- | --- | | **Standard** | **Learner Objectives** | | Geometry 4:  Classify two-dimensional figures in a hierarchy based on properties. | * I can recognize two-dimensional shapes can be classified into one or more categories by its attributes. |  |  |  |  |  | | --- | --- | --- | --- | | **What does this standard mean the students will know and be able to do?** | | | | | This standard builds on what was done in 4th grade. Figures from previous grades: *polygon, rhombus/rhombi, rectangle, square, triangle, quadrilateral, pentagon, hexagon, cube, trapezoid, half/quarter circle, circle.*  Students should be able to reason about the attributes of shapes by examining:   * What are ways to classify triangles? * Why can’t trapezoids and kites be classified as parallelograms? * Which quadrilaterals have opposite angles congruent and why is this true of certain quadrilaterals? * How many lines of symmetry does a regular polygon have? | | | | | **Examples**  **Create Hierarchy Diagrams using the following terms:** | | | | | **Polygons** *– a closed plane figure formed from line segments that meet only at their endpoints.*  **Quadrilaterals** *- a four-sided polygon.* **Rectangles** *- a quadrilateral with two pairs of congruent parallel sides and four right angles.*  **Rhombi** *– a parallelogram with all four sides equal in length.*  **Square** *– a parallelogram with four congruent sides and four right angles.* |  |  |  |  |  |  | | --- | --- | | **Lessons and Resources for Geometry 4** | | | Illuminations: [Sorting Polygons](http://illuminations.nctm.org/LessonDetail.aspx?ID=L277) | Illuminations: [Polygon Capture](http://illuminations.nctm.org/LessonDetail.aspx?ID=L270) |  |  |  |  |  |  | | --- | --- | --- | --- | --- | | **Emphasized Standards for Mathematical Practice** | | | | | | [2. Reason abstractly and quantitatively.](http://elementarymath.dmschools.org/2-reason-abstractly-and-quantitatively3.html) | [3. Construct viable arguments and critique the reasoning of others.](http://elementarymath.dmschools.org/3-construct-viable-arguments-and-critique-the-reasoning-of-others2.html) | [5. Use appropriate tools strategically.](http://elementarymath.dmschools.org/5-use-appropriate-tools-strategically5.html) | [6. Attend to precision.](http://elementarymath.dmschools.org/6-attend-to-precision3.html) | [7. Look for and make use of structure.](http://elementarymath.dmschools.org/7-look-for-and-make-use-of-structure.html) | |

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| |  |  | | --- | --- | | **Standard** | **Learner Objectives** | | Measurement and Data 3:  Recognize volume as an attribute of solid figures and understand concepts of volume measurement.  a. A cube with side length 1 unit, called a “unit cube,” is said to have “one cubic unit” of volume, and can be used to measure volume.  b. A solid figure which can be packed without gaps or overlaps using *n* unit cubes is said to have a volume of *n* cubic units. | * I can use unit cubes to measure the volume of three-dimensional shapes and label it as cubic units (cm, in, ft., etc.). | | Measurement and Data 4:  Measure volumes by counting unit cubes, using cubic cm, cubic in, cubic ft, and improvised units. |  |  | | --- | | **What does this standard mean the students will know and be able to do?** | | The concept of volume should be extended from area with the idea that students are covering an area (the bottom of cube) with a layer of unit cubes and then adding layers of unit cubes on top of bottom layer.  Students should have ample experiences with concrete manipulatives before moving to pictorial representations. As students develop their understanding of volume they recognize that a 1-unit by 1-unit by 1-unit cube is the standard unit for measuring volume. This cube has a length of 1 unit, a width of 1 unit and a height of 1 unit and is called a cubic unit. This cubic unit is written with an exponent of 3 (e.g., in3, m3).  Students connect this notation to their understanding of powers of 10 in our place value system. Models of cubic inches, centimeters, cubic feet, etc are helpful in developing an image of a cubic unit. Student’s estimate how many cubic yards would be needed to fill the classroom or how many cubic centimeters would be needed to fill a pencil box. | | **Example:** | |  |  |  |  |  | | --- | --- | --- | | **Lessons and Resources for Measurement and Data 3 + 4** | | | | Expressions: Unit 6/Lesson 1 – All (Page 581)  Activity Card (Intervention/On-Level) | Expressions: Unit 6/Lesson 2 - Activity ½ (Page 587)  Activity Card (Intervention) | [Fill the Box](https://sharepoint.dmps.k12.ia.us/sites/divisions/curr/Public%20Curriculum%20Documents/Mathematics/Elementary%20Math%202013%20-%202014/5th%20Grade/Unit%202/fillthebox.docx) | | Expressions: Activity Card 6-2: Intervention | Expressions: Unit 6, Lesson 1, Activity 1 (Page 582) |  |  |  |  |  |  | | --- | --- | --- | --- | | **Emphasized Standards for Mathematical Practice** | | | | | [1. Make sense of problems and persevere in solving them.](http://elementarymath.dmschools.org/1-make-sense-of-problems-and-persevere-in-solving-them5.html) | [2. Reason abstractly and quantitatively.](http://elementarymath.dmschools.org/2-reason-abstractly-and-quantitatively3.html) | [3. Construct viable arguments and critique the reasoning of others.](http://elementarymath.dmschools.org/3-construct-viable-arguments-and-critique-the-reasoning-of-others2.html) | [4. Model with mathematics.](http://elementarymath.dmschools.org/4-model-with-mathematics.html) | | [5. Use appropriate tools strategically.](http://elementarymath.dmschools.org/5-use-appropriate-tools-strategically5.html) | [6. Attend to precision.](http://elementarymath.dmschools.org/6-attend-to-precision3.html) | [7. Look for and make use of structure.](http://elementarymath.dmschools.org/7-look-for-and-make-use-of-structure.html) | [8. Look for and express regularity in repeated reasoning.](http://elementarymath.dmschools.org/8-look-for-and-express-regularity-in-repeated-reasoning.html) | |

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| |  |  |  | | --- | --- | --- | | **Standard** | | **Learner Objectives** | | Measurement and Data 5a /5b:  Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume. | a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes, and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent threefold whole-number products as volumes, e.g., to represent the associative property of multiplication. | * I can find the volume of a right rectangular prism by multiplying its length, width and height and prove it is the same as filling it with this amount of unit cubes. | | b. Apply the formulas *V* = *l* × *w* × *h* and *V* = *B* × *h* for rectangular prisms to find volumes of right rectangular prisms with whole number edge lengths in the context of solving real world and mathematical problems. | * I can apply volume formulas to right rectangular prisms to solve real world problems (“B” is the area of the base and can be determined by multiplying length times width):   + Volume = length x width x height   + Volume = area of base (B) x height |  |  |  |  | | --- | --- | --- | | **What does this standard mean the students will know and be able to do?** | | | | These standards involve finding the volume of right rectangular prisms (as shown in picture on previous page). Students should have experiences to describe and reason about why the formula is true. Specifically, that they are covering the bottom of a right rectangular prism (length x width) with multiple layers (height). Therefore, the  formula (length x width x height) is an extension of the formula for the area of a rectangle. | | | | **Examples:** | | | | When given 24 cubes, students make as many rectangular prisms as possible with a volume of 24 cubic units. Students build the prisms and record possible dimensions. | Students determine the volume of concrete needed to build the steps in the diagram below. | A homeowner is building a swimming pool and needs to calculate the volume of water needed to fill the pool. The design of the pool is shown in the illustration below. |  |  |  |  |  | | --- | --- | --- | --- | | **Lessons and Resources for Measurement and Data 5a + 5b** | | | | | [Volume of Prisms](https://sharepoint.dmps.k12.ia.us/sites/divisions/curr/Public%20Curriculum%20Documents/Mathematics/Elementary%20Math%202013%20-%202014/5th%20Grade/Unit%202/volumeofprisms.docx) | Expressions: Unit 6, Lesson 1, Activity 2 and 3 (Page 584) | Expressions: Unit 6/Lesson 3 (Page 595) | Expressions: Unit 12/Lesson 1 (Page 1131) |  |  |  |  |  | | --- | --- | --- | --- | | **Emphasized Standards for Mathematical Practice** | | | | | [1. Make sense of problems and persevere in solving them.](http://elementarymath.dmschools.org/1-make-sense-of-problems-and-persevere-in-solving-them5.html) | [2. Reason abstractly and quantitatively.](http://elementarymath.dmschools.org/2-reason-abstractly-and-quantitatively3.html) | [3. Construct viable arguments and critique the reasoning of others.](http://elementarymath.dmschools.org/3-construct-viable-arguments-and-critique-the-reasoning-of-others2.html) | [4. Model with mathematics.](http://elementarymath.dmschools.org/4-model-with-mathematics.html) | | [5. Use appropriate tools strategically.](http://elementarymath.dmschools.org/5-use-appropriate-tools-strategically5.html) | [6. Attend to precision.](http://elementarymath.dmschools.org/6-attend-to-precision3.html) | [7. Look for and make use of structure.](http://elementarymath.dmschools.org/7-look-for-and-make-use-of-structure.html) | [8. Look for and express regularity in repeated reasoning.](http://elementarymath.dmschools.org/8-look-for-and-express-regularity-in-repeated-reasoning.html) | |

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| |  |  | | --- | --- | | **Standard** | **Learner Objectives** | | Measurement and Data 5c:  Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.  c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real world problems. | * I can find the total volume of two right rectangular prisms to solve real world problems. |  |  | | --- | | **What does this standard mean the students will know and be able to do?** | | This standard calls for students to extend their work with the area of composite figures into the context of volume. Students should be given concrete experiences of breaking apart (decomposing) 3-dimensional figures into right rectangular prisms in order to find the volume of the entire 3-dimensional figure.  Students need multiple opportunities to measure volume by filling rectangular prisms with cubes and looking at the relationship between the total volume and the area of the base. They derive the volume formula (volume equals the area of the base times the height) and explore how this idea would apply to other prisms. Students use the associative property of multiplication and decomposition of numbers using factors to investigate rectangular prisms with a given number of cubic units. |  |  |  | | --- | --- | | **Lessons and Resources for Measurement and Data 5c** | | | Expressions: Unit 6, Lesson 2, Activities 1 and 2 (Page 588)  Activity card 6-1: On Level | Expressions: Unit 12/Lesson 3 (Page 1149) |  |  |  |  |  | | --- | --- | --- | --- | | **Emphasized Standards for Mathematical Practice** | | | | | [1. Make sense of problems and persevere in solving them.](http://elementarymath.dmschools.org/1-make-sense-of-problems-and-persevere-in-solving-them5.html) | [2. Reason abstractly and quantitatively.](http://elementarymath.dmschools.org/2-reason-abstractly-and-quantitatively3.html) | [3. Construct viable arguments and critique the reasoning of others.](http://elementarymath.dmschools.org/3-construct-viable-arguments-and-critique-the-reasoning-of-others2.html) | [4. Model with mathematics.](http://elementarymath.dmschools.org/4-model-with-mathematics.html) | | [5. Use appropriate tools strategically.](http://elementarymath.dmschools.org/5-use-appropriate-tools-strategically5.html) | [6. Attend to precision.](http://elementarymath.dmschools.org/6-attend-to-precision3.html) | [7. Look for and make use of structure.](http://elementarymath.dmschools.org/7-look-for-and-make-use-of-structure.html) | [8. Look for and express regularity in repeated reasoning.](http://elementarymath.dmschools.org/8-look-for-and-express-regularity-in-repeated-reasoning.html) | |

**Optional Whole Group Lesson Progression**

Unit Pacing: 5 weeks

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| --- | --- | --- | --- | --- |
| **Resource** | **Location** | | **Primary Focus** | **Standard** |
| **Introduce Volume**  ***Use models to develop concept of volume –*** Volume refers to the amount of space that an object takes up and is measured in cubic units such as cubic inches or cubic centimeters. Students need to experience finding the volume of rectangular prisms by counting unit cubes, in metric and standard units of measure, before the formula is presented. Provide multiple opportunities for students to develop the formula for the volume of a rectangular prism with activities similar to the one described below.  Give students one block (a I- or 2- cubic centimeter or cubic-inch cube), a ruler with the appropriate measure based on the type of cube, and a small rectangular box. Ask students to determine the number of cubes needed to fill the box. Have students share their strategies with the class using words, drawings or numbers. Allow them to confirm the volume of the box by filling the box with cubes of the same size.  Have students build a prism in layers. Then, have students determine the number of cubes in the bottom layer and share their strategies. Students should use multiplication based on their knowledge of arrays and its use in multiplying two whole numbers. Ask what strategies can be used to determine the volume of the prism based on the number of cubes in the bottom layer. Expect responses such as “adding the same number of cubes in each layer as were on the bottom layer” or multiply the number of cubes in one layer times the number of layers.  The Priority Standard for volume of a right rectangular prism states that students apply V = l x w x h and V = b x h. By developing the concept of layering, the teacher can guide students to see that l x w is the same thing as the base (b). Therefore, there are two commonly used formulas for volume of a rectangular prism. By understanding the concept of layering, students will make connections to finding the volume of other 3-D figures in later grades. | | | | |
| Expressions | | Unit 4, Lesson 3 (Page 375) | * I can recognize two-dimensional shapes can be classified into one or more categories by its attributes. | G.3  G.4 |
| Quantilies | | [Analyzing Quadrilaterals (Activity 2 only)](https://sharepoint.dmps.k12.ia.us/sites/divisions/curr/Public%20Curriculum%20Documents/Mathematics/Elementary%20Math%202013%20-%202014/5th%20Grade/Unit%202/Analyzing%20Quandrilaterals.pdf) |
| Quantiles | | [Sorting and Classifying Quadrilaterals](https://sharepoint.dmps.k12.ia.us/sites/divisions/curr/Public%20Curriculum%20Documents/Mathematics/Elementary%20Math%202013%20-%202014/5th%20Grade/Unit%202/Sorting%20and%20Classifying%20Quadrilaterals.pdf) |
| Illuminations | | [Sorting Polygons](http://illuminations.nctm.org/LessonDetail.aspx?ID=L277) |
| Illuminations | | [Polygon Capture](http://illuminations.nctm.org/LessonDetail.aspx?ID=L270) |
| Expressions | | Unit 6/Lesson 1 – All (Page 581)  Activity Card (Intervention/On-Level) | * I can use unit cubes to measure the volume of three-dimensional shapes and label it as cubic units (cm, in, ft., etc.). * I can find the volume of a right rectangular prism by multiplying its length, width and height and prove it is the same as filling it with this amount of unit cubes. * I can apply volume formulas to right rectangular prisms to solve real world problems (“B” is the area of the base and can be determined by multiplying length times width):   + Volume = length x width x height   + Volume = area of base (B) x height | MD.3  MD.4  MD.5a  MD.5b |
| Expressions | | Unit 6/Lesson 2 - Activity ½ (Page 587)  Activity Card (Intervention) | * I can use unit cubes to measure the volume of three-dimensional shapes and label it as cubic units (cm, in, ft., etc.). * I can find the volume of a right rectangular prism by multiplying its length, width and height and prove it is the same as filling it with this amount of unit cubes. * I can find the total volume of two right rectangular prisms to solve real world problems. | MD.3  MD.5a  MD.5c |
| Sharepoint | | [Fill the Box](https://sharepoint.dmps.k12.ia.us/sites/divisions/curr/Public%20Curriculum%20Documents/Mathematics/Elementary%20Math%202013%20-%202014/5th%20Grade/Unit%202/fillthebox.docx) | * I can use unit cubes to measure the volume of three-dimensional shapes and label it as cubic units. | 5.MD3  5.MD.4 |
| Expressions | | Activity Card 6-2: Intervention |

**Optional Whole Group Lesson Progression (Continued)**

Unit Pacing: 5 weeks

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| **Resource** | **Location** | **Primary Focus** | **Standard** |
| Expressions | Unit 6, Lesson 1, Activity 1 (Page 582) | * I can use unit cubes to measure the volume of three-dimensional shapes and label it as cubic units. * I can find the volume of a right rectangular prism by multiplying its length, width and height and prove it is the same as filling it with this amount of unit cubes. | 5.MD.3  5.MD.4  5.MD.5 |
| Sharepoint | [Volume of Prisms](https://sharepoint.dmps.k12.ia.us/sites/divisions/curr/Public%20Curriculum%20Documents/Mathematics/Elementary%20Math%202013%20-%202014/5th%20Grade/Unit%202/volumeofprisms.docx) |
| Expressions | Unit 6, Lesson 1, Activity 2 and 3 (Page 584) | * I can apply volume formulas to solve real world problems | MD.5b |
| Expressions | Unit 6, Lesson 2, Activities 1 and 2 (Page 588)  Activity card 6-1: On Level | * I can find the volume of a right rectangular prism by multiplying its length, width and height and prove it is the same as filling it with this amount of unit cubes | MD.5c |
| Expressions | Unit 6/Lesson 3 (Page 595) | * I can find the volume of a right rectangular prism by multiplying its length, width and height and prove it is the same as filling it with this amount of unit cubes. * I can apply volume formulas to right rectangular prisms to solve real world problems (“B” is the area of the base and can be determined by multiplying length times width):   + Volume = length x width x height   + Volume = area of base (B) x height | MD.5a  MD.5b |
| Expressions | Unit 8/Lesson 5 - Activity 1/2/3 (Page 837)  Activity Card (Intervention) | * I can generate two numerical patterns using two given rules and explain the relationship between corresponding terms in the two numerical patterns. * I can form ordered pairs consisting of corresponding terms for the two patterns. * I can graph ordered pairs on a coordinate plane in the first quadrant. * I can interpret coordinate points in real world and mathematical problems and represent them by graphing points in the first quadrant. | OA.3  G.2 |
| Expressions | Unit 8/Lesson 6 - Activity 1 (Page 845)  Activity Card (Intervention/On-Level) | * I can identify the x- and y-axis, and locate the origin on the coordinate system. * I can identify coordinates of a point on a coordinate system. * I can recognize and describe the connection between the ordered pair and the x- and y-axis (from the origin). * I can generate two numerical patterns using two given rules and explain the relationship between corresponding terms in the two numerical patterns. * I can form ordered pairs consisting of corresponding terms for the two patterns. * I can graph ordered pairs on a coordinate plane in the first quadrant. * I can interpret coordinate points in real world and mathematical problems and represent them by graphing points in the first quadrant. | OA.3  G.1  G.2 |
| Unit 8/Lesson 7 (Page 853) |
| Expressions | Unit 10/Lesson 2 (Page 985) | * I can generate two numerical patterns using two given rules and explain the relationship between corresponding terms in the two numerical patterns. * I can form ordered pairs consisting of corresponding terms for the two patterns. * I can graph ordered pairs on a coordinate plane in the first quadrant. | OA.3 |
| Expressions | Unit 10/Lesson 4 (Page 999) | * I can generate two numerical patterns using two given rules and explain the relationship between corresponding terms in the two numerical patterns. * I can form ordered pairs consisting of corresponding terms for the two patterns. * I can graph ordered pairs on a coordinate plane in the first quadrant. * I can identify the x- and y-axis, and locate the origin on the coordinate system. * I can identify coordinates of a point on a coordinate system. * I can recognize and describe the connection between the ordered pair and the x- and y-axis (from the origin). | OA.3  G.1 |

**Optional Whole Group Lesson Progression (Continued)**

Unit Pacing: 5 weeks

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| **Resource** | **Location** | **Primary Focus** | **Standard** |
| Expressions | Unit 8, Lesson 6, Activity 1 (Page 846) | * I can identify the x-and y-axis, and locate the origin on the coordinate system. * I can identify coordinates of a point on a coordinate system. * I can recognize and describe the connection between the ordered pair and x- and y-axis. | G.1 |
| Illuminations | [Generate the Graph](http://illuminations.nctm.org/Lessons/DescribetheGraph/DescribetheGraphAS.pdf) |
| Expressions | Unit 8, Lesson 5, Activities 1 – 3 (Page 838) | * I can generate two numerical patterns using two given rules and explain the relationship between corresponding terms in the two numerical relationships. * I can form ordered pairs consisting of a point on a coordinate system. * I can recognize and describe the connection between the ordered pair and x- and y- axis. | OA.3 |
| Expressions | Unit 11/Lesson 1 (Page 1009) | * I can generate two numerical patterns using two given rules and explain the relationship between corresponding terms in the two numerical patterns. * I can form ordered pairs consisting of corresponding terms for the two patterns. * I can graph ordered pairs on a coordinate plane in the first quadrant. | OA.3 |
| Expressions | Unit 12/Lesson 1 (Page 1131) | * I can find the volume of a right rectangular prism by multiplying its length, width and height and prove it is the same as filling it with this amount of unit cubes. * I can apply volume formulas to right rectangular prisms to solve real world problems (“B” is the area of the base and can be determined by multiplying length times width):   + Volume = length x width x height   + Volume = area of base (B) x height | MD.5b |
| Expressions | Unit 12/Lesson 3 (Page 1149) | * I can find the total volume of two right rectangular prisms to solve real world problems. | MD.5c |

**\*Unit pacing is approximate. Some lessons may take more than one day. Use teacher discretion based on student need when planning unit length.**