|  |
| --- |
| 4th Grade Mathematics - Investigations  Unit 3: Measurement and Geometry |
| Teacher Resource Guide |
| 2012 - 2013 |

In Grade 4, instructional time should focus on three critical areas:

1. Developing understanding and fluency with multi-digit multiplication, and developing understanding of dividing to find quotients involving multi-digit dividends;

Students apply their understanding of models for multiplication (equal-sized groups, arrays, area models) and models for division, place value, and the distributive property as they discuss and use efficient methods to estimate and compute products and quotients. They develop fluency with efficient procedures for multiplying whole numbers, understand and explain why the procedures work based on place value and properties, and use them to solve problems. Students interpret remainders based upon the context of the problem.

1. Developing an understanding of fraction equivalence, addition and subtraction of fractions with like denominators, and multiplication of fractions by whole numbers;

Students recognize that two different fractions can be equal (12/4 = 6/2), and they develop methods for generating and recognizing equivalent fractions. Students extend understandings about how fractions are built from unit fractions (3/4 = ¼ + ¼ + ¼), and use the meaning of multiplication to multiply a fraction by a whole number.

1. Understanding that geometric figures can be analyzed and classified based on their properties, such as having parallel sides, perpendicular sides, particular angle measures, and symmetry.

Students describe, analyze, compare, and classify two-dimensional shapes. Through building, drawing, and analyzing two-dimensional shapes, students understand properties of two-dimensional objects and solve problems involving symmetry.

4th Grade Mathematics 2012 - 2013

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Unit | Time Frame | | Test By |
| **TRIMESTER 1** | 1: Multiplication and Division Concepts | 6 weeks | 8/27 – 10/5 | October 5 |
| 2: Multi-Digit Multiplication | 6 weeks | 10/8 – 11/16 | November 16 |
| **TRIMESTER 2** | 3: Measurement/Geometry | 4 weeks | 11/19 – 12/21 | December 21 |
| 4: Multi-Digit Division | 7 weeks | 1/2- 2/22 | February 22 |
| **TRIMESTER 3** | 5: Fractions | 7 weeks | 2/25-4/19 | April 19 |
| 6: Decimal Fractions | 6 weeks | 4/22 – 5/29 | May 29 |

|  |  |
| --- | --- |
| **Big Ideas** | **Essential Questions** |
| When two-dimensional figures belong to more than one category they can have more than one name. | When can a two-dimensional shape have more than one name? |
| Finding the area of a rectangle requires multiplying the squares in one row by the number of rows. | How can we find the area of a rectangle? |
| Finding the perimeter of a two-dimensional figure requires finding the total of all the side lengths. | How can we find the perimeter of a rectangle? |

|  |  |  |  |
| --- | --- | --- | --- |
| Identifier | | Standards | Mathematical Practices |
| **STANDARDS** | **4.G.2**  4.G.1  4.G.3  4.MD.5  4.MD.6  4.MD.7 | **Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.**  Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.  Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.  Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:  a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.  b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n degrees.*  Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.  Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure. | 1) Make sense of problems and persevere in solving them.  2)Reason abstractly and quantitatively.  3) Construct viable arguments and critique the reasoning of others.  4) Model with mathematics.  5) Use appropriate tools strategically.  6) Attend to precision.  7) Look for and make use of structure.  8) Look for and express regularity in repeated reasoning. |
| **4.MD.3**  4.MD.2 | * **Apply the area and perimeter formulas for rectangles in real world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*** * Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| Identifier | | Standards | Bloom’s | Skills | Concepts |
| **STANDARDS** | **4.G.2**  4.G.1  4.G.3  4.MD.5  4.MD.6  4.MD.7 | **Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines, or the presence or absence of angles of a specified size. Recognize right triangles as a category, and identify right triangles.**  Draw points, lines, line segments, rays, angles (right, acute, obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.  Recognize a line of symmetry for a two-dimensional figure as a line across the figure such that the figure can be folded along the line into matching parts. Identify line-symmetric figures and draw lines of symmetry.  Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement:  a. An angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through 1/360 of a circle is called a "one-degree angle," and can be used to measure angles.  b. An angle that turns through *n* one-degree angles is said to have an angle measure of *n degrees.*  Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.  Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure. | Understand (2) | Classify (two-dimensional figures) | parallel lines  perpendicular lines  angles  right triangles category |
| **4.MD.3**  4.MD.2 | * **Apply the area and perimeter formulas for rectangles in real world and mathematical problems. *For example, find the width of a rectangular room given the area of the flooring and the length, by viewing the area formula as a multiplication equation with an unknown factor.*** * Use the four operations to solve word problems involving distances, intervals of time, liquid volumes, masses of objects, and money, including problems involving simple fractions or decimals, and problems that require expressing measurements given in a larger unit in terms of a smaller unit. Represent measurement quantities using diagrams such as number line diagrams that feature a measurement scale. | Apply (3) | Apply (area and perimeter formulas, rectangles) | rectangle  area  perimeter  length  width |

|  |
| --- |
| ***Instructional Strategies for ALL STUDENTS*** |
| ***Angles –***  Students can and should make geometric distinctions about angles without measuring or mentioning degrees. Angles should be classified in comparison to right angles, such as larger than, smaller than or the same size as a right angle. Students can use the corner of a sheet of paper as a benchmark for a right angle. They can use a right angle to determine relationships of other angles.  Angles are geometric shapes composed of two rays that are infinite in length. Students can understand this concept by using two rulers held together near the ends. The rulers can represent the rays of an angle. As one ruler is rotated, the size of the angle is seen to get larger. Ask questions about the types of angles created. Responses may be in terms of the relationship to right angles. Introduce angles as acute (less than the measure of a right angle) and obtuse (greater than the measure of a right angle). Have students draw representations of each type of angle. They also need to be able to identify angles in two-dimensional figures.  Students can also create an angle explorer (two strips of cardboard attached with a brass fastener) to learn about angles. They can use the angle explorer to get a feel of the relative size of angles as they rotate the cardboard strips around. Students can compare angles to determine whether an angle is acute or obtuse. This will allow them to have a benchmark reference for what an angle measure should be when using a tool such as a protractor or an angle ruler.  Another way to compare angles is to place one angle over the other angle. Provide students with a transparency to compare two angles to help them conceptualize the spread of the rays of an angle. Students can make this comparison by tracing one angle and placing it over another angle. The side lengths of the angles to be compared need to be different.  Students are ready to use a tool to measure angles once they understand the difference between an acute angle and an obtuse angle. Angles are measured in degrees. There is a relationship between the number of degrees in an angle and circle which has a measure of 360 degrees. Students are to use a protractor to measure angles in whole-number degrees. They can determine if the measure of the angle is reasonable based on the relationship of the angle to a right angle. They also make sketches of angles of specified measure.  ***Two-dimensional shapes -***  Two-dimensional shapes are classified based on relationships by the angles and sides. Students can determine if the sides are parallel or perpendicular, and classify accordingly. Characteristics of rectangles (including squares) are used to develop the concept of parallel and perpendicular lines. The characteristics and understanding of parallel and perpendicular lines are used to draw rectangles. Repeated experiences in comparing and contrasting shapes enable students to gain a deeper understanding about shapes and their properties.  Informal understanding of the characteristics of triangles is developed through angle measures and side length relationships. Triangles are named according to their angle measures (right, acute or obtuse) and side lengths (scalene, isosceles or equilateral). These characteristics are used to draw triangles.  Students often believe a wide angle with short sides may seem smaller than a narrow angle with long sides. Students can compare two angles by tracing one and placing it over the other. Students will then realize that the length of the sides does not determine whether one angle is larger or smaller than another angle. The measure of the angle does not change. |
| ***Routines/Meaningful Distributed Practice*** |
| **Distributed Practice that is Meaningful and Purposeful**  Practice is essential to learn mathematics. However, to be effective in improving student achievement, practice must be meaningful, purposeful, and distributed.   * Meaningful: Builds on and extends understanding * Purposeful: Links to curriculum goals and targets an identified need based on multiple data sources * Distributed: Consists of short periods of systematic practice distributed over a long period of time  Routines are an excellent way to achieve the mandate of Meaningful Distributed Practice outlined in the Iowa Core Curriculum.. The skills presented during routines do not necessarily reinforce the lesson concept for that day. Routines may be used to address a need for small increments of exposure to a skill or review of skills already taught. Routine activities may be repeated several days in a row, allowing for a build-up of conceptual understanding, or can be visited and re-visited over a period of time. Routines can be inserted as the schedule allows; in short intervals throughout the day or as a lesson opener or closer. Selection of the routine should be made based on informal teacher observation and formative assessments. |
| |  |  |  | | --- | --- | --- | | **Skill** | **Standard** | **Resource** | | Solve word problems involving distance, intervals of time, liquid volumes, masses of objects and money | 4.MD.2 |  | | Multiplication and division fact fluency | 3.OA.3 |  | | Whole number multiplication | 4.NBT.5 |  | | Round multi-digit whole numbers to any place | 4.NBT.3 |  | | Multi-digit addition and subtraction | 4.NBT.4 |  | | *Other skills students need to develop based on teacher observations and formative assessments.* | | | |

| ***Investigations Resources for Unit 3-Measurement and Geometry*** | | |
| --- | --- | --- |
| **Instructional Plan** | **Resource** | **Standards**  **Addressed** |
| Unit 4 Size, Shape, and Symmetry   * Investigation 2 Polygons of Many Types   Include 2.3A ( ICCSS - CC16-20, C9 - C11)   * Investigation 3 Measuring Angles   Add 3.2 (ICCSS - C12)  Include 3.4A (ICCSS - CC21 – 25, C13 – C15)   * Investigation 4 Finding Area   Add 4.3 (ICCSS – C16) | *Investigations* | **4.G.2**  **4.MD.3**  4.G.3 |
| Additional Focus needed on:   * Drawing lines and angles * Recognizing and decomposing angles * Measuring angles with a protractor * Solving problems involving finding the unknown angle * Applying the area and perimeter formulas for rectangles | *Investigations*  CGI Resource Bank of problems  Needs supplemented  Need protractors | 4.G.1  4.MD.5  4.MD.6  4.MD.7  **4.MD.3** |

| ***Resource Bank*** | | |
| --- | --- | --- |
| **Lessons** | **Teacher’s Edition**  **Pages** | **Standards**  **Addressed** |
| Wiki: Activity - Patchwork Symmetry |  |  |
| Wiki: Activity - Symmetry Detectives |  |  |
| Website: Activity – angles <http://www.figurethis.org/challenges/c10/challenge.htm> |  |  |
| Activity suggestions for angles in Instructional Strategies p. 4 of this guide |  |  |
| Website: Activity – angles <http://www.pbs.org/teachers/connect/resources/3937/preview/> |  |  |
| Wiki: Activity – Triangle Sort |  |  |
| Wiki: Activity – Classify Quadrilaterals |  |  |

**Note: The lessons listed below in the Resource Bank should be done in the order they are listed.**