

Archdiocese of Chicago: Mathematics Curriculum Framework

**State Goal 6:** Demonstrate and apply a knowledge and sense of numbers, including numeration and operations (addition, subtraction, multiplication, division), patterns, ratios, and proportions.

Learning Standard/Outcome	Sample Assessment	Connections
<p><b><i>Critical for Mastery at Preschool:</i></b></p> <p>P.06.01 Recognize “how many” in sets of objects. (6A)</p> <p><b><i>Significant to Develop at Preschool:</i></b></p> <p>P.06.02 Count with understanding (1-10). (6A)</p> <p><b><i>Useful to Work On at Preschool:</i></b></p> <p>P.06.03 Connect number words and numerals to quantities they represent. (6A)</p>	<p>Have students get objects and place them in groups. Use yarn to encircle the groups to help students distinguish between the groups. Then ask “How many in each group?”</p> <p>Make a necklace with beads using beads of a specific number. (For example make a necklace with three beads.)</p> <p>Make a concentration (matching) game, where the students must match the number word to the numeral. Each card should have a clue to aid in the reading. For example, on the numeral card and number word card, draw the same number of dots in the same color under the word and numeral.</p>	<p>Connect with color or shape recognition: Separate objects into shape or color groups. Ask students “How many are in each group?”</p> <p>Connect with color recognition: Have students make a necklace with beads of a specific color. (For example make a necklace with two blue beads and one red bead.)</p> <p>Connect with language arts by reading a counting book and let the students pick out the correct number word from the book.</p>

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<p><i><b>Critical for Mastery at Kindergarten:</b></i></p>		
<p>K.06.01 Recognize “how many” in sets of objects. (6A)</p>	<p>Count number of boys and girls in the class.</p>	<p>Connect to social studies: Group and count members of groups, for example, Pilgrims, Native Americans, or turkeys.</p>
<p>K.06.02 Count with understanding (0-100), including skip counting by 2s, 5s, and 10s from zero. (6A)</p>	<p>Count number of school days using a calendar or 100s pocket chart. Have twos, fives, and tens, a different color on the calendar. Clap on multiples of ten.</p>	<p>Connect to religion: Make a linking chain and count number of days of Advent and Lent leading to Christmas and Easter.</p>
<p>K.06.03 Connect number words (one to ten) and numerals (1 to 10) to the quantities they represent. (6A)</p>	<p>Play a matching game similar to concentration.</p>	<p>Connect to reading and phonics: Sound out the number words. Students should make their own flash cards and practice with the flash cards.</p>
<p><i><b>Significant to Develop at Kindergarten:</b></i></p>		
<p>K.06.04 Compare two or more sets, using manipulatives. (6D)</p>	<p>Separate colored links into groups and determine which group has more.</p>	<p>Connect to science: Separate fruits and vegetables into groups and tell which group has more.</p>

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<p>K.06.05 Develop initial understanding of place value (ones, tens, hundreds) and the base ten number system using manipulatives. (6A)</p> <p><i>Useful to Work On at Kindergarten:</i></p> <p>K.06.06 Explore and apply properties of addition and subtraction. (6B)</p>	<p>Use popsicle sticks and cups as visual for place values. A single stick is ones; a bundle with a red rubber band is tens, and a bundle with a blue rubber band is hundreds. Place the sticks in representative cups in the proper order. As students count days of school on the calendar, they also count the number of days using the popsicle sticks.</p> <p>Use links, cubes, plastic dinosaurs, or whatever is handy. Give students two groups of items and have them find the total number of links, etc. Give the students one group of items and tell them to take away a determined amount and find out how much is left. Make up a story using the terms some came or some went away.</p>	<p>Connect with writing skills: Write number of days of school using proper place value.</p> <p>Connect to writing and language skills: Students write a verbal sentence about a math situation. (e.g. On a tree were 3 birds. 2 birds came to the tree. that made 5 birds in the tree.)</p>

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<p><b><i>Critical for Mastery at Grade 1:</i></b></p> <p>1.06.01 Count with understanding, including skip counting by 2s, 5s, and 10s from zero. (6A)</p> <p>1.06.02 Develop initial understanding of place value and the base-ten number system using manipulatives. (6A)</p> <p>1.06.03 Connect number words and numerals to the quantities they represent. (6A)</p> <p>1.06.04 Solve one-step addition and subtraction number sentences and word problems using concrete materials. (6B)</p>	<p>Ask students to count out a certain amount of links. (e.g. Show me 30 links, counting by 2 links at a time, 5 links at a time, etc.) Students could count number of students present each day.</p> <p>Using index cards have students place the cards in the proper order for requested numbers. (e.g. Show me the number 254)</p> <p>Play a concentration (matching) game or bingo.</p> <p>Use links or cubes or other mainpulatives. Tell students a story and have them act it out with the manipulatives. (e.g. One day there was a party. The hosts of the party were 2 dogs. Then 4 dogs came to the party. How many dogs were at the party?)</p>	<p>Connect to Religion: Count number of days in Advent and Lent. Make a count down chain.</p> <p>Connect to language arts by writing numbers, and using phonics to sound out number words.</p> <p>Connect to language arts: Students write out verbal stories of the problems, sound out the words they are using and draw a picture of their story.</p>

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<p>1.06.05 Construct number sentences to match word problems. (6B)</p> <p>1.06.06 Explore and apply properties of addition and subtraction. (6B)</p> <p>1.06.07 Compare two or more sets using manipulatives to solve problems. (6D)</p> <p>1.06.08 Describe numeric relationships using appropriate vocabulary. (equal, more than, less than). (6A)</p>	<p>Have students write the number sentence to match the story above.</p> <p>Have students explain why the story was addition or subtraction.</p> <p>The teacher will tell a story and the students must decide if the story talks about more or less. The students will use manipulatives (frogs, dinosaurs, etc.) to help with the story. (e.g. One day Juan played marbles with Hector. Juan started out with 4 marbles and Hector had 5 marbles. Who had more?)</p> <p>Show students two pictures of groups of objects (boats, dogs, etc.). Ask them which group has more, less, or equal.</p>	<p>Students write the number sentences that match their own story, using both numerals and number words. For example, Alvin had four (4) cakes. He gave one (1) to his friend. He had three (3) left.</p> <p>Connect to religion: Are there more days in Advent or Lent? Are there more loaves or fishes in the Gospel story?</p>

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<p><i>Significant to Develop at Grade 1:</i></p> <p>1.06.09 Demonstrate concept of odd and even using manipulatives. (6A)</p> <p>1.06.10 Describe parts of a whole using <math>\frac{1}{2}</math>, <math>\frac{1}{3}</math>, and <math>\frac{1}{4}</math>. (6A)</p> <p>1.06.11 Compute using fact families. (6A)</p>	<p>Give students a certain number of links or cubes. Ask them if the group represents an odd or even number.</p> <p>Using a Hershey bar, have students divide the chocolate bar into <math>\frac{1}{2}</math> (two equal parts), into <math>\frac{1}{3}</math> (three equal parts), and <math>\frac{1}{4}</math> (four equal parts). Ask them which is smaller.</p> <p>Using links or cubes of different colors or shapes, have students make 2 groups. Then add the groups. Switch the groups to show that it doesn't matter in which order they are added. Do the same with subtraction.</p>	<p>Connect to religion: Did Jesus have an odd or even number of apostles?</p> <p>Connect to science: Have the students weigh the whole Hershey bar, then weigh <math>\frac{1}{2}</math>, etc. Ask them which is heavier? Can they figure out that if they put all the pieces on the balance that they will weigh the same as the whole candy bar?</p> <p>Connect to art and language arts: Have students draw pictures of groups of items. They should then write the math sentence for adding the groups. Students then draw another picture in which the groups have switched places. Again write the math sentence and add. Repeat for subtraction.</p>

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<p><i>Useful to Work On at Grade 1:</i></p> <p>1.06.12 Use mental math counting strategies. (6C)</p> <p>1.06.13 Describe reasonable and unreasonable sums and differences. (6C)</p> <p>1.06.14 Demonstrate and describe the affects of adding and subtracting whole numbers using appropriate mathematical notation (+, -, =) and vocabulary (and, take away, have left, more, remaining). (6B)</p>	<p>Play “Around the World” using addition and subtraction math facts(flash cards).</p> <p>Ask students if it is reasonable to add the weight of an ant to the weight of an elephant. Would there be a difference in the weight of the student if a mosquito landed on his/her arm?</p> <p>Tell the students a math story. As you tell the story have the students write the correct math sentences and explain.</p>	<p>Connect to language arts: Students write a math story about reasonable or unreasonable sums and differences, practicing their penmanship and phonics. Afterward students write the math sentences that correlate with their story and draw a picture of their story. Each student reads his/her story to the class.</p>

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<p><i>Critical for Mastery at Grade 2:</i></p> <p>2.06.01 Recognize and explain the concept of odd and even. (6A)</p> <p>2.06.02 Extend initial understanding of place value (ones up to hundred thousands) and the base-ten number system using multiple models. Represent the numbers to demonstrate an understanding of the base-ten number system. (6A)</p> <p>2.06.03 Describe numeric relationships using comparison notation (<math>&lt;</math> <math>&gt;</math> <math>=</math>); order, and compare whole numbers. (6A)</p>	<p>Use mitten cut-outs. Students should determine if they have a set of odd or even mittens.</p> <p>As the teacher orally says a number, the student writes the number on a piece of paper.</p> <p>Each student should receive a bag of items; food, marbles, links, etc. For a specified amount of time, they should go to different partners and compare the number of items in their bags. They should write the partner's name and the number sentence that describes the comparison on a chart.</p>	<p>Connect to language arts: Students should determine if their spelling words have an odd or even number of letters. Print even words in one column and odd words in another.</p> <p>Connect to technology: Do lists on the computer.</p> <p>Connect to social studies: Reading a table of population values, the student will order them from least to greatest. Students may compare populations of different villages in the area and write the comparisons in a proper math sentence.</p> <p>Connect to life: Compare family members. Who has more sisters, brothers, pets, etc?</p>



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<p>2.06.04 Describe parts of a set using <math>\frac{1}{2}</math>, <math>\frac{1}{3}</math>, and <math>\frac{1}{4}</math>. (6A)</p>	<p>Use a Hershey candy bar and show <math>\frac{1}{2}</math>, <math>\frac{1}{3}</math>, and <math>\frac{1}{4}</math>.</p>	<p>Connect to life: Discuss the result of sharing a box of 12 crayons with 2, 3, and 4 friends.</p>
<p>2.06.05 Demonstrate fluency with basic addition and subtraction facts. (6B)</p>	<p>Use flash cards and have a math bee, or play “Around the World”.</p>	<p>Connect to values: Have a <u>food drive</u> for Thanksgiving. Students keep track of the amount of food brought in through addition.</p>
<p>2.06.06 Demonstrate relationship between addition and subtraction. (6B)</p>	<p>Using straws, students build or add on to the straws. Then they take apart or take away from their creation. Addition and subtraction sentences must be written for each creation and destruction.</p>	<p>Connect to movement: Have one group of students pretend to be the builders and two groups pretend to be the building material. The builders have two piles of materials. That they add together. Then they decide to Take apart or take away from the construction. Write number sentences to describe each action.</p>
<p>2.06.07 Explain and use mental math strategies to solve simple addition and subtraction problems. (6C)</p>	<p>Each student has a white board, marker, and kleenex. The teacher calls out a problem and the student writes the answer on the white board and holds it up.</p>	<p>Connect to language arts: Discuss mental strategies to learn spelling words.</p>

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<p>2.06.08 Use cardinal and ordinal numbers appropriately. (6A)</p> <p><i>Significant to Develop at Grade 2:</i></p> <p>2.06.09 Represent, order, label, and compare unit fractions using concrete materials, compare unit fractions. (6A) (6D)</p> <p>2.06.10 Solve two-step (carry, borrow) addition and subtraction number sentences and word problems. (6B)</p>	<p>Describe the number of players and their positions on a baseball team. (e.g. 3 players cover the bases, 1<sup>st</sup>, 2<sup>nd</sup>, and 3<sup>rd</sup>.)</p> <p>The students should arrange fraction bars in ascending or descending order; then they should write the order in proper math sentences.</p> <p>Students should work in partners with base ten blocks. One partner makes up an addition or subtraction number problem that requires borrowing or carrying. The other student solves the problem. Both students write the correct number sentence.</p>	<p>Connect to science and art: Students explain the number and order of the planets. Make a drawing.</p> <p>Connect to science: Compare volumes of liquid in science such as <math>\frac{1}{4}</math>, <math>\frac{1}{2}</math>, and <math>\frac{1}{3}</math> cup. Weigh <math>\frac{1}{4}</math> cup of water. Ask students to guess (hypothesize) or estimate how much two <math>\frac{1}{4}</math> cups of water would weigh. Then weigh another <math>\frac{1}{4}</math> cup and add the two weights. Continue for four <math>\frac{1}{4}</math> cups. Repeat with <math>\frac{1}{2}</math> and <math>\frac{1}{3}</math> cups. Compare the weights of <math>\frac{1}{4}</math>, <math>\frac{1}{3}</math>, and <math>\frac{1}{2}</math> cups.</p>

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<p>2.06.11 Estimate sums and differences of one or two- digit numbers. (6B)</p> <p><i>Useful to Work On at Grade 2:</i></p> <p>2.06.12 Connect repeated addition to multiplication. (6B)</p> <p>2.06.13 Analyze situations to determine whether exact numbers or estimates are appropriate. (6C)</p>	<p>Students possess a certain amount of play money. They pretend to go shopping and estimate if they have enough money to make their purchases.</p> <p>Using counting cubes, students separate the cubes into groups with the same number of cubes in each group. Then count the total number of cubes by adding each group of cubes. Write an addition sentence. (e.g. <math>3+3+3+3 = 12</math>) Now examine the number of groups and write the multiplication sentence (e. g. <math>4 \times 3 = 12</math>). Compare the math sentences.</p> <p>Discuss plans for giving a birthday party. Decide which quantities for different items must have an exact or approximate number. (e.g. ingredients to bake the cake, paper plates and cups, number of candles on the cake, number of chairs, number of balloons for decoration, etc.)</p>	<p>Connect to religion and art: Use the Bible story of the Loaves and the Fish.. Students should draw a picture of how the loaves and fish were multiplied, using groups of equal number of loaves and fish. Write a multiplication sentence for the picture.</p> <p>Connect to maps: To describe the size of continents, do you have to count an exact number of countries, or can you estimate size from the map?</p>

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<p><b><i>Critical for Mastery at Grade 3:</i></b></p> <p>3.06.01 Represent, order, and compare whole numbers to demonstrate an understanding of the base-ten system. (6A)</p> <p>3.06.02 Recognize equivalent representations of whole numbers and generate them by composing and decomposing numbers (e.g. <math>123 = 100 + 20 + 3</math>). (6A)</p> <p>3.06.03 Show and use the relationship between multiplication and division. (6B)</p> <p>3.06.04 Demonstrate and describe the effects of multiplying and dividing whole numbers using appropriate mathematical notation (<math>\times</math>, <math>\div</math>) and vocabulary (multiply by, divide by, dividend, divisor, quotient, product) (6B)</p>	<p>Order index cards on which are written numbers.</p> <p>Students are given whole numbers and must decompose them or given the decomposed form, they must compose them.</p> <p>Draw an illustration of the relationship between multiplication and division by putting fact families on triangles. Use counters to illustrate the relationship between the two operations.</p> <p>Students read verbal sentences that contain the proper vocabulary and translate the sentences into proper math notation, and vice versa.</p>	<p>Connect to life: Make a timeline of your life. Create your own number line.</p> <p>Connect to metric/standard measurement.</p> <p>Connect to life and values: Through teaching the value of cooperation, one can demonstrate that having help can cut (divide) the time needed for a task by the number of people helping; whereas if there is no help the time needed for the task is greater (multiplied).</p> <p>Connect to language arts and team work: Students write verbal sentences and a Partner translates them into the proper math sentences.</p>

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<p>3.06.05 Demonstrate fluency with basic multiplication and division facts (0-12). (6B)</p>	<p>Play “Bingo”, “Concentration”, or “Top It” (“War”).</p>	<p>Connect to music: Sing the “Multiplication Rock” song and/or use the video. Connect to reading: “If a student is required to read 10 minutes each night, how many minutes will he/she have logged in 1 week, 1 month?”</p>
<p>3.06.06 Describe the relationship between two sets using <math>&lt;</math>, <math>&gt;</math>, and <math>=</math>, <math>\neq</math>. (6D)</p>	<p>Students throw two dice, compare the values, and write the relationship between the dice using proper notation.</p>	<p>Connect to spelling: Compare the number of syllables in spelling words.</p>
<p>3.06.07 Represent, order, label, and compare familiar fractions (<math>\frac{1}{2}</math>, <math>\frac{1}{3}</math>, <math>\frac{1}{4}</math>, <math>\frac{2}{3}</math>, <math>\frac{2}{4}</math>, <math>\frac{3}{4}</math>, <math>\frac{1}{6}</math>, <math>\frac{1}{8}</math>) (6A)</p>	<p>Color paper fraction bars and order them accordingly. Write the order in proper math notation. Create a fraction number line.</p>	<p>Connect to music: Compare <math>\frac{1}{8}</math>, <math>\frac{1}{4}</math>, and <math>\frac{1}{2}</math> notes. Sing, clap, or stomp the notes to form rhythms.</p>
<p>3.06.08 Determine whether exact answers or estimates are appropriate for solutions to problems. (6C)</p>	<p>Pretend to go shopping. Do you need to know the exact amount of your order or an approximation to know if you have enough money? Students should provide other examples when exact is important or when estimates are helpful.</p>	<p>Connect to social studies: Discuss exact and approximate areas in geography. For example, Chicago is in northern Illinois would be exact, and in the Western Hemisphere would be approximate. For example, I live <math>1\frac{1}{4}</math> miles from school from school would be exact ,and I live a little more than a mile from school would be approximate.</p>

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<p><i>Significant to Develop at Grade 3:</i></p> <p>3.06.09 Recognize and generate equivalent forms of familiar fractions (e.g. <math>\frac{1}{2} = \frac{2}{4} = \frac{3}{6}</math>; <math>\frac{1}{3} = \frac{2}{6} = \frac{2}{3} = \frac{4}{6}</math>; <math>\frac{1}{4} = \frac{2}{8}</math>). (6A)</p> <p>3.06.10 Explore, identify, and use relationships between and among properties of operations (commutative applies to addition but not subtraction). (6B)</p> <p>3.06.11 Solve multiplication and division sentences and word problems. (6B)</p>	<p>Students should make a model that demonstrates the equivalent fractions for one set. (e.g. for <math>\frac{1}{3}</math>: Make a Lego model using different colors for the equivalent fractions <math>\frac{1}{3}</math> and <math>\frac{2}{6}</math>)</p> <p>Using play-doh, demonstrate the commutative property by making shapes in groups and switch them around as they are added to show that there is no difference in the addition, but there is a difference in subtraction.</p> <p>Students should create their own word problems (and answer key) and share them with a partner.</p>	<p>Connect to movement (kinetic learning): Students illustrate the mathematical property by moving groups of students.</p> <p>Connect to reading and language arts: Read word problems and write the proper math sentence and solve.</p> <p>Connect to social studies: For example, study of immigration: “In 1900 it took 14 days to cross the Atlantic by boat. Today, it takes 7 hours by plane. How much longer was the trip in 1900?”</p>

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<p>3.06.12 Develop and use strategies (rounding) to estimate the results of whole number computations and judge the reasonableness of such results. (6C)</p>	<p>Use a number line to round a list of numbers.</p> <p>Given a list of estimated answers, distinguish between those that are reasonable and those that are unreasonable.</p>	<p>Connect to social studies: Use a timeline to estimate dates of historical occurrences.</p>

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<p><b><i>Critical for Mastery at Grade 4:</i></b></p> <p>4.06.01 Represent fractions as parts of unit wholes, as parts of a set, as locations on a number line, and as divisions of whole numbers. (6A)</p> <p>4.06.02 Recognize and generate equivalent forms of familiar fractions. (6A)</p> <p>4.06.03 Represent, order, and compare decimals to demonstrate understanding of the place-value structure in the base-ten number system. (6A)</p> <p>4.06.04 Solve addition or subtraction number sentences and word problems using fractions with like denominators. (6B)</p>	<p>Compare characteristics of the class. Compare boys versus girls, blonde hair versus dark hair, blue eyes versus green eyes, etc. as parts of the whole class. Write as fractions and place on a number line. Combine characteristics to determine fractions as parts of sets. For example, what fraction of the class are blue-eyed boys? Green-eyed blondes?</p> <p>Play fraction: “Fish”, where students collect a pair of equivalent fractions. Use geometric parts of a hexagon to illustrate fractional parts of the whole</p> <p>Compare money: 1¢, 10¢, and 100¢ and write as decimals.</p> <p>Read and decipher a Math Rebus.</p> <p>Use a hexagon to solve addition/subtraction of fractions.</p>	<p>Connect to social studies: Compare population of Cook or Lake County as a whole of Illinois.</p> <p>Connect to science: Introduce the metric system (1m = 10 dm = 100 cm = 1000mm). Write as decimals.</p> <p>Connect to collaboration and creativity: With a partner, create a fraction math Rebus. Connect to reading: Read the Rebus to the class.</p>



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<p>4.06.05 Solve multiplication and division sentences and word problems. (6B)</p> <p>4.06.06 Apply knowledge of basic multiplication facts (factors 0-12) to related facts (e.g. <math>3 \times 4 = 12</math>, <math>30 \times 4 = 120</math>, <math>300 \times 4 = 1200</math>). (6B)</p> <p>4.06.07 Develop and use strategies (e.g. compatible numbers, front-end estimation) to estimate the results of whole-number computations and to judge the reasonableness of such results. (6C)</p>	<p>Solve a crossword puzzle.</p> <p>Play “Concentration” or “Whip It” where the matches can be the math sentence or the answer.</p> <p>You need to make \$120. The method you choose to raise the funds is to have a lemonade stand. Brainstorm with a group: the size of the drink, the price of the drink, the expenses (amount needed of lemons, sugar, cups, water and their cost.)</p>	<p>Connect to language arts and art: Write and illustrate word problems, with an answer key, and share them with a neighbor.</p> <p>Connect to religion: Read the Bible passage where Jesus says to forgive your neighbor not 7 x 7, but 70 x 7 times.</p> <p>Connect to Social studies: Read and interpret pictographs with population expressed in millions.</p> <p>Connect to religion: For Lent, the classroom plans to participate in the Heifer Project. The class decides to buy a llama for an impoverished family. The llama costs \$100. The class will hold a school bake sale to raise the money. Estimate how much you should sell the baked goods for, and how many you need to sell.</p>

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<p>4.06.08 Solve multi-step (borrow, carry, double digit) number sentences and word problems using whole numbers and the four basic operations. (6B)</p> <p><i>Significant to Develop at Grade 4:</i></p> <p>4.06.09 Identify prime numbers through 100. (6A)</p>	<p>Provide a nutrition label for each student. Explain that nutrition labels are used to help people choose the best foods to eat to keep them healthy. People must be able to interpret these labels according to their needs. Students should use the label to calculate information related to various health concerns. For example, calculate amount of calories obtained from fat, amount of carbohydrates from fiber or sugar, total amount of vitamins provided, etc. Students should calculate the total amount of calories consumed if 2 portions are eaten or 1/2 portion, etc.</p> <p>An alternative would be to have students bring in a nutrition label. Students can then compare nutritional properties for a variety of foods Calculate the amount (more or less) of calories from fat, etc.</p> <p>Make a table of the numbers from 1-100. Color the prime numbers red.</p>	<p>Connect to language arts: Demonstrate and write directions for an activity requiring a specific order (e.g., making a peanut butter sandwich, getting dressed ) to reinforce the order for regrouping in addition and subtraction.</p> <p>Make patterns on 100's charts – use prime numbers and clues.</p>

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<p>4.06.10 Recognize equivalent representation for decimal and generate them by composing and decomposing numbers (e.g. <math>0.15 = 0.10 + 0.05</math>). (6A)</p>	<p>Play “Bingo”.</p> <p>Use “name collection boxes” to give as many equivalents for a decimal as you can.</p>	<p>Connect to science: <math>0.156 \text{ m} = 100\text{cm} + 50 \text{ dm} + 6 \text{ mm}</math>.</p>
<p>4.06.11 Describe classes of numbers according to characteristics such as factors and multiples. (6B)</p>	<p>Make factor trees or characteristic houses.</p>	<p>Describe members of a family according to characteristics (e.g. hair and eye color, height, earlobe, etc.) Compare characteristics with other students.</p>
<p>4.06.12 Explore and use divisibility rules (2, 5, and 10). (6B)</p>	<p>Suppose a friend of the school donated 1,250 books. Determine if the number of books could be divided evenly in 2, 5, or 10 classrooms. Explain how you can tell. State how many books each would get.</p>	
<p><b><i>Useful to Work On at Grade 4:</i></b></p>		
<p>4.06.13 Analyze how the size of the whole affects the size of the fraction (e.g. <math>\frac{1}{2}</math> of a large pizza is not the same as <math>\frac{1}{2}</math> of a small pizza). (6A)</p>	<p>Make models of relative sizes of an object (e.g. small, medium and large pizzas).</p>	<p>Connect to science: Demonstrate the mass of containers. (For example, weigh the contents of one-half of an 8 ounce cup and one-half of a 16 ounce cup, and compare the weights).</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p><b><i>Critical for Mastery at Grade 5:</i></b></p> <p>5.06.01 Place mixed numbers and decimals on a number line. (6A)</p> <p>5.06.02 Show equivalent representations of a number by changing from one form to another form (e.g. standard form to expanded form, fraction to decimal, decimal to percent, improper fraction to mixed number). (6A)</p> <p>5.06.03 Determine whether a number is a prime or composite. (6B)</p> <p>5.06.04 Identify all the whole number factors of a composite number. (6B)</p>	<p>Take a survey of the class.(e.g. favorite CD) Convert the results to fractions, decimals, and percent, etc. Arrange the results on a number line.</p> <p>Students create graphic posters showing equivalent forms of numbers.</p> <p>Use divisibility rules and place results in a table of primes and composites. Color the prime numbers red. Make a factor tree for the composite numbers. (outcomes 03 and 04)</p>	<p>Connect to life: Collect data on the type and quantity of commercials in one hour of TV. Divide the ads into types of propaganda (bandwagon, etc.). Convert the numbers into fractions, decimals, etc. Arrange them in ascending order on a number line.</p> <p>Connect to social studies: Gather various kinds of <i>per capita</i> data from several countries (household income, food consumption, level of education, rooms in their houses, etc.). Convert numbers into fractions, decimals, etc. Display in charts.</p> <p>Connect to technology: Use computers to create charts.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p>5.06.05 Solve number sentences and word problems using addition and subtraction of fractions with unlike denominators. (6B)</p> <p>5.06.06 Solve number sentences and word problems using addition and subtraction of decimals. (6B)</p> <p>5.06.07 Develop and use strategies to estimate computations involving familiar fractions and decimals in situations relevant to students' experience (e.g. double a recipe); evaluate the reasonableness of the estimation. (6C)</p> <p>5.06.08 Explore and use divisibility rules (2, 3, 5, 9, 10). (6B)</p> <p>5.06.09 Compute with 10, 100, 1000, and other powers of 10. (6B)</p>	<p>Prepare a grocery and price list for ingredients for a fruit salad for 10 people using a grocery ad. (outcomes 05 and 06)</p> <p>Make Trail Mix in class. Students work in groups of four and must decide the ingredients and amounts to prepare Trail Mix such that each member of the group receives <math>\frac{2}{3}</math> cup. Afterwards, they must decide how much to buy to satisfy their needs.</p> <p>Play "Old Maid". The "Old Maid" is a prime number.</p> <p>Measure the length of the room in meters. Calculate the length in cm and mm.</p>	<p>Connect to social studies and map skills: Compare amounts of agricultural products for a region.</p> <p>Connect to social studies and map skills: Estimate distances between cities.</p> <p>Connect to science: Practice conversion of metric units. 1 m = 10 dm = 100 cm = 1000 mm</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p>5.06.10 Recognize and use the inverse relationships of addition and subtraction, multiplication and division to simplify computations and solve problems. (pre-algebraic equations) (6B)</p> <p><i>Significant to Develop at Grade 5:</i></p> <p>5.06.11 Identify and express ratios using appropriate notation (a/b, a to b, a:b). (6D)</p> <p>5.06.12 Explore and identify properties of square numbers. (6B)</p> <p><i>Useful to Work On at Grade 5:</i></p> <p>5.06.13 Describe integers using familiar applications (e.g. thermometer, above/below sea level). (6A)</p>	<p>Make a diorama of the relationships: addition and subtraction, multiplication and division.</p> <p>Perform a survey of types of music enjoyed by the class and determine the ratios of jazz to rap to country, etc.</p> <p>Calculate the area of squares and rewrite the multiplication sentence as the power of 2.</p> <p>Balance a savings account where a withdrawal is designated as a negative number and a deposit is a positive number.</p>	<p>Make a story board or cartoon of a math situation.</p> <p>Connect to social studies: Determine the ratios of various kinds of agricultural products in a region.</p> <p>Connect to science: Introduce scientific notation using square powers of 10. (for example, <math>2.3 \times 10^2</math>)</p> <p>Connect to science: Using the Internet or a newspaper, record the weather/temperature over a week period. Evaluate the change in temperature each day where a rise in temperature is written as a positive number and a decrease in temperature is written as a negative number.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p>5.06.14 Determine the least common multiple (LCM) and the greatest common factor (GCF) of a set of numbers. (6B)</p> <p>5.06.15 Solve multiplication number sentences and word problems with whole numbers and familiar fractions. (6B)</p>	<p>Calculate LCM and GCF of a set of numbers.</p> <p>Make up “What Am I” clues. (For example, I am the result of <math>\frac{1}{2}</math> times <math>\frac{3}{4}</math>. What number am I?).</p>	

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<p><i><b>Critical for Mastery at Grade 6:</b></i></p> <p>6.06.01 Represent place values from millionths through billions using powers of ten. (6A)</p> <p>6.06.02 Compare and order fractions and decimals efficiently and find their approximate position on a number line. (6A)</p> <p>6.06.03 Write prime factorization of numbers. (6B)</p> <p>6.06.04 Determine the least common multiple (LCM) and the greatest common factor (GCF) of a set of numbers. (6B)</p>	<p>Write the distances of the planets from the sun in numerals and words.</p> <p>Working in pairs, have one student say a number aloud and the other student write the number.</p> <p>Use index cards with different fractions and decimals written on the cards. Have students line in order from least to greatest and read their number out loud.</p> <p>Compare batting averages among players, in fraction and decimal form. Arrange the players on a number line from worst to best.</p> <p>Draw prime factor trees for 5 numbers chosen by the students.</p> <p>Students identify the least common multiple and greatest common factor of given numbers.</p>	<p>Connect to religion: Make a timeline of the eras of the Earth. Highlight the period when Jesus was alive and other periods of salvation history.</p> <p>Connect to life: Compare batting averages of the home team over a season.</p> <p>Connect to art or technology: Draw trees to represent prime factorization</p>



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Learning Standard/Outcome	Sample Assessment	Connections
<p>6.06.05 Demonstrate the meaning of multiplication and division of fractions including reciprocals. (6B)</p>	<p>Draw a picture showing how multiplication of fractions work.</p>	
<p>6.06.06 Simplify simple arithmetic expressions with rational numbers using the field properties and the order of operations. (6B)</p>	<p>Using your local theater, calculate the amount of money needed to take a family of 5 to the movies; include price of ticket, soda and popcorn or candy. How would the prices change if some people decided to share the food?</p>	<p>Connect to musical intelligence: Have students make up a song or a rhyme about order of operations.</p>
<p>6.06.07 Solve number sentences and word problems with whole numbers, fractions and decimals. (6B)</p>	<p>Multiply whole numbers by fractions. Write an explanation for the answers.</p>	<p>Connect to science: In an experiment, students need 4g of sugar. They have the choice of using 1g, <math>\frac{1}{2}</math> g, <math>\frac{1}{4}</math> g, or <math>\frac{1}{3}</math> g sugar cubes. They should make a list of all of the possible ways to make 4g.</p>
<p>6.06.08 Solve multi-step number sentences and word problems with rational numbers using the four basic operations. (6B)</p>	<p>Students solve problems in a maze. The correct path is a combination of number sentences and answers.</p>	<p>Connect to social studies: Use a map of Egypt or Rome as the maze.</p>
<p>6.06.09 Select and use appropriate operations, methods, and tools to compute or estimate using whole numbers with natural number exponents. (6C)</p>	<p>Estimate the solution to the ones place for a set of problems. Then calculate the exact answer and write the answer using exponents.</p>	

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Learning Standard/Outcome	Sample Assessment	Connections
<p>6.06.10 Solve proportions and word problems using percents. (6D)</p>	<p>Calculate the tip on an amount spent at a restaurant.</p> <p>Use a small bag of M&amp;M's. Estimate the % of each color, then calculate the percent.</p>	<p>Connect to social studies: Using a map and map scale, calculate the percent difference in distance between cities from your origin.</p>
<p>6.06.11 Demonstrate and explain the meaning of percents, including greater than 100 and less than 1 and compute mentally 1%, 10%, 50%, and 100% of a number. (6D)</p>	<p>Calculate sale prices of CDs using real ads. (e.g. use mental computing strategies to calculate the price of a CD that is originally 14.99 and is on sale for 15% off.)</p> <p>Calculate discounts on items from stores where the students shop. Explain why a sale price would never be greater than 100%. Why would you not want a sale price of less than 1%?</p>	<p>Connect to life: Students take a survey of the number of hours, to the nearest <math>\frac{1}{4}</math> hour, that they sleep. Compare to the number of hours that they should sleep. Compute mentally whether they are closer to 10%, 50%, etc.</p>
<p>6.06.12 Create and explain a pattern that shows a constant ratio. (6D)</p>	<p>Draw two scale drawings of your room and furniture.</p>	<p>Connect to life: Work with a recipe to demonstrate how equal ratios are used in doubling and tripling recipes.</p>
<p>6.06.13 Recognize and use the inverse relationships of addition and subtraction, multiplication and division, to simplify computations and solve problems. (6B)</p>	<p>Use algebra tiles or a balance scale models and solve equations.</p>	

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Learning Standard/Outcome	Sample Assessment	Connections
<p>6.06.14 Determine equivalent ratios. (6D)</p> <p>6.06.15 Represent, order, compare, and graph integers. (6A)</p> <p><i>Significant to Develop at Grade 6:</i></p> <p>6.06.16 Analyze situations to determine whether ratios are appropriate to solve problems. (6D)</p> <p>6.06.17 Represent any large number using scientific notation. (6A)</p>	<p>Compare ratios and determine which ratios are equivalent.</p> <p>Graph integers on a number line.</p> <p>Using index cards with integers on them, give each student a card and have students line up along a number line according to the card they were given.</p> <p>Use one frame of a comic. Divide it into 6 congruent parts. Draw each part enlarged on a regular sized paper.</p> <p>Rewrite large numbers in scientific notation.</p>	<p>Connect to social studies: Given a list of locations, compare them in relation to sea level, which is represented as 0 on the number line. Locations above sea level are written as positive and locations below sea level are written as negative.</p> <p>Connect to athletics: Work with a PE teacher or baseball or softball coach to discuss how batting averages are computed.</p> <p>Connect to science: Represent the distance from the sun to the planets in scientific notation.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p>6.06.18 Demonstrate and describe the effects of multiplying or dividing by a fraction less than or greater than one. (6B)</p> <p><i>Useful to Work On at Grade 6:</i></p> <p>6.06.19 Represent repeated factors using exponents. (6A)</p>	<p>Draw a diagram that explains the results of multiplying or dividing fractions less than or greater than one.</p> <p>Rewrite factors with exponents.</p>	<p>Connect to creative writing: Pretend you were communicating with an Alien from outer space. Write the directions and explanation for multiplying and dividing by a fraction less than or greater than one.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p><b><i>Critical for Mastery at Grade 7:</i></b></p> <p>7.06.01 Represent any large number using scientific notation. (6A)</p> <p>7.06.02 Show relationships between sets of numbers, including rational numbers, whole numbers, natural numbers, and integers. (6A)</p> <p>7.06.03 Represent, order, compare, and graph integers. (6A)</p> <p>7.06.04 Represent repeated factors using exponents. (6A)</p>	<p>Research distances to the stars and the mass of various atoms; write these numbers in scientific notation.</p> <p>Label a set of numbers as whole, integers, rational, or natural or make a graphic organizer that relates all of the numbers.</p> <p>Record the stock prices for several stocks for a week. Graph the progress for the stock, increase is positive and decrease is negative.</p> <p>Rewrite multiplication of repeated factors as a base and exponent using place value in the base 10 number system.</p>	<p>Connect to science: Write the distances of the planets from the Earth in scientific notation.</p> <p>Connect to technology: Use computers to create the graphic organizer.</p> <p>Use analogies to help understanding: Use relationships in a family to relate to numbers (e.g. Immediate Family= parents+ children, like whole numbers = natural +0; Extended family = Immediate Family + Cousins, like integers = whole numbers + negatives ) Ask students to make their own analogies.</p> <p>Connect to science: Plot the depth at which different fish are found in the sea.</p> <p>Connect to measurement: Represent the metric system as factors of ten. (e.g. 1 m = 100 cm = <math>10^2</math> cm)</p>

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<p>7.06.05 Write prime factorizations using exponents. Describe relationships between prime factorizations and properties of squares, primes, and composites. (6B)</p>	<p>Draw a factor tree using prime factors for two numbers. Exchange trees with a neighbor. The neighbor should analyze the two trees. This analysis should include: 1) Was the initial number a prime or composite? 2) Can the prime factors be written as a power? 3) What is the LCM of the two numbers? 4) What is the GCF for the two? (outcomes 05 and 06)</p>	
<p>7.06.06 Determine the least common multiple (LCM) and greatest common factor (GCF) of a set of numbers using prime factorization. (6B)</p>	<p>Using prime factorization, determine the LCM and GCD of a group of numbers.</p>	
<p>7.06.07 Simplify arithmetic expressions containing exponents using the field properties and the order of operations. (6B)</p>	<p>Solve problems using exponents and other operations.</p>	<p>Connect to science: Calculate the height of an object that takes 5 seconds to fall. (<math>d = 1024 - 16t^2</math>)</p>
<p>7.06.08 Solve multi-step number sentences and word sentences and word problems with rational numbers using the four basic operations. (6B)</p>	<p>Find simple interest (<math>I = P \times r \times t</math>)</p> <p>Calculate the total cost of purchasing an item after an item is discounted and sales tax is figured.</p>	<p>Connect to life: Visit a local bank and determine what are real interest values for savings accounts and loans. Then calculate the amount of money you would have in a savings account after 1 year if you invested \$1000. How much would you pay in interest if you took out a \$1000 loan? Calculate monthly payments.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p>7.06.09 Select, use, and justify appropriate operations, methods, and tools, to compute or estimate with integers and familiar rational numbers. (6C)</p> <p>7.06.10 Simplify arithmetic expressions containing integers using the field properties and order of operations. (6B)</p> <p>7.06.11 Work flexibly with fractions, decimals, and percents to solve number sentences and word problems. (6D)</p> <p>7.06.12 Create and explain ratios and proportions that represent quantitative relationships. (6D)</p> <p>7.06.13 Create and explain a variety of equivalent ratios to represent a given situation. Develop, use, analyze, and explain methods for solving numeric or word problems involving proportions (6D)</p>	<p>Choose proper strategies to solve problems with integers and rational numbers. Explain choices and use of field properties and order of operations. (outcomes 09 and 10)</p> <p>Follow stock market prices for a chosen stock. Determine percent increase or decrease and gain or loss.</p> <p>Design a mall; stores and facilities must be in proper proportions.</p> <p>Determine the height of the school flag pole using ratios. Explain methods for solving the problem.</p>	<p>Connect to health education: Collect nutrition information from labels. Calculate percent of calories from fat or amount of vitamin A in one serving.</p> <p>Connect to art and/or technology: Draw the mall that you designed by hand or using a computer design program.</p> <p>Connect to social studies: Research the proper height of an official flag pole and the size of the American flag which is hoisted on the pole. What distance is half mast? If the pole is shorter, what size flag should be used to keep the same ratio?</p>

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<p>7.06.14 Recognize and use exponential, scientific, and calculator notation. (6A)</p> <p>7.06.15 Demonstrate and describe the effects of multiplying or dividing by a fraction less than or greater than one. (6B)</p> <p><i>Significant to Develop at Grade 7:</i></p> <p>7.06.16 Solve problems that involve percents, including percent increase and decrease, regardless of the piece that is missing. (6D)</p>	<p>Students should provide examples of the different types of notation and explain why they are different and similar.</p> <p>Students will plan a park that is <math>\frac{6}{8}</math> of an acre.. A flower garden will be part of this park that will take up <math>\frac{1}{4}</math> of the park, and a playground will also be included that will be <math>\frac{1}{3}</math> of the park. Calculate the acreage for the garden and playground.</p> <p>Calculate percent change for a variety of situations. Students may make up their own scenarios.</p> <p>Work problems involving discount and mark-up.</p> <p>Figure tips on a restaurant bill. Be able to compute 15% and 20 % mentally.</p>	<p>Connect to language arts and technology: Write the explanation for the similarities and differences of the notations using computers..</p> <p>Connect to life: Suppose you want to tile your bathroom and kitchen floors. Measure your bathroom and kitchen floors at home using metric units. You want to tile both floors with the same tile in the same size. Find the common factors for both rooms to determine the largest size tile that you can use for both rooms. Students should come with another example to show the effects of multiplying and dividing fractions. They should draw their plan and explain the dimensions.</p> <p>Connect to science or social studies and technology: Research an animal on the endangered animal list. Make a table that records the population of this animal. Calculate the percent change (increase or decrease) with time for this animal. Use computers to make the table.</p>



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<p>7.06.17 Develop, use, and explain strategies to compute exact answers mentally with integers and simple rational numbers using a variety of techniques. (6C)</p>	<p>Use mental math or other strategies to solve problems with integers and rational numbers. Make a list of good strategies to use.</p>	<p>Connect to writing: Write a paragraph on how to compute exact answers mentally.</p> <p>Connect to speech: Each student explains his/her “best” strategy to the class.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p><i>Critical for Mastery at Grade 8:</i></p> <p>8.06.01 Recognize and use exponential, scientific, and calculator notation. (6A)</p> <p>8.06.02 Represent, order, and compare rational numbers using a variety of methods and materials. (6A)</p> <p>8.06.03 Simplify arithmetic expressions containing integers using the operations (field properties) and the order of operations. (6B)</p>	<p>Calculate the loudness of objects using a chart of known decibels: (difference in decibels) /10; loudness = ten raised to the power of 1<sup>st</sup> calculation.). Compare the loudness of different objects.</p> <p>Give students rational numbers on index cards. Some have numbers in fraction form; some have numbers in decimal form. Have student line up in order from least to greatest and read out their number.</p> <p>Solve algebraic equations in one variable.</p>	<p>Connect to health education: What levels of sound cause injuries to hearing? Measure sounds at dances, sporting events, etc. and record using exponential and scientific notation. What conclusions can you draw?</p> <p>Connect to science: Determine the time it takes to boil a potato at various locations.  <math display="block">T = \frac{40(237 - (212 - 1.85x))}{212 - 185x - 16}</math>                     where x = altitude</p>

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<p>8.06.04 Describe and use the inverse relationships of squaring and finding square roots to simplify computations and solve problems. (6B)</p> <p>8.06.05 Select, use, and justify appropriate operations, methods, and tools to compute or estimate with real numbers. (6C)</p>	<p>Using the formula: Beaufort Number = <math>2\sqrt{(\text{wind speed} + 9) - 6}</math> where the Beaufort Number or force number is a way to calculate the wind speed in sea conditions, and s =wind speed in knots. The Beaufort Number has a value of 0-12 and the wind speed is 0 to greater than 64 knots. If a Beaufort Number is provided (0-12), then the students should calculate the wind speed. If the wind speed is provided (0-64), then the student should calculate the Beaufort Number. Through these calculations the student may understand the relationship of square and square root.</p> <p>Plan a Thanksgiving dinner menu for a family of 15. Ages of guests should vary. Menu must include estimated portions for each guest, grocery list with amounts, and price list. Grocery ads should be used to aid in prices of items. Include sales tax of your area. A budget should be given. Present information in a visually appealing format. Design seating arrangements for your guests. Discuss methods used to solve the problems.</p>	<p>Connect to physics: Calculate wind speed of many objects.</p> <p>Collect data on the bounciness of different types of balls. Drop a ball from a measured height. Measure the height that the ball bounces on the first bounce. Continue for at least 4 different initial heights for each ball. Graph the data. Calculate the y intercept. Find the equation of the line.</p>

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<p>8.06.06 Analyze algorithms (procedures) for computing with real numbers and develop fluency in their use. (6C)</p> <p>8.06.07 Determine and explain whether exact values or approximations are needed in a variety of situations. (6C)</p> <p>8.06.08 Develop, use, analyze, and explain methods for solving number sentences or word problems involving proportions with rational numbers. (6D)</p>	<p>Have students work in teams and teach a lesson to the class on each of the rules for computing with real numbers.</p> <p>Provide students with scenarios where data would be collected ( i.e. reporter determining number of people at Times Square on New Years Eve, profits per month for a company, votes garnered for a candidate during an election, weight of a battleship, etc). The students should categorize the scenarios according to whether the data collected will be exact or an estimate and explain their reasons.</p> <p>Collect data to determine lengths of part of a human body compared to lengths of the head. Discuss methods for solving the problem.</p>	<p>.</p> <p>Connect to science: Provide the students with a recipe for cookies. Provide the students with numerous measuring devices of varying accuracy from exact to estimation (i.e. measuring cups and spoons; graduated cylinder and analytical balance; coffee mug and salad bowl). The students should explain which equipment they would use and why. To test out their choices, students then make the cookies using the different equipment and compare outcomes (taste, texture) and ease of making the cookies. Explain why some devices would not be used</p>

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<p>8.06.09 Solve problems that involve percents, including increase and decrease, regardless of the piece of information that is missing. (6D)</p>	<p>Calculate percent change in basketball scores for you team over a period of time (win/loss record). Knowing the percent change, predict the number of games that you might win next season.</p>	<p>Using a chart on the amount and type of chlorofluorocarbons used in the U.S. over the last 10 years, calculate the percent change in use over time.</p>
<p>8.06.10 Place rational numbers on a number line. (6A)</p>	<p>Collect stock market data for 15 stocks. Arrange the absolute change for the stocks on a number line.</p>	<p>Connect to science: Research the boiling points of 5 common liquids. Arrange them on a number line in ascending order.</p>
<p>8.06.11 Determine and describe the effects of arithmetic operations with decimals and integers. (6B)</p>	<p>Perform arithmetic operations with decimals and integers and explain the results obtained.</p>	<p>Connect to writing: Write verbal explanations for results obtained from arithmetic operations of decimals and integers.</p>
<p>8.06.12 Judge the reasonableness of numerical computations and their results. (6B)</p>	<p>Perform conversion calculations for length, weight, and volume. Determine if the results are reasonable. Explain your thinking.</p>	<p>Connect to science: Perform metric conversions and analyze results for reasonableness.</p>
<p>8.06.13 Explain how ratios and proportions can be used to solve problems of percent, growth, and error tolerance. (6D)</p>	<p>Have students solve problems of percent, growth, and error tolerance using ratios and proportions. Have students give a written explanation on their problem solving method and why they chose it.</p>	

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Learning Standard/Outcome	Sample Assessment	Connections
<p><i>Significant to Develop at Grade 8:</i></p> <p>8.06.14 Determine an appropriate numerical representation of a problem situation, including roots and powers, if applicable. (6B)</p> <p>8.06.15 Determine an appropriate number of digits to represent an outcome (6C)</p>	<p>Conduct a survey over the past five years on the population of your school or city; include ethnic and racial composition. Construct a graph of the changes with respect to overall change and respective ethnic/racial composition. Calculate percent change for each group and overall population. Predict the population over the next five years in a graph. Discuss appropriate numerical representation of this data.</p> <p>Given a variety of different types of outcomes have students determine an appropriate number of digits to represent these. (For example, distance to the moon, width of a hair, distance to California, likelihood of winning the lotto, etc.)</p>	<p>Connect to values and life: From your Predictions in the assessment for 8.06.14, what changes should be made in your school or city to accommodate those changes?</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p><b><i>Critical for Mastery at Grade 9:</i></b></p> <p>9.06.01 Represent, order, and compare real numbers. (6A)</p> <p>9.06.02 Compare and contrast the properties of numbers and number systems, including the rational and real numbers. (6B)</p> <p>9.06.03 Determine an appropriate numerical representation of a problem situation, including roots and powers, if applicable. (6B)</p> <p>9.06.04 Judge the effects of such operations as multiplication, division, and computing powers and roots on the magnitudes of quantities. (6B)</p> <p>9.06.05 Simplify expressions using the field properties, order of operations, and properties of equality for the set of real numbers. (6B)</p>	<p>Compare a list of real numbers using Venn Diagrams.</p> <p>Crte a graphic organizer to compare and contrast real numbers.</p> <p>The cost of living can be demonstrated through an exponential growth curve that follows the exponential growth equation: <math>y = C(1+r)^t</math>. If the initial hourly wage was \$2.60 and the cost of living increased was 6.0%, write the proper numerical representation for the cost of living.</p> <p>Given the equation, <math>(4x)^2 \cdot y = c</math>, students should determine the effect of doubling y on the magnitude of c, the effects of halving x on c, the effect of tripling x on c, etc.</p> <p>Simplify algebraic expressions in one variable.</p>	<p>Connect to social studies: Using a historical timeline, students will represent and order real numbers.</p> <p>Connect to speech and technology: Present the graphic organizer to the class using Power Point.</p> <p>Connect to life: Analyze the results of the cost of living growth curve. How would this affect the standard of living for a single person, a family, a college student?</p> <p>Connect to life: Double one side of a rectangular garden. How is the area affected?</p> <p>Connect to critical thinking: Solve problems where the student must add parentheses to make the expression true.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p>9.06.06 Develop fluency in operations with real numbers using mental computation or paper-and-pencil calculations for simple cases and technology for more complicated cases. (6B, 6C)</p> <p>9.06.07 Determine and explain whether exact values or approximations are needed in a variety of situations. (6C)</p> <p>9.06.08 Develop an appropriate number of significant digits to represent an outcome. (6C)</p>	<p>Solve algebraic equations in one variable, powers, roots, or proportions.</p> <p>Given several scenarios the students should decide if approximations or exact values are needed; such as friends splitting the cost evenly for a restaurant bill when the amount to be paid by each cannot be evenly divided.</p> <p>Students should measure the length and width of the classroom. Some students should measure the room in feet, others in meters, and others in inches. The students should then calculate the area of the room and report the answer using the appropriate number of significant digits.</p>	<p>Connect to science: Solve velocity problems.</p> <p>Students should write their own scenarios where approximations and exact values are necessary.</p> <p>Connect to life: In Business, students are asked to solve money problems. If students are asked to solve a price per unit, they should decide the proper number of significant digits in the answer. Would it make sense to report a gain or loss of \$1.000435? Explain.</p>



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Learning Standard/Outcome	Sample Assessment	Connections
<p>9.06.09 Explain how ratios and proportions can be used to solve problems of percent, growth, and error tolerance. (6D)</p>	<p>Students should research the growth curve for humans (ask the family doctor for the curve he/she uses). By comparing their growth while young, determine their ratio for growth. Predict how tall they will be when an adult.</p>	<p>Students should look in the newspaper to find the exchange rates for currency. Use ratios and proportions to calculate the value of foreign currency obtained for \$100 U.S. dollars. Determine the percent difference among the different foreign currency.</p>
<p>9.06.10 Set up and solve direct and inverse variation of simple quantities. (6D)</p>	<p>The weight that an airship is capable of supporting varies directly with its volume. The students should write the equation for the relationship. After researching airships, the students should solve the equation given either the volume or weight.</p>	<p>Connect to science: In chemistry the Gas Laws are examples of direct and inverse variations. Students should use the inverse relationship of Boyle's Law (<math>P_1V_1 = P_2V_2</math>), to calculate the change in volume of a gas when the other three values are known.</p>
<p><i>Significant to Develop at Grade 9:</i></p>		
<p>9.06.11 Organize problem situations using matrices. (6A)</p>	<p>Students should rewrite a table in matrix format.</p>	<p>Connect to technology: Make a spreadsheet for data taken from a newspaper article or a spreadsheet showing stock from a section of a store.</p>
<p>9.06.12 Solve problems using simple matrix operations. (6B)</p>	<p>Students should solve matrix problems using addition and subtraction.</p>	

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Learning Standard/Outcome	Sample Assessment	Connections
<p><i>Useful to Work On at Grade 9:</i></p> <p>9.06.13 Illustrate the relationship between second and third power roots and powers of a number. (6A)</p>	<p>Students should illustrate the relationship between the area of a square and the volume of a cube.</p>	<p>Connect to life: Determine the amount of airspace in the classroom and the amount of floor space. Do the same for other spaces. Discuss the relationships.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p>The learning standards/outcomes from Goal 6 that relate to geometry have already been addressed in Grade 9: Algebra 1 Focus.</p>		

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Learning Standard/Outcome	Sample Assessment	Connections
<p><b><i>Critical for Mastery at Grade 11:</i></b></p> <p>11.06.01 Represent numbers in equivalent forms (e.g., exponential/logarithmic, radical/rational exponents). (6A)</p> <p>11.06.02 Represent numerical intervals using correct notation. (6A)</p> <p>11.06.03 Compare and contrast the properties of numbers and number systems, including the complex numbers such as solutions to quadratic equations that do not have real solutions. (6B)</p> <p>11.06.04 Use the field properties and properties of equality for the set of complex numbers. (6B)</p> <p>11.06.05 Solve problems using exponents and logarithms. (6B)</p> <p>11.06.06 Solve problems using matrices. (6B)</p>	<p>Students should represent numbers in a variety of equivalent forms.</p> <p>Students should determine the proper notation to denote numerical intervals.</p> <p>Students should examine the discriminant, <math>b^2-4ac</math>, to determine if the solution to the quadratic equation is imaginary or real.</p> <p>Simplify problems of complex numbers.</p> <p>Given the exponential function, <math>f(x) = ab^x</math>, and values for <math>f(x)</math>, such as <math>f(0) = 3</math>, students should be able to determine the values for <math>a</math> and <math>b</math>, as well as other values for <math>x</math>.</p> <p>Students should solve 3 equations in 3 unknowns using matrices.</p>	<p>Connect to science: Calculate pH or <math>[H^+]</math> values where <math>pH = -\log [H^+]</math>.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p>11.06.07 Determine the level of accuracy needed for computations involving measurement and irrational numbers. (6C)</p> <p>11.06.08 Describe the role of rounding error in calculations. (6C)</p> <p>11/06.09 Set up and solve proportions for direct, inverse, and compound (joint of mixed) variations of quantities involving powers and multiple variables. (6D)</p> <p><i>Significant to Develop at Grade 11:</i></p> <p>11.06.10 Explain that vectors and matrices are systems that have some of the properties of the real-number system. (6B)</p>	<p>Analyze given problems to determine the level of accuracy needed. Explain.</p> <p>Students should convert radian measures to degree measures (<math>1 \text{ radian} = 180/\pi</math>). Demonstrate the rounding error possible depending on the value of <math>\pi</math> used in the calculations (e. g. <math>\pi = 3.14</math>, <math>\pi = 3.142</math>, <math>\pi = 3.14159</math>, etc)</p> <p>Using sine, cosine, and tangent calculate the length of a side of a right triangle. The Trig functions are examples of direct proportions.</p> <p>For a given vector, the students should determine its x and y components, then discuss how these components possess properties of the real number system.</p>	<p>Connect to other areas: What effect would rounding have on designing a circular stairway? A sculpture? A sewer pipe? Students think of other examples..</p> <p>Connect to physics: Given the time that an object moves and its coordinates on the coordinate plane of the object's original and final position, calculate the speed at which the object is moving, <math>d =tv</math>.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p>11.06.11 Estimate an appropriate answer for a given term in a sequence. (6C)</p> <p><i>Useful to Work On at Grade 11:</i></p> <p>11.06.12 Explain the connection of percents to growth patterns, error, and probability. (6D)</p>	<p>Given a sequence, the student will determine the pattern or function of the sequence. Then the student will determine the value of a desired term.</p> <p>Students should research the population (total as well as per grade) of the school over the last 5 years. Using the values obtained, the students should calculate the percent change (increase or decrease) of total population over the five years, as well as, freshmen, sophomore, junior, and senior populations. The students should also calculate the percent difference between freshmen and senior population for each year. Do most of the freshmen stay until senior year? A graph should be constructed of the populations. What is the projected population of the school for the next 5 years. What is the probability that the population will decrease? What is the rounding error in the calculations? One could also compare female to male populations</p>	<p>Students could expand their population studies to the population of the community in which they live.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p><b><i>Critical for Mastery at Grade 12:</i></b></p> <p>12.06.01 Represent numbers in equivalent forms. (6A)</p> <p>12.06.02 Graph or interpret the graph of a complex number in rectangular and vector forms. (6A)</p> <p>12.06.03 Determine the opposite, reciprocal, absolute values, and positive integral powers of a complex number. (6A)</p> <p>12.06.04 Solve problems using complex numbers and their various representations. (6B)</p>	<p>Write the complex number <math>z = -2 - 2\sqrt{3}i</math> in trigonometric form.</p> <p>Plot <math>i, i^2, i^3, i^4,</math> and <math>i^5</math> in the complex plane. Then write each in trig form. Describe what happens to the angle <math>\theta</math> as higher powers of <math>i</math> are created.</p> <p>Given a complex number, the student should be able to analyze the number and state its opposite, reciprocal, absolute value, and positive integral powers.</p> <p>Using various representations of complex numbers, students should be able to solve a variety of problems. Students should be able to create their own problems and include an answer key. Exchange student's problems and have other students solve them. Students should also create a quiz for their classmates to take.</p>	<p>Connect to religion: Discuss the equivalent forms of Jesus as God and man.</p> <p>Research Benoit Mandelbrot and his Mandelbrot Set. Find an example of a fractal picture. Write a brief history of Mandelbrot and include an example of a fractal picture.</p>

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<p>12.06.05 Develop fluency in operations with real numbers, vectors, and matrices using mental computation or paper-and-pencil calculations for simple cases, and technology for more complicated cases. (6B)</p> <p>12.06.06 Describe the role of rounding error in calculations. (6C)</p>	<p>Students should calculate compounded daily interest <math>A = P \cdot e^{rt}</math> where <math>e = 2.718</math>, for a variety of situations. In addition students should determine the rounding errors for these calculations. Afterwards, the students should determine the most accurate answer. (outcomes 05 and 06)</p>	