

Archdiocese of Chicago: Mathematics Curriculum Framework

State Goal 7: Estimate, make and use measurements of objects, quantities and relationships and determine acceptable levels of accuracy.

Learning Standard/Outcome	Sample Assessment	Connections
<p><i>Significant to Develop at Preschool Level:</i></p> <p>P.07.01 Demonstrate a beginning understanding of measurement using non-standard units and measurement words. (EC-A)</p> <p>P.07.02 Construct a sense of time through participation in daily activities. (EC-B)</p> <p>P.07.03 Estimate measurements. (EC-B)</p> <p>P.07.04 Show understanding of and use comparative words. (EC-B)</p>	<p>Use activity, “How Many Shoes Long Am I?” Line up several pairs of shoes against the wall. Children lie down beside the shoes and the class counts how many shoes long each child is. Results can be recorded or graphed. Repeat the activity at the beginning and end of the school year to compare results.</p> <p>Periodically use a timer to signal transition times in the classroom. Race against the timer while putting together a puzzle.</p> <p>Use apples and different size containers (e.g., bowl, bucket, bushel) to estimate and then count how many apples will fit in each.</p> <p>Sort objects of different sizes (e.g., teddy bear counters, Lego blocks, paper clips). Build towers that are short and tall. Use a balance scale to demonstrate heavier and lighter.</p>	<p>Connect to science: Unit on dinosaurs (measure objects using paper dinosaur “bones”). Connect to religion: God made us special. Connect to art and small motor development: Trace and cut out student’s shoe and use it to measure “how many steps long” an object is.</p> <p>Connect to science: Use a calendar to name the month and talk about the weather. Discuss seasonal changes.</p> <p>Connect to science: Study of autumn crops. Connect to religion: The wonder and beauty of God’s creation. Connect to life skills/religion: Share the apples with one another.</p> <p>Connect to art: Trace and cut out adult and children’s hands. Arrange them by size from smallest to largest. Connect to language arts: Read <u>Titch</u> by Pat Hutchins.</p>

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<p>P.07.05 Incorporate estimating and measuring activities into play. (EC-C)</p>	<p>Use rulers, tapes, yardsticks, block, links, etc. in centers for experimenting with measurement.</p>	<p>Connect to physical education: Small and large motor development. Connect to language arts: Read <u>Measuring Penny</u> by Loreen Leedy.</p>

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<p><i>Critical to Develop at Kindergarten Level:</i></p> <p>K.07.01 Demonstrate a beginning understanding of measurement using non-standard units and measurement words. (EC-A)</p> <p>K.07.02 Compare objects by length. (EC-A)</p> <p>K.07.03 Order objects by size and sort them by shape. (EC-B)</p> <p>K.07.04 Show understanding of and use comparative words. (EC-B)</p>	<p>Measure personal items using linking cubes, candy bars, or paper clips.</p> <p>Put color strips in order from shortest to longest, tell which is longer.</p> <p>Collect different size leaves with the class. Sort by size and then by shape.</p> <p>Identify the leaves (see #3 above) in relation to each other as “larger than” or “smaller than”.</p>	<p>Connect to language arts: Read <u>Miss Nelson is Missing</u>.</p> <p>In science, discuss growth of seeds. Place stages in sequence.</p> <p>Connect to science: Discuss the fact that different trees have different leaves. Connect to religion: We are all different creations of God, but He loves and cares for us all. Connect to language arts: Read <u>Pezzettiono</u>.</p> <p>Draw an object that is larger than you (car), and one that is smaller than you (ant)</p>

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<p>K.07.05 Construct a sense of time through participation in daily activities. (EC-A)</p> <p>K.07.06 Identify the days of the week. (EC-A)</p> <p><i>Significant to Develop at Kindergarten Level:</i></p> <p>K.07.07 Compare objects by weight. (EC-A)</p>	<p>Tell and show time to the hour by relating daily school activities to the time of day on a clock (e.g., time for gym, time for lunch, time to go home).</p> <p>Play the game, “Name the Day” (e.g., “I am the day before (or after) Tuesday. What’s my name?”)</p> <p>.</p> <p>Fill six identical containers with different objects of different weights. Give students cards with pictures and/or words of the containers’ contents. Students will arrange the cards, estimating which containers will be the heaviest and which will be the lightest.</p>	<p>Connect to language arts: Reinforce oral presentation skills, for example explain the steps in brushing your teeth. Connect to religion: Discuss Sunday as God’s special day and draw a picture of one thing the student’s family does to make Sunday special.</p> <p>Connect to language arts: Learn and recite the poem, “Monday’s child is fair of face...”; Connect to religion: Learn the meaning of the word “Sabbath”.</p> <p>.</p> <p>Connect to science: Introduce a balance scale and show how it can be used to compare weight. Draw an object heavier than you and lighter than you.</p>

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K.07.08 Estimate and compare capacity. (EC-C)	Demonstrate empty, full, and half-full using containers and colored water.	Connect to science/art: Mix the different colors of water to form new ones. Connect to religion/real life application: As a class, follow a recipe and share it with classmates.

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<p><i>Critical for Mastery at Grade 1:</i></p> <p>1.07.01 Determine the attributes of an object that are measurable (e.g., length and weight are measurable; color and texture are not). (7A)</p> <p>1.07.02 Compare and order objects according to measurable attributes. (7A)</p> <p>1.07.03 Measure objects using nonstandard units. (7A)</p> <p>1.07.04 Explore and describe chronological events (e.g., calendars, timelines, seasons). (7A)</p> <p>1.07.05 Identify units of money and the value of each. (7A)</p>	<p>From home, bring in an object that has measurable and non-measurable attributes. Identify the attributes and share them with the class.</p> <p>Sort attribute blocks by size. Order them from smallest to largest.</p> <p>Trace hands onto construction paper. Measure a bookshelf (or other object) using “hand measure”.</p> <p>Display a calendar and season chart on a bulletin board. The “Student of the Day” will name and point to the correct month, day, and season of the year.</p> <p>Match coins (or reproductions of them) to their corresponding values.</p>	<p>Use data in connection to a language arts presentation and use the data to illustrate the presentation.</p> <p>Use in conjunction with science (e.g., measure the length of snakes and draw different kinds of snakes). Arrange and display them in order from shortest to longest.</p> <p>Connect to religion: Use hands to create a display for religion, “God gives us hands to help”.</p> <p>Use in connection to a language arts oral presentation.</p> <p>Connect to values and Catholic identity: Sort coins for classroom mission contributions.</p>

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<p>1.07.06 Count like sets of coins. (7A)</p> <p><i>Significant to Develop at Grade 1:</i></p> <p>1.07.07 Tell time using an analog clock. (7A)</p> <p>1.07.08 Count, compare and order sets of unlike coins. (7A)</p> <p>1.07.09 Show equivalent amounts of money. (7A)</p> <p>1.07.10 Estimate nonstandard measurements of length, weight, and capacity. (7B)</p>	<p>Given sets of like coins, count the value of a number of pennies, nickels and dimes.</p> <p>Demonstrate time to the nearest hour (using a “Judy clock”) as to when school starts, lunch begins, and school ends.</p> <p>Given sets of unlike coins (or reproductions) which are less than or equal to \$1.00, arrange them in order from least to greatest.</p> <p>Using coins, (or reproductions) exchange ten pennies for one dime or two nickels.</p> <p>Guess how many steps it would take to walk the length of the classroom. Record the estimate. Verify the actual results.</p>	<p>Connect to school events: Use 100 pennies (or reproductions of them) to make a poster design for 100’s Day.</p> <p>Connect to language arts by writing new verses for “Hickory Dickory Dock” for the various times on the clock.</p> <p>Connect to values: Using Holy Childhood Association data, exchange equivalent coins to “purchase” milk for one child in a mission country.</p>

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<p><i>Useful to Work On at Grade 1:</i></p> <p>1.07.11 Explore and explain making change using manipulatives. (7A)</p> <p>1.07.12 Select appropriate nonstandard units to measure length, weight, and capacity (e.g., number of handfuls of cubes to fill a container). (7C)</p>	<p>Purchase items in a class “store” and make change for purchases less than \$1.00.</p> <p>Estimate and record how many small cups of jellybeans it would take to fill a glass jar. Verify the results of the estimate. Was the estimate less than or greater than the actual number?</p>	<p>Connect to science: study of capacity.</p>

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<p><i>Critical for Mastery at Grade 2:</i></p>		
<p>2.07.01 Measure objects using standard units. (7A)</p>	<p>Measure the length of a student’s shoe, desk or book bag to the nearest inch or centimeter.</p>	<p>Connect to religion project: “Ruler of Gratitude”. Given a template of a ruler, mark each inch with the name of someone or something for which or for whom you are grateful.</p>
<p>2.07.02 Tell time using an analog clock. (7A)</p>	<p>Given templates of an analog clock, draw hands to show the times for various “special” classes (e.g., gym, computer, library, art, music).</p>	<p>Connect to computer class: Use available software and/or Internet sites with interactive time-related activities.</p>
<p>2.07.03 Order events chronologically. (7A)</p>	<p>With parental help, make a timeline of special events (one per year) from birth to current age. Include a picture or illustration for each event.</p>	<p>Connect to social studies (using a timeline); language arts (oral presentation); or religion (“I Am a Special Creation of God”).</p>
<p>2.07.04 Show equivalent amounts of money. (7A)</p>	<p>Use coins or reproductions of them to exchange quarters, dimes, pennies and nickels.</p>	
<p>2.07.05 Describe relationships within units of time and money (e.g., 12 inches in a foot). (7A)</p>	<p>Using rulers and “Judy clocks”, count the number of inches in a given number of feet and the number of minutes in an hour.</p>	

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<p>2.07.06 Count, compare and order sets of unlike coins. (7A)</p> <p><i>Significant to Develop at Grade 2:</i></p> <p>2.07.07 Explore and explain making change using manipulatives. (7A)</p> <p>2.07.08 Estimate elapsed time for a given task. (7B)</p> <p>2.07.09 Estimate the amount of money needed to make purchases. (7B)</p> <p>2.07.10 Select an appropriate unit and tool for measurement. (7C)</p>	<p>Combine unlike coins into sets that make \$1.00.</p> <p>Purchase items at a classroom “store” and make change from \$1.00.</p> <p>Estimate how long a given task will take (e.g., read a story). Compare the estimate with the actual time and use the words “greater than” or “less than” to describe the comparison.</p> <p>Given a list or display of school supplies, estimate the cost of purchasing three items.</p> <p>Students will give an example of something that could be measured using a ruler, a balance scale, and a thermometer.</p>	<p>Connect to language arts (oral presentation): Demonstrate to the class how you arrived at the amount of change received.</p> <p>Connect to journal writing: If you had \$100.00, how would you spend it?</p> <p>Connect to science topics involving temperature, weight, or linear measure.</p>

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<p>2.07.11 Solve problems using money and time. (7C)</p> <p><i>Useful to Work On at Grade 2:</i></p> <p>2.07.12 Identify the type of measure (e.g., weight, height, volume, temperature) for each measurable attribute. (7A)</p> <p>2.07.13 Explain the need for using standard units for measuring. (7A)</p> <p>2.07.14 Estimate standard measurements of length, weight, and capacity. (7B)</p>	<p>Choose three items from a menu and find the total cost.</p> <p>Given a display of objects that have one, two, or three dimensions, identify measurable attributes.</p> <p>Students will walk the perimeter of the classroom. They will count the number of steps and chart the results. They will then discuss why the number of steps is not consistent. What would be a way to make the number of steps more consistent?</p> <p>Each student will estimate his or her own height (and/or weight) and work with a partner to complete an actual measurement.</p>	<p>Connect to art: Design a new American coin.</p> <p>Connect to science: Students could measure the evaporation of water over the day. Discuss the importance of using same measurement unit.</p> <p>Connect to language arts: After listening to the story “Jack and the Beanstalk”, discuss the height, length, and weight of the characters and objects in the story and compare them to real life.</p>

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<p>2.07.15 Explore and describe perimeter and area of real objects. (7C)</p>	<p>Use string to demonstrate the perimeter of a student's desktop. Use sheets of paper to show the area.</p>	<p>Connect to art: Draw a rectangle – the “rim” is its perimeter. Color the area. Make a classroom “quilt” of the design blocks. Measure the perimeter of the finished quilt.</p> <p>Connect to religion: Use the “quilt” throughout the year to block in special occasions and activities (e.g., First Communion, Reconciliation, field trips).</p>

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<p><i>Critical for Mastery at Grade 3:</i></p> <p>3.07.01 Measure objects using standard units in the U.S. customary and metric systems. (7A)</p> <p>3.07.02 Perform simple unit conversions within a system of measurement (e.g., three feet is the same as one yard). (7A)</p> <p>3.07.03 Show and explain perimeter of an object by measuring and adding its linear units. (7A)</p>	<p>Measure your pencil using centimeters and inches. Record your measurements.</p> <p>Use unit multipliers (e.g., 16 oz. = 1 lb.) to perform conversions within the customary and/or metric systems.</p> <p>Use a geoboard to construct a rectangle. Explain how to find the perimeter by counting the units. Record the perimeter.</p>	<p>Connect to science: Measure the height of each student at the beginning of the year and record the measurements in inches and centimeters. Measure again at the end of the year and calculate the differences. Connect to art: Make a craft that requires measurement to complete it.</p> <p>Connect to art: Build a class file of pictures of recognizable objects or foods which show equivalent measures. Display them on a bulletin board.</p> <p>Connect to writing: List five instances of when perimeter would be used in a real life application (e.g., baseboards, enclosing a garden with a fence).</p>

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<p>3.07.04 Show and explain area of an object by counting square units. (7A)</p> <p>3.07.05 Determine elapsed time between events. (7C)</p> <p>3.07.06 Solve problems using perimeter and area of simple polygons. (7C)</p>	<p>Draw a rectangle on grid paper (or use pattern blocks). Count the interior units to demonstrate how to calculate area. Find the area and record it.</p> <p>Write a story problem such as, “The class went on a field trip. They left at 8:30 a.m. and arrived at 10:00 a.m. How long did it take them to reach their destination?” Solve the problem you wrote. Go on “walkabouts” throughout the school. Record beginning and ending times and determine elapsed time.</p> <p>Given the dimensions of a rectangular garden, draw the garden on grid paper and determine the number of feet of fence needed to enclose it and the number of square feet available for planting.</p>	<p>Connect to writing: List two ways you could change the appearance of your room which would necessitate computing area (e.g., carpeting, wallpaper). Connect to art: Draw a picture of the changes in your room.</p> <p>Connect to technology: Students prepare a daily schedule and determine the starting time for each class. They type it in “table format”.</p> <p>Connect to science: Given the climate in Illinois, list five crops that could be grown and five that could not. Research the amount of garden area needed to grow the crops.</p> <p>Connect to language arts: Write a paragraph explaining what crops/plants you would grow and why you chose them.</p>

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<p>3.07.07 Make change from a given amount using bills and coins. (7C)</p> <p><i>Significant to Develop at Grade 3:</i></p> <p>3.07.08 Explain the need for using standard units for measuring. (7A)</p> <p>3.07.09 Develop and use common referents for linear measure to make comparisons and estimates. (7B)</p> <p>3.07.10 Estimate perimeter of simple polygons. (7B)</p>	<p>Bring in newspaper ads or flyers from the Sunday newspaper. Select three items to purchase (under \$1.00). Find the total cost and use coins and bills (or reproductions of them) to make change from a \$5.00 bill.</p> <p>Measure objects using nonstandard units (e.g. paper clips, pencils, erasers). Record and compare measurements with a neighbor. Measure the objects again with standard units (ruler) and compare it with a neighbor. Discuss and describe why standard units are needed.</p> <p>Use various objects as benchmarks (e.g., one paper clip = one inch) and measure common objects in the classroom.</p> <p>Given polygons of different sizes and with different numbers of sides, estimate the perimeter using customary and metric units. Measure the polygons and compare your</p>	<p>Connect to religion: Using HCA data, answer the question, “If you contribute \$5.00 to the missions, how much would be left after food/medicine is purchased for one child for a week?”</p> <p>Connect to science topics where use of standard measurement is necessary to insure consistent results.</p>

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<p>3.07.11 Select and apply standard units to measure length, area, volume, weight, time, and temperature. (7C)</p> <p><i>Useful to Work On at Grade 3:</i></p> <p>3.07.12 Describe multiple measurable attributes (e.g., length, mass/weight, time, temperature, area, volume, capacity) of a single object. (7A)</p>	<p>estimate to the actual measure.</p> <p>Play, “What’s My Measure?” List one object on each index card (e.g., elephant, can of soda, third grade student); list one unit of length, weight, etc. on another set of index cards. Match the appropriate measure(s) for each object.</p> <p>Select an object in the classroom. List all of the measurable attributes you can name. Play the card game, “What’s My Measure?” and match as many units of measure cards as you can with the object.</p>	<p>Connect to science study of capacity: Record the weights of all class members. Given the number of pounds an elevator can hold, determine how many students could ride the elevator.</p> <p>Connect to religion: Hold a contest to guess the weight of a jar of jelly beans. Contribute the money collected to the missions or a favorite charity. Share the jellybeans with the class.</p>

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<p><i>Critical for Mastery at Grade 4:</i></p> <p>4.07.01 Measure with a greater degree of accuracy. (7A)</p> <p>4.07.02 Develop and use common referents for volume, weight/mass, capacity, area, and angle measures to make comparisons and estimates. (7B)</p> <p>4.07.03 Determine the volume of a cube or rectangular prism using concrete materials. (7C)</p>	<p>Measure the sole of your shoe to the nearest quarter inch/centimeter and record the measurement. Working in pairs, measure the length of a classmate’s arm from the tip of the middle finger to the inside of the elbow using the same measures as above. Record the measurements.</p> <p>Use benchmarks (e.g., capacity of a two liter bottle, angle formed at the corner of a paper) to compare other objects to the benchmark (e.g., greater than, less than) and to estimate measures of the objects.</p> <p>Use sugar cubes or plastic blocks to build a cube or rectangular prism. Record the number of cubes representing the length, width, and height. Count the total number of small cubes comprising the whole prism and record your answer. Is there a relationship between length, height and width, and the volume? Explain your answer.</p>	<p>Connect to science: Plant beans (or other fast growing seeds) in milk cartons. When the seeds have sprouted, measure and record the growth on a daily or weekly basis. Compare and/or graph the results.</p> <p>Connect to language arts: Make a list and give an example of when these terms are used in everyday life.</p> <p>Connect to science: Design an aquarium and determine its volume. Connect to technology: Using the Internet, research types of fish that would or would not be compatible in the aquarium.</p>

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<p>4.07.04 Create an accurate representation of a polygon with a given perimeter or area. (7C)</p> <p><i>Significant to Develop at Grade 4:</i></p> <p>4.07.05 Convert U.S. customary measurement into larger or smaller units with the help of a conversion chart. (7A)</p> <p>4.07.06 Convert linear metric measurements into larger or smaller units with the help of a conversion chart. (7A)</p>	<p>Using grid paper and given a specific perimeter or area, draw a playground to be used by the students.</p> <p>Using reproduced conversion charts (or those generated by the class), work with a partner to convert customary measures into larger or smaller units (e.g., feet into inches, ounces into pounds). Write an explanation of how the conversions were derived.</p> <p>Design a game board in which students must convert linear metric measures into larger or smaller units. A team of two students alternate turns to complete the problems, checking each other's work as they proceed. A conversion chart may be used.</p>	<p>Connect to physical education: Discuss safety issues related to the use of the playground. Connect to language arts: Write a list of rules/procedures for using the playground safely.</p> <p>Connect to science: In experimentation, discuss how the size of the unit can affect the precision of the measure, and what implications this may have on the results of an experiment.</p> <p>Connect to science: Measure objects using two different units (e.g., cm and mm). Make a table to show the comparisons.</p>

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<p>4.07.07 Develop and discuss strategies for estimating the perimeter, area, and volumes of regular and non-regular shapes. (7B)</p> <p>4.07.08 Describe multiple measurable attributes (e.g., length, mass/weight, time, temperature, area, volume, capacity) of a single object. (7A)</p> <p><i>Useful to Work On at Grade 4:</i></p> <p>4.07.09 Measure angles using a protractor or angle ruler. (7A)</p>	<p>Students work in teams to cut out a two-dimensional figure and to construct a three-dimensional figure. The team will discuss and develop strategies for estimating the perimeter, area, and volume of their figures and write an explanation to be presented to the class.</p> <p>Select three objects in the classroom. List all of the measurable attributes you can name. Show your list to a partner and see if she or he can add any.</p> <p>Use straws connected with twist ties to represent rays. Depict angles using the “rays” and draw the pattern formed. Measure the angle(s) formed and record the measure(s).</p>	<p>Connect to language arts: Develop and enhance oral presentation skills centering on clarity of explanation.</p> <p>Connect to religion: Discuss personal attributes that are not concretely measurable (e.g., honesty, trustworthiness, love/concern for others), but are gifts given to us by God and enhanced by our personal choices. Connect to language arts: Differentiate between concrete and abstract nouns. Connect to science: Discuss attributes that are observable but not easily measurable (e.g., color, texture, sensory).</p> <p>Connect to social studies: Create a “cutaway” globe to demonstrate how degrees of longitude are generated.</p>

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<p>4.07.10 Select and apply appropriate standard units and tools to measure the size of angles. (7C)</p>	<p>Describe why a protractor could be used to measure the number of degrees in an angle and why a ruler could not. Choose the correct scale on a protractor to measure a given angle.</p>	<p>Connect to science/technology: Research how ancient people used a sundial based on the angle of the sun's rays at a given time of day.</p>

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<p><i>Critical for Mastery at Grade 5:</i></p> <p>5.07.01 Calculate and compare length, perimeter, area and volume within the customary and metric systems. (7A)</p> <p>5.07.02 Convert U.S. customary and metric measures into smaller or larger units. (7A)</p> <p>5.07.03 Calculate and compare weight/mass within the customary and metric systems. (7A)</p> <p>5.07.04 Estimate perimeter and area of regular shapes. (7B)</p> <p>5.07.05 Develop and use formulas to determine the areas of squares, rectangles, and right triangles. (7C)</p>	<p>Measure the length and width of a classroom (or other room) and determine the perimeter and area of the room using customary and metric measures.</p> <p>Using the information in #1 above, convert the perimeter into larger or smaller units.</p> <p>Convert “Earth weight” in pounds and kilograms to weight on other planets, given the gravitational pull of the planets.</p> <p>Use candy bar wrappers to estimate perimeter and area.</p> <p>Use grid paper to construct a model of a rectangle. Verify its perimeter and area by counting units. Demonstrate how cutting a diagonal line across the rectangle derives the area of a right triangle. Write this as a formula and use it to find the perimeter and area of a rectangle with different dimensions.</p>	<p>Connect to technology: Using the data compiled by all class members, create a computer spreadsheet to verify the calculations.</p> <p>Connect to technology: Expand the spreadsheet (see #1) to convert the calculations into larger or smaller units.</p> <p>Connect to science: Use data in connection to science topics related to the study of the planets.</p> <p>Connect to values and religion: Share the candy from the project with a lower grade class and teach them the concept of $\frac{1}{2}$.</p>

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<p>5.07.06 Interpret scale on a map or drawing using a constant ratio and use it to formulate and answers questions about the actual measurement. (7C)</p> <p><i>Significant to Develop at Grade 5:</i></p> <p>5.07.07 Classify and draw angles of any given measure using a protractor or angle ruler. (7A)</p> <p>5.07.08 Develop and discuss strategies for determining area and perimeter of irregular shapes. (7C)</p> <p>5.07.09 Use appropriate tools to measure, draw or construct figures. (7C)</p>	<p>Using a map in a social studies textbook, determine the distance between several points. Write and answer questions related to the distances.</p> <p>Using a standard analog clock, give examples of times of the day in which the clock hands form acute, right, obtuse, and straight angles. Measure the angles on the clock using a protractor or angle ruler. Justify your classification of angle type.</p> <p>Use paper models to cut irregular shapes into rectangles, squares and triangles. Determine how these smaller individual shapes could be used to compute the area/perimeter of the larger shape. Explain your reasoning.</p> <p>Given various examples of lines, shapes, objects, and angles, determine what tool should be used to measure or reproduce it.</p>	<p>Connect to social studies: Use the candy bar wrapper (see #4) as a “scale” to measure distances on a map.</p> <p>Connect to art/religion: Using a protractor or angle ruler, construct and color geometric shapes (Ex. five-point star). Make cards to send to homebound parishioners.</p> <p>Connect to art: Projects related to geometric constructions.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p><i>Useful to Work On at Grade 5:</i></p> <p>5.07.10 Explain that all measurements are approximations, but that precision is affected by choice of units. (7B)</p>	<p>Use the appropriate tool(s) to measure.</p> <p>Measure an object starting with a large unit of measure (Ex. meter) and progressing to smaller units. Determine which measurement is more precise. Answer the question, “If we keep using smaller units, will we continue to be more precise?” Give examples of when precise measurement is very important and when it is less important.</p>	<p>Connect to science experiments in which precise measurement is necessary. Connect to language arts: Write a story in which precision of measurement is important.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p><i>Critical for Mastery at Grade 6:</i></p> <p>6.07.01 Estimate distance, weight, temperature and elapsed time using reasonable units and with acceptable levels of accuracy. (7B)</p> <p>6.07.02 Select and justify an appropriate formula to find the area of triangles, parallelograms, and trapezoids. (7C)</p> <p>6.07.03 Develop and use formulas for determining the areas of triangles, parallelograms, and trapezoids. (7C)</p>	<p>With a partner, write a word problem in which estimation of distance, weight, elapsed time, and/or temperature are key elements. Solve the problem and present it to the class.</p> <p>Draw a triangle that is not a right triangle. Represent the height with a series of dashes from the vertex to the longest side. Enclose the triangle in a rectangle and cut out the three pieces. Form two congruent triangles. Determine that the area of one triangle is one half of the larger rectangle. Write the formula and test the formula on a similar figure.</p> <p>Write the formula determined in #2 above. Test the formula on a similar figure. Solve problems involving area using the appropriate formulas. Explain why the formula you chose works. Write out the formulas for determining the area of each shape.</p>	<p>Connect to language arts: Oral presentation (discuss how accuracy in human relations' problems differs from accuracy in math problems). Share your solution with the class.</p> <p>Connect to science: Examine geological features in diagrams and photos to discover whether these shapes appear naturally in rock formations.</p> <p>Connect to social studies by finding the areas of parts of flags from different countries.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p>6.07.04 Develop and use the formula for determining the volume of rectangular and triangular prisms. (7C)</p>	<p>Use a shoebox or similar rectangular prism. Measure its dimensions and use the information to determine its volume. Write the formula.</p>	<p>Connect to science: Determine the volume of various triangular prisms and correlate the volume with the size of the spectrum each creates as light passes through.</p>
<p>6.07.05 Develop and use the formula for determining the circumference and area of a circle. (7C)</p>	<p>Cut a length of string to represent the circumference and the diameter of a circular object. Compare the lengths and explain how they relate to the mathematical approximation for pi. Use the formula to determine the area and circumference for a circle of a different size.</p>	<p>Connect to religion/art: Construct a circle with a six inch diameter. In a spiral fashion, write the ways in which God's love for us never ends (e.g., He gave us Jesus, our parents, friends).</p>
<p>6.07.06 Measure with a greater degree of accuracy, any angle using a protractor or angle ruler. (7A)</p>	<p>Make an adjustable angle with cardboard strips and brass fasteners. Demonstrate angles that are right, acute, and obtuse. Measure them using a protractor or angle ruler.</p> <p>Have a scavenger hunt in the classroom for right, acute, and obtuse angles.</p>	<p>Connect to science: Design an experiment to measure the amount of heat absorbed by a paved surface at different times of the day. Discuss how the angle of the sun hitting the surface affects the results.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p>6.07.07 Read and interpret scale on a map or scale drawing and use it to answer questions about actual measurement. (7C)</p> <p><i>Useful to Work On at Grade 6:</i></p> <p>6.07.08 Investigate the history of the U.S. customary and metric systems of measurement. (7A)</p> <p>6.07.09 Select an appropriate formula or strategy to find the surface area and volume of rectangular and triangular prisms. (7C)</p>	<p>Design a “Classroom of your Dreams” on grid paper. Convert the grid scale to a larger measurement for your final drawing. Use proportions to derive the scale measurements.</p> <p>Locate two sources on the Internet to research the topic.</p> <p>Fold two 8.5x11” papers into fourths. Cut a square from the open corner (not on the fold lines). Crease the papers to form a box and lid. Work with a partner to find the area of each face. Decide what strategy could be used to find the total surface area.</p>	<p>Connect to language arts: Write a proposal to the principal justifying the need to build your classroom; Connect to technology: Given prices, (e.g., building costs, materials, equipment) use a spreadsheet to find the cost of building your classroom. Connect to social studies: Construct a scale model of a Roman building.</p> <p>Connect to technology: Make a master list of websites used by the class and distribute the list to the teachers for future reference.</p> <p>Connect to religion/art. Construct a triangular prism using tagboard. On the rectangular faces, write “Father, Son, and Holy Spirit”, and put words and symbols for each person of the Trinity (e.g., Creator, Redeemer, Guide). Share the projects with a lower grade class studying the Trinity.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
6.07.10 Calculate the surface area of a cube, rectangular prism, and triangular prism. (7C)	Calculate the surface area of the box/lid in #8 above.	Connect to science: Create a cube, rectangular or triangular prism with water soluble material and compare the rate of solubility with surface area.

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Learning Standard/Outcome	Sample Assessment	Connections
<p><i>Critical for Mastery at Grade 7:</i></p> <p>7.07.01 Select and justify the choice of either U.S. customary or metric systems of measurement according to the situation (e.g., measure fabric in yards, measure dry chemicals in grams). (7A)</p> <p>7.07.02 Estimate angle measure, area, and volume using reasonable units and with acceptable levels of accuracy. (7B)</p> <p>7.07.03 Determine and describe acceptable levels of accuracy in estimation situations. (7B)</p>	<p>Given a list of real life measurement applications (e.g., building a cabinet, using a recipe, measuring dry chemicals for an experiment) choose customary or metric units. Name the unit to be used (e.g., inch, cup, grams) and tell why it is appropriate for the particular application.</p> <p>Create a “mental protractor” using a clock face on which each minute represents six degrees. Estimate and record the angles for given times of the day. Create a “mental ruler” based on the length of a sheet of loose-leaf paper (approximately one foot). Estimate the measures of two and three-dimensional figures.</p> <p>Check the accuracy of the obtained measures (see #2 above) using a protractor and ruler to determine acceptable levels.</p>	<p>Connect to science: Based on the topic of a science experiment, choose customary or metric measures and justify your choice.</p> <p>Connect to science/technology: Research how ancient mariners used a sextant to determine location based on the angles of the stars. Connect to religion: Construct a pie graph of the Church’s liturgical year.</p> <p>Connect to science: On an inclined plane, use matchbox cars to estimate distances traveled. Measure the actual distances to determine the accuracy of the estimates.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p>7.07.04 Select an appropriate formula to determine the circumferences and the area of circles. (7C)</p> <p>7.07.05 Solve simple problems involving rate, time, and distance. (7C)</p> <p>7.07.06 Select and use appropriate units and tools to measure volume, surface area, and mass/weight accurately for a given situation. (7C)</p>	<p>List terms that are specific to circles (e.g., circumference, diameter, radius, pi). Given a list of formulas to compute the perimeter or area of various geometric shapes, eliminate those that do not include pi (or other terms specific to circles) as part of the formula. Select the appropriate formula based on the relationship of pi to diameter.</p> <p>Write and solve word problems related to the formula, “distance is equal to rate multiplied by time”, such as, “I traveled 55 mph on a trip which lasted 4 ½ hours. How far did I drive?”</p> <p>Use a shoebox or other rectangular prism and appropriate tools (e.g., ruler or meter stick, scale) to measure the volume, surface area, and weight of the prism. Record the measurements.</p>	<p>Connect to physical education/health: Draw a model of a circular racetrack with a specified diameter (e.g., two miles). Using the correct formula, determine the distance a jogger must run to complete the distance around the track. Given the number of calories burned per minute of jogging, calculate the total number of calories burned for a specified length of time.</p> <p>Connect to social studies: On a map, find a city you would like to visit and to which your family could drive. Based on its distance and a given rate of speed, calculate the driving time.</p> <p>Connect to science: Measure the volume of irregularly shaped objects by using a graduated cylinder. Compare units used for measuring solid objects (e.g., shoebox or rectangular prism) with those used for measuring liquids and/or irregularly shaped objects.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p>7.07.07 Determine the volume of a sphere. (7C)</p> <p>7.07.08 Develop and describe surface area and volume formulas for cones and cylinders by relating pyramids to cones and prisms to cylinders. (7C)</p> <p><i>Significant to Develop at Grade 7:</i></p> <p>7.07.09 Select and explain an appropriate formula or strategy to find the surface area and volume of rectangular and triangular pyramids. (7C)</p>	<p>Using the formula for the volume of a sphere, compute the volumes of various spheres accurately in cubic units.</p> <p>Refer to the assessment regarding computing the volume of rectangular and triangular prisms (#9). Adapt this assessment by constructing the related figures and developing/describing formulas for surface area and volume.</p> <p>Using grid paper and patterns, cut out a square prism (with one open side) and a triangular pyramid having the same base measurement. Tape the sides together on each. Using sand, fill the pyramid and pour the contents into the cube until it is filled. Based on the formula for the volume of a cube, derive a formula for the volume of the pyramid. Using another set of patterns, cut apart the faces of each figure to determine a strategy for finding the surface area</p>	<p>Connect to science/technology: Find information on the Buckminsterfullerene molecule, one of the tiniest spheres with great potential. Use a tall cylinder of marbles to represent these molecules.</p> <p>Connect to science: Construct a variety of tagboard cones and cylinders. Compare and contrast their surface areas and volumes.</p> <p>Connect to social studies: Find the area of the base of the Great Pyramid and/or compute its surface area.</p> <p>Connect to social studies: Research ancient pyramidal structures of past civilizations citing location, function, and size. Chart obtained information.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p>7.07.10 Solve problems involving mixed units of the same attribute including time, money, length, and area. (7C)</p> <p>7.07.11 Develop and discuss strategies to find the area of combined shapes. (7C)</p> <p><i>Useful to Work On at Grade 7:</i></p> <p>7.07.12 Make simple measurements to determine indirect measures (e.g., determining the height of a flagpole using its shadow and similar right triangles). (7A)</p>	<p>of each solid.</p> <p>Align numbers with like units. Convert units to add or subtract. Simplify the sum or difference using unit conversions.</p> <p>Discuss strategies for finding the area of various tangram pieces individually. Use this information to determine the area of a figure which combines a number of tangrams. Construct a different figure and describe how the area could be computed.</p> <p>Sketch two objects and their shadows (e.g., a tree with an 18-foot shadow and a 3-foot pole with a 6-foot shadow). Determine the height of the tree using a proportion.</p>	<p>Connect to science: Study a time line of geologic history, noting the various divisions of time and when major evolutionary events occurred; Construct a scale showing the distances (lengths) between the planets in the solar system.</p> <p>Connect to technology: Investigate how a surveyor uses a range pole tripod to calculate measurements used in his/her profession.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p>7.07.13 Explore and explain derived measurements (e.g., velocity and density). (7C)</p>	<p>Use a balance to measure the mass of a pencil in grams. Submerge the pencil in a graduated cylinder filled with 90 ml of water to determine its volume. Calculate the pencil's density by dividing its mass by its volume.</p>	<p>Connect to science: Compare and contrast densities of selected elements on the periodic table. Graph these densities.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p><i>Critical for Mastery at Grade 8:</i></p> <p>8.07.01 Measure any quantity to the greatest degree of accuracy determined by the tool. (7B)</p> <p>8.07.02 Solve problems involving scale drawings, models, maps, or blueprints. (7C)</p> <p>8.07.03 Solve problems involving time, temperature, mass, speed, distance, density, and monetary values. (7C)</p>	<p>Using a ruler, protractor, or scale, measure to the nearest sixteenth of an inch, nearest millimeter, nearest degree, or nearest ounce/gram.</p> <p>Using a specified scale (Ex. $\frac{1}{2}'' = 5 \text{ ft.}$), a photo of an <i>Apollo</i> command module and its actual height, create a scale drawing of the ship.</p> <p>Write and solve word problems which involve calculations related to time, temperature, mass, speed, density, or monetary values. Use the correct formulas where applicable.</p>	<p>Connect to social studies/technology: Research types of measurements used by ancient civilizations (e.g., Greeks, Romans) or Native American groups. Share your findings. Discuss possible ways the types of measures impacted the civilizations.</p> <p>Connect to real life problem solving: View <i>Apollo 13</i>, an actual event which involved courageous problem solving.</p> <p>Connect to physical education/health: Research the winning times and speeds for a track event of your choice for the past five summer Olympics.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p>8.07.04 Solve simple scale conversions, contractions, and dilations (e.g., maps and diagrams). (7A)</p> <p>8.07.05 Solve simple problems involving rates and other derived measurements such as velocity and density. (7C)</p> <p>8.07.06 Determine the surface area of three-dimensional figures. (7C)</p>	<p>Demonstrate how to make a dilation (or contraction of a triangle in which the size of the dilation is twice that of the original triangle (or the size of the contraction is one half of the original figure).</p> <p>Make a hypsometer (simple sextant) to find the angle of elevation of an object that is too tall to measure</p> <p>Determine a roller coaster's acceleration by finding the change between initial and final velocity using the correct formula.</p> <p>Create diagrams to model motion problems and then derive algebraic equations and solve.</p> <p>Compute the area of each face of a three-dimensional figure and label it. Add the areas of all the faces to find the surface area.</p>	<p>Connect to social studies: Have students research the exchange rate of the dollar to the money of five other countries. Have them convert between the two monetary systems.</p> <p>Connect to science/technology: Make a bar graph of the ten fastest roller coasters in the U.S. using data obtained from the Internet.</p> <p>Connect to art: Create three-dimensional sculptures with specified surface areas.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p><i>Significant to Develop at Grade 8:</i></p> <p>8.07.07 Solve problems involving angle measurement in polygons and circles. (7C)</p> <p>8.07.08 Make simple measurements to determine indirect measures (e.g., determining the height of a flagpole using its shadow and similar right triangles). (7A)</p> <p><i>Useful to Develop at Grade 8:</i></p> <p>8.07.09 Determine the maximum error in measurements. (7B)</p>	<p>Draw a circle with a specified radius. Inscribe a polygon with a given number of sides within the circle. Measure the angles of the inscribed figure to check your work.</p> <p>Sketch two objects and their shadows (e.g., a tree with an 18-foot shadow and a 3-foot pole with a 6-foot shadow). Determine the height of the tree using a proportion.</p> <p>Using a particular tool, (e.g., ruler, meter stick, scale) establish and explain a reasonable range within which a measurement may be considered accurate (e.g., if measuring to the nearest eighth of an inch, plus or minus one sixteenth of an inch</p>	<p>Connect to religion: Using published data, (e.g., U.S. Census Bureau and Holy Childhood Association) research average income for a family of four in the U. S. and in a mission country. Construct a pie chart for each country showing percent of income for various indices (e.g., housing, food, recreation). Connect to language arts: Compare your results and give an oral presentation to the class.</p> <p>Connect to technology: Investigate how a surveyor uses a range pole tripod to calculate measurements used in his/her profession.</p> <p>Connect to science/physical education: Give examples of measurements in which error is virtually eliminated due to the precision of digitalized instruments (e.g., Olympic races, NASCAR races, horse races).</p>

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8.07.10 Determine derived measurement. (7C)	may be acceptable). Make a list of derived measurements (e.g., area, velocity, density) and the measurements from which they are derived (e.g., length, width). Write and solve a word problem related to each derived measure.	

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<p><i>Critical for Mastery in Algebra I:</i></p> <p>9.07.01 Select units and scales that are appropriate for problem situations involving measurement. (7A)</p> <p>9.07.02 Check measurement computations using unit analysis. (7C)</p> <p>9.07.03 Solve problems involving multiple rates, measures, and conversions. (7C)</p>	<p>Demonstrate knowledge of measurable attributes and appropriate units and scales in the U.S. customary and metric systems for such measurements (e.g., linear units, square units, cubic units). Give examples of situations in which each type of measure would be appropriate.</p> <p>Solve and check computations involving measurements using unit analysis (At 55 mph, how many miles could someone travel in 6.5 hours?)</p> <p>Using the formula for simple interest, find the difference in the cost of financing a car at two different rates for three years or for five years.</p>	<p>Connect to science: Research and list measurements that are related to specific topics (e.g., power is measured in watts; energy is measured in joules). Connect to religion: The Bible uses an ancient measure, the “cubit”. Convert the dimensions of Noah’s ark from cubits to inches to feet.</p> <p>Connect to social studies/driver’s education: Using established data, compare the legal maximum speed limits in the fifty states. Make a line plot of the data.</p> <p>Connect to business/finance: Compare and contrast the change in interest rates over the past ten years as it affects a car loan.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p><i>Significant to Develop in Algebra I:</i></p> <p>9.07.04 Convert between the U.S. customary and metric systems using the conversion factor. (7A)</p> <p>9.07.05 Solve problems using indirect measurement by choosing appropriate technology, instruments, and/or formulas. (7C)</p> <p><i>Useful to Develop in Algebra I:</i></p> <p>9.07.06 Determine answers to an appropriate degree of accuracy using significant digits. (7B)</p>	<p>Using established conversion factors (e.g., to change miles to kilometers, multiply by 1.6093), write and solve problems such as, “The distance from City A to City B is 563 miles. Convert this to kilometers and round to the nearest tenth, if necessary.”</p> <p>Use the Pythagorean theorem to calculate the measure of the third side of a right triangle, given the measures of the other two sides. Depending on the complexity of the measures, demonstrate the key sequence on a calculator.</p> <p>Using the guidelines for determining the number of significant digits in each addend of a problem, find the sum and round it to the appropriate number of significant digits.</p>	<p>Connect to social studies and science; Research the <i>Le Systeme Internaionale (SI)</i>, an improved version of the metric system derived circa 1960, and explain how to convert an astronomical unit (AU) from meters to kilometers.</p> <p>Connect to architecture: Find examples of how and why triangles are frequently used in building design and construction. Research the use of the golden ratio in art.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p><i>Significant to Develop at Grade 10:</i></p> <p>10.10.01 Determine geometric probability based on area. (10C)</p> <p><i>Useful to Work On at Grade 10:</i></p> <p>10.10.02 Discuss situations where permutations and combinations should be used in counting outcomes. (10C)</p>	<p>Calculate the probability for regional area.</p> <p>Look at the number of ways points can divide lines. Look at the number of ways lines can divide the plane. Look at the most number of regions that can be determined from the least number of lines. What can you predict from these outcomes?</p>	<p>Connect to values: Discuss how statistics can be used to persuade people to make decisions that are counter to Christian beliefs and values.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p><i>Critical for Mastery in Algebra 2/Trigonometry:</i></p> <p>11.07.01 Convert angle measures between degrees and radians. (7A)</p> <p>11.07.02 Analyze precision, accuracy, and appropriate error in measurement situations. (7B)</p> <p>11.07.03 Determine a reasonable estimate of measure for more complex problem situations. (7B)</p>	<p>Given a circle divided into fractional sectors, use a proportion to convert the angle measures of the sectors into degrees and into radians. (Ex., What is the measure of the angle of a sector that is one-fifth of a circle?) (1) $1/5 \times 360^\circ = 72^\circ$ (2) $1/5 \times 2(\pi) = 2(\pi)/5$ radians).</p> <p>Explain the difference between precision and accuracy in mathematical terms. Use these terms to explain the possible errors made when measuring an object with a ruler only marked with non-fractional units.</p> <p>If a gas pump measures fuel to the nearest tenth of a gallon and an odometer measures distance to the nearest tenth of a mile, what is your estimate of the most accurate gas mileage you might calculate? Justify your estimate by performing the appropriate calculations.</p>	<p>Connect to science/geography: Using two imaginary rays from the center of the Earth to two locations on its surface, use degrees of latitude, conversion of angles into radians, and the given radius from the Earth's center to the surface to find the distance between the two locations.</p> <p>Connect to science/technology: Research the accuracy of quartz timepieces. Compare this accuracy to that of an atomic clock. List some of the variables that affect quartz timepieces that do not affect atomic clocks.</p> <p>Connect to real life application: Use your estimate and current gas prices to calculate the cost of driving from Chicago, Illinois to Miami, Florida.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p><i>Significant to Develop in Algebra 2/Trig:</i></p> <p>11.07.04 Solve problems to a desired interval of accuracy. (7B)</p> <p>11.07.05 Solve practical problems using non-linear scales. (7C)</p>	<p>Using the formula for pressure, compute the pressure of various tires to the nearest atmosphere (atm).</p> <p>The growth rate of a particular species is 0.05 per year. How many years will it take before the population doubles its size?</p>	<p>Connect to physics: Create a table showing how accurate a barometer would need to be to provide an accurate reading to one meter, for buildings of various heights.</p> <p>Connect to technology and economics: Research how a community uses patterns to predict population growth and plan for future needs of the community.</p>

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Learning Standard/Outcome	Sample Assessment	Connections
<p><i>Critical for Mastery in Pre-Calculus:</i></p> <p>12.07.01 Set up and solve measurement conversions using multiple rates and conversion factors. (7A)</p> <p>12.07.02 Estimate the magnitude and directions of physical quantities (e.g., velocity, force, slope). (7B)</p> <p><i>Significant to Develop in Pre-Calculus:</i></p> <p>12.07.03 Apply informal concepts of successive approximation, upper and lower bounds, and limit in measurement situations. (7B)</p>	<p>A truck has a wheel measuring a 36” diameter. If the wheels are rotating at 630 rpm, find the truck’s speed in miles per hour.</p> <p>Viewing graphs of lines, state whether the slope is positive, negative, zero, or undefined. Mentally calculate the slope by counting the rise and run rather than drawing right triangles.</p> <p>If the area of a graphic region is bounded by the x-axis, the line $x=10$, and the graph of the equation $y=x^2$, approximate the area of the region using “bars” one unit wide.</p>	<p>Connect to science: Using a balloon that is partially inflated and placed near a heat source, record the temperature and the balloon’s size at various times (e.g., twenty minute intervals). Record your observations in U.S. customary and metric units.</p> <p>Connect to science: Investigate how Bernoulli’s Principle regarding velocity and properties of fluids applies to the ability of an airplane to rise into the air.</p> <p>Connect to business: Given the cost of a vehicle and the amount and number of monthly payments, use Newton’s method of successive approximations to find the monthly interest rate (accurate to five decimal places).</p>