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| **GRADE: 7th** | | |
| **Unit Title:**  **Lesson Title: Measurement/Conversion**  **Estimated Duration: 1-2 days** | | **Real-World Purpose:**  **Measurements are importance and they are an essential element in our lives. There are three areas of measurements: weight, area, volume, length and even temperature. Measure is used for prescribing the correct dosage of medicines, when preparing foods, building structures, calculating distance, and many common tasks we take for granted.** |
| **Standard(s):**  **7.RP.1**  **Compute unit rates associated with ratios of fractions, including ratios of lengths, areas and other quantities measured in like or different unit.**  **I can:**  **Discuss the importance of accurate measurements; recall how units of measurements have been calculated throughout history; and use his or her own feet as a standard measurement and then measure and compare distances.** | | |
| **Performance Objective: (Evidence of Learning)**  **TSW be able to master task with at least 75 % accuracy:**   * **Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.** * **Students select and use tool to measure.** * **Students will solve problems involving measurement and the conversion of measurements from a smaller unit to a larger unit** * **Students will specify units of measure and state the meaning of the symbols they choose.** | | |
| **Prerequisite Skills:**  **The students should have a basic understanding that measurement of weight, liquid and distance are in different units. The metric system uses grams for weight (mass), meters for distance (length), and liters for liquids (capacity).**  **The students should have a basic understanding of multi-step word problems that require a variety of operations within one word problem.**  **The students should have the understanding that if a decimal is not present, it is understood to be at the right end of the ones digit in the number.**  **The students should have an understanding that within the base 10 place value , the value of a digit to the right is the size, and the value of a digit to the left is ten times the value.**  **The students should be able to multiply and divide by powers of 10.** | | |
| **Materials/Resources:**   * **Rulers or tape measures, one for every student** * **Quarters, one for every student** * **Paper and pencil, one for every student** | | * **Model how to use the words in discussion** * **Read and discuss the meaning of words in a mathematical context** * **Create pictures/symbols to represent words** * **Write/discuss using the words**   **Key Vocabulary:**  **Distance**  **Definition: the length of the space between two points**  **Context: The distance between Los Angeles, California, and Tokyo, Japan, is 5,478 miles, or 8,815 kilometers.**  **metric system**  **Definition: a decimal system of units based on the meter as a unit length**  **Context: Most countries use the metric system.**  **foot**  **Definition: a unit of length equal to 12 inches**  **Context: Although the standard length of a foot is 12 inches, it has ranged throughout history between 10 and 27 inches.**  **Introduce words with student-friendly definitions and pictures** |
| **Elements of Rigor:**   * **Conceptual understanding of key concepts** * **Procedural skill and fluency** * **Rigorous application of mathematics in real-world contexts**   **Students access their prior knowledge of the skill of measurement and they would have an opportunity to build on that knowledge to construct a new understanding of the meaning of measurement and how it can be used in daily life**   * **To measure something according to a particular attribute means you compare the object to a unit and determine how many units are needed to have the same amount as the object** * **Measurements are estimates.** * **When reporting a measurement, you must always indicate the unit you are using.** | | |
| **Lesson Introduction** | | |
| **How will you introduce the lesson?** Standardized Units of Measure: Who Needs Them? **People use units of measure so frequently in daily life that they hardly think about what they are doing. A motorist goes to the gas station and pumps 13 gallons (a measure of volume) into an automobile. To pay for the gas, the motorist uses dollars—another unit of measure, economic rather than scientific—in the form of paper money, a debit card, or a credit card.**  **Student Exploration Activity**  **TSW look up car advertisements and determine what car is more feasible to drive based on miles and gallons of gas needed to get to a location. They need to understand how much gas is in a gallon and how far they will need to travel.**  **TSW compare units of measurements.**  **Read more:** [**http://www.scienceclarified.com/everyday/Real-Life-Chemistry-Vol-1/Measurement-Real-life-applications.html#ixzz4k4xPgeEF**](http://www.scienceclarified.com/everyday/Real-Life-Chemistry-Vol-1/Measurement-Real-life-applications.html#ixzz4k4xPgeEF) | | |
| **Lesson Activities** | | |
| **Day one**  **1. TSW determine the distances between the places listed below. You can use** [**MapQuest**](http://www.mapquest.com/directions) **for those in the U.S. and the** [**Distance Calculator**](http://www.indo.com/cgi-bin/dist) **for international distances.**  **· Distance between your school and the closest shopping mall**  **· Distance between your school and a school in another town in your state**  **· Distance between your town and a large city elsewhere the United States.**  **· Distance between your town and Paris, France, or any other foreign city**  **2. Watch *Measure for Measure: Lengths and Heights*, and point out that the narrator says, "Measurement rules our lives. It has sliced up our world and helped us impose order and logic on our restless universe." Ask students what they think this means. Ask what a world with no measurements would be like. Then have students discuss how people featured in the program (below) used measurements.**  **· Sailors calculate positions of stars and the accurate time to determine longitude and latitude at sea.**  **· Scientists measure the wavelengths, speeds, and heights of tsunamis, as well as a deep-sea gauge measuring underwater pressure to detect incoming tsunamis.**  **· The rower measured his heart rate.**  **3. Ask students why accurate measurements were so important to these people. (Sailors *needed to know the time to determine longitude or they could be off course by hundreds of miles. Accurate measurements allow scientists to predict tsunamis and give warnings. The rower must know how well his heart is pumping blood.* )**  **4. The video segment "Going the Distance" reviewed the history of measurements and noted that different countries once used their own measurement systems. How have units of length been determined? (People *used the length of their own foot, hand, fingertip, pace, or the distance from the elbow and fingertip. In England, the distance from the ruling monarch's nose to fingertip was one yard and three barleycorns made up one inch.* ) What was the problem with using the human body or natural products as a standard of measurement? (They *always differ.*) Who first called for standard measurements, and why? (Traders *needed to know how much they were buying or selling.*)**  **5. The foot has long been a unit of measurement, but it has ranged between 10 and 27 inches. Explain to students that in this activity, they will use their own feet as a unit of measurement and then measure and compare distances.**  **6. Have students work with a partner to measure the length of their feet without shoes. Have them record this measurement in standard inches.**  **Length of my foot in standard inches: \_\_\_\_\_\_\_\_\_\_\_\_\_**  **7. Using their personal unit measurement, have students determine the length of a personal non-standard inch. They should divide the length of their foot by 12. (Example: If a student's foot measures 8 inches, a non-standard inch would be 8 divided by 12 = .6.) Students may round their answer to the nearest eighth (class/record information on table).**  **Day two**  **Length of my personal inch in standard inches: \_\_\_\_\_\_\_\_\_\_\_\_\_**  **8. Have students draw two squares with four-inch sides, one using standard inches, the other using personal inches. (Using the example above, the second square would have 2.5-inch sides.)**  **9. Have students attach their personal squares to the board. Discuss the consequences of countries using non-standard measurements. For example, what if one country supplied parts for a machine to be produced in another country?**  **10. Now students will consider their personal units of measurement on a larger scale. How many personal feet would go into a mile? (5,280 standard feet = one mile) When comparing feet to miles, the numbers are very large, so it will be easier to compare standard miles and new miles using a ratio. First, determine the ratio of the standard foot to a personal foot. For example, 12 inches to 8 inches is 12: 8, or 1.5. In other words, a standard foot is 1.5 times larger than the new foot. Since ratios are constant, you can also say that a standard mile is 1.5 times longer than a personal mile. That means a distance of 100 standard miles would measure 150 personal miles. (They will multiply the distance times 1.5: 100 X 1.5 = 150))**  **11. Give students a chart to show distances between your school or town and different locations. Then have them use the ratio to determine the distances with their personal measurement system. For example, your chart might look like this:**     |  |  |  | | --- | --- | --- | | **Distance** | **Standard Miles** | **Personal Miles** | | **from school to mall** | **5 miles** | **7.5 miles** | | **from Charlotte, North Carolina, to Asheville, North Carolina** | **130 miles** | **195 miles** | | **from Charlotte to New York, New York** | **630 miles** | **945 miles** | | **from Charlotte to Paris, France** | **4,165 miles** | **6,247.5 miles** |   **12. Have students share some of the distances they determined. Then discuss the consequences of using non-standard units of measurement. Pose these questions to the class: What would happen if you gave directions to the mall using personal miles? What if a pilot used personal miles to calculate the distance on an international flight to Paris? Why are standard measurements so important? Ask students to share other examples of why accurate measurements are critical.** | | |
| **Lesson Closure** | | |
| **Exit ticket**  **TSW explain the process of how they converted units.** | | **Essential Questions:**  **How do we measure items?**  **What forms of measurement do we often use to measure items?**  **What are some units in the metric system?**  **What are some items we measure using these metric units?**  **What does conversion mean?**  **Why might conversion be necessary?**  **When might you need to convert units of measure?**  **Where have you seen these basic units of measure in the grocery store?**  **How are these units abbreviated? Why?** |
| **Standards for Mathematical Practice** (select all that apply) | | |
| * **Make sense of problems and persevere in solving them.** * **Reason abstractly and quantitatively.** * **Construct viable arguments and critique the reasoning of others.** * **Model with mathematics.** * **Use appropriate tools strategically.** * **Attend to precision.** * **Look for and make use of structure.**          * **Look for and express regularity in repeated reasoning.** | | |
| **Supplemental Activities** | | |
| **Intervention**  **The following may help students remember the metric chart “King Hector Died Monday; Don’t Call Me,” or “King Henry Died Monday Drinking Chocolate Milk”. Liters or grams can be used as base units. Provide the student with a chart of equivalent measures. Show students how to use cancellation to find answers. Example: Convert 5 gal. to quarts. 5 gal • = 5 x 4 qt = 20 qt**   * **online video lesson on conversions** * **create a storybook on conversion** * **bring in objects for hands-on and visual learners** | | **Enrichment (home)**  **Chocolate Chewies Recipe**  **Using addition, subtraction, multiplication, and division solve the following problems to create a usable recipe for chocolate chewies.**  **Try not to use a calculator. Show your work.**  **Be sure that the number in the last column is the most efficient measurement to use.**  **192 / 24 = \_\_\_\_ Tbsp. = \_\_\_\_ c. milk**  **32 + 16 = \_\_\_\_ tsp. = \_\_\_\_ c. sugar**  **288 / 48 = \_\_\_\_ tsp. = \_\_\_\_ Tbsp. Butter**  **Be sure that the number in the last column is the directions:**  **1. In a saucepan, boil milk, sugar, and butter for 3 minutes or cook for 5 minutes in the microwave.**  **2. Remove from heat and add…**  **120 / 2.5 = \_\_\_\_ T. = \_\_\_\_ c. cooking oats**  **376 - 361= \_\_\_\_ t. = \_\_\_\_ Tbsp. cocoa**  **25 x .04 = \_\_\_\_ t. = \_\_\_\_ tsp. vanilla**  **Directions Continued:**  **3. Make into balls. Optional: For part of the oats substitute coconut, mini marshmallows, or rice krispies.**  **4. While the cookies are cooling wash and dry all the dishes, and clean your kitchen area.**  **Chocolate Chewies Recipe KEY**  **Using addition, subtraction, multiplication, and division solve the following problems to create a usable recipe for chocolate chewies.**  **Try not to use a calculator. Show your work.**  **25 x .04 = 1 t. = 1 tsp. vanilla**  **t efficient measurement to use.**  **192 / 24 = 8 Tbsp. = 1/2 c. milk**  **32 + 16 = 48 tsp. = 1 c. sugar**  **288 / 48 = 6 tsp. = 2 Tbsp. Butter**  **Directions:**  **1. In a saucepan, boil milk, sugar, and butter for 3 minutes or cook for 5 minutes in the microwave.**  **2. Remove from heat and add…**  **120 / 2.5 = 48 T. = 3 c. cooking oats**  **376 - 361= 15 t. = 5 Tbsp. cocoa**  **Directions Continued:**  **3. Make into balls. Optional: For part of the oats substitute coconut, mini marshmallows, or rice krispies.**  **4. While the cookies are cooling wash and dry all the dishes, and clean your kitchen area.**  **Author:**  [**Shelli Barnum**](http://my.uen.org/218941)  [**Nikki Sue Larkin**](http://my.uen.org/217212)  [**Laura Schiers**](http://my.uen.org/97845)  [**TRACY ANDERSON**](http://my.uen.org/4501)  [**Jeffrey Harrah**](http://my.uen.org/210108)  [**mary ann lindsey**](http://my.uen.org/218510) |
| **Performance Based Assessment Task** | | |
| **Math Task**  Solving word problems using conversion with 75% mastery  [**https://www.khanacademy.org/math/cc-fifth-grade-math/cc-5th-measurement-topic/cc-5th-unit-word-problems/e/converting-units-word-problems--us-customary-**](https://www.khanacademy.org/math/cc-fifth-grade-math/cc-5th-measurement-topic/cc-5th-unit-word-problems/e/converting-units-word-problems--us-customary-) | **Rubric/ Plausible Student Response(s)** | |