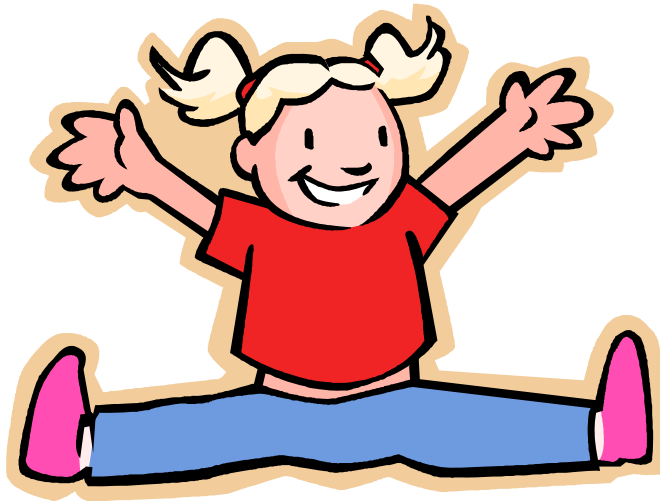


The Science of Metric Measurements

Metric Madness



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Objective

To apply the skills of estimation and metric measurement in an engaging format. Students rotate from station to station and test their metric measuring skills.

Materials

Calculator, timer, paper plates, tape, crayons, container, sponge, plastic tubs, water, meter sticks/tape measures, masking tape, milliliter and liter containers, funnel, balance scale with gram cubes, kilogram scale, large can of vegetables or milk carton full of beans or other objects.

Classroom Management

Students should work in teams of four, with each student carrying out a specific role, such as materials manager, maintenance director, recorder/reporter or principal investigator. Students may rotate jobs at each station, share responsibilities, or keep the same role throughout the entire investigation. All students should assist each other, as needed.

Engage

How well can we estimate and use metric measurements?

Explore

1. This lesson is well suited as a culminating activity, to be conducted at the end of a unit on metric measurement. Or, the lesson can be used as an awareness builder to begin to develop students' measurement skills.
2. Before the investigation begins, set up six stations around the room. Each station will have a different activity. Supply instruction cards and necessary materials at each station, and provide each team with the Metrically Marvelous Madness worksheet. (Blackline Masters are provided at the end of this lesson description).
3. This is a team activity and students must come to consensus on their estimates for each activity.
4. As each team completes one station, it will trade places with another team. This process will take some time and patience, but the exploration is worth the effort.

Explain

5. When all teams have completed all six stations, they should complete the data analysis worksheet and calculate the total difference estimate and actual measurement. The team with the smallest total difference should be declared the "Metrically Marvelous Winner." Almost any award will do, whether a badge, pencil or food treat. It is advised to give something to the entire group.
6. Post-activity class discussion may begin with the following questions.
 - Why did the winning team have the smallest number?
 - At which station was it most difficult to use your estimation skills? At which station was it easiest? Why?
 - Was teamwork helpful?

Elaborate

7. Where have you seen metric measurements used? In those cases, why do you think metric measurements were used instead of US customary units or standard measures? Answers can include: at the Olympics and on maps, beverage bottles, road signs, food packages, etc.

Evaluate

- Metric Scavenger Hunt: students are given several specific metric measurements and are instructed to find items that match the measurements as closely as possible, within a certain period of time.
- Convert a recipe from US customary units to metric measures and prepare it in class.

* Note: Check out the excitement and math talk this activity generates in the classroom.

Specific Objectives

Scientific Processes

- Using tools and materials to answer questions
- Interpreting and synthesizing results
- Communicating results
- Working in teams and collaborating
- Exploring connections into other curricular areas
- Demonstrating understanding
- Making real-world connections

Scientific Inquiry

- Plan and implement investigations.
- Collect information.
- Analyze and interpret.
- Communicate.
- Construct (tables, graphs and charts) to organize, examine and evaluate.

Critical Thinking and Problem Solving

- Analyze, review and critique.
- Draw inferences.
- Represent using models.

Tools and Technology

- Collect and analyze using tools.
- Demonstrate that repeated investigation may increase reliability.

Concepts

- Observe, describe and record changes in size, mass, color, position, quantity, time, temperature, sound and movement. (SCI.K.9, 1.1, 2.9)
- Describe properties of objects and characteristics of organisms. (SCI.K.1)
- Sort objects and events based on properties and patterns. (SCI.1.5)
- Classify and sequence organisms, objects and events based on properties and patterns. (SCI.2.3)
- Identify characteristics of living organisms. (SCI.2.1)
- Identify characteristics of non-living objects. (SCI.2.2)

Team Members _____

Metrically Marvelous Madness

Station 1: Super Squeeze (mL)

Estimate _____
Actual _____
Difference _____

Station 2: Soaring Saucers (cm)

Estimate _____
Actual _____
Difference _____

Station 3: Full Fill (L)

Estimate _____
Actual _____
Difference _____

Station 4: Walking Wild (m)

Estimate _____
Actual _____
Difference _____

Station 5: Crayon Caper (gm)

Estimate _____
Actual _____
Difference _____

Station 6: Heavy Duty (kg)

Estimate _____
Actual _____
Difference _____

Total Difference _____

Station 1: **Super Squeeze**

1. Observe a sponge soaking in a container of water.
2. As a team, agree on an estimate for the total number of mL of water contained in the sponge.
3. Squeeze the sponge into a mL container to measure the actual amount of water it contains.
4. Calculate the difference between your team's estimate and the actual amount of water in the sponge.
5. Record the results on your Metrically Marvelous Madness worksheet.

Station 2: **Soaring Saucers**

1. As a team, estimate how many centimeters the saucer (paper plate) will fly.
2. Discuss and agree upon a method for propelling and measuring the saucer's flight, considering the path the saucer will take.
3. Measure the distance of flight.
4. Calculate the difference between your team's estimate and the actual distance flown.
5. Record the results on your Metrically Marvelous Madness worksheet.

Station 3: **Full Fill**

1. As a team, agree on an estimate for the number of liters of water the plastic tub will hold.
2. Use a liter measure to fill the tub with water.
3. Calculate the difference between your team's estimate and the actual number of liters of water that fit into the tub.
4. Record the results on your Metrically Marvelous Madness worksheet.

Station 4: **Walking Wild**

1. Each member of the team should estimate the number of meters he or she can walk in five seconds. The recorder should add all the estimates together and record the group's total estimate.*
2. From the masking tape starting line, each team member should walk, not run, as far as possible in five seconds. One team member will time the walk, starting and stopping the walker. Another teammate will mark the spot where the walker stops and measure the distance walked. Repeat this process with each team member. The Recorder will record all distances walked.
3. Compare your team's estimated total distance walked with the actual total.
4. Record the estimated and actual results on your Metrically Marvelous Madness worksheet.

** For older groups, this can be an average.*

Station 5: **Crayon Caper**

1. Select a team member to serve as the “experiment subject.”
2. As a team, estimate the number of grams of crayons this individual will be able to hold in one hand.
3. Have the “experiment subject” grab as many crayons as he/she can hold in one hand.
4. Use a scale to measure the mass of crayons held?.
5. Calculate the difference between your team’s estimate and the actual number of crayons held.
6. Record the results on your Metrically Marvelous Madness worksheet.

Station 6: **Heavy Duty**

1. As a group, estimate the number of kilograms in a milk container filled with beans.
2. Use a scale to measure the weight of the container.
3. Calculate the difference between your team's estimate and the actual weight of the container.
4. Record the results on your Metrically Marvelous Madness worksheet.