Introduction to Measurement

Purpose:
To learn to measure length with a ruler; To learn about the history and procedure of measurement; To investigate the need for standards in measurement; To understand the relationship between the English and Metric systems.

Background:
There are two types of measuring systems: English and Metric. The English system is based on arbitrary measurements set hundreds of years ago. (For extra credit, look up how these measurements were determined.) The INCH is defined as the distance between the first and second joints of the index finger. The FOOT is defined as the length of the foot. The YARD is defined as the distance from the tip of the nose to the tip of the middle finger when the arm is outstretched. You will discover during the lab how the Metric system is defined.

Materials:
- Ruler (6 inch/30 cm), meter stick (showing both systems), paper, pencil, calculator and graph paper

Procedure:
WORK IN GROUPS OF THREE

1. List 5 items commonly measured in each of the following: inches, feet, yards.
   1. 
   2. 
   3. 
   4. 
   5.
2. What are some disadvantages of using the original definitions of inches, feet and yards?

3. With the ruler or the meter stick, measure the length of your finger between the first and second joints of your right hand (an 'inch'), the length of your foot (a 'foot') and the distance from the tip of your nose to the end of the middle finger on your right hand (a 'yard'). Do this for each member of your group. Record your data on your paper and on the chart on the board.

<table>
<thead>
<tr>
<th>Name</th>
<th>Length between 1st and 2nd digits of right index finger</th>
<th>Length of your right foot</th>
<th>Length between tip of nose to tip of middle finger of right hand</th>
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4. Calculate the average length of the 'inch', 'foot' and 'yard' for the group and for the whole class.

5. If you were buying material or chain by the yard, who would you want to measure it? Why?

6. Fill in the following table (look at your ruler to do this).
   a. _________ inches = 1 foot
   b. _________ feet = 1 yard
   c. _________ inches = 1 yard

7. Use the meter stick to find the number of inches in a meter. 
   1 meter = _________ inches
8. Meter sticks have units called centimeters and millimeters. What does CENTI- mean and what does MILLI- mean? State another word using each of these prefixes.

   Centi =

   Milli =

9. Look at the meter stick. Which units are millimeters and which are centimeters?

10. Which are smaller?

11. On your paper, draw a line which is 10 mm long. Just under that line draw one which is 1 cm long.

   10mm =
   1cm =

12. How do the two lines compare?

13. How many mm are in 1 cm?

14. What does DECI- mean?

15. On your paper, draw a line which is 10 cm long and just under that line draw one which is 1 dm long.

   10cm =
   1dm =

16. How do the two lines compare? How many cm are in 1 dm?

17. How many mm = 1 m?

18. How many cm = 1 m?

19. How many dm = 1 m?
20. Look at the answers above. What is the common factor (multiple) for each of these conversions?

**Additional exercises:**

Temperature, mass and volume all have English and Metric equivalent measures. Mass and volume are measures in ounces and pounds in the English system and in liters, millileters and grams in the Metric system.

**Analysis:**

1. Why do you think scientists and most of the world use the Metric system?

2. What is the base unit of the metric system for measuring:
   A. length?
   B. temperature?
   C. volume?
   D. and mass?

3. If you were in Iceland and the Icelanders are excited because the temperature is going to be 22 degrees outside, what will you wear to the beach? Explain.

4. You need a piece a special metal weighing exactly four pounds. This metal is processed in France in gram and kilogram amounts. What problems will you encounter in getting the piece of metal weighing exactly 4 pounds.