Area, Perimeter, and Volume

Intended for Grade: 3rd Grade

Subject: Math

Description: This is a folder of activities and worksheets that explores the concepts of area, perimeter, and volume. The student will develop an understanding of standard and metric systems of measurement, methods of measurement, and calculation of area, perimeter, and volume.

Objective: The student will be able to interpret the application of area, perimeter, and volume. Through the use of the equations, the students will be able to compute these measurements. They will demonstrate their acquired knowledge on numerous activities and worksheets.

State Framework addressed:
3. Develop the process of measurement and the concepts related to units of measurement.
   3.A Measure a given object to the nearest fourth of an inch.
   3.B Select, use, compare, and convert within the appropriate standard (English and metric) system of measurement.
3.C Determine the perimeter and areas (grid areas) of appropriate standard and nonstandard geometric figures.
3.D Identify the attributes of length, weight, capacity, mass, volume, time, and temperature using English and metric units of measurement.
3.E Calculate and solve problems with elapsed time.

National Standard addressed:
Math standard, Measurement

Materials:
See attached activities

Background:
n/a

Procedure:
See attached activities

Evaluation:
Correct completion of the activities and worksheets as well as hands on activities will show that the students have learned the unit.

Extended Activities:
Sources:

See attached activities

Prepared by:

Bret Morris
NSF NMGK-8
University of Mississippi
12/2/03
Two and Three Dimensions
Materials:
index cards
shapes
construction paper
tape
glue
scissors

This activity will help reinforce perimeter and area, as well as, help make the transition to volume. Choose a few shapes that you have used to help teach area and perimeter with. Copy these shapes onto index cards (one shape per card). For example shapes might include a heart, pentagon, rectangular structures, and other common shapes used in GED math books.

Have students find the area and perimeter of the shapes on the index cards.

Once students have successfully completed that, and you are ready to move onto volume, have students take the two dimensional shapes on the index cards and have them make three dimensional objects out of construction paper. This will help show the difference between area, perimeter and volume.

Classroom Math
Materials:
classroom objects
measuring tools

Make a list of objects around your classroom that you could take the perimeter, area and volume of. For example: tables, doors, chalkboards, books, chairs, notebooks, bookcases, chalk, etc. Then send students out in teams to gather the information. This would also be a wonderful exercise to graph the results from!

From: http://www.mwcc.mass.edu/HTML/DEVENSLearningCenter/pav.html
Volume Lab
Materials:
water
rice
beans
spaghetti noodles (elbows, shells, or ziti)
four equal size measuring cups
four equal size containers

This lab will have four stations. At each station you will have one measuring tool and one container. Then at one station place the box of noodles. At the next station place the bag of rice. At the next station place the bag of beans. At the last station place a jug of water. Students will work in teams and go from station to station.

When students get to a station they will predict the number of scoops it will take to fill the container with the object that is located at this station. If they are at the water station, they will predict how many scoops it will take to fill the container with water. Then test their hypothesis. Students will work their way through each station doing the same thing. Do they see a pattern? Can they form a theory about their results? And lastly what exactly is the volume of the container they are using?

*At each station it should take the same number of scoops to fill each container, no matter what the object they are scooping is.

From: http://www.mwcc.mass.edu/HTML/DEVENSTRENGTH/pav.html

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Perimeter of a Circle

What is a circle? A circle is a curved line. The circumference is the length of the circle or the distance around the circle. The diameter is the straight distance across the circle through the middle. The radius is 1/2 of the diameter or the distance from the center to the outside of the circle.

On the GED test, a formula is given to find the circumference of a circle.

It is \( c = d \). Many ask what is \( \pi \). Here is an activity to define it.

You will need string or heavy thread. Use several different circular objects to compare the diameter of each to the distance around. Objects could be margarine tub lids, tin cans, crackers, trash can lids, etc.

1. Cut the string to the distance of the diameter of the circular object.
2. Mark one place on the circular object as a starting point. Stretch the string around the object. Count the number of times it takes to go around the object. You might want to roll the circle on the desk or the floor.
3. Repeat this activity with several different circular objects. Remember to use a piece of string the length of the diameter.
4. You should discover that it always takes a little more than 3 diameters to go around the circle. Therefore, the circumference is \( \pi d \) and is about 3 1/7.

Pizza Perimeter

Discuss that pizza sizes refer to the diameter. For instance, a 12" pizza or 14" pizza means the pizza has a diameter of 12" or 14".

Ask students to bring in prices of various sizes of pizza. Have them figure out which size pizza gives the best value per circumference.

From: http://www.mwcc.mass.edu/HTML/DEVENSLEARNINGCENTER/pav.html

NSF NMGK8
<table>
<thead>
<tr>
<th>Activity</th>
<th>Date</th>
<th>Points Earned</th>
<th>What I Learned</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Marble Grab: Students estimate the number of marbles they can grab, estimate and then weigh to the nearest gram (oz.).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Sponge Squeeze: Students saturate a sponge with colored water, squeeze as much as they can into a container, estimate and measure to the nearest milliliter (oz.).</td>
<td></td>
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</tr>
<tr>
<td>3. How Big Around? Students compare metric to standard units by measuring the circumference of objects using string and rulers.</td>
<td></td>
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</tr>
<tr>
<td>4. Cotton Ball Throw: Students stand behind a line and throw a cotton ball as far as they can. Then they estimate and measure the distance in centimeters (in.).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Car Race: Students estimate and determine how far they can roll a toy car in centimeters (in.).</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Minus Meter: Students start with a paper meter and cover it with decimeter rods. They roll dice to determine how many centimeters to take away. The first person to clear their meter wins.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Footprint: Students estimate and determine the area of their own foot by counting the number of squares covered by their footprint.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Turtle Race: Students roll the dice to determine how many centimeters to add to a track. The person who completes the track first is the winner. Use a centimeter ruler to mark off distances.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>9. Are You a Square or Rectangle? Students estimate and measure their height and arm span to determine if they are a square or a rectangle.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>10. Calibrated Scale: Students will compare weights of classroom objects using a calibrated scale.</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

From: [http://westgresham.gresham.k12.or.us/jcooke/MeasCon4_5.htm](http://westgresham.gresham.k12.or.us/jcooke/MeasCon4_5.htm)
Perimeter Introduction

1. **Introduction to perimeter:** Distance around a polygon or a figure is its PERIMETER.

A regular polygon with side = a and number of sides = n is given. Perimeter = na

Octagon with side a = 2 km, number of sides n = 8. \( P = na = 8(2) = 16 \text{ km} \)

Perimeter of a square with length of a side a = 10 cm. \( P = a + a + a + a = 4a = 4(10) = 40 \text{ cm} \)

Polygons:

- Circle
- Triangle
- Parallelogram
- Trapezoid
- Rhombus
- Pentagon
- Hexagon
- Octagon

Perimeter of a rectangle with length l = 10 m and width w = 7 m. \( P = l + l + w + w = 2l + 2w = 2(10 + 7) = 34 \text{ m} \)
Perimeter or circumference (C) of a circle.

\[ r = \text{radius} \quad \text{and} \quad d = \text{diameter} \]
\[ d = 2r \]

For every circle: Circumference/Diameter = \( \pi \) and \( \pi \) is approximately = 3.14 (or) 22/7

Perimeter or circumference of a circle \( C = \pi d = 2\pi r \).

Find the circumference of a circle with radius = 8 m.

\[ \text{Circumference of a circle } C = \pi d = 2\pi r = 2 \times 3.14 \times 8 = 50.24 \text{ m} \]

Perimeter Exercise 1 (Page 1)

1. Draw the shapes (not to the scale) and calculate the perimeter:

<table>
<thead>
<tr>
<th>Rhombus with side 1 km</th>
<th>Pentagon with side 8 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Square with side 9 m</td>
<td>Rectangle 2 cm by 6 cm</td>
</tr>
<tr>
<td>Hexagon with side 5 km</td>
<td>Pentagon with side 3 m</td>
</tr>
</tbody>
</table>

From: [http://www.angelfire.com/ca5/hwforkids/1area.html](http://www.angelfire.com/ca5/hwforkids/1area.html)
Perimeter Exercise 1 (Page 2)

2. Calculate the perimeter of the following figures—Figures are not to scale:

- $a = 10$ cm, $b = 10$ cm, $c = 6$ cm, $d = 4$ cm,

- $a = 9$ cm, $b = 16$ cm, $c = 8$ cm, $d = 9$ cm,

- $a = 12.3$ km, $c = 16.6$ km, $b = 9$ km, $d = 5$ km

- $a = 12.5$ m, $b = 16.3$ m, $c = 15$ m, $d = 5$ m

From: [http://www.angelfire.com/ca5/hwforkids/1aarea.html](http://www.angelfire.com/ca5/hwforkids/1aarea.html)
3. Calculate the perimeter of the following figures—Figures are not to scale: Example

a = 17 m, b = 15.3 m, c = 10.5 m, d = 7 m

a = 17 km, b = 18.5 km, c = 3.6 km, d = 6 km

a = 12.3 km, b = 13.2 km, c = 6 km, d = 6.3 km

a = 12.3 km
Perimeter Exercise 2 (Page 1)

1. Calculate the circumference of the following: Example

- $r = 9 \text{ m},$
- $r = 10 \text{ km},$
- $r = 4 \text{ m},$
- $r = 3 \text{ cm},$

from: [http://www.angelfire.com/ca5/hwforkids/2area.html](http://www.angelfire.com/ca5/hwforkids/2area.html)

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There is a great website that demonstrates capacity by 3 different containers and water being poured from one to the other. Check it out: http://dfee.org/framework/r/capacity.html

There is a WONDERFUL interactive site on the internet that allows the students to choose which area they would like to concentrate on. Check it out at: http://www.oswego.org/testprep/math3-4.cfm
Some of the following pages came from that website.
The metric system is another system of measurement used to describe an object’s length, mass, or volume. It uses one base unit and adds prefixes. The metric system uses the powers of ten as the conversion factors from unit to unit.

### Metric Units of Length

<table>
<thead>
<tr>
<th>Kilometer (km)</th>
<th>1 km = 1,000 m</th>
<th>A kilometer is about the length of 100 school buses lined up end to end.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><img src="image" alt="School bus diagram" /></td>
</tr>
</tbody>
</table>

NSF NMGK8
<table>
<thead>
<tr>
<th>Unit</th>
<th>Conversion</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meter (m)</strong></td>
<td>1 m = 100 cm</td>
<td>A meter is about half the height of a door.</td>
</tr>
<tr>
<td><strong>Decimeter (dm)</strong></td>
<td>1 dm = 10 cm</td>
<td>A decimeter is about the width of your teacher’s hand.</td>
</tr>
<tr>
<td><strong>Centimeter (cm)</strong></td>
<td>1 cm = 10 mm</td>
<td>A centimeter is about the width of a pencil.</td>
</tr>
</tbody>
</table>
The **AREA** of a figure is the number of **square units** needed to cover it.

<table>
<thead>
<tr>
<th>4 cm</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 cm</td>
</tr>
</tbody>
</table>

Count the number of square units to find the area.  

You can also find the area of a rectangle by using a **formula**.  

\[
\text{Area} = \text{length} \times \text{width}
\]

Area = 8 square cm

Area = 2 × 4

Area = 8 square cm
**Perimeter** is the word used to describe the distance around the outside of an object or shape. To find the perimeter of any shape, add the lengths of its sides.

When two pairs of sides are the same length, multiply 2 times the length and 2 times the width. Then add the products.

\[
(2 \times 9 \text{ m}) + (2 \times 5 \text{ m}) = \]

**Perimeter:**

\[
18 \text{ m} + 10 \text{ m} = 28 \text{ m}
\]

When all the sides are the same length, multiply the number of sides times the length of one side.

\[
4 \text{ sides} \times 5 \text{ cm} = \]

**Perimeter:**

\[
4 \times 5 = 20 \text{ cm}
\]

When the lengths of the sides are different, add the lengths of the sides.

\[
5 \text{ cm} + 5 \text{ cm} + 4 \text{ cm} + 8 \text{ cm} + 4 \text{ cm} = \]

**Perimeter:**

\[
26 \text{ cm}
\]
The **Volume** of a solid is the number of **cubic units** it contains.

This is one cubic unit

Find the cubic measure by **counting** the cubes.

| 10 cubic units |

You can also find the volume of a **rectangular prism** by using a **formula**.

\[
\text{Volume} = \text{length} \times \text{width} \times \text{height}
\]
<table>
<thead>
<tr>
<th>3 cm</th>
<th>5 cm</th>
<th>2 cm</th>
</tr>
</thead>
</table>

**Volume** = \(3 \text{ cm} \times 2 \text{ cm} \times 5 \text{ cm}\)

**Volume** = \(30 \text{ cubic cm}\)

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**Remember:**

Use **square units**, a 2-dimensional measure, to talk about **area**.

Use **cubic units**, a 3-dimensional measure, to talk about **volume**.
Practice Page

Metric Units for measuring

Answer the following questions dealing with measurement.

Answers are using formula: area = length x width

1. A football field is a rectangle that is 120 m long and 50 m wide. What is the area of a football field?

Choose:
- 5,000 sq m
- 6,000 sq m
- 6,000 m
- 5,000 m

2. A soccer field is a rectangle that is 100 m long and 75 m wide. What is the area?

Choose:
- 750 sq m
- 7,000 sq m
- 7,500 sq m
- 700 sq m
Perimeter: add the measures of all its sides.

3. Find the perimeter.

Choose:
- 24 cm
- 42 cm
- 20 cm
- 22 cm

4. What is the perimeter of the trampoline with a length of 5 m and a width of 4 m?

Choose:
- 20 m
- 9 m
- 19 m
- 18 m

5. Tommy rides his scooter around a park that is shaped like a regular hexagon. Each of its sides are 1 km long. If he makes two complete trips around the park, how far did he ride?

Choose:
- 12 km
- 6 km
- 5 km
- 10 km
Answers are using formula: $\text{Volume} = \text{length} \times \text{width} \times \text{height}$

<p>| | | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td><strong>6.</strong></td>
<td></td>
<td><strong>Choose:</strong></td>
</tr>
<tr>
<td></td>
<td>Find the volume of a mailbox that measures 30 cm long, 15 cm wide, and 10 cm high.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>3,000 cubic cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>3,500 cubic cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4,000 cubic cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4,500 cubic cm</td>
</tr>
</tbody>
</table>

<p>| | | |</p>
<table>
<thead>
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<th></th>
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</thead>
<tbody>
<tr>
<td><strong>7.</strong></td>
<td></td>
<td><strong>Choose:</strong></td>
</tr>
<tr>
<td></td>
<td>Find the volume of a shopping cart that measures 40 cm long, 20 cm wide, and 25 cm high.</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>2,000 cubic cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>20,000 cubic cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>85 cubic cm</td>
</tr>
<tr>
<td></td>
<td></td>
<td>200 cubic cm</td>
</tr>
</tbody>
</table>
Area is the number of square units needed to cover a flat surface.

Some Metric Units for measuring area are square centimeter, square decimeter, or square meter.

Find the area of the figures by counting squares.

<table>
<thead>
<tr>
<th>1 square unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 square units</td>
</tr>
</tbody>
</table>
Find the area of the figures by counting the shaded squares.

| 1 square cm | 12 square cm | 6 square cm |

Sometimes you need to count half squares to find the area of a figure.

1 whole square + 2 half squares
2 half squares = 1 whole square
2 + 1 = 3 square units

Sometimes you need to estimate the area of a figure.

4 whole squares + 4 almost whole squares + 4 about half squares
4 half squares = 2 whole squares
4 + 4 + 2 = about 10 square units

Remember:
You can find the area of some figures by counting squares.
**Answer each of the questions below.**

**Find the area of each figure.**

<table>
<thead>
<tr>
<th>Figure 1</th>
<th>Figure 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image1" alt="Figure 1" /></td>
<td><img src="image2" alt="Figure 2" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Figure 3</th>
<th>Figure 4</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image3" alt="Figure 3" /></td>
<td><img src="image4" alt="Figure 4" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Figure 5</th>
<th>Figure 6</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image5" alt="Figure 5" /></td>
<td><img src="image6" alt="Figure 6" /></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Figure 7</th>
<th>Figure 8</th>
</tr>
</thead>
<tbody>
<tr>
<td><img src="image7" alt="Figure 7" /></td>
<td><img src="image8" alt="Figure 8" /></td>
</tr>
<tr>
<td>Figure 1</td>
<td>Figure 2</td>
</tr>
<tr>
<td>----------</td>
<td>----------</td>
</tr>
<tr>
<td><img src="image1.png" alt="Figure 1" /></td>
<td><img src="image2.png" alt="Figure 2" /></td>
</tr>
</tbody>
</table>

**Estimate the area of each figure.**

**Remember:**

You can find the area of some figures by counting squares.

Sometimes you need to count half squares to find the area of a figure. Sometimes you need to estimate the area of a figure.
The customary system is another system of measurement used in the United States to describe how long, how heavy, or how big something is.

Inch, foot, yard, and mile are units for measuring area, perimeter, and volume.

**Length:**

- 12 inches (in) = 1 foot (ft)
- 3 feet = 1 yard (yd)
- 5280 feet = 1 mile (mi)

The area of a figure is the number of square units needed to cover it.

Count the number of square units to find the area.

Area = 9 square in.
**Perimeter** is the word used to describe the distance around the outside of an object or shape. To find the perimeter of any shape, add the lengths of its sides.

<table>
<thead>
<tr>
<th>Shape</th>
<th>Perimeter Calculation</th>
<th>Perimeter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rectangle</td>
<td>(2 x 10 ft.) + (2 x 4 ft.) =</td>
<td>20 ft. + 8 ft. = 28 ft.</td>
</tr>
<tr>
<td>Square</td>
<td>4 sides x 3 yd</td>
<td>4 x 3 = 12 yd</td>
</tr>
<tr>
<td>Triangle</td>
<td>5 in. + 10 in. + 7 in. =</td>
<td>22 in.</td>
</tr>
</tbody>
</table>

*When two pairs of sides are the same length, multiply 2 times the length and 2 times the width. Then add the products.*

*When all the sides are the same length, multiply the number of sides times the length of one side.*

*When the lengths of the sides are different, add the lengths of the sides.*
The **Volume** of a solid is the number of cubic units it contains.

<table>
<thead>
<tr>
<th></th>
<th>This is one cubic unit</th>
</tr>
</thead>
</table>

Find the cubic measure by **counting** the cubes.

<table>
<thead>
<tr>
<th></th>
<th>5 cubic units</th>
</tr>
</thead>
</table>

You can also find the volume of a **rectangular prism** by using a **formula**.

**Volume** = length × width × height
Remember:

Use **square units**, a 2-dimensional measure, to talk about **area**.

Use **cubic units**, a 3-dimensional measure, to talk about **volume**.

Volume = 4 in. × 2 in. × 5 in.

Volume = 40 cubic in.
Answer the following questions dealing with measurement.

Answers are using formula: area = length x width

1. A football field is a rectangle that is 110 yd long and 50 yd wide. What is the area of a football field?

   Choose:
   - 5,000 sq yd
   - 5,500 sq yd
   - 6,000 sq yd
   - 5,000 yd

2. A soccer field is a rectangle that is 90 yd long and 70 yd wide. What is the area?

   Choose:
   - 6,300 sq yd
   - 6,500 sq yd
   - 5,400 sq yd
   - 1,600 sq yd
Perimeter: add the measures of all its sides.

3. Find the perimeter.

<table>
<thead>
<tr>
<th>4 ft.</th>
<th>10 ft.</th>
<th>4 ft.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Choose:
- 28 ft
- 20 ft
- 14 ft
- 22 ft

4. What is the perimeter of the bus with a length of 12 ft and a width of 4 ft?

Choose:
- 28 ft
- 30 ft
- 16 ft
- 32 ft

5. Emma rides her bike around a park that is shaped like a regular pentagon. Each of its sides are 1 mile long. If she makes three complete trips around the park, how far did she ride?

Choose:
- 12 mi
- 5 mi
- 10 mi
- 15 mi
### Answers are using formula: \( \text{Volume} = \text{length} \times \text{width} \times \text{height} \)

<table>
<thead>
<tr>
<th></th>
<th>Find the volume of a treasure chest that measures 45 in long, 15 in wide, and 20 in high.</th>
<th>Choose:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□ 10,350 cubic cm</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ 13,500 cubic in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ 15,300 cubic in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ 3,500 cubic in</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Find the volume of a water cooler that measures 10 in long, 12 in wide, and 28 in high.</th>
<th>Choose:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>□ 3,630 cubic in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ 3,360 cubic in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ 3,000 cubic in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>□ 3,300 cubic in</td>
<td></td>
</tr>
</tbody>
</table>
Topic: Area and Volume

Objective: Students will be able to describe the difference between area and volume and also be able to understand how various units of measure relate to one another.

Materials: Newspaper, scissors, masking tape, rulers and meter sticks, cardboard (and something to cut it with), markers to identify finished models.

Procedure:

Following an introduction to area and volume students will work in groups to build models of square centimeters, square inches, square feet, square meters, and then cubic centimeters, cubic inches, cubic feet, and cubic meters. This becomes a good cooperative team effort at problem solving. Students are provided with materials, but no initial instruction is given on how to build their models.

Source:

Topic: Volume

Objective:

The students will estimate, measure, record, compare, and order objects and containers.

Materials:

2 liter bottles, milk jugs, and other containers with different volumes.

Procedure:

Have students bring in a variety of beverage containers, such as 1 liter milk containers or 2 liter drink bottles. Have them work together to estimate and record the volumes of the containers. They can read the labels to determine the actual volume of the containers and then arrange the containers from greatest volume to least volume. Provide students with opportunities to sort and order using different units of measure.

Source:

Topic: Volume (of the mouth)

Objective:

Students will learn to measure the volume of an irregularly shaped container.

Materials:

Water, mouths, graduated cylinders, beakers, cups, and straws.

Procedure:

Ask students who has the biggest mouth in the class. Then ask them the focus question of how can we tell for sure that that student has the biggest mouth? Introduce the unit of milliliters and tell students that they are going to measure the volume of their mouths in milliliters to find out who has the biggest mouth. Give students cups of water and have them fill their mouths with water by using a straw. When they have their mouths full, have them spit out the water into a beaker. Then teach students how to use a graduated cylinder to measure the volume of that water. Whoever has the largest volume of water after spitting it out has the biggest mouth in the class.

Source:

**Topic:** Measurement

**Objective:** Students will learn that objects that have different sizes (circumference, diameter, height, and length) may still have the same volumes.

**Materials:** Beans, conventional and non-conventional measuring devices, and 5-by-8-inch cards rolled into tubes, with some rolled the short way and some rolled the long way. Also, use something to close one end of the tube so it will hold materials.

**Procedure:**

Present students with the two different tubes and ask them to predict how much taller one tube is than the other and how much different the circumference and diameter are. Once students have made their predictions, have them measure the sizes using conventional or non-conventional means. Once students have gone through this process, ask them the following questions:

--If you filled the two tubes with beans to compare how much each holds, which would hold more?

--Would they hold the same amount?

--Why do you think that?

Finish by allowing students to pour beans into one tube and then empty the tube's contents into the other tube. Explain to students that just because different objects have different sizes, they may not have different volumes. Show them that the two containers were made from the same 5-by-8-inch cards.

**Source:**

**Topic:** Measurement (area and perimeter)

**Objective:** Students will be able to demonstrate that objects with the same perimeter do not necessarily have the same area.

**Materials:** centimeter squared paper, string

**Procedure:**

Begin by having students trace their feet on the centimeter squared paper. Then have them find the area of their feet in square centimeters and record their measurements. Now, use string to put around the traced feet and cut it to represent the perimeter of their feet. Now look for other students that have the same or similar perimeters and see if the area is the same also. Most likely, there will be some students whose foot perimeter is the same, but their foot areas are different. Use these examples to show students that objects that have the same perimeters do not necessarily have the same area. To extend this to another situation, have students use the string that they cut to fit the perimeter of their feet, to make squares on the grid paper. Now measure the area of the square and compare it to the area of their feet. Also, ask students to try to make a shape using their string that does have the same area as their foot. Finally, have students make different shapes with the string that all have different areas.

**Source:**


From: [http://www.lessonplanspage.com/MathActivityFile.htm](http://www.lessonplanspage.com/MathActivityFile.htm)
### Table of Weights and Measures

**U.S. Measurements**

<table>
<thead>
<tr>
<th>Length or Distance (Linear)</th>
<th>Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 inch</td>
<td>2.54 centimeters</td>
</tr>
<tr>
<td>1 foot</td>
<td>0.3048 meter</td>
</tr>
<tr>
<td>1 yard</td>
<td>0.9144 meter</td>
</tr>
<tr>
<td>1 mile</td>
<td>1,609.3 meters</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Square Measure (Area)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 square inch</td>
<td>6.452 centimeters</td>
</tr>
<tr>
<td>1 square foot</td>
<td>929 sq. centimeters</td>
</tr>
<tr>
<td>1 acre</td>
<td>0.4047 hectare</td>
</tr>
<tr>
<td>1 square mile</td>
<td>259 hectares or 2.59 kilometers</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cubic Measure</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 cubic inch</td>
<td>16.387 cubic centimeters</td>
</tr>
<tr>
<td>1 cubic foot</td>
<td>0.0283 cubic meter</td>
</tr>
<tr>
<td>1 cubic yard</td>
<td>0.7646 cubic meters</td>
</tr>
<tr>
<td>1 cord</td>
<td>3.625 cubic meters</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Dry Measure</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1 pint</td>
<td>0.5505 liter</td>
</tr>
<tr>
<td>1 quart</td>
<td>1.1012 liters</td>
</tr>
<tr>
<td>1 peck</td>
<td>8.8096 liters</td>
</tr>
<tr>
<td>1 bushel</td>
<td>35.2383 liters</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Liquid Measure</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>4 fluid ounces</td>
<td>1 gill</td>
</tr>
<tr>
<td>1 pint</td>
<td>4 gills</td>
</tr>
<tr>
<td>1 quart</td>
<td>2 pints</td>
</tr>
<tr>
<td>1 gallon</td>
<td>4 quarts</td>
</tr>
</tbody>
</table>

From: [http://www.abcteach.com/Math/usmetr.htm](http://www.abcteach.com/Math/usmetr.htm)
Title: Cheerios - Not Just for Breakfast Anymore

Organization: Waller Elementary, Bay District Schools
Author: Cathy Burgess

Description

In this lesson, students practice measurement of surface area and perimeter with estimation by completing activities using Cheerios breakfast cereal.

Duration

One 50-minute math block

Materials

-1 box of Cheerios (a handful for each student)
-Napkin
-Blank computer paper (1 per student)
-Tape
-Pencil
-Cheerios Activity Sheets (see associated file)
-Cheerio Rubric
-Index Cards (enough for each child to have one)
-Sentences written on chalkboard/dry erase board
My estimation is _______________.
My actual measurement is _______________.
-1 red square cut from construction paper 9 in. x 9 in.
-1 orange construction paper rectangle 12 in. x 4 in.
-20 blue construction paper squares 1 in. x 1 in.

Preparations

1. Gather materials for the lesson: Cheerios, pencil, blank computer paper, napkins.
2. Run off Cheerio activity sheet and rubric
3. Cut red, orange, and blue squares from construction paper.
4. Put tape on the back of the blue squares so they stick when you fill in surface area and perimeter.

---

**Procedures**

Note: This is an introductory lesson for surface area and perimeter, and a review of estimation. Area and perimeter are the only part of the standard covered in this lesson. (not length, weight, capacity, or volume)

1. Begin the lesson by showing a box of Cheerios and asking: Who likes Cheerios? What do you do with Cheerios? Well today we are going to use Cheerios a little differently. We are going to use them to measure the surface area and perimeter of different objects. (Make sure to tell the students that they will get to nibble on the Cheerios as they do this activity.)

2. Tell students: First of all, let me tell you what surface area is. Surface area refers to the amount of surface covered by a figure or object. It is measuring the inside of an object. Today we are going to measure with non-standard units and later with standard units. For example, look at my red square. Let’s estimate how many of these blue units it will take to fill in the surface of my square? Fill in the sentence, My Cheerios estimation is_______. (Accept any reasonable answer.) Put the blue units on until they fill the square. It measures exactly ______. Let’s do it again, this time with a rectangle. Ask a volunteer to estimate how many units it will take. Ask another volunteer to actually measure the inside of the rectangle. Fill in the estimation and actual measurement sentences on the board.

3. Next introduce perimeter. Tell students: Perimeter measures the distance around an object. Look back at the red square we measured before for surface area. Let’s find the perimeter this time. First estimate what you think the perimeter might be. (Write answers on board). Now measure the perimeter of the orange rectangle. What is a good estimation? What is the exact measurement? Write estimation and actual measurement in sentences on the board.

4. Tell students: Now let’s practice measuring area and perimeter using the activity sheet. Again who can tell me what surface is? What about perimeter? Go over the directions, tracing your hand and foot then filling it in with Cheerios for surface area and perimeter. Show the index card and talk about how it will be completed. Check for understanding. Pass out Cheerios, napkins, and activity sheet. Give each child a handful of Cheerios (as they nibble you may need to pass out
more). Also pass out rubric so students have the correct idea of exactly what the
teacher is looking for.

5. Walk around to formatively assess the children as they complete the activity
sheet. Respond and give feedback to those who need it.

6. After the activity sheet is completed, encourage students to discuss what they
did.

Assessments

Use completed Cheerio activity charts to formatively assess the student’s ability
to:

- use a wide variety of concrete objects to investigate measurement of length
- use estimation strategies to determine a reasonable estimate of a quantity.

A rubric in the attached file includes the criteria for successful performance.

Extensions

An extension or modification of this lesson would be to go to Beacon Student Web
Lessons and practice perimeter. See web link above.

Another extension would to add an entry to a math journal describing the activity
on area and perimeter.

From:
Cheerios Activity Sheet

Name: ______________________________

1. Surface area measures the inside of an object.

<table>
<thead>
<tr>
<th>Object</th>
<th>Estimated Cheerios</th>
<th>Actual Cheerios Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Index Card</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. Perimeter measures the distance around the object.

<table>
<thead>
<tr>
<th>Object</th>
<th>Estimated Cheerios</th>
<th>Actual Cheerios Measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hand</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foot</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Index Card</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Directions:

1. Trace your hand below, connecting a straight line across your wrist. Carefully place Cheerios close together on the inside of your hand without overlapping them. This is called **surface area**. Record your information on the activity sheet.

2. Now count the number of Cheerios along the outside border of your traced hand. This is called **perimeter**. Now record your information on the activity sheet.
Directions:

1. Trace your foot below. Fill in the surface area with the Cheerios and record your information on the activity sheet.

2. Now count the Cheerios on the outside border of your foot. Record your perimeter information on the activity sheet.

3. Now find the surface area and perimeter of the index card and record it on the activity sheet.
## Cheerios Activity Rubric

<table>
<thead>
<tr>
<th></th>
<th><strong>Commentable</strong></th>
<th><strong>Acceptable</strong></th>
<th><strong>See Teacher</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Area</strong></td>
<td><em>Completes all categories for estimates and actual measurement and all data is recorded.</em></td>
<td><em>Most categories for estimates and actual measurement are completed and recorded.</em></td>
<td><em>Categories are incomplete with data missing in several areas.</em></td>
</tr>
<tr>
<td></td>
<td><em>Estimates are written and are realistic. They exhibit a sound idea of area measurement.</em></td>
<td><em>Estimates are written with some idea of area measurement.</em></td>
<td><em>Estimates are unrealistic and show little idea of the concept of area.</em></td>
</tr>
<tr>
<td></td>
<td><em>Accurately measures area of hand, foot and index card.</em></td>
<td><em>Area Measurement of hand, foot, and index card are mostly accurate.</em></td>
<td><em>Area measurements of hand, foot, and index card are inaccurate.</em></td>
</tr>
<tr>
<td><strong>Perimeter</strong></td>
<td><em>Completes all categories for estimates and actual measurement and all data is recorded.</em></td>
<td><em>Most categories for estimates and actual measurement are completed and recorded.</em></td>
<td><em>Categories are incomplete with data missing in several areas.</em></td>
</tr>
<tr>
<td></td>
<td><em>Estimates are realistic and exhibit a sound idea of perimeter.</em></td>
<td><em>Estimates are written with some idea of perimeter.</em></td>
<td><em>Estimates are unrealistic and show little idea of the concept of perimeter.</em></td>
</tr>
<tr>
<td></td>
<td><em>Accurately measures perimeter of hand, foot and index card.</em></td>
<td><em>Perimeter measurements of hand, foot, and index card are mostly accurate.</em></td>
<td><em>Perimeter measurements of hand, foot, and index card are inaccurate.</em></td>
</tr>
</tbody>
</table>
Title: Cubed Containers

Organization: Parker Elementary, Bay District Schools
Author: Renee Black

Description

This lesson allows for cooperative groups to explore volume in relation to centimeter cubes and other nonstandard units of measurement using small containers.

Duration
45 minutes

Materials

- Graph paper and pencils for each student
- Centimeter cubes (enough for groups of three to share)
- Small different-shaped containers (medicine cups, small jewelry boxes, small tuna cans, potted plant water trays, etc.)
- Baby jar filled with small candies
- Paper clips
- Marbles
- Small clean tuna cans
- Small jewelry boxes
- Overhead with marker
- Overhead graph paper transparency
- Water
- Graduated cylinder

Preparations

1. Have small containers, centimeter cubes, marbles, paper clips, and graph paper ready to distribute.
2. Have overhead materials ready to use.
3. Have baby jar filled with small candies and the paper clips ready to refill jar.
4. Be prepared to take an example of each container and fill with water to compare

NSF NMGK8
volume of water to nonstandard units of measure.

**Procedures**

1. Hold up a baby jar and have students make individual estimates of the contents, and write on the overhead. Offer the contents to the one who comes closest to the correct amount of candy.

2. Ask students if the number of paper clips put into the now empty jar would be the same as the number of small candies. Have them make individual predictions and record on overhead.

3. Check their predictions.

4. Graph candy amount and paper clip amount on overhead graph paper. Be sure to label the axis and give the graph a title.

5. Discuss the meaning of -volume- and how it relates to the amount of candies and paper clips the baby jar held.

6. Show different small containers and relate volume to the shapes of the containers.

7. Divide the class into groups of three.

8. Have each group make a prediction about the number of centimeter cubes that the first small shape will hold.

9. Check the predictions, and have each student graph the first amount.

10. Pass out the other containers, and have the groups go through steps eight and nine on their own.

11. The groups will rotate the containers and get at least four different measurements for the different containers on their graph paper.

12. Go through steps eight through eleven using different nonstandard units of

NSF NMGK8
measurement.

13. Each group will create at least two math sentences comparing data (ie. 12 + ___ = 18 or greater/lesser problems, subtraction problems).

14. Demonstrate how water can be used to measure volume by pouring water into separate containers and then pouring into cylinder to measure volume.

Assessments

The teacher is looking for the ability of students to connect the concept of volume with the product of number-sentences and graphs. This lesson is designed to introduce the concept of volume. Assessments with this lesson are not to be graded. They are to determine whether or not students understand the concepts presented. Assessment will be based on the completed graphs, the math sentences, and teacher observation of interaction between group members. This work should demonstrate that students

- write accurate number sentences regarding their findings about volume (MA.A.3.2.2.3.1)

- use estimation strategies to determine a reasonable estimation of volume (MA.A.4.2.1.3.1)

- use oral language to communicate knowledge of measurement concepts (MA.B.1.2.1.3.1)

- use a variety of concrete objects to investigate measurement of capacity and volume (MA.B.1.2.1.3.2)


NSF NMGK8
Title: What's the Matter with that Cup?

Organization: Berkeley Preparatory School, Hillsborough County Schools
Author: Kelly Neal

Description

Which restaurant gives you more bang for your buck? Students measure volume, circumference, and height of fast food cups, find which one has the greatest volume, and compare/contrast those measurements to discover any correlations between them.

Duration

Two 30-45 minute sessions

Materials

-A refreshing soda to drink
-Ruler (1 per group)
-Measuring tape (1 per group)
-Graduated Cylinder (1 per group)
-Various “large” cups from fast food restaurants (enough for 1 per group)
-Beaker (demonstration-one only)
-Liquid measuring cup (demonstration-one only)
-Measuring spoon (demonstration-one only)

Preparations

1. You will need to try the experiment ahead of time, measuring the height, circumference, and volume of each cup you select. Create an answer key after you’ve completed your measurements so the cups you’ve chosen to use will have accurate information available to compare against the students’ measurements.
2. Copy the measurement chart, rubric, and discussion page for each student.
3. Make an overhead of the measurement chart, rubric, and discussion page.
4. Gather measuring materials for each group and for demonstration.
   *ruler, measuring tape, and graduated cylinder (one for each group)
5. Gather sample “large” cups from various fast food chains. If you follow this lesson, you will need eight.
6. Make name tags for each child: Volumizer, Sir Cumference, and The Ruler. Create enough of each to be sure your students each have one of the three jobs.

---

**Procedures**

NOTE: Students should have certain prior knowledge before participating in this lesson. They need to understand circumference, milliliters, and centimeters. This lesson will only address metric units to compare length and volume.

**DAY ONE**

1. Walk to the front of the room, dramatically drinking a tall, refreshing soda from your favorite fast food chain. If possible, drink the last few drops so that you make a large slurping noise.

2. Ask the children to name their favorite soft drink to order when eating out.

3. Ask the students which restaurant they think might offer the largest amount of soda in what they call a large cup?

4. Reveal empty cups from each of the following fast food restaurants (or any others that are available in your town): Burger King, McDonald's, Sonic, Kentucky Fried Chicken, Wendy's, Church's, Popeye's, Chic-Fil-A.

5. Ask students to predict which cup they believe will hold the most liquid. List the names of each restaurant on the board and record, by vote, which cup the students predict will have the largest volume.

6. Discuss ways in which you might decide, accurately, which cup will hold the most. Accept all student proposals and suggestions for measuring.

7. Present the students with the various measurement tools: tape measure (in cm), ruler (with cm increments), graduated cylinder, measuring cup, measuring spoon, and a beaker.
8. Introducing the word volume:
Volume is defined as the amount of space taken up by a three-dimensional object. Volume often refers to liquid volume, which is defined as the amount of space taken up by a liquid, which spreads completely to fill its container.

9. For purposes of using the same measurement tool, have the students use the graduated cylinder. You may need to demonstrate how to accurately measure with the cylinder.

10. List on the board the three measurements the students will be responsible for: volume, circumference, and height. Explain to the students that they will be measuring these various other aspects of the cups to look for any relationships among the volume, circumference of the top of the cup and/or the height of the cup.

11. Demonstrate how to complete each of the three measurements by posting on the overhead a copy of the chart students will record their information on. The circumference of the rim of the cup should be measured by the measuring tape in cm and recorded. The height of the cup, however, will be more challenging. To accurately measure the height, stand the cup on a flat surface, and line up the cm side of a ruler alongside the cup so that the ruler and the cup are parallel.

12. After the students understand the measuring required, explain how the measuring will take place. You can assign responsibilities any way you choose (grouping children into threes). I would suggest giving each child one job as: Volumizer (to measure volume) Sir Cumference (to measure circumference) The Ruler (to measure height) The students could keep these jobs throughout the activity, or you could rotate jobs each time a cup is measured. Students will stay stationary, and the cups will rotate among groups. Students will need to take turns measuring the cups and recording information individually on their charts. (You could assign “The Ruler” in charge of passing along/collecting cups.)

13. Give each group a ruler, measuring tape, graduated cylinder, and a cup once directions are understood and let ’em go!
DAY TWO

1. Review information from the previous day and ask students to confirm which cup each group holds the most liquid (greatest volume).

2. Explain to the students that yesterday they had been doing what scientists call EXAMINING MATTER! After writing the word MATTER on the board, see if they can guess what MATTER is by listing on the board various objects (for example: dump truck, pencil, earring, dog bone, shoes, hot dogs, soda cups).

3. Take a few minutes to discuss with the students what these items have in common. Once you’ve exhausted all possibilities...share with them the definition of matter: Objects that take up space and have mass are called matter. If students need a brief explanation of MASS: Mass is the amount of matter an object has. We often use a triple-balance beam to measure mass. See the extension section for more details on mass.

4. Explain to the students that today they will be comparing the data collected yesterday while examining MATTER. (the soda cups)

5. Lead the students in a discussion about relationships among cups. (Is there any data that the cups share? Do any cups share any measurements? Do the tallest cups have the largest volume? Does the circumference of the lid have anything to do with volume?)

6. Show the students the discussion page (provided) and discuss how students should complete the form with their original partners.

7. Also show the students the rubric, which describes levels of accomplishment necessary to demonstrate understanding of the tasks.

8. Allow students time to complete discussion page in their original groups, being sure to circulate among the students to provide assistance.

9. Discuss results as a class to determine whether or not circumference and height of cups relate directly to volume.
Assessments

Students will complete a measurement chart for the teacher to formatively assess the students' ability to use concrete objects to measure volume, circumference, and height.

The rubric included in the lesson provides criteria for successful performance in comparing and contrasting those measurements.

Extensions

1. Students can continue their exploration of volume by measuring different sized cups from home that are deceiving in their size/volume to enhance estimating and measuring skills.
2. Measuring skills could also be enhanced by estimating and solving volume, perimeter, length problems with french fry containers.
3. Further instruction on mass could be conducted by bringing in any number of objects to hide in small brown paper bags. Students (in small groups or one by one in front of the room) could reach into the bag and describe the texture and size of the object (properties). I would surely include a bag with nothing in it. Although students might believe the bag is empty, air is considered matter because it has mass and takes up space. You can further demonstrate it by filling a ziplock bag with air, sealing it shut, and weighing it on a balance scale.

From:

NSF NMGK8
Title: Cooking a Few of my Favorite Things

Organization: Cedar Grove Elementary, Bay District Schools
Author: Joyce Sewell

Description

In this activity, students learn about the nutritional value of foods, calculate the measurements, and prepare a healthy recipe for the class. Then students publish a class cookbook with their recipes.

Duration

Five 25-minute sessions

Materials

- Children informational books and literature about food and nutrition, including children’s cookbooks
- Dole Foods Internet site (www.dole.com)
- Measurement chart that shows common conversions
- Measuring cups and spoons
- Cooking cart (optional)
- Word processing software
- Spreadsheet software, such as Data Wonder by Addison-Wesley
- Resource people to include, but not limited to, room mothers or volunteers to supervise measuring, cooking, quality control and cleanup while cooking
- Measurement chart handout, one per group (see Associated File)
- Overhead transparency of Measurement chart (see Associated File)

Preparations

1. Collect books related to food, cooking, and nutrition.

2. Collect charts relating to the food pyramid.
3. Find a measurement conversion chart in a recipe book and enlarge it to chart size.

4. A Cooking Cart is optional for this lesson, but makes cooking easier to manage. The Cooking Cart contains a microwave, toasters, pots and pans, serving utensils, and measuring cups and spoons. If you don't have a Cooking Cart, you can gather these items from around the school perhaps or your home.

5. Arrange for adult supervision during the cooking, perhaps a room mother or other school volunteers.

6. Make copies and an overhead transparency of the Measurement Chart (see Associated File).

---

**Procedures**

Prior to this lesson, invite a nutritionist, perhaps a nurse or lunchroom manager, to talk with the students about the nutritional value of foods and the food pyramid.

1. Divide the class into groups, one for each of the food groups as represented on the food pyramid. Each group researches to find the foods that belong to their food group. Use books or food boxes that display the food pyramid for research materials. Access the Internet site listed in the Resource section of this lesson. Students prepare a chart and a mini report that shows the foods in their group to share with the class.

2. Each group shares what they have learned about the foods in their category in an oral presentation. Each group then conducts a survey to answer the question - Which foods are the most popular in our food group with the students in the class?-

3. Students graph this information using a spreadsheet program. (This requires a lesson on how to use the particular spreadsheet program you choose to use.)

4. Groups then search for recipes that include foods from their group based upon the survey. They select one recipe to prepare for the class.
5. Next, model using problem-solving skills to plan how much food it will take to prepare their recipe for the entire class. Do this using the Measuring Chart (see Associated File) and a recipe of your choice that is consistent with the survey results. Model how to take each ingredient, find its nutritional value, and multiply the ingredient by the number of servings you will need for your class. This will give the total quantity of each ingredient needed to prepare the recipe.

6. Students are now ready to make a list of the ingredients necessary to prepare their recipe for the entire class. Groups also prepare a chart of their favorite recipe that is later shared with the class. (The chart needs to be in large print so students can read it as they cook. It should also contain information about the nutritional value of foods in the recipe.)

7. Students measure each ingredient as calculated and prepare their favorite recipe for the class under adult supervision.

8. Students share their illustrations or charts showing the foods found in their recipe and the nutritional value. They present their graphs to show the results of the survey about the most popular foods in their group. After the reports, have a tasting party to try out their cooking.

9. Compile the recipes into a class book.

---

**Assessments**

A rubric is used to determine if students have completed each step in preparation of their presentation. Each student writes recipes to be shared in the class cookbook. Students receive a grade for their group presentations and for their efforts in the class cookbook.

4 Topic is clearly explained.  
Charts, graphs, posters, and individual recipes for the cook book support the topic.  
Presentation is well organized and interesting.  
Food served is well presented and tastes good as well as supports the topic.
3 Topic is explained.
Charts, graphs, posters, and individual recipes for the cook book relate to the food group.
Presentation is organized.
Food served belongs to correct food group and tastes good.

2 Topic is stated but is not explained. Some charts, graphs, posters, and a few recipes to support the topic. Presentation is partially organized. Food is served from the correct food group but may not be prepared correctly.

1 Topic is not clear.
Few charts, graphs, posters, or recipes are used.
Presentation is disorganized.
Food may or may not belong to the correct food group. May have difficulty preparing food.

0 Little or no effort.
Incomplete supporting material.
No recipe or food for the tasting party.

Extensions

This lesson is part of a unit on nutrition and a healthy body. It was an extension of a unit on body systems.

From: http://www.beaconlearningcenter.com/search/details.asp?item=70
Area and Volume

An AskERIC Lesson Plan

AUTHOR: Timothy Welch, Greenwood Elementary School, LaGrande, OR

Date: 1994

Grade Level(s): 3

Subject(s):
- Mathematics/Measurement

OVERVIEW:

Students sometimes need a break from paper and pencil math problems in order to keep them interested and stimulated in math. For some kids certain math concepts are too abstract and need to be made more hands-on.

PURPOSE:

Many students have a difficult time understanding the concepts of area and volume. Textbooks have pictures which don’t always allow the students to grasp the ideas. This activity takes away the abstract idea and replaces it with a concrete model.

OBJECTIVE(s):

Students will be able to describe the difference between area and volume and also be able to understand how various units of measure relate to one another.
RESOURCES/MATERIALS:

- newspaper
- scissors
- masking tape
- rulers and meter sticks
- cardboard (and something to cut it with)
- markers to identify finished models

ACTIVITIES AND PROCEDURES:

Following an introduction to area and volume students will work in groups to build models of square centimeters, square inches, square feet, square meters, and then cubic centimeters, cubic inches, cubic feet, and cubic meters. This becomes a good cooperative team effort at problem solving. Students are provided with materials, but no initial instruction is given on how to build their models.

TYING IT ALL TOGETHER:

When the groups have completed their projects they will send a spokesperson to the front of the room to share with the class what they have built, what it is called, and how it compares to some of the other models built by other groups. This activity leaves students with a lasting memory of these ideas which are otherwise hard to grasp.

From:
http://ericir.syr.edu/Virtual/Lessons/Mathematics/Measurement/MEA0001.html

NSF NMGK8
Tree Measurement

An AskERIC Lesson Plan

AUTHOR: Jeanette Vratil, Lowell Elementary, KS
Date: 1994

Grade Level(s): 4, 5, 6

Subject(s):
  • Mathematics/Measurement

OVERVIEW:

This activity is used to help understand vertical and horizontal measurement of large objects.

OBJECTIVES:

Students will be able to:

1. Demonstrate measurement of the trunk, crown, and height using vertical and horizontal measurement.
2. Compare results with other groups.
3. Create a graph of their findings for the trunk, crown, and height of the tree.
4. Define horizontal, vertical, and circumference.
MATERIALS:

- string
- ruler
- paper
- pencil
- meter stick
- tree

ACTIVITIES:

TRUNK:

1. Measure from the ground to 4 1/2 feet high on the trunk.
2. At that height, measure the trunk’s circumference. Use a string around the trunk and measure the length of the string.
3. Round to the nearest inch. Record the number and label as circumference.

CROWN:

1. Find the tree’s five longest branches.
2. Put markers on the ground beneath the tip of the longest branch.
3. Find a branch that is opposite it and mark its tip on the ground.
4. Measure along the ground from first marker to the second marker.
5. Record the number and label as crown.

HEIGHT:

1. Have your partner stand at the base of the tree.
2. Back away from the tree, holding your ruler in front of you in a vertical position. Keep your arm straight. Stop when the tree and the ruler appear to be the same size. (Close one eye to help you line it up.)
3. Turn your wrist so that the ruler looks level to the ground and is in a horizontal position. Keep your arm straight.
4. Have your partner walk to the spot that you see as the top of the ruler. Be sure the base of the ruler is kept at the base of the tree.
5. Measure how many feet he or she walked. That is the tree’s height. Round to the nearest foot and record your answer as the height.
TYING IT ALL TOGETHER:

Allow time for groups to compare answers and then re-measure the tree is needed. Usually it takes several measurements. Be sure and allow time for each person to take several measurements since they will be working with partners.

CLASSROOM:

Have students make bar graphs using information gathered outside. Have students locate the biggest tree, smallest tree of the same species.

Useful Internet Resource:
* What can you find out about trees?
http://www.wildkids.org.uk/woodland/tree_measure.htm

From:
http://ericir.syr.edu/Virtual/Lessons/Mathematics/Measurement/MEA0011.html
Activity 1: Judge and Jury

Preparing the Investigation

Reproduce a copy of the Activity Sheet "Judge and Jury," for each student.

Structuring the Investigation


2. In turn, help the pupils to cut out their baby-step unit from newspaper and to duplicate several copies.

3. Guide the pupils to record the number of baby steps that equals each of the other steps.

4. Measure the distances from the heel of the starting foot to the toe of the ending foot.

5. Fill in a box on the graph for each baby step.

Extensions

1. Organize the pupils into small groups. Help them to compare their graphs by making such statements as

   - "My umbrella step was six baby steps long; everyone else’s umbrella step was equal to more of their baby steps than mine."
   - "George’s giant step was ten of his baby step long."
   - "Andy’s was twelve of his baby step long."
   - "Paulette’s longest step was the umbrella step; mine was the giant step."

2. Encourage the pupils to look up and play variations of the game (see Bibliography), as well as to make up additional steps and to measure the distances of these steps in "baby steps," adding the data to their graphs.
Activity 2: Pitching Cards

Preparing the Investigation

1. Reproduce a copy of the Activity Sheet "Pitching Cards" for each student.

Structuring the Investigation

1. Give each student a set of five unlined index cards and crayons. Ask them to draw a picture of themselves on the front and to write data about themselves on the back, for instance, age, grade, and hobbies.

2. Demonstrate how to pitch the cards from a set distance to the well, as well as how to measure distances with a meter stick.

3. Divide the students into small groups and distribute a copy of the Activity Sheet to each student.

4. Guide the students as they take five turns each, recording the distance from the wall of each card pitched.

5. Ask the students to order their distance data from least to greatest.

6. Demonstrate how to determine the median, or middle score, and the range.

7. Discuss the completed worksheets.

Extensions

1. Help the students to order the medians for the group and to determine the median of the medians and the range for the group. Compare individual scores to the group's median and range, emphasizing the amount of variation.

2. Display the pitching cards, the personal data, and the pitching data. Compare these data to the data on the traditional baseball cards.
Activity 3: The Celebrated Jumping Frog

Using the story "The Celebrated Jumping Frog of Calveras County" by Mark Twain, students simulate a jumping-frog contest and determine the distances "jumped." The students record the distance of individual jumps in centimeters and determine the total distance jumped (the sum of the three separate jumps) and the official distance (the straight-line distance from the starting line to the end of the frog's third jump). The students compare the range and median of the total distances with those of the official distances of the group. An online version of this story can be seen at http://www.visitcalaveras.org/frogstory.html

Preparing the Investigation

1. Reproduce a copy of the activity sheet "The Celebrated Jumping Frog" for each student.

Structuring the Investigation

1. Have each student create a frog from a cotton ball.

2. Demonstrate how to place the frog on a large paper clip that has been slightly spread apart and make it "jump." By placing the frog on the smaller end and pushing down on the elevated large end, the player can usually make the frog hop over her or his finger. Also demonstrate how to record the distances in centimeters on the Activity Sheet.

3. Allow the students to practice jumping their frog.

4. Divide the students into small groups and show them how to set up a track with a starting line and a course for the official distance.

5. Guide the students as they work in small groups to simulate the frog jump and record the data on their chart.

6. Discuss the variations from the median of the group for each player and compare the medians and ranges for the total distance with those for the official distance.

NSF NMGK8
Activity 4: Spinning Tops

Background Information

During a top-spinning contest students measure the distance along a curve using indirect measurement. They record the data for their group in a chart and compute their individual median and the group median.

Preparing the Investigation

1. Reproduce a copy of the activity sheet "Spinning Tops" for each student.

Structuring the Investigation

1. Guide the students as they decorate tops made by pushing a writing pen through a plastic cover, such as those from yogurt and margarine containers.

2. Distribute a large sheet of white "contest paper" and demonstrate a spin on the top and how to "copy" the distance with yarn or string and then measure the string with a centimeter ruler.

3. Guide the students as they record the data in their charts and compute the medians.

4. Encourage discussion of the tables created.

From: http://illuminations.nctm.org/lessonplans/prek-2/games-p2/index.html#a1
Great websites:

This site has interactive conversions and even games to play with measurement.
## Metric Weights and Measures

### Length

<table>
<thead>
<tr>
<th>Unit</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kilometer (km)</td>
<td>1,000 Meters</td>
</tr>
<tr>
<td>Hectometer (hm)</td>
<td>100 Meters</td>
</tr>
<tr>
<td>Dekameter (dam)</td>
<td>10 Meters</td>
</tr>
<tr>
<td>Meter (m)</td>
<td>1 Meter</td>
</tr>
<tr>
<td>Decimeter (dm)</td>
<td>0.1 Meter</td>
</tr>
<tr>
<td>Centimeter (cm)</td>
<td>0.01 Meters</td>
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<td>Millimeter (mm)</td>
<td>0.001 Meters</td>
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### Capacity

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<thead>
<tr>
<th>Unit</th>
<th>Value</th>
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</thead>
<tbody>
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<td>Kiloliter (kl)</td>
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</tr>
<tr>
<td>Hectoliters (hl)</td>
<td>100 Liters</td>
</tr>
<tr>
<td>Deciliters (dal)</td>
<td>10 Liters</td>
</tr>
<tr>
<td>Liter (l)</td>
<td>1 Liter(∗)</td>
</tr>
<tr>
<td>Deciliter (dl)</td>
<td>0.10 Liters</td>
</tr>
<tr>
<td>Centiliter (cl)</td>
<td>0.01 Liters</td>
</tr>
<tr>
<td>Milliliter (ml)</td>
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</table>

* 1 liter + U.S. 1.057 quarts

### Mass and Weight

<table>
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<th>Unit</th>
<th>Value</th>
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</thead>
<tbody>
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<td>Metric Ton</td>
<td>1,000,000 Grams</td>
</tr>
<tr>
<td>Quintal (P)</td>
<td>100,000 Grams</td>
</tr>
<tr>
<td>Myriagram</td>
<td>10,000 Grams</td>
</tr>
<tr>
<td>Kilogram</td>
<td>1,000 Grams</td>
</tr>
<tr>
<td>Hectogram</td>
<td>100 Grams</td>
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<tr>
<td>Dekagram</td>
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<tr>
<td>Gram</td>
<td>1 Gram(∗)</td>
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<tr>
<td>Decigram</td>
<td>0.10 Grams</td>
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<tr>
<td>Centigram</td>
<td>0.01 Grams</td>
</tr>
<tr>
<td>Milligrams</td>
<td>0.001 Grams</td>
</tr>
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</table>

* 1 gram + U.S. 0.035 ounces

NSF NMGK8
# Metric Conversions

All you'll need to know about them!

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<thead>
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<th>By</th>
<th>To Find</th>
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<td>.0328</td>
<td>feet</td>
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<tr>
<td>Centimeters</td>
<td>.3937</td>
<td>inches</td>
</tr>
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<td>Foot-pounds</td>
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<td>Gallons</td>
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<td>Gallons</td>
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<td>liters</td>
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<td>Inches</td>
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<td>centimeters</td>
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<td>feet</td>
</tr>
<tr>
<td>Kilograms</td>
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<td>Kilometers</td>
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<td>Kilometers</td>
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<td>miles/hour</td>
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<td>inches</td>
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<td>Meters</td>
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<td>Meter-kilograms</td>
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<td>foot-pounds</td>
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<td>Meters/minute</td>
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<td>centimeters/second</td>
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<tr>
<td>Unit Conversion</td>
<td>Conversion Factor</td>
<td></td>
</tr>
<tr>
<td>-----------------</td>
<td>------------------</td>
<td></td>
</tr>
<tr>
<td>Meters/minute</td>
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<td>Miles</td>
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<tr>
<td>Miles/hour</td>
<td>.8684 knots</td>
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<tr>
<td>Miles/hour</td>
<td>1.6093 kilometers/hour</td>
<td></td>
</tr>
<tr>
<td>Miles/hour</td>
<td>.447 meters/second</td>
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<tr>
<td>Ounces</td>
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<tr>
<td>Ounces</td>
<td>2.8349x10² kilograms</td>
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<tr>
<td>Pounds</td>
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<td></td>
</tr>
<tr>
<td>Pounds</td>
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<tr>
<td>Quarts</td>
<td>.946 liters</td>
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<tr>
<td>Quarts (dry)</td>
<td>67.2 cubic inches</td>
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<td>Quarts (liquid)</td>
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<tr>
<td>Sq. centimeters</td>
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<tr>
<td>Sq. kilometers</td>
<td>.3861 square miles</td>
<td></td>
</tr>
<tr>
<td>Sq. kilometers</td>
<td>1.196x10⁶ square yards</td>
<td></td>
</tr>
<tr>
<td>Sq. meters</td>
<td>10.7639 square feet</td>
<td></td>
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<tr>
<td>Sq. meters</td>
<td>1.196 square yards</td>
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<tr>
<td>Sq. miles</td>
<td>2.59 square kilometers</td>
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<tr>
<td>Sq. yards</td>
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<tr>
<td>Yards</td>
<td>91.44 centimeters</td>
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<tr>
<td>Yards</td>
<td>.9144 meters</td>
<td></td>
</tr>
</tbody>
</table>

 Measurement Lab

Objectives

• Students will be able to measure linearly using ruler/meter stick within a quarter of an inch.
• Students will be able to measure liquid capacity.
• Students will be able to measure mass.

Materials

• A worksheet to record measurement;
• Gram scales (balance beam) for each workstation
• Rulers and meter sticks
• Assortment of graduated containers
• An "unknown quantity" workstation could be added as a test.

Procedures

1. Set up lab of different forms of measuring - one at each station.
2. Using overhead, demonstrate measuring with each type.
3. Using graduates, demonstrate reading the mantissa.
4. Divide class into 4 groups.
5. Each student is given 10 minutes/station.
6. Teacher supervises stations (linear stations need most help).
7. Mass measurement station may need instruction as well.
8. Students discuss results within groups, then groups share with class.
9. Have students measure something at home under 1 foot; over 6 feet; capacity of cooking pots;
10. Give students the formula for area, then ask kids: "How big is your yard?"

Note, its fun for kids to estimate measure using a variety of measurement units: the length of a pace, size of a hand, etc.
CAPACITY:

Capacity is the space something takes up. Capacity is often measured in milliliters, liters, cups, pints, quarts, and gallons. We measure liquids such as gasoline, pop, and milk by capacity.

Activities

- Take a Tablespoon and a measuring cup. Estimate how many Tablespoons are in a cup. Using a pitcher of water, fill a Tablespoon and dump it into a cup. Continue to do this until the cup measures up to one. How many Tablespoons did it take?

- Which is larger in capacity a liter or a quart? Take an empty liter container and an empty quart container. Fill which you think is smaller with water. Pour the full container into the larger; it should fit with room to spare if your choice was correct.

- Have students bring in canned goods. Cover the weight and then have them guess how much each can weighs. See if students can find two cans that weigh the same.
Topic: Measurement

Focus of activities:

- linear and liquid measurement

Measurement concepts and skills are directly applicable to the world in which children live. By measuring familiar objects and liquids, children will develop an understanding of measurement concepts and formulas.

Instructions

- Help the child gain experience in estimating and measuring in linear measurement and liquid measurement.

For example, the child takes two BIG steps, marks the spot, and then estimates the distance before measuring. Or, the child pours liquid into a container, estimates the volume of liquid, and then pours the liquid into a measuring cup to make an accurate measure.

- Provide the child with a ruler, a tape measure, and a measuring cup.
- When assistance is required, help the child use the tools above for measuring. Ask questions about the estimation of measures. For example, ask the child if an object is as long as an object already measured.
- The following may be helpful:

  millimeters, centimeters, kilometers milliliters, liters

  $10 \text{ mm} = 1 \text{ cm} \quad 1000 \text{ mL} = 1 \text{ L}$

  $100 \text{ cm} = 1 \text{ m}$

  $1000 \text{ m} = 1 \text{ km}$

Answers to the mathematics activities will be provided in the following day’s guide.
Activities 1: Measurement

1. Draw a line that you think is 100 mm long. Measure the line with a ruler, then add to, or cross out some of the line to make it 100 mm long.

2. Choose 4 different empty tins, such as juice, pop, tuna, or soup tins. Estimate the height of each in mm and the circumference in cm. Make a chart to record all of your estimates before measuring. How close were your estimates?

3. Create a picture using the following directions:

   Use blue paper or color paper blue to make a square lake that is 25 cm on each side. Cut the following shapes out of different paper, and glue them onto the lake:

   a) A triangular island (labeled A) with a perimeter of 15 cm

   b) A rectangular island (labeled B) with a perimeter of 12 cm

   c) An irregular shape (labeled C) with a perimeter of 20 cm

   d) A circular shape (labeled D) with a circumference of about 22 cm

4. a) Choose a clear plastic bottle. Paste a strip of paper along the side. Use a container marked in milliliters (mL) to pour 50 mL of water into the bottle. Mark the height on the side. Pour in another 50 mL. Mark 100 mL on the paper. Continue until you have filled the bottle.

   b) Collect 4 different containers of various sizes. Estimate the number of milliliters each container will hold, and then use your marked plastic bottle to check your estimates.

Activities 2: Measurement

1. A beaver has a body length of about 64 cm. A snowshoe hare has a body length of about 45 cm. The body length of a bobcat is about 80 cm.

   a) About how much longer is a beaver than a snowshoe hare?

   b) About how much longer is a bobcat than a beaver?
c) If they agreed to co-operate, what would be the approximate total length of the 3 animals when lying in a row?

2. The perimeter of Tiffany’s bedroom is 16.6 meters. The perimeter of Carmen’s bedroom is 17.3 meters. They both like the same wallpaper border. When they go to the store, how much wallpaper border should they buy for the two rooms?

3. Tom and Ahmed estimated the length of a long hallway. Tom’s estimate was 12 meters. Ahmed’s was 15 meters. The actual measurement was 13.5 m. Whose estimate was closest and by how much was it off the actual measurement?

4. Jamie decided to set up his train track in a somewhat triangular shape. The sides measured 1.52 m, 1.69 m, and 2.71 m. How much track did he use for the route?

5. Avril surprised her mother by making an applesauce cake for dinner. She needed several kinds of liquid: buttermilk (150 mL), oil (225 mL), vanilla (15 mL), and a semi liquid, applesauce (150 mL). What is the total volume of all of those ingredients?

6. The perimeter of a square painting is 20 meters. If Jan decided to paint a border along each side in a different color, how long would each of those borders be?

7. Estimate, then measure the length of items that you have in your home.
   a) Try to find the combination that will give you the largest answer possible.
   b) Try to find the combination that will give you the smallest answer possible.

8. In a track and field meet, the following results were posted:

<table>
<thead>
<tr>
<th>Name</th>
<th>First Jump</th>
<th>Second Jump</th>
<th>Third Jump</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mary Chong</td>
<td>1.41</td>
<td>1.39</td>
<td>1.36</td>
</tr>
<tr>
<td>Silva Patriel</td>
<td>1.38</td>
<td>1.36</td>
<td>1.40</td>
</tr>
</tbody>
</table>

a) Which girl jumped the longest distance?

b) What is the difference between the longest and shortest distance?
Metric and English: Two systems of measurement

An AskERIC Lesson Plan

Submitted by: Amy Walker and Casey Babcock
Email: Aimuth@aol.com (Amy), dngrgrl@selway.umt.edu (Casey)
School/University/Affiliation: University of Montana
Endorsed by: Lisa Blank
University of Montana

Date: April 7, 2000

Grade Level(s): 3, 4

Subject(s):
  • Mathematics/Measurement

Duration: one 50-minute session

Description: A lesson comparing the Metric system of measurement to the English system. Deals with the recent failed probe to Mars, and how these systems of measurement were involved in that problem.
Goals: To answer the question: will using two differing systems of measurement to construct something cause problems?

Objectives: Students will:
1. explain why the Polar Lander NASA sent to Mars, missed.
2. Explain how the two systems of measurement are different

Materials:

Per group of two: Ruler (metric or English), worksheets, sheet of 8½ x 11" paper, dictionary, new pencil
Overhead projector
Worksheets/Overhead projections (Here’s What We Think & Here’s What We Found)

Procedure:

Scientific Explanation:

There are about $2\frac{1}{2}$ centimeters in an inch. America is one of the only countries still not using the metric system of measurement. The metric system bases itself off one standard, and increases by increments of 10. For example:

1 meter=10 decimeters
10 decimeters=100 centimeters=1 meter
10 centimeters=1,000 millimeters=1 meter
10 meters=1 decameter
10 decameters=100 meters=1 hectometer
10 hectometers=1,000 meters=1 kilometer

Scientists usually measure things using the metric system. So, American scientists need to know how to convert to the metric system in order to communicate with scientists around the world.
In order to find out what the students already know about the metric and English systems of measurement, ask them questions. For example, Can anyone tell me something they know/think they know about the Metric system? English system? What things do you want to know about these two systems? Record their responses by writing them on the chalkboard, overhead or chart paper. Central Science Question: Will using two differing systems of measurement to construct something cause problems?

Focus Phase:

Do you remember hearing about the probe (The Polar Lander) NASA sent to Mars recently? Everyone was very excited about the mission. The probe was supposed to land on a part of Mars that had not been studied before. It was going to collect samples of materials found in the atmosphere and take photographs of the polar region of the planet. Scientists world-wide waited expectantly for the first reports from the probe, but they never came. As the days passed, they gave up hope and began looking for possible causes of the failure. What they discovered was this: U.S. scientists had used English measurements when programming a portion of the system. The rest of the system had been programmed using metric measurements. Do you think that this could have caused the mission to fail? Write down what you think and why.

Challenge Phase:

We’re going to experiment for ourselves to see if we can determine if using two different systems of measurement could have caused this error. How do we determine the measurement of something? Divide the class in half. Ask students to make
predictions about the measurement of five items (student desk, the dictionary, a sheet of paper (8½" by 11"), a new pencil and an item of their choice) and write them down on the worksheet. Allow them 5-10 minutes to complete this portion. Then provide them with rulers, ½ the class with English system and the other ½ with metric system. Have them write down the actual measurements on their measurement worksheet. (Be sure they circle the system of measurement their group uses.) Ask them how they think their measurements will compare with those of their classmates.

*Concept Introduction:*

Ask students to share the results from their investigations. Create a chart of the data together on the overhead using the "What we found..." worksheet. Have member from the different groups share their findings with the rest of the class, or have individual students come to the overhead and write down what they found. Have the rest of the students agree/disagree with the answers. If they disagree have them explain why. Ask: What is the difference between the measurements in centimeters and the ones in inches? (They should notice that the measurements in inches are smaller numbers than those in inches.) Do you think you would always get the same results? To reinforce the idea, have students take the measurement of their chosen object with the measuring tool they did not use (metric/English). Then ask them to compare the results to see if they seem to fit with the rest of the results.

*Concept Application:*

Ask students if their prediction about what happened to the Mars probe has changed. Why or why not? What from this lesson
backed up or caused you to change your first idea. Do you think that what you have learned will always be true? Ask them to write down their answers to these questions. Explain to them that the Mars probe actually overshot Mars and kept going in space because the two units of measurement that were used are different. In order for the mission to have been successful the probe would have needed to be programmed with the same exact unit of measurements. On the chart from the beginning of the lesson, write down what students now know. Ask if there are things they still want to know.

**Assessment:** The students will demonstrate science understandings by:

1) explaining that the probe overshot Mars because two different units of measurements were used.

2) Correctly predicting that measurements in centimeters will always be a larger number than the number of inches in a measurement.

3) Their ability to identify things they now know about the differences between the English and Metric systems of measurement.

**Useful Internet Resources:**

[The International System (Metric)](http://kids.infoplease.lycos.com/ipka/A0801185.html)

[Metric System](http://www.encyclopedia.com/articles/08391.html)
Measurement

Grade Level: Third
Content Area: Measurement-Volume
Skills: Measure with non-standard units in cylinders and rectangular prisms
Prerequisites: Understand Meaning of Volume
Instructional Practices: Estimations, Reasoning, and Connections to Real World

Materials Needed: Several sheets of 9" x 12" constructions paper cut in half (9" x 6"), tape, approx. two cups of beans per group
Technology: Measure It

Activity:

Divide the class into groups of five. Give each group the above materials. Have each group construct a tall slim cylinder by rolling one piece of paper the long way. Overlap the edges and tape the cylinder together. Then make another cylinder by rolling another paper the other way, overlap, and tape. Children are to now estimate which will hold the most beans (greater volume). Now, fill cylinders with beans. Make another tall and short cylinder. Crease these cylinders along their heights in three places to form two rectangular prisms. Fill the rectangular prism and compare the volumes of the similar cylinders to
the prism.


Math Lesson Plan, Topic: Volume (of the mouth)

Grade Level: Second to Fourth

Objective:

Students will learn to measure the volume of an irregularly shaped container.

Materials:
Water, mouths, graduated cylinders, beakers, cups, and straws.

Procedure:
Ask students who has the biggest mouth in the class. Then ask them the focus question of how can we tell for sure that that student has the biggest mouth? Introduce the unit of milliliters and tell students that they are going to measure the volume of their mouths in milliliters to find out who has the biggest mouth. Give students cups of water and have them fill their mouths with water by using a straw. When they have their mouths full, have them spit out the water into a beaker. Then teach students how to use a graduated cylinder to measure the volume of that water. Whoever has the largest volume of water after spitting it out has the biggest mouth in the class.
Math Lesson Plan, Topic: Volume

Grade Level: First to Third

Objective:

The students will estimate, measure, record, compare, and order objects and containers.

Materials:
2 liter bottles, milk jugs, and other containers with different volumes.

Procedure:

Have students bring in a variety of beverage containers, such as 1 liter milk containers or 2 liter drink bottles. Have them work together to estimate and record the volumes of the containers. They can read the labels to determine the actual volume of the containers and then arrange the containers from greatest volume to least volume. Provide students with opportunities to sort and order using different units of measure.
Source:

Volume Activities

Activities that incorporate use of the measuring kit.

Know your Measuring Tools:
Put students into small groups. Give each group member an unlabeled container (cup, pint, quart, half-gallon, gallon, etc...).

Order Up:
Fill equal size containers with different amounts of colored water. Have the students line the containers up based on the capacity of water they are holding.

Estimate Equivalents:
Provide a variety of measuring tools. Let the students explore the tools to get acquainted with them. Have the students estimate how many small containers will fit into the large containers. After they have made their estimates, provide water for them to measure the accurate amounts. Using the measuring utensils, fill the containers keeping record of how many units it took to fill the containers. (Example: How many quarts in a gallon?)

Extension: Use a variety of everyday containers (soda bottles, soup can, milk jug, etc...) and find their equivalents.

Cooking with Equivalents:
Explore a variety of different recipes with the students. Make one of the recipes together in class. Try doubling the recipe or making half servings. For more advanced students, have them convert the recipe from standard units to metric and vise versa.

Scavenger Hunt:
After students are familiar with different measurements, send them on a scavenger hunt to try and find equivalent containers for each measurement studied. They can find things in school, at home or in the community. Provide a checklist of different capacities to find.

Resource: Learning Resources, Liquid Measuring Set Activity pamphlet
If a square has an area of 36 m^2, what is the length of a side in inches?

? 

What is the perimeter of this square?

If this same square was the front side of a cube, what would the volume be?
Calculate the area and perimeter of these rectangles.

Add up each side of these rectangles to find their perimeter.

7 in. 3 in.

15 ft.

6 ft.

Go back and multiply a long side times a short side in order to find their area.

22 m 5.5 m

18 cm

37 cm
Calculate the area and perimeter of these squares.

Add up each side of these squares to find their perimeter.

2.5 in.

Go back and multiply two sides of each square to find their area.

15 m

12 in.

70 ft.
John and Amy’s New House

John and Amy decided to build a house to live in. The builders told them that it would cost $100 a square foot to build a house. John and Amy do not want to spend over $400,000 on their house. How many square feet can John and Amy afford to build?

Below are the floor plans of their house. John and Amy wanted the front of their house to be 80 feet long. How long should their side walls be according to the max square footage above.

Calculate the perimeter of John and Amy’s house.
## Conversion Chart

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<th>To</th>
<th>Multiply by</th>
</tr>
</thead>
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<td>inches</td>
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<td>meters</td>
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<tr>
<td>yards</td>
<td>miles</td>
<td>.0005682</td>
</tr>
</tbody>
</table>

NSF NMGK8
Name:___________________

Area, Perimeter, Volume Conversions

Convert the following from SI units to metric units or vice versa.

1. 15.5 meters = _______ yards

2. 40.7 inches =________centimeters

3. 98.4 cubic centimeters = ________cubic feet

4. 2.45 liters = __________gallons

5. 45 miles = ____________feet

6. 3.93 pints =___________quarts

7. 35 ounces =_________pounds

8. 56 square meters = __________square feet
9. 43.83 pounds = _____________grams

10. 1.34 feet/second = _____________miles/hour
<table>
<thead>
<tr>
<th>RESTAURANT CUP</th>
<th>CIRCUMFERENCE of the rim of the cup (cm)</th>
<th>HEIGHT (cm)</th>
<th>VOLUME (mL)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Burger King</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>McDonald’s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sonic</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kentucky Fried Chicken</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Wendy’s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Church’s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Popeye’s</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Chic-Fil-A</td>
<td></td>
<td></td>
<td></td>
</tr>
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</table>

NSF-GK8
<table>
<thead>
<tr>
<th>Measurement</th>
<th>COMMENDABLE</th>
<th>ACCEPTABLE</th>
<th>NEEDS ASSISTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Measurement</td>
<td>*Completes all measurements for circumference, height, and volume on the chart.</td>
<td>*Most measurements for circumference, height, and volume are completed.</td>
<td>*Measurements are incomplete and missing data in several places.</td>
</tr>
<tr>
<td>Measurement</td>
<td>*Records data using appropriate customary measurements (cm and mL).</td>
<td>*Data is recorded, but with a few mistakes.</td>
<td>*Data is recorded inaccurately, using incorrect measurement.</td>
</tr>
<tr>
<td>Measurement</td>
<td>*Accurately measures cups’ circumference, height, and volume using cm and mL.</td>
<td>*Measurements of circumference, height, and volume are mostly accurate.</td>
<td>*Measurements are incorrect.</td>
</tr>
<tr>
<td>Measurement</td>
<td>*Accurately compares measurements by ranking each cup from largest to smallest volume.</td>
<td>*Ranking each cup from largest to smallest volume is mostly accurate.</td>
<td>*Ranking each cup from largest to smallest is incorrect.</td>
</tr>
<tr>
<td>Measurement</td>
<td>*Identifies cup with the largest volume.</td>
<td>*</td>
<td>*Could not or did not identify cup with the largest volume.</td>
</tr>
<tr>
<td>Measurement</td>
<td>*Identifies realistic relationships between measurements.</td>
<td>*Relationships are written and show some idea of relationships between measurements.</td>
<td>*No relationships are noted, or the relationships are incorrect/missing.</td>
</tr>
</tbody>
</table>

NSF-GK8
DISCUSSION...WHAT DO YOU THINK?

Which restaurant provided the cup with the largest volume? ________________________________

Rank the cups from largest to smallest: 1. ___________________ 2. ___________________

3. ___________________ 4. ___________________ 5. ___________________

6. ___________________ 7. ___________________ 8. ___________________

Look at your data and talk with your partners about the following questions:

Which of your cups have the same circumference? ________________________________

Volume? ________________________________

Height? ________________________________

Do any of your cups share two or more measurements? Which ones? ________________________________

Examine the measurements of the circumference and height of each cup. Would either of these measurements give you a clue about how much volume the cup would have? Explain your thinking on the back of this paper.
Measurement Chart

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Nutritional Value</th>
<th>Amount of one serving size</th>
<th>X _____ students</th>
<th>Total quantity of ingredient</th>
</tr>
</thead>
</table>

NSF-GK8