



Drexel-SDP GK-12 ACTIVITY

Activity: Unit Conversion

Subject Area(s) Measurement, Problem solving

Associated Unit Measurement, module 2

Associated Lesson embedded

Activity Title Unit Conversion

Grade Level 6 (3-8)

Activity Dependency None

Time Required 60-100 minutes

Group Size 2

Expendable Cost per Group None

Summary

Unit conversion is typically a difficult skill for sixth grade students to develop. Unit conversion utilizing the factor-label method and dimensional analysis helps to avoid confusion during the multiplication and division process.

Engineering Connection

Suppose an engineer draws out a design for a new microscope. She uses the English units of inches in her drawing. Now, the microscope is to be manufactured in Europe, where the metric system is used. What is she to do to have her design understood and manufactured overseas? She must convert the English units of inches to the metric units of centimeters.

Keywords

Measurement, units, conversion

Educational Standards

Pennsylvania Standards

3.1.7 Unifying Themes

3.1.7.D. Explain scale as a way of relating concepts and ideas to one another by some measure.

2.3 Measurement and Estimation

2.3.B. Convert linear measurements within the same system.

Pre-Requisite Knowledge

Be familiar with English units of linear measurement (inches, feet) versus the metric units of linear measurement (centimeters, meters).

Learning Objectives

- Students will be able to convert units of money, length, and volume using the factor-label method.
- Students will understand equalities and ratios = 1.

Materials List

- Worksheet(s)

Introduction / Motivation

Suppose an engineer draws out a design for a new microscope. She uses the English units of inches in her drawing. Now, the microscope is to be manufactured in Europe, where the metric system is used. What is she to do to have her design understood and manufactured overseas? She must convert the English units of inches to the metric units of centimeters.

(Unit conversion is typically a difficult skill for sixth grade students to develop. Unit conversion utilizing the factor-label method and dimensional analysis helps to avoid confusion during the multiplication and division process.

Review the background material with the students, discuss the vocabulary, then begin the activity.)

Vocabulary / Definitions

Word	Definition
Unit conversion	The process of equating different units of measurement
Dimensional analysis	A technique that uses unit conversion as a tool to check the correctness of a calculation.

Procedure

Background

Discuss that the United States uses the English system of measurement while most of the world uses the metric unit of measurement.

Before the Activity

Collect and distribute materials.

With the Students

Procedure:

Day 1: MONEY

1. Introduce to the students that there are various combinations of money that are equal to one dollar.
2. Develop the concept of a ratio = 1 by using 4 quarters/dollar = 10 dimes/dollar, etc.
3. Remind students that anything multiplied by 1 is equal to itself.
4. Remind students that it is necessary to cancel out like-units from the top and bottom of the ratios. Also, the unit being converted TO is the unit on the TOP.
5. Practice converting various combinations of coins and bills into other units using the factor-label method.
6. Give the students a worksheet for homework.

Day 2: HEIGHT

Materials

- Tape Measure (English and Metric)
- Calculators (optional)

Procedure

1. Measure the height of each student and give them their heights in varying units (i.e. millimeters, centimeters, meters, inches, feet, yards)
2. Students will use the factor label method to determine their height in the units not given to them (example: centimeters to meters and millimeters).
3. Students share their findings with the class and the class as a whole will check their work.
4. Give the students a homework sheet converting units of length into other units using the factor-label method.

Day 3: M&Ms AND VOLUMES

Materials

- Bag of M&Ms
- Liter/ 500mL beaker
- Boxes of various sizes (jewelry boxes, shoe boxes, cereal boxes, fishtank)

- Ruler/ tape measure

Procedure

1. Pour M&Ms into a clean beaker to a known volume.
2. Pour them out onto a clean towel and have students count them. This will provide a density.
3. Give them the ratio $1\text{L}/1000\text{ cm}^3 = 1$, and have them convert the volume to cm^3 .
4. Give the students the measurements of the various sized boxes from small to large.
5. Have the students determine the volume of the boxes using the measurements.
6. Using the factor label method, have the students determine how many M&Ms will fit into the box.

Safety Issues

- None.

Troubleshooting Tips

- Help the students to understand that each block (top over bottom) within their unit conversion has a value equal to 1.

Investigating Questions

Have student groups complete the following worksheets.

NAME: _____

DATE: _____

HINT:

$$\frac{1 \text{ dollar}}{4 \text{ quarters}} = 1 \quad \frac{1 \text{ dollar}}{10 \text{ dimes}} = 1 \quad \frac{1 \text{ dollar}}{20 \text{ nickels}} = 1 \quad \frac{1 \text{ dollar}}{100 \text{ pennies}} = 1$$

$$\frac{12 \text{ nickels}}{\text{_____}} \times \frac{\text{dimes}}{\text{nickels}} = \frac{\text{dimes}}{\text{_____}}$$

$$\frac{7 \text{ nickels}}{\text{_____}} \times \frac{\text{pennies}}{\text{nickels}} = \frac{\text{pennies}}{\text{_____}}$$

$$\frac{3 \text{ dollars}}{\text{_____}} \times \frac{\text{nickels}}{\text{dollars}} = \frac{\text{nickels}}{\text{_____}}$$

$$\frac{15 \text{ nickels}}{\text{_____}} \times \frac{\text{quarters}}{\text{nickels}} = \frac{\text{quarters}}{\text{_____}}$$

$$\frac{5 \text{ dollars}}{\text{_____}} \times \text{_____} = \frac{\text{quarters}}{\text{_____}}$$

$$\frac{325 \text{ pennies}}{\text{_____}} \times \text{_____} = \frac{\text{nickels}}{\text{_____}}$$

NAME: _____

DATE: _____

MY HEIGHT: _____ centimeters

1. _____ centimeters X _____ $\frac{\text{millimeters}}{\text{centimeters}}$ = _____ millimeters

2. _____ centimeters X _____ = _____ meters

MY HEIGHT: _____ inches

3. _____ inches X _____ = _____ feet

4. _____ feet X _____ = _____ yards

(USE THE ANSWER FROM PROBLEM 3 TO SOLVE PROBLEM 4)

NAME: _____

DATE: _____

M&Ms RATIO:

$$\frac{\text{M\&Ms}}{\text{mL}} \quad \leftarrow \text{(Number of M\&Ms)}$$
$$\quad \quad \quad \leftarrow \text{(Volume of M\&Ms)}$$

$$\frac{1 \text{ mL}}{1 \text{ cm}^3} = 1$$

Box Type	Dimensions (cm)	Volume	Estimate of the number of M&Ms that will fit in the box	Actual number of M&Ms each box can hold (factor-label method)	Difference between estimate and actual value
Jewelry Box					
Shoe Box					
Cereal Box					

Assessment

Pre-Activity Assessment

None

Activity Embedded Assessment

Have the student groups complete the worksheets.

Post-Activity Assessment

Evaluation will be based upon teacher observation of student participation and completion of the worksheets.

Activity Extensions

Devise other unit conversion activities—for time, weight on other planets, etc.

Owner

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