



Drexel-SDP GK-12 ACTIVITY

Activity: Convert It

Subject Area(s) Data Analysis & Probability, Measurement, Number & Operations, Science and Technology

Associated Unit Forget the Cheddar!

Associated Lesson Convert It

Activity Title Convert It

$$\frac{1 \text{ inch}}{25.4 \text{ mm}} = 1$$

Don't be afraid to express yourself in different ways.

Grade Level 7 (6-12)

Activity Dependency

Construct A Car, Quantify It

Time Required 20 minutes

Group Size 2

Expendable Cost per Group US\$0

Summary

Students are encouraged to convert the measurements they recorded in “Quantify It” to a different measurement system in order to relate the imperial and metric systems and practice the operations necessary to convert a measurement.

Engineering Connection

When analyzing a model, Mechanical Engineers draw diagrams to illustrate and understand the loads that cause motion or deformation. Sometimes a diagram that shows forces and dimensions of component parts is sufficient to calculate a solution, but computer simulations may be used in the case of complex models. These complex models must be accurately described and loaded into the simulation as a *drafted* diagram, which can be scanned by high-tech laser techniques or designed using low-tech computer-aided drafting (CAD) software with measurements assessed using a micrometer or vernier caliper.

Keywords

measure, classroom object, car, distance, force, English unit, metric unit, SI unit, MKS, convert, factor-label

Educational Standards

- PA Science:
 - 3.1.7 – Unifying themes
- PA Math:
 - 2.1.8.D – Apply ratio and proportion to mathematical problem situations involving distance, rate, time, and similar triangles
 - 2.2.8.A – Complete calculations by applying the order of operations
 - 2.3.5.D – Convert linear measurements within the same system
 - 2.3.8.A – Develop formulas and procedures for determining measurements
 - 2.4.5.B – Use models, number facts, properties, and relationships to check and verify predictions and explain reasoning

Pre-Requisite Knowledge

Knowledge of unit lengths and awareness of measurement systems

Learning Objectives

After this activity, students should be able to:

- Set up a factor-label line calculation
- Compute a multi-step conversion (multiplying and dividing correctly)
- Relate combinations of macro-units $\left(1 \text{ N} = 1 \frac{\text{kg}\cdot\text{m}}{\text{s}^2} \rightarrow 1 \text{ lb} = 1 \frac{\text{slug}\cdot\text{ft}}{\text{s}^2}\right)$ using conversions of distance, mass, and time.

Materials List

Each group needs:

- “Convert It” worksheet
- Calculator

Introduction / Motivation

[Continue from **Convert It Lesson**] All units can be composed of three quantities: distance, mass, and time. In the example mentioned earlier, the Mars orbiter didn't have its software written in the same measurement system as its sensors. As a result, it detected that a landing surface was farther than it actually was, causing the orbiter to smash into the ground because it hadn't slowed to an appropriate speed. What other quantities, besides position, might be affected by the same software glitch? (Velocity, acceleration, force). Why? (These units depend on the unit of distance).

Convert the quantities you estimated and measured in the previous activity. After completing these, you can try to compute the conversion factor for Newtons to pounds or Pascals to PSI (pounds per square inch) based on unit analysis.

Procedure

Background

The associated worksheet is meant as a guide for converting distances and can be modified accordingly.

Before the Activity

- Distribute "Convert It" worksheets
- Distribute calculators

With the Students

1. Check students' progress and offer assistance or additional explanation

Attachments

chedda_3_activity_convert_it_worksheet.pdf

Owner

Drexel University GK-12 Program

Contributors

John C. Fitzpatrick, Mechanical Engineering and Mechanics, Drexel University

Copyright

Copyright 2008 Drexel University GK-12 Program. Reproduction permission is granted for non-profit educational use.