**Orbiting the Earth**

*Introduction to dimensional analysis*

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**LESSON SOURCE:** *http://www.pbs.org/teachers/mathline/concepts/space/activity2.shtm*
**DATE LESSON TO BE TAUGHT:** First two days of the 4 week unit.
**GRADE LEVEL:** 10-12
**CONCEPT(S):** The purpose of this lesson is to introduce students to a type of problem solving called dimensional analysis. They will need this type of problem solving not only later in life, but also to derive the equation for the driving question.
**OBJECTIVES:**
SWBAT

- Convert conversion equations to fractions;
- Convert from one unit of measure to another;
- Solve problems involving conversions.

**TEKS:** §112.45. Chemistry. (2) Scientific processes. The student uses scientific methods during field and laboratory investigations. The student is expected to: (A) plan and implement investigative procedures including asking questions, formulating testable hypotheses, and selecting equipment and technology; (B) make measurements with precision; (C) express and manipulate chemical quantities using scientific conventions and mathematical procedures such as dimensional analysis; (D) organize, analyze, evaluate, make inferences, and predict trends from data; and (E) communicate valid conclusions.

**MATERIALS LIST and ADVANCED PREPARATIONS:**
Per student

- 1 graphing calculator
- 1 Worksheet
- An extra sheet or sheets of paper
- A pen or pencil

**SAFETY:**
There are no safety issues other than making sure each group stays on task.

## ENGAGEMENT

| What the Teacher Will Do | Eliciting Questions<br>Formative Assessment | Student Responses |
|---|---|---|

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|---|---|---|
|  | "On October 29, 1998, John Glenn blasted off as a payload specialist aboard the Space Shuttle Discovery. This marked Glenn's second voyage into space: his first was on February 20, 1962, when Glenn, one of the seven astronauts in the Mercury Program, piloted the United States' first manned orbital mission aboard the Friendship 7." | |

## EXPLORATION

| What the Teacher Will Do | Eliciting Questions Formative Assessment | Student Responses |
|---|---|---|
|  | -Today we are going to learn about John Glenn's space voyage through calculations. These types of calculations are very helpful in the real world when you have to convert units in an equation. | |
| The teacher assigns groups of about 3 students each and passes out the handout to work from. | -We will be working in groups of three to solve these problems so you all can think about and solve the problem as a group. | -Students go into assigned groups and work on the assignment. |

## EXPLANATION

| What the Teacher Will Do | Eliciting Questions Formative Assessment | Student Responses |
|---|---|---|
| Once students seem to be done working in groups, have a volunteer from each group come up to the board for each problem and explain it to the class (this way if one group doesn't get a problem, another group can help explain it to them). | | -Selected students write their solutions and explain their rationale on the board. |

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|---|---|---|
| While each group is explaining their problem, have other groups correct their mistakes if they had any. | | |

## ELABORATION

| What the Teacher Will Do | Eliciting Questions Formative Assessment | Student Responses |
|---|---|---|
| If all students got each problem correct, there is no need to elaborate, but since this is a relatively new topic for them, it is highly likely that all groups wouldn't understand at least one problem. | | |
| Teacher goes over harder problems that had stumped the students. | | -Students correct their mistakes. |

## EVALUATION

| What the Teacher Will Do | Eliciting Questions Summative Assessment | Student Responses |
|---|---|---|
| Have groups turn in their lab sheets to be graded. | | |