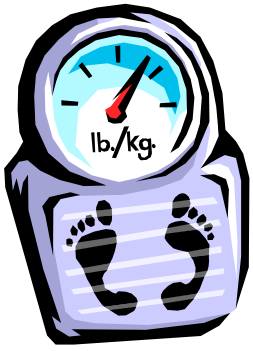
Soda on Saturn – Weighing In & Growing Old
Teacher Version

Introduction & Purpose
This activity will introduce your students to how gravity and age varies on the different planets due to differences in planetary mass, size, and orbit. Most students are surprised at how their own weight and age would differ on each planet, which makes this a fun activity. This activity is also relevant to Rover construction because the Martian gravitational field is different than that of the Earth, so the performance of a Rover tested on the Earth's surface will perform differently on Mars. The Rover's ability to collect and/or sample rocks on the Martian surface may be affected by this difference in gravity.

Objective
Students will form a hypothesis about the weights of the planets in our solar system. Students will also calculate their own weights and ages on each of the planets. They will use their weight information to revise their initial hypothesis. Finally, students will check their weight and age calculations on the Internet.

Materials Needed
- 8 empty Soda cans and one unopened Soda can
- 824 pennies
- *Planetary Data* table (in Student Version)
- *Multiplication Factors* table (in Student Version)
- Calculator
- Computer
- Pens or pencils
- Idaho TECH Lab Notebook

Procedure:
1. To set up this activity, fill empty Soda cans with the number of pennies indicated in the following list:
   - Mercury - 38
   - Venus - 101
   - Earth - (use an unopened can of Soda)
   - Mars - 38
   - Jupiter - 293
   - Saturn - 119
   - Uranus - 102
   - Neptune - 133
   - Pluto - none



2. Randomly label each can with a number, and record which number represents which planet. ***Do not share this information with your students.***
3. Have the team compare the weights of the different cans by picking them up one by one. Then have the students form a hypothesis in their Lab Notebook about the proper order of the cans according to the order of the planets in our solar system based upon how much each can weighs. Have the team line up the cans in the order they hypothesized.
4. Next, have the students review the background information that demonstrates how mass and size determine the gravitational pull of a planet. Be sure they understand the relationship between gravity and weight. Also, review how the length of a planet's orbit affects the length of that planet's year. Be sure they understand the relationship between the length of a planet's orbit and an individual's age.
5. Have the students use their calculators and the multiplication factor table included in the Student Activity Book to calculate their weights and ages on the various planets.
6. Now that the team has thought about their weights on the different planets, they should be able to revise their hypothesis about the Soda cans with this new knowledge. Let them change the order of the cans if they wish. Once they are satisfied with the order, reveal to them which planet is represented by each Soda can.
7. Finally, have the students check their answers for their weight on each planet by using the following web site: http://www.exploratorium.edu/ronh/weight/
8. If time allows, encourage the students to explore these web sites further. Make sure the team records their thoughts and ideas in their Lab Notebook!

Debriefing

Lead the team in a discussion about why being aware of your weight and age on another planet may be important. Have them reconsider some of the questions posed at the beginning of this activity in their Activity Book and encourage the team to use their imaginations, and to record their thoughts and ideas in their Idaho TECH Lab Notebook.

- How will gravitational fields different than that of Earth affect the Rover's mobility?
- How will the difference in gravity affect the Rover's ability to sample Martian rocks?
- What other aspects of a Mars Rover mission might be affected by differences in weight?
- How could differences in age affect a mission to Mars in which astronauts spend time on the surface?
- What if humans ever colonize Mars?