NATIONAL GEOGRAPHIC

GIANT MAPS

SOLAR SYSTEM

GRAVITY IN SPACE

RECOMMENDED GRADES: 4-12

TIME NEEDED: 40 MINUTES

Description

Students calculate their weight on each planet and then use blocks to construct a three-dimensional graph of their weight. Students also model how it would feel to move on each planet by using gravity values to measure the distance they jump.

Learning Objectives

Students will:

- calculate weight on each planet
- use blocks to model weight on each planet
- use each planet's relative gravitational strength to determine how they would be able to move on each planet

Materials

- Blocks (300)
- Calculators (20)
- Measuring tapes (8)

Preparation

5 minutes

- Place blocks on the center of the map so that they are accessible to students.
- Place measuring tapes near edge of map where months are displayed.

Tips/Modifications

Tip

- Remind students to record units when necessary.

Rules

Have students remove shoes before walking on the map.

DIRECTIONS

PART ONE: WEIGHT IN SPACE

1. Have students gather along the edge of the map and ask them to observe the planet illustrations and describe their size. Ask students questions, e.g., *Do you think you would weigh the same on every planet? What affects our weight on a planet? Do you think gravity is the same on every planet?*

2. Using the definitions provided in the Solar System Vocabulary table, review gravity, weight, and mass with students. Explain that people would weigh different amounts on different planets because each planet has a different gravity. Tell students they are going to calculate their weight on each planet and see how it differs from planet to planet.

3. Ask students to leave the map and move to an activity space away from the map. The students will be using calculators and writing utensils that are not allowed on the map.

4. Design a data sheet with students (or make copies of the sample provided) to record their weight or other number to be used in their calculations. For younger students, a class average may be used; for older students, individual weights may be calculated. Ask students to note the relative gravitational strength of each planet provided in the data chart. Ask: *Which planet has the highest relative gravity compared to Earth?* (Jupiter) *Which planet has the lowest relative gravity compared to Earth? (Mars)*

Modification

Use a white board or easel to display the data sheet. Have students record their answers for the class. Using white board markers, the data could be filled in then wiped clean at the end of the activity.

5. Individually or in groups, have students calculate their weight on each planet in the solar system by multiplying the figure they are using to represent their weight on Earth by the planet's relative gravitational strength given in the data chart. Have students record their newly calculated weights on their data charts.

6. Explain to students that they are going to represent their "new" weight on each planet using blocks or bingo chips. Divide students into eight groups and assign each group to a planet. Determine how many pounds, newtons, or kilograms each block will represent, e.g., each block = 5 kilograms. Have students work in their groups to calculate how many blocks or bingo chips they need to represent their weight on each planet.

6. Invite students back onto the map, and have students display their weight with blocks on each planet based on their calculations. When all blocks have been displayed at each planet, have students observe the differences between the planets. Ask: *Which planet would you weigh the most on? Why? Which planet would you weigh the least on? Why? Which planets would gravity feel nearly the same as Earth? Why?* Ask students to predict which planet they think they could jump the highest on.

Modification
Have older students make a graph using graph paper to represent their weight on each planet in addition to using blocks.

PART TWO: HOW FAR COULD YOU JUMP?

1. Have students line up in pairs and have one student stand at one end of the map and jump as far as they can on the map.

2. Using a measuring tape, have their partner measure the distance the student jumped.

Modification
If time allows, have students complete three jumps and average their distance.

3. Have students switch places so that each student has a chance to jump and have their jump measured.

4. Have students leave the map and obtain a calculator, writing utensil, and the data chart from Part One.

5. Have the students calculate how far they would be able to jump on each planet by dividing the distance they jumped on Earth with the relative gravity value provided on the data chart.

5. When all calculations have been completed, ask for eight student pairs to volunteer. Assign each volunteer to a planet. Using a tape measure, have pairs measure the distance that students would be able to jump on each planet and have the remaining students observe the differences between the distances. Have a class discussion. Ask: *Which planet could you jump the farthest on? Which planet would be difficult to walk on? Which planet would be a great place to go and compete in the high jump? Which planet would be most like Earth to jump on?*

EXTENDING THE LEARNING

- When all calculations have been completed, ask for eight student pairs to volunteer. Assign each volunteer to a planet. Using a tape measure, have pairs measure the distance that students would be able to jump on each planet and have the remaining students observe the differences between the distances. Have a class discussion. Ask: How does a planet's gravity compare to its radius and mass? (Hint: it is proportional to mass, but inversely proportional to radius squared.)

DATA SHEET

Use this data sheet in Part One and Part Two of the activity.

Planet	Mercury	Venus	Earth	Mars	Jupiter	Saturn	Uranus	Neptune
Gravity relative to Earth	0.378	0.907	1.0	0.377	2.36	0.916	0.889	1.12
Weight on Earth								
Weight on Planet								
Jump Distance								