



## Planet Relative Size and Distance

**Lesson Concept** Planets vary greatly in their relative size and distance from the sun.

**Link** In the previous lesson, students learned that the sun was in the middle of the solar system and that the planets orbited the sun. In this lesson, students learn just how big the solar system is. In the next lesson, students will investigate the characteristics of each of the planets.

**Time** 1 hour 40 minutes (can be done on different days)

Part I Relative Size: 55 minutes

Part II Distance: 45 minutes

### **Materials**

#### Whole Class

R1 Playdough Planets

R2 Resource Images

#### Per Partner

12 x 18 Light colored construction paper

1 Sheet of white paper

Plastic Knife

3 lbs. of Play Dough

#### Groups of 4

Planet Distance Lab Sheet

1 Strip of cash register tape 400 cm long

Markers (standard set)

Meter stick

Masking tape

#### Individual

Planet Distance Lab Sheet

Science Notebook

Pencil

White sheet of paper for sketching

Exit Card

**Advance preparation**

1. Set up supplies for partners (see list above).
2. Duplicate exit cards.

**Procedure:**

**Part I**                      **Relative Size**

**Engage**                      **(10 minutes) The solar system has planets of various sizes and distances from the sun.**

1. In a think-pair-share, ask partners to recall what they remember about the planets, their size, their order and distance from the sun. Have them record their ideas in their notebook.
2. Ask partners to share what they recall: ask first for the names of the planets and record them on the board. It is ok if they don't remember them all at this point.
3. Next ask students to try to put the planets in an order from the sun. Try to get consensus, but it is ok at this point if there is disagreement of the order.
4. Lastly, ask students to "vote" for what they think is the biggest planet (record the number of students next to each planet) and to "vote" for which they think is the smallest (again record the number of students next to each planet).
5. Explain that students will conduct two investigations to find out more about the order and size of each planet and their distance from the sun.

**Explore #1 (45 minutes) The planets vary greatly in size.**

6. Hold up a 3-lb ball of Playdough and explain that this ball of dough represents the combined mass of all the planets in the solar system, plus the dwarf planet Pluto.
7. Distribute the 3-lb ball of Playdough to partners and ask each to pick up the ball to get an idea of its weight.
8. Ask partners to form the eight planets to match the relative sizes they think the planets are. Ask them to sketch and label each planet in their notebook, or on the piece of white paper.

*Teacher Note: If students did not list all of the planets in Step 2, add the missing ones to the list on the board.*

9. Call the names of different planets and have partners show what they made. Ask students to compare and contrast what each group did. Conduct a discussion as appropriate based on what students share.
10. Explain that they will now do an activity to determine the relative size of the planets.
11. Distribute a piece construction paper to partners and ask them to:
  - a. fold the paper length wise (hotdog style), then fold that in half and then half again, ultimately having a totally of 8 squares.

- b. label each square with the name of one planet (Mercury, Venus, Earth, Mars, Jupiter, Saturn, Uranus, and Neptune)

*Teacher Note: Students will place the Playdough ball on the appropriate square to help them identify and separate each “planet.” Pluto will be created and discussed, but is the last one done and can be set next to Neptune.*

12. Distribute the white sheet of paper and ask students to label it “extra.” Distribute the plastic knife.
13. Explain to students that they need to listen to the following directions very carefully and follow them exactly as presented. They will work as a team to make the planets and should take turns handling and cutting the Playdough so that each person gets a turn.
14. Read the directions **(R1)** and post one direction at a time on the document camera. Provide time for partners to complete each step.
15. Ask students to compare their final “planets” with the sketches they made in Step 8. What surprised them?
16. Use the document camera to show the relative sizes of the sun and the planets.
17. Ask students to re-sketch the planets in their notebook according to their relative size.
18. Have the students recombine the three pounds of play dough and seal it in an air-tight container.

## **Part II      Distance**

### **Explore #2              (30 minutes) Planets vary greatly in their distance from the sun, with a distinct separation between the inner and outer planets**

19. Divide class into groups of 4 (have 2 sets of partners work together).
20. Distribute the Planet Distance Lab Sheet to each group and:
  - Ask students what are common units to measure distance on Earth (e.g., miles, kilometers; feet/miles, centimeters). Ask them if they think these units would work well to measure distances in space. Discuss
  - Explain that since distances in space are so vast/big, they are measured in Astronomical Units (AU).
  - Explain that in this model students will use centimeters, but keep the same relative scale.
  - Complete the chart for the centimeter measurements.

*Teacher Note: Depending on the class’ mathematic skills, have students work in partners to complete the chart to find the distances in centimeters, or complete the chart as a whole group.*

21. Distribute the rest of the materials to each group (meter stick, cash register tape and markers) and ask them to find a place on the floor where they can spread the tape at its length and tape it down with masking tape to prevent movement.

22. Ask students to draw a small side view of the sun on one side of the tape at one end.
23. Have students use their chart to measure where the rest of the planets go in relationship to the sun. Have them mark in pencil where each planet is located.
24. Once the students have measured out the planet locations, ask them to draw their planets with marker on the cash register tape

*Teacher Note: When done properly, the dwarf planet Pluto will be almost to the end of the tape.*

*If students finish the measurement from the sun to each planet and there is time, consider having them measure the distances between planets.*

25. Have the students share and discuss their models with the whole class

**Explain** (10 minutes) *The planets vary greatly in relative size and distance from the sun.*

26. Ask students to review their sketch of the relative sizes of the planets and their distance tape. What do they notice about the planets? How do they differ in size? In distance? Are some planets clumped together? If so which? Are some further apart? If so, which?

*Teacher Note: There is a distinct group of four inner planets that are much closer to the sun and each other than the outer planets, which get increasingly farther away from the sun. The outer "gas" giant planets are also much larger than the other "rock" planets*

**Extend/Evaluate** (5 minutes) *The planets vary greatly in relative size and distance from the sun.*

27. Have the students complete the exit card.



## Planet Distance Lab Sheet

Planet	Average Distance from the Sun in AU	Scale Distance from the Sun in Cm	Marker Color
Mercury	4/10	4	
Venus	7/10	7	
Earth	1		
Mars	2		
Jupiter	5		
Saturn	10		
Uranus	19		
Neptune	30		
Pluto (dwarf planet)	39		

Name: \_\_\_\_\_

### Exit Card



I used to think \_\_\_\_\_, but

now I think \_\_\_\_\_

\_\_\_\_\_

Name: \_\_\_\_\_

### Exit Card



I used to think \_\_\_\_\_, but

now I think \_\_\_\_\_

\_\_\_\_\_

## Playdough Planets

### **A. Divide the Entire Ball of Playdough into 10 Equal Parts**

*Roll the ball out into a "baguette" first and then the cuts can be measured at equal intervals.*

Combine 6 parts together, roll them into a ball, and put the ball into the Jupiter box. Similarly combine 3 parts and put them into the Saturn box. Put 1 part in "Extra."

### **B. Cut the Extra Part Into 10 Equal Parts**

Take 5 parts and combine them with the ball in the Saturn box. Combine 2 parts to put into the Neptune box.

Put 2 parts into the Uranus box.

Put 1 part in "Extra."

### **C. Cut the Extra Part Into 4 Equal Parts**

Take 3 parts and combine them with the ball in the Saturn box.

Put 1 part in "Extra."

### **D. Cut the Extra Part Into 10 Equal Parts**

Put 2 parts into the Earth box.

Put 2 parts into the Venus box.

Take 4 parts and combine them with the ball in the Uranus box.

Put the 2 parts in "Extra"

### **E. Combine the Remaining 2 Extra Parts and Cut Into 10 Equal Parts**

Put 1 part into the Mars box.

Take 4 parts and combine them with the ball in the Neptune box. Take 4 parts and combine them with the ball in the Uranus box.

Put the 1 part in "Extra."

### **F. Cut the Remaining Extra Part Into 10 Equal Parts**

Put 7 parts into the Mercury box.

Take 2 parts and combine them with the ball in the Uranus box.

Put the 1 part in "Extra."

### **G. Cut the Remaining Extra Part Into 10 Equal Parts**

Take 9 parts and combine them with the ball in the Uranus box. That last 1 part is Pluto.

Resource Images





