Name:
Group Members:

Lab 1

I. A Sense of Size

(A) Procure yourself a beach ball and proceed to inflate it. Determine a method to measure the radius of the ball, measure it, and record it here *including units!*.

(A) _____

(B) For the purposes of this lab, this beach ball is your new Sun. Using Table 1, if the Sun was the size of your beach ball, what size would the Earth be? It may help to recall the way that proportions work:

$$\frac{\text{Scaled Sun}}{\text{Actual Sun}} = \frac{\text{Scaled Object}}{\text{Actual Object}}$$

(B) _____

Table 1: Solar System Data

Object	Equatorial Radius	Distance from Sun
Sun	6.96×10^8 m	–
Mercury	2.44×10^6 m	5.80×10^{10} m
Venus	6.05×10^6 m	1.08×10^{11} m
Earth	6.37×10^6 m	1.49×10^{11} m
Mars	3.40×10^6 m	2.28×10^{11} m
Jupiter	7.15×10^7 m	7.78×10^{11} m
Saturn	6.03×10^7 m	1.43×10^{12} m
Uranus	2.56×10^7 m	2.87×10^{12} m
Neptune	2.48×10^7 m	4.50×10^{12} m

(C) For each planet in the chart below, determine the planet's size in your model solar system, and sketch the approximate size of the planet. Be sure to include the units on your radii!

Mercury

Radius=_____

Venus

Radius=_____

Earth

Radius=_____

Mars

Radius=_____

Jupiter

Radius=_____

Saturn

Radius=_____

Uranus

Radius=_____

Neptune

Radius=_____

(D) How many Jupiters could you fit side-by-side across the middle of your beach ball Sun?

(D) _____

II. **A Sense of Distance**

Now that we've looked at the sizes of objects in the solar system, we are going to change things up a bit (and get a bit of exercise. . .) by looking at distances in the Solar System. For these next bits, choose the best jumper in your group.

(A) Before going any further, pause a moment to do some estimation. You are not graded on accuracy here, just discuss it with your group and give it your best guess. If the Sun is the size of your beach ball, about how many leaps do you think it would take your jumper to reach Earth?

(A) _____

(B) How many leaps do you think it would take your jumper to reach Uranus?

(B) _____

(C) You'll need to know how much distance your jumper can cover in a typical leap, so grab a meter stick and take a few test leaps to see how far they are traveling. Consider taking 5 tests and then average the results (add the values and then divide by 5).

Average Leap = _____ meters

(D) Time for some quick calculations. Returning to your proportion method, how many meters from the beach ball Sun should the Earth be in your model?

(D) _____

(E) Given your average jump length, how many leaps would should it take to cover this distance?

(E) _____

(F) How does this compare to your guess?

(G) Repeat the last 3 steps to determine and compare the distance of Uranus from the beach ball Sun. Were you closer or further away with this estimate?

Distance = _____ meters

Distance = _____ leaps

(H) Now to head outside! Grab your beach ball Sun and ensure someone is your group has a method to take a picture. Find a corner of campus where you have a long straight stretch in front of you and plunk down your Sun. If someone in your group really doesn't want to walk or if your Sun is blowing away, leave someone behind to babysit it at this point.

(I) Time for your jumper to prove their awesomeness. Start leaping in a direction where you can go straight for a long ways. The rest of the group should tag along, and take over the jumper duties if needed. Hop your way to where Earth should be and turn back to look at your Sun. Does this seem about correct (is the beach ball the same size in the sky as the Sun?)? Take a selfie looking back, making sure the Sun is visible!

(J) Now for the real journey. Uranus is a ways out, so hopefully you chose a long straight stretch. You really should switch off jumpers for this next bit unless you have a leaping fitness phenom (or masochist...) in your group. Hop your way on out to Uranus and take a look back again at your tiny Sun. Can you still see it? Grab another selfie at least pointing in the correct direction.

(K) Whew! You are done! Walk back to collect your Sun and return to Collins. Turn your completed lab reports into Sarah and email your images to me (jjrembold@willamette.edu) with the subject line: "Lab Photos - Group A/B" depending on which lab group you are in. Also include the names of your group members in the email body!