

Solar System Model with Ari:

Answer Key

Name: _____

Date: _____

Vocabulary

Scale - A ratio (like 1:5) that shows how a model's size compares to the real object.

Scale Factor - A number which represents how much bigger or smaller a model is compared to the real object.

Activity 1

For this activity, you will calculate the size of the planets using the scale factor you and your teacher calculated if the sun was shrunk down to the size of a ping pong ball. Before you begin, make sure to write the **scale factor** in the space below.

Scale Factor: 34,800,000,000

You will need to use the scale factor above to calculate the diameter (in cm) and distance from the sun (in cm).

- The model **diameter (cm)** is equal to:

$$\frac{\text{real diameter (cm)}}{\text{scale factor}}$$

- The **model distance from the sun (in cm)** is equal to:

$$\frac{\text{real distance from sun (cm)}}{\text{scale factor}}$$

The calculations for Mercury are worked out as an example.



Diameter of a ping pong ball:
4 cm



Diameter of the sun:
139,200,000,000 cm

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Mercury Example

- Model diameter (cm):

$$\frac{\text{real diameter (cm)}}{\text{scale factor}} = \frac{487,900,000}{34,800,000,000} = 0.014 \text{ cm}$$

- Model distance from the sun (cm):

$$\frac{\text{real distance from sun (cm)}}{\text{scale factor}} = \frac{5,791,000,000,000}{34,800,000,000} = 166 \text{ cm}$$

☐ Complete the calculations for the remaining planets and fill out the table below.

Note: Answers may vary slightly due to rounding.

	Real Distances		Model Distances	
	Diameter (cm)	Distance from Sun (cm)	Diameter (cm)	Distance from Sun (cm)
Sun	139,200,000,000		4	
Mercury	487,900,000	5,791,000,000,000	0.0140	166
Venus	1,210,000,000	10,820,000,000,000	0.0348	311
Earth	1,274,000,000	14,960,000,000,000	0.0366	430
Mars	677,900,000	22,790,000,000,000	0.0195	655
Jupiter	13,980,000,000	77,860,000,000,000	0.4017	2237
Saturn	11,650,000,000	143,300,000,000,000	0.3348	4118
Uranus	5,072,000,000	287,700,000,000,000	0.1457	8267
Neptune	4,925,000,000	450,300,000,000,000	0.1415	12940

Next, we need to create scale models of each planet. The models of most planets will be too small to measure with Ari on this scale, so their diameter will be measured with notecards, which have a thickness of ~ 0.01 cm.

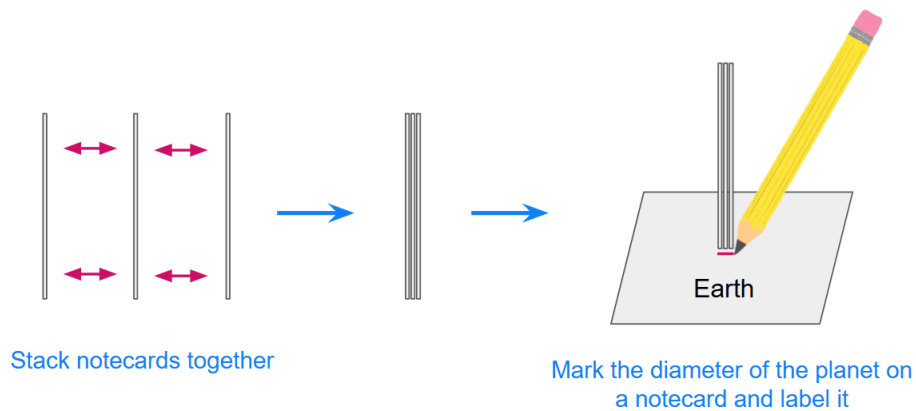
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If a planet has a diameter of ~0.03 cm on this scale, like Earth, you should stack 3 notecards together and use that as a makeshift ruler with which to draw the diameter of the planet. See the image below as an example.

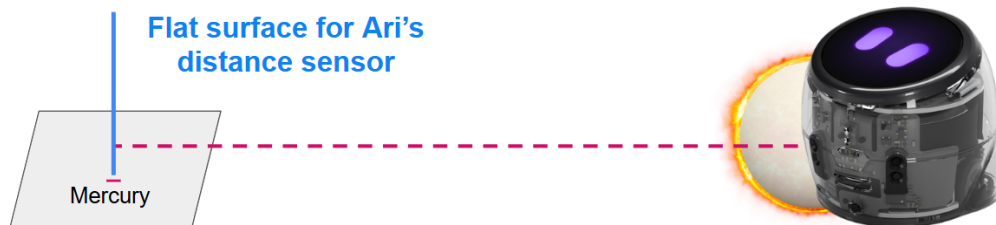


- ☐ Create models of each planet, following the image above as a guide.

Activity 2

Now that the notecard models of each planet are finished, we'll create a **1 : 34,800,000,000** scale model of the solar system.

- ☐ Find a long stretch of straight space and place your sun (the ping pong ball) on the floor.
- ☐ Use Ari to measure the distance from the sun to the first planet, Mercury. Use the **model distance from the sun** numbers from your table in Activity 1. You will need some sort of flat surface for Ari's distance sensor. (see image below)



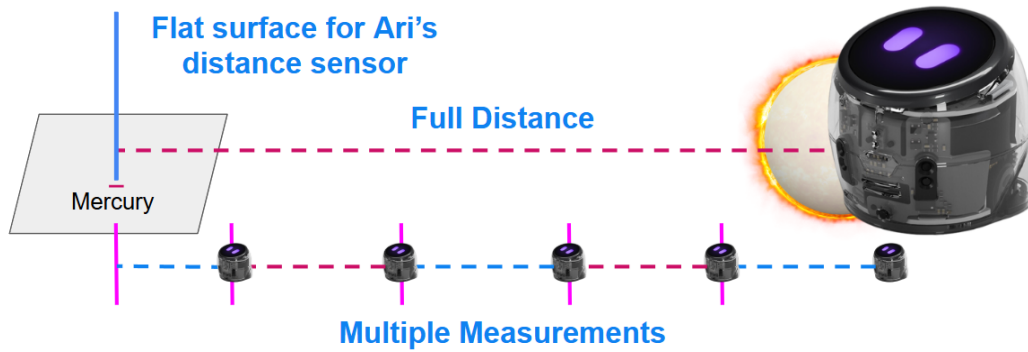
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Note: Depending on Ari's maximum range, you may need to take multiple measurements and combine them until you get to the total.



- ☐ Repeat the previous step for the remaining planets.

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Exit Ticket

Please answer the following prompts.

Do not forget to include your **name** and **date** on this paper!

1. A student created a 3D model of themselves and wants to 3D print it at a 1 : 20 scale. If the student is 167 cm tall, how big will the model be?

$$\frac{167 \text{ cm}}{20} = 8.35 \text{ cm}$$

2. The diameter of a basketball is roughly 24 cm. A student wants to build a model where the diameter is 15 cm. What scale will the model be?

$$\frac{24 \text{ cm}}{15 \text{ cm}} = 1.6$$

The model is a 1 : 1.6 scale