

## **Create a Solar System Scale Model with Spreadsheets**

### **Standards/Objectives:**

Students use scale, proportion and/or ratios to develop a scale solar system calculator. Using spreadsheet software, students will calculate the distance between planets and create a solar system model that fits in the school yard.

- CCSS.MATH.CONTENT.7.RP.A - Students will analyze proportional relationships and use them to solve real-world and mathematical problems.
- CCSS.MATH.CONTENT.7.RP.A.2.B - Students will identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
- CCSS.MATH.CONTENT.7.RP.A.2.C - Students will represent proportional relationships by equations.
- CCSS.MATH.CONTENT.7.EE.B - Students will solve real-life and mathematical problems using numerical and algebraic expressions and equations.
- CCSS.MATH.CONTENT.7.EE.B.4 - Students will use variables to represent quantities in a real-world or mathematical problem, and construct simple equations and inequalities to solve problems by reasoning about the quantities.
- CCSS.MATH.CONTENT.7.G.A.1 - Solve problems involving scale drawings of geometric figures, including computing actual lengths and areas from a scale drawing and reproducing a scale drawing at a different scale.
- KAST.CT.1.B - Students will collect data or identify relevant data sets, use digital tools to analyze them, and represent data in various ways to facilitate problem-solving and decision-making. Students will select and utilize an age-appropriate digital tool to represent data ex.: spreadsheets, digital graphs/charts , with guidance and support from adults.

### **Measurable Activity:**

- Calculating the scale distances between sun and planets by creating a formula in your spreadsheet.
- Create and display a scale model of the solar system.

### **Materials/Technology:**

- Not-to-scale solar system model images
- Computer
- Spreadsheet (Google Sheets)
- Distance markers
- Paper
- Pencil
- Colored pencils
- Centimeter ruler

- Compass
- Measuring Tape
- [Solar System Reference Guide](#) (see link or images)
- [Scale Distance Google Sheet](#) (see link or images)
- [Scale Size Spreadsheet](#) (see link or images)
- [Scale Size and Distance Spreadsheet](#) (see link or images)

**Resource:**

- <https://www.jpl.nasa.gov/edu/teach/activity/create-a-solar-system-scale-model-with-spreadsheets/>
- [Solar System Size and Distance](#)

**Evidence:**

When the opportunity arises when this may be implemented in the classroom, this activity will provide a more hands on approach to the concept of scale factor. With the use of technology and spreadsheet formulas, students are converting measurements and developing skills that are required when using spreadsheets. This activity goes beyond just calculating the measurements, but allowing students to visually see their calculations and measurements. It puts it in perspective of how dynamic the solar system is.

Distance from the Sun to planets in astronomical units (au):

Planet	Distance from Sun (au)
Mercury	0.39
Venus	0.72
Earth	1
Mars	1.52
Jupiter	5.2
Saturn	9.54
Uranus	19.2
Neptune	30.06

	A	B	C	D
1			1 au = 10 cm	
2	PLANET	au	cm	
3	Mercury	0.39	=B3*10	
4	Venus	0.72		
5	Earth	1		
6	Mars	1.52		
7	Jupiter	5.2		
8	Saturn	9.54		
9	Uranus	19.2		
10	Neptune	30.06		
11				

$$\frac{\text{Scale Diameter}}{\text{Scale Distance}} = \frac{\text{Actual Diameter}}{\text{Actual Distance}}$$

Diameter of planets and their distance from the Sun in kilometers (km):

Planet	Diameter (km)	Distance from Sun (km)
Sun	1,391,400	-
Mercury	4,879	57,900,000
Venus	12,104	108,200,000
Earth	12,756	149,600,000
Mars	6,792	227,900,000
Jupiter	142,984	778,600,000
Saturn	120,536	1,433,500,000
Uranus	51,118	2,872,500,000
Neptune	49,528	4,495,100,000

	A	B	C
1		Scale diameter (cm)	Actual diameter (km)
2	Sun		1,391,400
3	Mercury		4,879
4	Venus		12,104
5	Earth	1.0	12,756
6	Mars	$= (B5 * C6) / C5$	6,792
7	Jupiter		142,984
8	Saturn		120,536
9	Uranus		51,118
10	Neptune		49,528

	A	B	C	D	E
1		Scale diameter (cm)	Scale distance from sun (cm)	Actual Diameter (km)	Actual distance from sun (km)
2	Sun		-	1,391,400	-
3	Mercury			4,879	57,900,000
4	Venus			12,104	108,200,000
5	Earth	1.00	$= (B5 * E5) / D5$	12,756	149,600,000
6	Mars			6,792	227,900,000
7	Jupiter			142,984	778,600,000
8	Saturn			120,536	1,433,500,000
9	Uranus			51,118	2,872,500,000
10	Neptune			49,528	4,495,100,000

### Qualitative Data Collection:

At the conclusion of this project students will complete the linked google form to reflect on their learning. The survey will require students to bring light to common misconceptions about the size of planets and distance between planets as well as reflect on how ratios were used in their discoveries. This data will serve as a formative assessment to bring attention to any remaining misconceptions students might have about the use of scale factor.

Survey Link: <https://forms.gle/cNndu1N17cmmmSia7>