Earth, Moon, Sun
Scale Model

Learning Objective:
I will create a **scale model** of the Earth, Moon, and Sun to compare their sizes and distances from each other.

NGSS: 5-ESS1-1

Day 1:

1. **Define "Universe"**
2. **Discuss how the Sun and Moon compare in the sky.**
3. **Compare the actual sizes (diameters) of the Moon, Earth, and Sun.**
4. **Complete Table 1: Actual Sizes**

The Universe

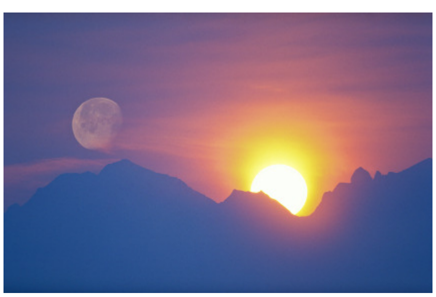
Everything that exists including all of space is considered the universe . That is all planets, moons, stars and the Earth. It is incredibly difficult for people to picture just how big the universe is, because it is immensely huge.

The Earth is <u>very small</u> compared to some objects in space, yet the Earth seems HUGE to us. It is also difficult for people to imagine how far apart objects in space are from each other, because the distances are much farther than anything we travel on Earth.

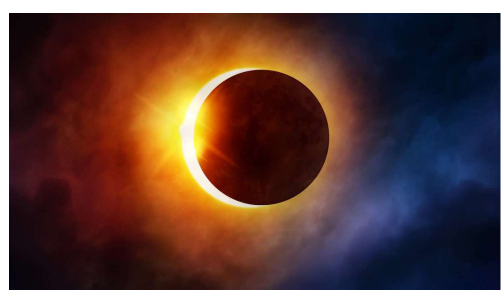
Today we will focus on comparing sizes and distances of three space objects: The Sun, Moon, and Earth.

Think About This…

When you are standing on the Earth and look up into the sky, **how do the sizes of the Moon and the Sun compare**? *Does one look bigger than the other? Or do they look about the same size?*

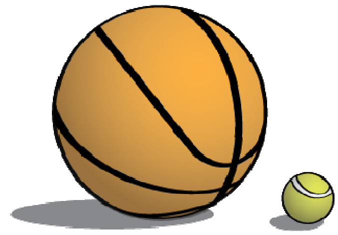


Have you ever seen the Sun and the Moon in the sky at the same time?



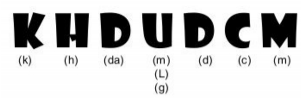
Have you ever seen a solar eclipse?

Actual Sizes….

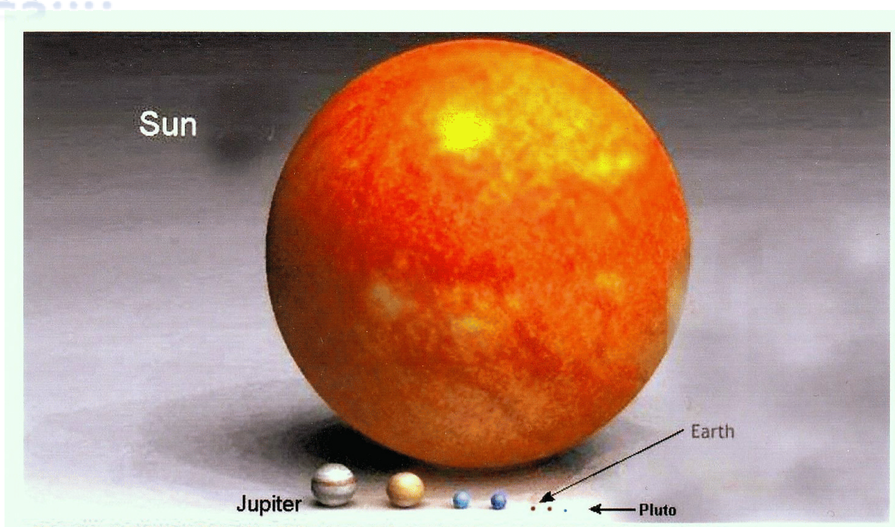


Earth's diameter = **12,742 kilometers** (km)
or **12,742,000 meters**

Moon's diameter = **3,474 kilometers** (km)
or **3,474,000 meters**



Actual Sizes….

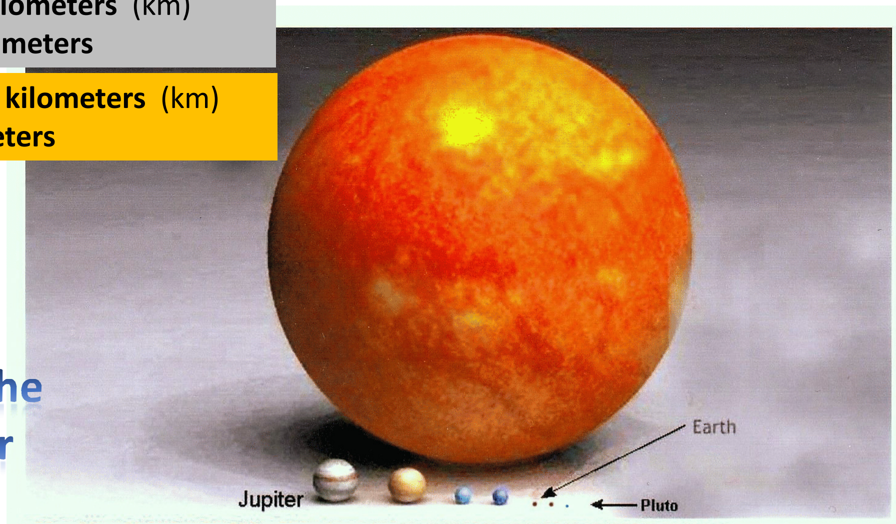


Observations: Look at the model above showing the size of the Sun to other planets in our solar system, including Earth. With a partner, come up with a **scientific comparison of the Sun and the Earth**.

Earth's diameter = **12,742 kilometers** (km)
or **12,742,000 meters**

Moon's diameter = **3,474 kilometers** (km)
or **3,474,000 meters**

Sun's diameter = **1,392,000 kilometers** (km)
or **1,392,000,000 meters**

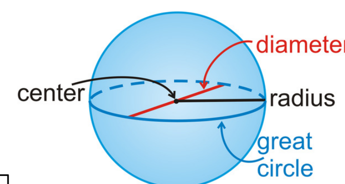


Video Link

Discuss:
Can anything in the universe be larger than our Sun?

video link

Actual Sizes….



TASK: Complete the tables in your science journals.

The Earth is ______________ kilometers (km) wide. The width of a sphere is also called its diameter. The Moon has a diameter of ______________ km. The Sun has a diameter of _______________km.

	Smallest	Middle	Largest
Object			
Diameter (km)			

Day 2:

1. **Define a Scale Model.**
2. **Discuss real life examples of scaled models.**
3. **Draw a scale model of the size of the Moon, Earth, and Sun in our journals.**
4. **Discuss the distance between the Moon, Earth, and Sun.**

What is a **Scale Model**?

If we want to compare the sizes of the Earth, Moon, and Sun, we cannot draw them in their actual sizes. They would be WAY too big to draw! These objects are immensely large and far away from each other.

We need to draw a scale model. A scale model is either a zoomed in representation of something that is very small, or zoomed out version of something that is very large. To make a scale model you either shrink or enlarge all of the objects by the same amount (or ratio).

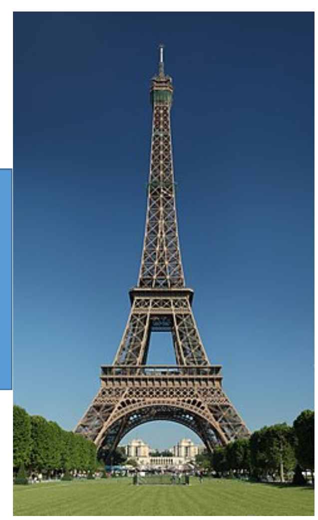
Example of a Scale Model

A small but **exact copy** of something.
Exact in terms the **ratio** of measurements of the **model** to measurements of the real thing.

If you measured the real car and divided everything by 16, you would have a 1/16 scale model.

..another example.

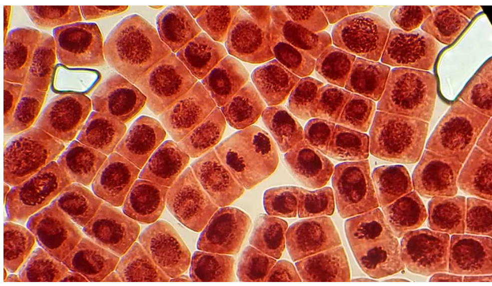
Some scale models **REDUCE** or shrink the real thing.

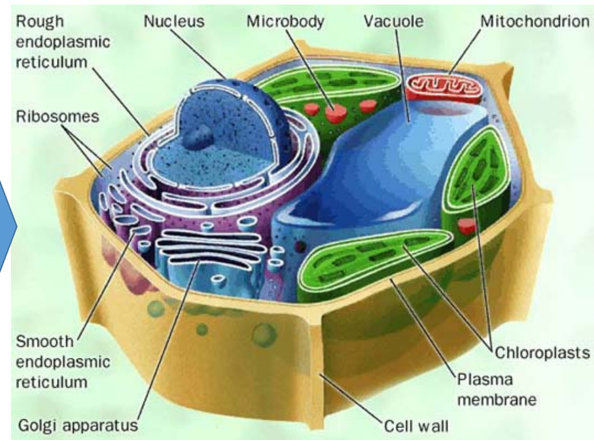


If you measured the real Eiffel Tower divided it by 300, you would have a 1/300 scale model.

..another example.

Some scale models **ENLARGE** the real thing.





A microscopic cell enlarged to show details.

Discuss:

This is a cute shoe box model of the solar system made by a 3rd grader.

Do you think it is a **scale model**? ***Why or why not?***
Are there elements of this model that **look *scaled***? *If so, how?*

Scale Model of Size:

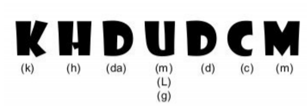
TASK: Draw a scale model of the Moon, Earth, and the Sun that shows their sizes compared to each other.
If we zoom out to draw these huge objects about **6 billion times smaller** (6×10^9) than they actually are, they would be the following sizes:

Moon = 0.5 mm

Earth = 2 mm

Sun = 19.8 cm
or 198 mm

19.8 cm
Use guiding dots on paper

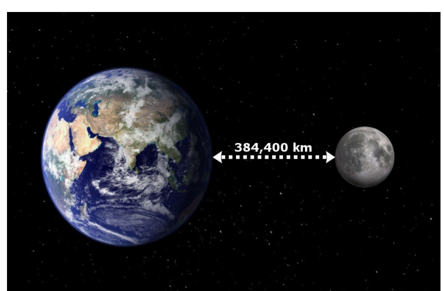


Actual Distance:

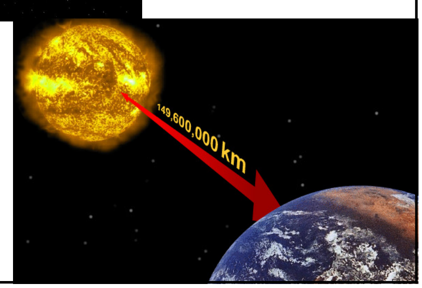
We can also create scaled models to represent the distance things are from each other.

The Moon is ______________ kilometers (km) away from the Earth.

The Earth is _______________ kilometers (km) away from the Sun.



Fill in the blanks: The _____________ is much closer to the Earth than the _________.



Day 3:

1. Predict the measurements for a scale model of distance.
2. Create a scale model of distance between the Moon, Earth, and Sun.
3. Complete “My observations about distance and size of objects”.
4. Using the hallway, construct a working scale model of the actual distance.
5. Discuss an even bigger scale model in the hallway. Can we do it?

Create your scaled model:

Predict

If the Earth and Moon were the sizes from our scale model on page 3, they would be __________ cm apart from each other.

Directions for Page 4:

1. Label the 2mm circle on the left side of the page “Earth”.
2. Measure 5 ½ cm to the right and draw a small dot to represent the 0.5 mm scaled Moon. Label it “Moon”.

Predict

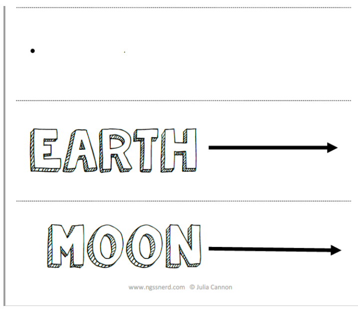
If the Earth and Moon are ________ cm away from each other in our model, predict how far you think our 19.8 cm scaled Sun would be from Earth.
(Hint: it will not fit on the paper!)

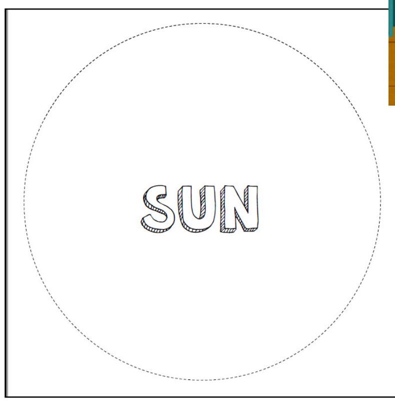
My Prediction:

Actual Distance:

Construct your scaled model:

Directions:
1. Cut out each of the parts on the dotted lines.
2. Hallway expectations – lay down the Earth and Moon paper.
3. Calculate 70 feet (floor tiles) – lay down Sun paper
4. Observe. Return to classroom.





Day 4:

1. **Complete Analysis of Scale Models**
2. **Calculate a larger scale model of the Moon, Earth, and Sun.**
3. **Invite another class to observe scale model and ask us questions.**

Analysis of Scale Models

Questions to answer in your interactive notebooks:

1. What do you notice about the distance of the Earth to the Moon, compared to the distance of the Earth to the Sun?
2. If the Sun is actually so much larger than the Moon, then why do you think they look like they are about the same size from Earth?
3. Are the models we made at a smaller or larger or same size as the actual Moon, Earth, and Sun? How do you know?
4. Why do scientists use scale models to represent very large or very small objects?
5. Which is larger, the size of the Sun, or the empty distance between the Sun and Earth?
6. Why do you think we didn't draw a model that included both the correct size and distance for the Earth, Moon, and Sun?
7. Based on what we've learned about scale models in this lesson, is the picture of the solar system below drawn to scale? Why or why not?