

Using Tinkercad Models to Represent Sizes and Distances in Space

Overview:

In this activity you are going to build some virtual models that will help you understand some of the size and distance scales we'll encounter as we study Astronomy.

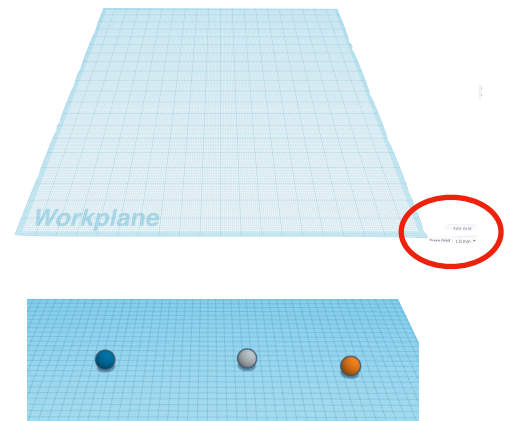
A bit about Tinkercad:

For this activity you will use a web-based 3D design platform called Tinkercad. If your school uses Google Suite or if you have your own Google Account you can go to tinkercad.com and click on "Sign In" then "Sign in with Google". You can also make a free account with a different email address.

Tinkercad is very user friendly and you'll probably be able to figure out the basics pretty fast. There are some helpful tutorials at <https://www.tinkercad.com/learn>. And, of course, you can always contact your teacher with questions.

Part 1: Sizes in the Solar System

1. Start a new project in Tinkercad.
2. Click on "Edit Grid" in the lower right hand corner and change the height and width to 200 mm.
3. Add three sphere to the grid. Color code them as follows:
BLUE = Earth GRAY = Moon ORANGE = Jupiter
4. Do a little research to determine the diameters of these objects in kilometers. Add these to the table below.



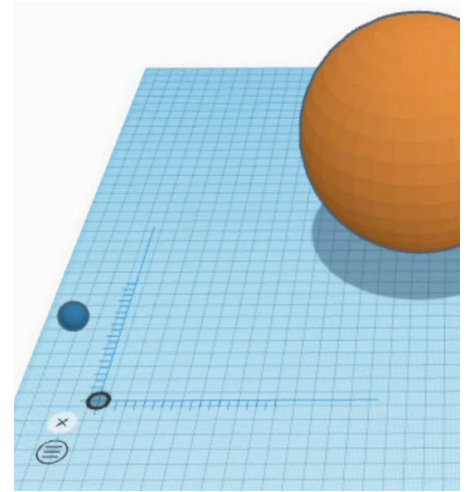
Object	Diameter in Kilometers	Scaled Diameter in Millimeters
Earth		
Moon		
Jupiter		

5. Our scale for the model we're building will be 1000 kilometers in Real Life = 1 millimeter in Tinkercad. Determine the scaled diameter for each of the objects and add it to the table above.
6. Resize each of the three sphere to the scaled diameter in the table above. Note that in Tinkercad you change diameter by changing the Length, Width, and Height of the sphere.
7. Arrange the objects so they are clearly visible and use the "Text" tool in "Basic Shapes" to add labels for each object and a scale.
8. When you are finished, click "Send To" in the upper right hand side of the screen and email your model to your teacher.

Part 2: Distances in the Solar System

1. In this part we're going to modify the model you made in Part 1.
2. Click on the Ruler tool and place the origin somewhere along the left side of the Workplace.
3. Drag the Earth sphere so that it lines up with the origin of the ruler.
4. Look up the distance from the Earth to the Moon and record it below along with the scaled version (1000 km = 1 mm)

distance from Earth to Moon = _____ km =
_____ mm in Tinkercad



5. Drag the Moon to the correct scaled distance. As you move it, the ruler will show you its distance from the Earth.
6. Re-arrange your labels and scales to that everything is clearly visible.
7. When you are finished, click "Send To" in the upper right hand side of the screen and email your model to your teacher.

Extensions

Use your Tinkercad models to answer these question. Send a screenshot or copy of your revised models with the answers.

1. How many Earths do you need to line up to match the diameter of Jupiter?
2. How many Jupiters would fit between the Earth and Moon?
3. How many Earths could fit inside Jupiter?
4. What would the Sun look like in the model? Look up the diameter of the Sun, add a sphere to your model, then adjust its diameter to create a scale model of the sun. Spoiler alert ... it's big!

Part 3: Constellations and Distances to the Stars

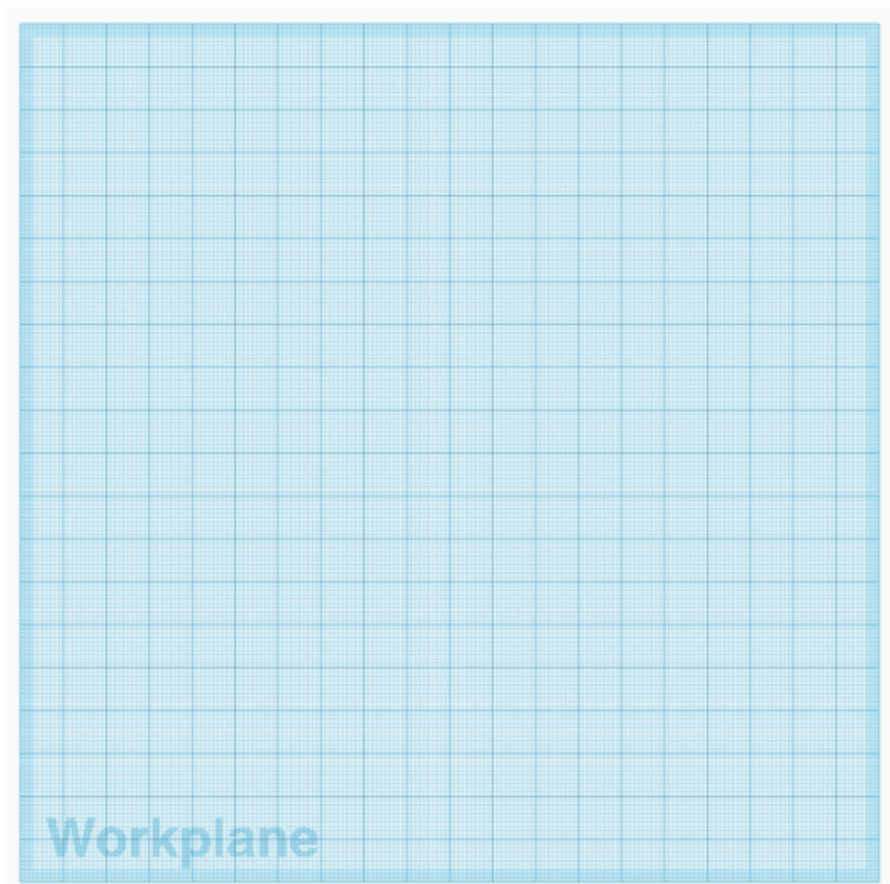
Generally, students knowledge about stars when they enter an early Astronomy class is the names of some constellations and an awareness that stars are really far away. In this activity we'll build upon this knowledge by building models of constellations that include a scale representations of the distances to the stars that make them up.

1. Start a new Tinkercad file (no need to change the workspace).
2. Add one "star" from the "Basic Shapes" and makes its length and width 10 mm.
3. Do a google image search to find a picture of a constellation you'd like to study. It's best to start off with something simple like the Big Dipper. If you choose something more complicated only worry about the stars that a most prominent.

4. On the grid, map out the stars in your constellation.

5. Do a little more research and determine the distance from Earth to each of the star above. Write the distances next to each star.

6. In Tinkercad, make copies of your star until you have enough to create the constellation. Arrange these so you have a drawing of your constellation in Tinkercad.



7. The base of the grid represents that surface of the Earth. Drag the stars up to their distance from the Earth using the scale 1 mm = 1 light year.

8. When you are finished, the shadows on the Workplane will show the constellation as viewed from Earth and the stars will be arranged in a way that shows their actual distance for the Earth.

9. Click "Send To" in the upper right hand side of the screen and email your model to your teacher.

