



Stars and constellations Home School Edition

What are stars and constellations? Learn and explore in this activity.

Utah Core Science Standards

2.2.2 Observe and record recognizable objects and patterns in the night sky.

2.2.2b Observe and describe the number, arrangement and color/brightness of stars in the night sky.

Materials Needed

- Toothpicks
- Spaghetti
- Regular marshmallows
- Mini marshmallows
- Other materials of your choice

Next Generation Science Standards

5-ESS1-1 Support an argument that differences in the apparent brightness of the sun compared to other stars is due to their relative distances from Earth

Background

Our sun is a star. How is it different than other stars? Other stars are very, very, far away so they appear as small lights in the night sky. Stars are always shining in our sky, but we can only see them when our sun's bright light is not shining (at night).

Stars vary in size and temperature. Our sun is an average size star. When we look at stars at night their relative brightness depends on two things, how far away they are and what size they are. Brighter stars are either closer to Earth or quite large, or both.

A constellation is a grouping of stars. Constellations are useful for astronomers, both professional and amateur, to navigate their way around the sky. Constellations have allowed humans to chart the sky into visible patterns of stars for thousands of years. Most cultures have created fascinating constellation myths and stories.

We see constellations in 2-D, as if their pattern was on a sheet of flat paper. In fact, the distances between stars in constellations can be vast. Constellations are patterns that can only be seen from Earth. From other places in space they would no longer appear as a group.

Since the Earth rotates around its axis every 24 hours, the stars appear to move through the sky. Actually, we are moving.

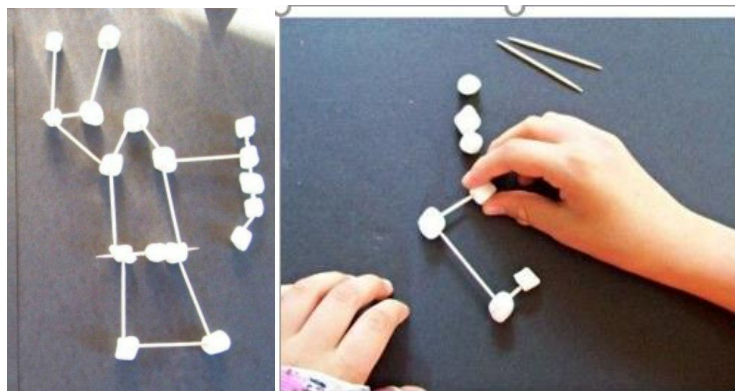
Students will learn about these concepts and then create their own constellations, helping them to understand Earth and Space science.

Directions

- What is our sun. A star! Why does it appear so bright? It is so much closer than any other star.
- Watch this video about stars. What are stars and constellations? Why questions for kids. Click on the video tab at the top of the lesson. <http://www.greatbasinobservatory.org/lesson-plans/stars-and-constellations>
- While watching the video take some notes in a chart like the one below to track what you learn.
 - Make a chart like this and try to answer these questions in your chart.

Stars	Constellations
What are stars? How do they vary? Note some information that was the most interesting to you on stars.	What are constellations? Do they move? Can you explain why? Note some information that was the most interesting to you about constellations.

- Now comes the fun part, you will be making your own constellation.
- Have your toothpicks, spaghetti and mini marshmallow ready.
- Use your materials to create a single, or multiple constellations. You can create ones that are real- like Orion or the Big and Little Dipper. Or get creative and design your own constellation. If you make your own, make a story to go with it.



Examples of constellations built with marshmallows and toothpicks or spaghetti

- If you make your own constellation design, make a story to go with it! We'd love for you to share your constellation story and design with us. Snap a photo and send it along with your story to greatbasinobservatory@gmail.com



- Now its time to look at your constellation from a new perspective. **How can you take some of the concepts you learned in the video and represent that in your constellation?**
- Think about how you learned that *stars are different sizes and distances from Earth*. Is your constellation flat? Are the stars all the same size? Think creatively, can you change your constellation to better *represent* a group of stars in space? How can you do this?
- There are a variety of ways to do this.... We don't want to hamper your creativity! But, if you are stumped look at the GBO printable download here to see some examples <http://www.greatbasinobservatory.org/lesson-plans/stars-and-constellations>
- Once again, we'd love to see what you came up with. Please send us a photo and description (or a video) of how you changed your constellation to add a better representation of star groups.

Extension

You've learned the basic concepts now about star size, distance, and even a little about color. You have also learned that constellations are not flat, they are groupings we see as flat, but in actuality the stars in a constellation can be far distances from each other.

The next activity can be done with your entire family or you can do it yourself. This activity is really neat and great for all ages. You'll learn a lot about two common constellations seen in the night sky.

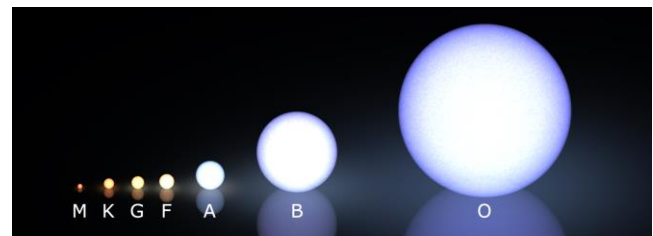
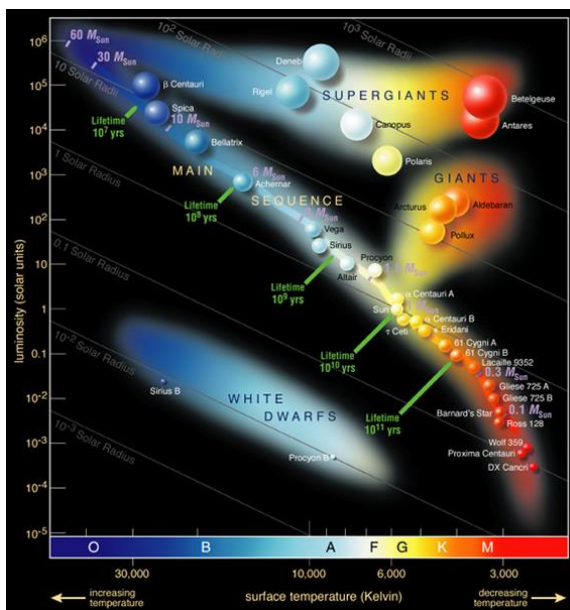
Constellations in 3-D Creation Activity

Materials Needed

- Common objects around your house that you can easily move- cardboard boxes, or chairs, kitchen bowls, anything you can move and set on the floor easily- 7 will be needed.
- 7 copies of the Orion and Big Dipper sheet in color, cut in half (or less, you really only need one copy per person). If you don't have a printer, bring up the sheet on a tablet or phone, that will work perfectly fine and save trees!
- 12 blue stars, 1 Betelgeuse, 1 Mizar prints in color- or just draw some stars on a sheet of paper to represent each and save a lot of printer ink. Reuse some old paper to save trees.
- Tape
- A long space. Your living room or backyard will work best.

Activity Directions

- Gather your supplies and your family.
- Decide which constellation you want to build first.
- Hand each person a copy of the constellation. Or have each person bring up the pdf file on your phone or tablet. You can also do this entire exercise yourself.
- For the activity you will need to note the second bit of information under each star. The first bit of information refers to the star's type/ size. If you are interested, you can reference the chart below. Understanding the star type is not necessary for this activity. (Our sun is a G2V yellow dwarf type star). The second number is the light years away the star is from Earth. We will be working with this number.



- You will be representing the amount of light years away from Earth each star in the constellation is. Or put another way, you will be placing your constellation's stars in a 3-D picture.

- **First a note on light years.** A light-year is the distance light travels in one Earth year.

One light-year is about 9 trillion km (6 trillion miles). That is a 9 with 12 zeros behind it!

Our Sun is the closest star to us. It is about 93 million miles away. Our sun's light takes about 8.3 *minutes* to reach us. This means that we always see the Sun as it was about 8.3 minutes ago.

The next closest star to us is about 4.3 light-years away. So, when we see this star today, we're actually seeing it as it was 4.3 years ago. All of the other stars we can see with our eyes are farther, some even thousands of light-years away.



Directions continued

- Looking at your constellation you can see how many light years each star is from Earth (the second number under each star). Now it is time to build your 3-D model of the constellation.
- Decide on a line that represents Earth's surface. Now decide how many steps back from the Earth you'll need to go to place each star. You'll need to devise a scale. Do this together as a group (if you are doing this with your family) or on your own. For example, should each step back represent 50 light years, or 20, 10, or maybe 100? Whatever number you choose, you need to keep this your scale for each star in the constellation. You'll want to decide based upon the room available and the constellation you are using.
- Once decided, step back the correct steps and place your star. Tape your star on an object (chair, cardboard box, etc)
- Do this for all the constellation's stars. Now you have created an accurate 3-D constellation model!
- Once done, step to your location representing Earth's surface. Are you surprised by how distant the constellation's stars are?
- There are some interesting things you can learn from looking at your 3-D scaled constellation. Think about if we can see all these stars with our naked eye, what does that tell us about really distant stars? Might that mean they are really large or really bright? Check it out on the chart on the earlier page. Is that the case?
- Repeat this process with the next constellation.

Final Notes

The Big Dipper is unusual as the stars are relatively close together and actually are related in a group. Did you notice how Mizar and Alcor are really close? They are a double star. If you can see these two individually in the night sky you have excellent vision. And have passed a 13th century Persian eye test! But you may actually still have excellent eyes even if you can't see these two. Why? What things could affect this eye test? Light pollution for one. When the sky is darker, we can see the stars much better. One reason Great Basin National Park is so popular for astro-tourism.

How did you end up building your 3-D constellation? Please send us a photo, we'd love to see!
Send to: greatbasinobservatory@gmail.com