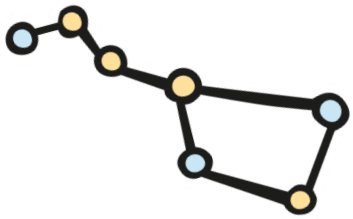
CLOSEST STARS

It’s a Beautiful Day in Our Stellar Neighborhood



Curriculum topics

- Coordinate Graphing
- Galaxies and Stars
- Modeling
- Patterns in the Sky
- Solar System

Subjects

- Earth & Space Science
- Physical Science

Grade range: 5 - 8

Who we are: Resource Area for Teaching (RAFT) helps transform the learning experience by inspiring joy through hands-on learning.

The history of observing constellations dates to prehistory, with early humans across different cultures identifying patterns in the night sky and associating them with stories, myths, and deities, creating constellations to mark the passage of time and navigate by the stars. The most recognized constellation names and patterns today primarily originated from ancient Greek and Mesopotamian astronomy. For example, Ursa Major, also known as the Great Bear, is a constellation in the northern sky, whose Latin name means "greater (or larger) bear", referring to and contrasting it with nearby Ursa Minor, the lesser bear.

In this activity, students create a 3-dimensional model of the closest stars that demonstrates the scale and structure of space and our Milky Way galaxy. They use a variety of materials as they map star positions and distances, practicing coordinate graphing along the way!

Share Your feedback!
http://bit.ly/RAFTkitsurvey

Materials

Materials in the kit may vary but generally, this kit contains the following:

- Pony beads, regular, multiple colors (30)
- Skewers, points removed (20)
- Foam, stiff, 12” x 12” x 1” (1)
- 1 cm graph paper (2)
- Closest Stars Printable Ruler sheet (1), download extras at: https://tinyurl.com/6yw7ycpu
- **Not included:** Tape/glue

To Do and Notice

1. Print and/or cut out one or more paper rulers (cm) from the Closest Stars Printable Ruler sheet.

2. **Assembly:** Attach a sheet of 1 cm graph paper, centered, to the foam (Scale: 1cm = 1 light year).

3. Label a point in the center of the graph (0,0) and number the X and Y axes. Use the data table on page 3 below to graph the X,Y coordinates of each star. Label each point with the star name.

4. Insert a bamboo skewer vertically into the foam at each labeled point. Slip a pony bead over each skewer, preferably using different colored beads for each star. For stars listed as “binary” in the table, add another bead to those skewers so they have 2 beads.

5. Starting from the foam, use the paper ruler from step 1 above to measure the “Z-Adjusted” value (in cm) for the first star in the table. Move that bead up along the skewer to its measured value. Use tape or glue to secure the bead in place. For binary stars, move and secure both beads together on the skewer.

6. Repeat step 5 above for each star in the data table.

7. **Analyze & Discuss:** Based on the model, what do you notice about the distances between the stars? Which stars are the closest/farthest from our Sun (from us)? Choose 2 stars from the model and discuss their distances in terms of light years (Scale: 1cm = 1 light year).

8. **Share** your experience with RAFT! Submit photos/video via email at education@raft.net or on social media (Facebook, Twitter, Instagram).

Star Coordinate Data Table

Print and distribute to each student/group as needed

Star	X	Y	Z	Z (Adjusted)
Sun	0.0	0.0	0.0	+12.0
Proxima Centauri	-1.6	-1.2	-3.7	8.3
Alpha Centauri (binary)	-1.7	-1.4	-3.8	8.2
Barnard's Star	-0.1	-6.0	+0.5	12.5
Wolf 359 (CN Leo)	-7.4	+2.1	+0.9	12.9
Lalande 21185	-6.4	+1.6	+4.8	16.8
Alpha Sirius	-1.6	+8.2	-2.5	9.5
Beta Sirius	-1.6	+8.2	-2.4	9.6
Luyten 726-8 (binary)	+7.8	+3.6	-2.8	9.2
Ross 154	+1.9	-8.5	-3.8	8.2
Ross 248	+7.4	-0.6	+7.2	19.2
Epsilon Eridani	+6.3	+8.5	-1.8	10.2
Luyten 789-6	+9.8	-3.7	-2.9	9.1
Ross 128	-10.9	+0.6	+0.2	12.2
61 Cygni (binary)	+6.4	-6.0	+7.0	19.0
Epsilon Indi	+5.5	-3.1	-9.5	2.5
Procyon (binary)	-4.8	+10.3	+1.0	13.0
Sigma 2398	+1.1	-5.9	+10.0	22.0

Core Content Skills:

Science & Engineering (NGSS)

Constructing and Developing Explanations, Engaging in Argument from Evidence, Analyzing and Interpreting Data, Earth and the Solar System, The Universe and its Stars, Earth and the Solar System; Scale, Proportion, and Quantity, Cause and Effect, Patterns

CCSS Mathematics

Coordinate Pairs & Graphing, Ratios & Proportions, Geometry

Social Emotional Learning

- Self-awareness
- Self-management
- Responsible decision-making

The Science Behind the Activity

Our Sun is located on one of the outer arms of the spiral-shaped Milky Way galaxy, a cluster of well over 200 billion stars (see illustration below, right). At the scale of the model, the Milky Way would be 1 km across and 30 meters thick (at our location). This model presents locations of the closest stars (within 24 cubic light-year "boxes"); however, most stars appear quite dim. Humans can see only a few bright stars with the unaided eye (Alpha Sirius = brightest). Powerful telescopes assist us with seeing stars, especially where they are clustered (see below, left).

A light year is the distance light travels in one Earth year. Light travels about 6 trillion miles. That's a 6 followed by 12 zeros, or 6,000,000,000,000!

Rene Descartes, a 17th century French mathematician, developed coordinate graphing as a means of identifying and analyzing locations in 3D space (x, y, and z axes), as applied in this activity.

Reuse

This kit uses 100% reusable materials designed for other uses. To continue making a positive impact in reducing waste, reuse these materials in other projects. Additionally, any unused materials can be collected and delivered back to RAFT.

Feedback

Please comment on this kit by taking this short survey: http://bit.ly/RAFTkitsurvey. Let us know of any material concerns (missing, broken, or poorly fitting parts) as well as any suggestions for improvement.

Visit https://raft.net to view related activities!

Solar System in the Round
Space Stuff to Scale
Star Distances on a Map
Sun Measurer

Resources

- The Milky Way (video) - https://www.youtube.com/watch?v=Yni3hpdZe88
- Star-related article - https://wonderopolis.org/wonder/Why-Do-Stars-Twinkle