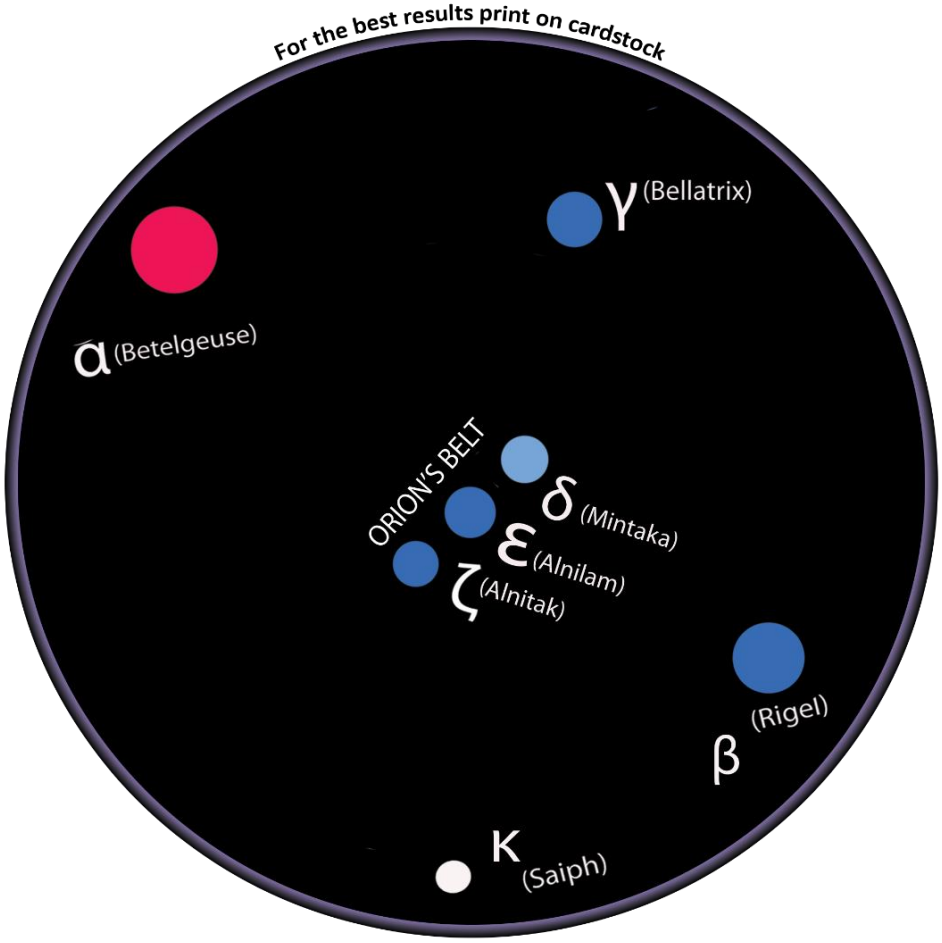
# Make A 3-D Orion Constellation

## GETTING THE PERSPECTIVE

### Is what you see what you get?

When we view the stars from earth, we are unable to perceive the varying distances. To the unaided eye, the distances appear the be the same, except they are not. In this activity you will create to model that sheds a little light on the perspective. Your completed model will show the relative distances of the stars from earth.

Two versions of the activity are included, and we've included a worksheet for you to create your own using the constellation Cassiopeia.




## KEY CONCEPTS:

1. A light year is about 6 trillion miles or just under 10 trillion kilometers.
2. Star color gives us a clue to its temperature. The red stars are among the coolest and the blue stars are among the hottest. Where do stars like our sun fit? Right in the middle.
3. Stars in a constellation are ordered by brightness using the Greek alphabet α, β, γ, δ, ε, ζ, κ. Looking at the model above, which star is the second brightest based on the alphabet?_____.

## THE CONSTELLATION ORION

The Constellation Orion the Hunter includes the prominent asterism Orion's belt: three bright stars in a row, Betelgeuse a massive red supergiant nearing the end of its life, the blue supergiant Rigel is the sixth brightest star in the night sky and the blue giant Bellatrix is known as the "Amazon Star". Orion is best seen from late fall to mid spring.

Just below Orion's belt is the Orion Nebula, a fascinating region where brand new stars are beginning their lives.

## VISIT CHABOT

If you would like to see a giant 3-D constellation model, visit Chabot Space & Science Center's Observation Deck where you can view a giant model of the Big Dipper or go to our YouTube channel ChabotSpace to watch a video about it.

For extra fun, try to create your own model with fun materials from home.

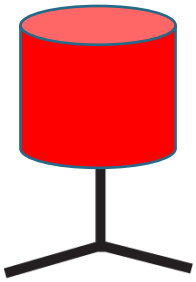
Inspired by the "Three-Dimensional Orion" by the Astronomical Society of the Pacific

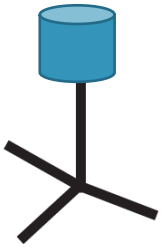
## MATERIALS

- Template from page 1
- 7 staws or plastic coffee stirrers
- Tape
- Ruler
- Scissors
- 2 large and 6 small marshmallows. Tip: try coloring your own. You'll need 1 large red, 1 large blue, 1 small white and 4 small blue. You can also replace the marshmallows with dough.

## DIRECTIONS

1. Split one end of each straw into 2 or 3 legs. (see below).
2. Tape the legs of each straw to its corresponding position on the template on the first page. For extra durability poke a hole through each star on the template and run the straw through. Tape it on the backside to hold it secure.
3. If you do not have colored marshmallows you can use food dyes or frosting to tint your marshmallows.
4. Once all seven straws have been placed, insert the corresponding marshmallow by color and size on top of each straw to represent each star.

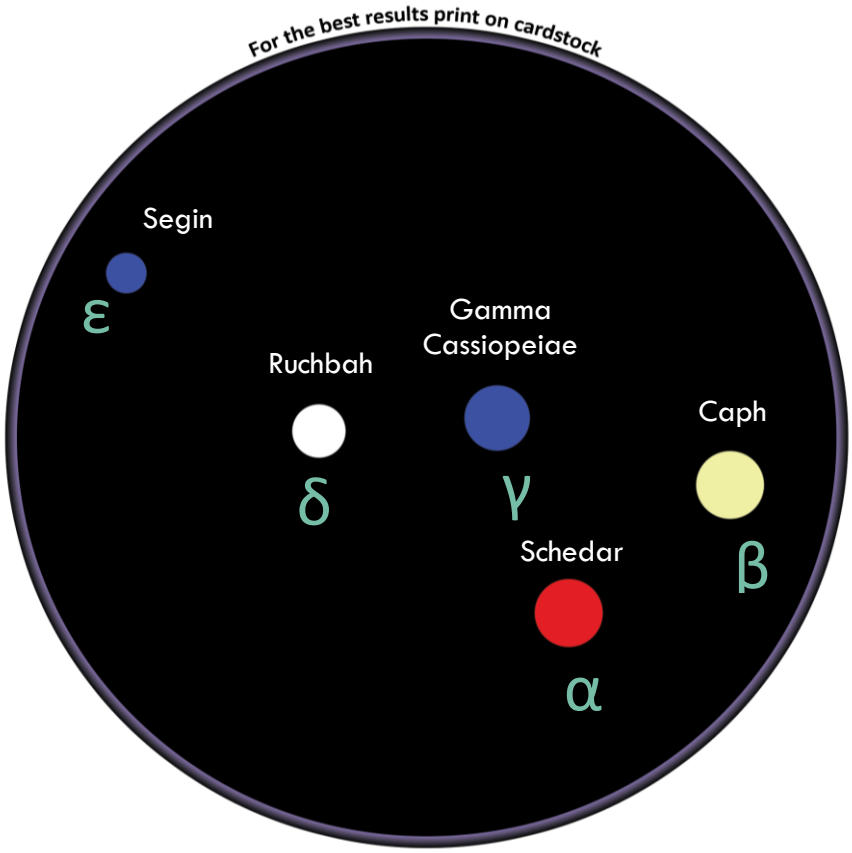




| Greek Letter | α | β | γ | δ | ε | ζ | κ |
|---|---|---|---|---|---|---|---|
| Greek word | Alpha | Beta | Gamma | Delta | Epsilon | Zeta | Kappa |
| Star name | Betelgeuse | Rigel | Bellatrix | Mintaka | Alnilam | Alnitak | Saiph |
| Distance in light years | 429 | 777 | 243 | 919 | 1,359 | 826 | 725 |
| Straw height in imperial units | 1.75 in | 3 in | I in | 3.75 in | 5.5 in | 3.25 in | 3 in |
| Straw height in metrics | 4.44 cm | 7.5 cm | 2.5 cm | 9.5 cm | 14 cm | 9 cm | 7.5 cm |
| Star color | Red | Blue | Blue | Light Blue | Blue | Blue | White |
| Marshmallow size | Large | Large | Small | Small | Small | Small | Small |

# Make Your Own 3-D Model of Cassiopeia

Now it's time to apply what you've learned from creating the Orion model to a new challenge. Using the information below, create your own 3-D model of the constellation Cassiopeia.




What measurement will you use for each 50-light year? _____.

Enter the number in the chart below. Use it to calculate the height of your stars.

In the Orion model we used 1 inch / 2.5 centimeters for every 200 light years.

What material will you use to build the distances? _____. What materials will you use for stars? _____.

| Greek letter | α | β | γ | δ | ε |
|---|---|---|---|---|---|
| Star name | Schedar | Cath | Gamma Cassiopeiae | Ruchbah | Segin |
| Distance in light years | 230 | 55 | 550 | 99 | 400 |
| Calculate the height | | | | | |
| Star color | Orange | Yellow-White | Blue | White | Blue |

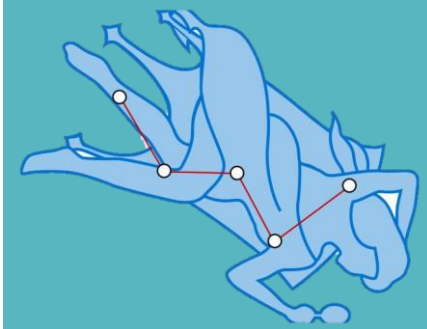
## THE CONSTELLATION CASSIOPEIA

Cassiopeia, the queen of Aethiopia, is one the easiest constellations to find in the night sky for its distinct W shape and its year-round visibility. She sits next to her husband Cephus and above her daughter Andromeda.

The brightest star in the constellation is the strikingly orange Schedar.

Within the boundaries of the constellation there are multiple star systems that contain exoplanets.

She was known for her stunning beauty and vanity. She sits on her throne upside down as a punishment from the gods.



# Make a 3-D Paper Model of Orion

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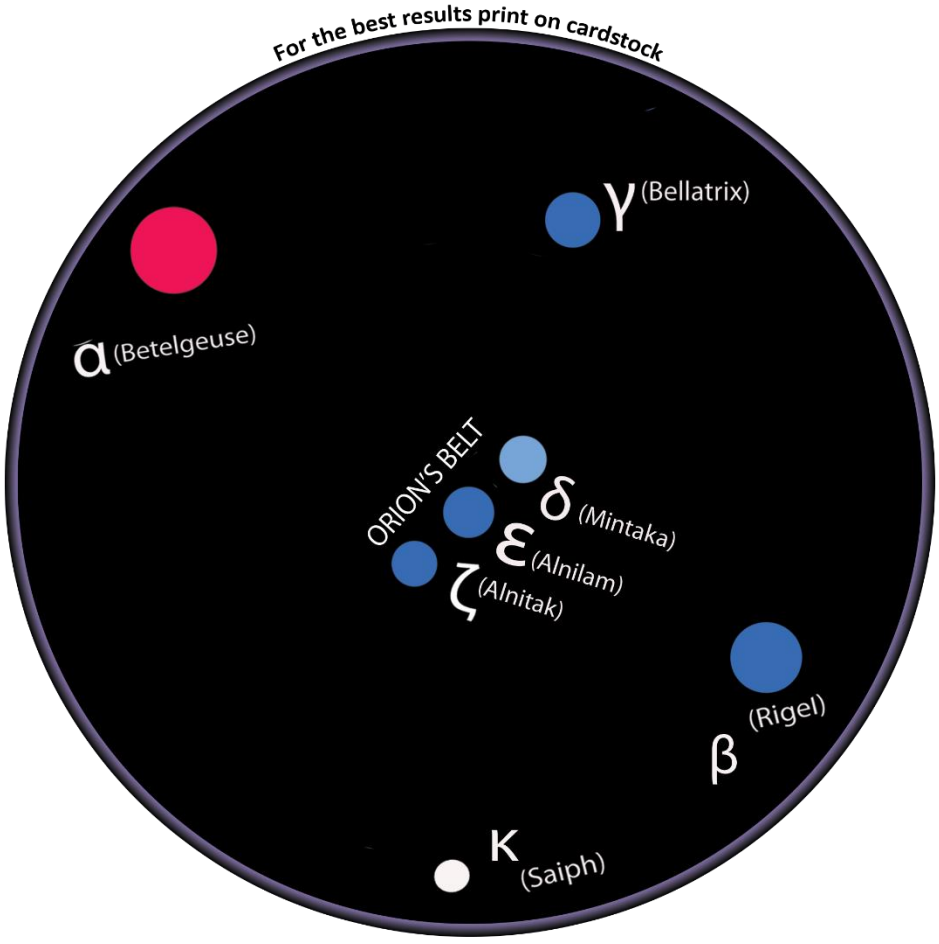


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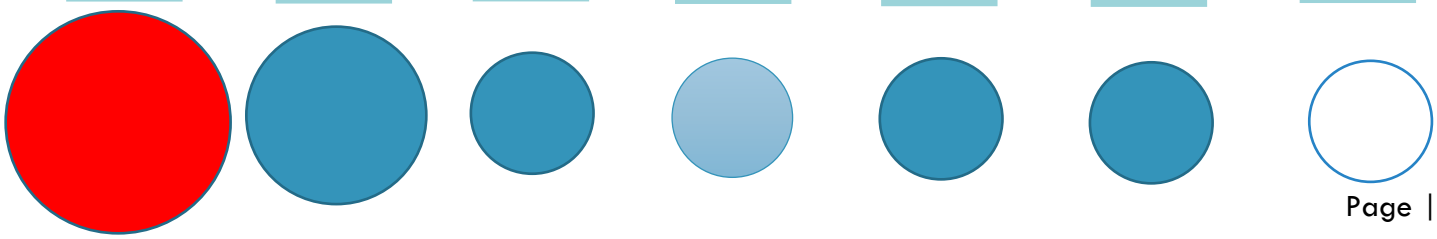
## DIRECTIONS:

1. Print both pages onto cardstock.
2. Measure the distances of the stars below. Cut them out leaving a little extra room at both ends to create a fold.
3. Glue or take one of the folded ends on the corresponding star on the previous page.
4. Fold the top ends to create a surface for the stars.
5. Cut out and glue the stars at the bottom of the page to the top of the folded end of the stands.

| Alpha | Beta | Gamma | Delta | Epsilon | Zeta | Kappa |
|---|---|---|---|---|---|---|
| α | β | γ | δ | ε | ζ | κ |
| BETELGEUSE 429 light years<br>1.75 in. or 4.44 cm. | RIGEL 777 light years<br>3 in. or 7.50 cm. | BELLATRIX 243 light years<br>1 in. or 2.5 cm. | MINTAKA 919 light years<br>3.75 in. or 9.50 cm. | ALNILAM 1,359 light years<br>5.5 in. or 14 cm. | ALNITAK 826 light years<br>3.25 in. or 9 cm. | SAIPH 725 light years<br>3 in. or 7.50 cm. |

FOLD→



# STANDARDS, SKILLS, AND CONCEPTS (NGSS)

## NEXT GENERATION SCIENCE STANDARDS

Completing these activities and experiments will satisfy the following NGSS standards:

- **1-ESS1-1**: Patterns of stars are studied and predicted.
- **5-ESS1-1**: The brightness of stars is due to relative distances.
- **5-ESS1-2:** Patterns are revealed of seasonal changes of the appearance of some stars in the night sky.
- **K-2-ETS1-2**: Physical models are developed to illustrate how the shape and size of an object functions.

## PRACTICES FOR K-12 CLASSROOMS

Throughout these activities, learners of all ages will practice skills such as:

- **Developing and Using Models**
- **Carrying out Investigations**
- **Analyzing and Interpreting Data**
- **Using Mathematics and Computational Thinking**

## CROSS CUTTING CONCEPTS

Completing these experiments and activities will help children understand the following about cross cutting concepts:

- **Patterns:** similarities and differences of patterns in the natural world are recognized and used to describe phenomena.
- **Cause and Effect:** cause and effect relationships are identified to explain change of natural phenomena.
- **Scale, Proportion, and Quantity:** scale models at measured units are used to describe natural phenomena that is too immensely large to study.

## GIRL SCOUT BADGE CORRELATION

SPACE SCIENCE INVESTIGATOR, JUNIORS STEP: 3

- **Make a 3–D constellation.** Stars look tiny and faint because they are so far away. But are they all the same distance? You can make a **3-D model of the constellation Orion** to see how it looks from Earth and from outer space!