

Capitol Area Council NOVA Award in a Bag

Science Everywhere NOVA Award

Visit <https://www.scouting.org/stem-nova-awards/awards/cub-scout/science-everywhere/> for the NOVA Award requirements

In this NOVA in a Bag, there are supplies to complete Requirement 2A, Requirement 3A-C, and Requirement 5. Suggestions and resources are given to help complete Requirement 1 and 4.

For Requirement 1, choose option A or option B or option C from below, then complete ALL THE REQUIREMENTS within the option chosen:

Option A: Watch one of more episodes of a show about anything related to science. The Scout needs to watch a total of one hour.

Then do the following:

1. **Make a list** of at least two questions or ideas from what you watched.
2. **Discuss** two of the questions or ideas **with your counselor.**

Option B: Read about anything related to science. The Scout needs to read a total of one hour.

Then do the following:

1. **Make a list** of at least two questions or ideas from what you read.
2. **Discuss** two of the questions or ideas **with your counselor.**

Option C. Do a combination of reading and watching about anything related to science. The Scout needs to do a total of one hour.

Then do the following:

1. **Make a list** of at least two questions or ideas from what you watched and read.
2. **Discuss** two of the questions or ideas **with your counselor.**

*** Suggestions on completing this requirement*

Youtube is a great place to find some amazing videos to help complete Requirement 1 on any of the NOVA awards. For Cub Scouts, one hour of watching, reading or attending a live event are required, while for Scouts BSA three hours of watching, reading or attending a live event are required.

Remember to create a list of questions or observations and talk to a NOVA Counselor about them. Parents and NOVA Counselors, please always check Youtube videos before you allow youth to view.

Some of my favorite STEM Youtube Channels include

- * NASA Channel <https://www.youtube.com/user/NASAtlevision/videos>
- * Bill Nye the Science Guy <https://www.youtube.com/user/TheRealBillNye/videos>
- * National Geographic <https://www.youtube.com/user/NationalGeographic/videos>
- * Nat Geo Kids https://www.youtube.com/channel/UCXVCgDuD_QCkI7gTKU7-tpg
- * Periodic Videos <https://www.youtube.com/user/periodicvideos/videos>
- * Sick Science <https://www.youtube.com/user/SteveSpanglerScience/featured>
- * Sci Show Kids <https://www.youtube.com/user/scishowkids>
- * Science Max <https://www.youtube.com/channel/UCbprhISv-0ReKPPyh7-Dtw/featured>
- * Kids Science https://www.youtube.com/channel/UCwWa8EzP8vul_hvFWOTryEg
- * NOVA Videos <https://www.youtube.com/user/NOVAonline>
- * Mythbusters https://www.youtube.com/channel/UCOwjHCP2jMeGC_Fbqj2Pq

The requirements for Reg 2 Option A are :

Complete all of the following with our suggestions on how to teach:

a.) Explain the scientific method to your adult counselor.

*** Background: The Scientific method is a way of carrying out an investigation or experiment. By using the scientific method, scientists can learn to ask questions, make observations and answer those questions using data collected. The scientific method is in the image above and starts with asking a question or becoming interested in a topic. A researcher or scientist then does background research to learn more about the topic and refines their questions. Once they know their question, they create a hypothesis, or what they think the answer will be. More importantly, they create a null hypothesis, which is essentially what will happen if nothing happens. For example, if I am testing to see if adding a breath mint to water will make water colder, my hypothesis is that a breath mint will make water colder. My null hypothesis is that a breath mint will have no effect on water. Next in the scientific method is to conduct a test and collect data.*

After that, a researcher or scientist will analysis the data and see if the hypothesis or null hypothesis was rejected or accepted. Finally, they will report the results found so that other scientists can learn from the experiment also.



****Activity to complete with youth -**

1. Print or write out the following statements, one line per page

- Make OBSERVATIONS**
- Ask a QUESTION**
- Study or RESEARCH background information**
- Formulate a HYPOTHESIS**
- Develop and conduct an EXPERIMENT**
- Accept or reject Hypothesis based on experiment RESULTS**
- Develop your CONCLUSIONS and REPORT**

2. Make a set of cards for each group of 3-4 Cub Scouts. Mix up cards and set out on one side of a room. Have Cub Scout teams line up on the other side of the room.

3. When you call "Go", one Cub Scout from each group is allowed to walk (not run) to the cards, pick one up and bring it back. When that Cub Scout is back to their group, the next Cub Scout in the group can walk to the cards, pick up a card and return it to the group. This continues until either all the cards are gone or a group believes they have all the steps of the Scientific Method.

4. Once the group has collect the cards, they need to place the Scientific Method cards in order. The first group to have the complete scientific method in order and can explain how it works wins. Please note, the group may put Research before Question or Observation with Experiment. As long as they can logically explain, go with it. The Scientific Method in actuality is not as linear as we like to make it look.

Scientific Method Race

Make
OBSERVATIONS

Scientific Method Race

Ask a
QUESTION

Scientific Method Race

Study or
RESEARCH
background
information

Scientific Method Race

Formulate a
HYPOTHESIS

Scientific Method Race

Accept or reject
Hypothesis based
on experiment
RESULTS

Scientific Method Race

Develop your
CONCLUSIONS
and REPORT

Develop and conduct an EXPERIMENT

b.) Use the scientific method in a simple science experiment. Explain the results to an adult.

*** Background : We are going to do a simple biology experiment. If you get one of our kits, it will include the wood samples and magnifying glasses for up to 8 youth working in teams. Otherwise you will need to get some wood cookies (can be ordered on Amazon, bought at a Arts and Crafts Store or made by an adult in the group. See the end of this post for some suggested links).*

As a tree grows, it puts on growth rings, which you can count. However, those growth rings can vary in size depending on amount of rain or nutrients, species of plant or if something else was affecting growth (for example, if the tree was growing bent, the growth rings at the bend might be different). Climate researchers use this variation in tree rings growth from ancient trees to determine historic climate patterns. (see <https://climate.nasa.gov/news/2540/tree-rings-provide-snapshots-of-earths-past-climate/> for more info about this)

***Activity to complete with youth –*

Materials

- Wood Cookies – 4 different cookies included
- Ruler or measuring tape – included

- Chart – included

1. Hand out wood cookies and magnifying glasses and ask the youth to make observations of their wood discs.

2. Help lead the youth to asking a question they have the wood discs. For this example, we will be looking at "Are all growth rings the same size?"

3. Have youth develop a hypothesis.

4. Help the youth develop an experiment or complete the following experiment?

4a. Select at least 4 different wood cookies. If possible, get a least two different species of tree. If you get one of our kits, the cookie will be labelled.

4b. Measure the diameter each wood cookie (the width of the cookie at its widest point). Divide this by 2 to get the radius of the cookie and record that number on your chart.

4c. Count the number of growth rings for each wood cookie getting from the center out to one of the edges. You only need to count from center to edge, not edge to edge.

4d. Divide radius in cm by number of growth rings to get the average size of each growth ring. Compare the results for all the wood cookies you have.

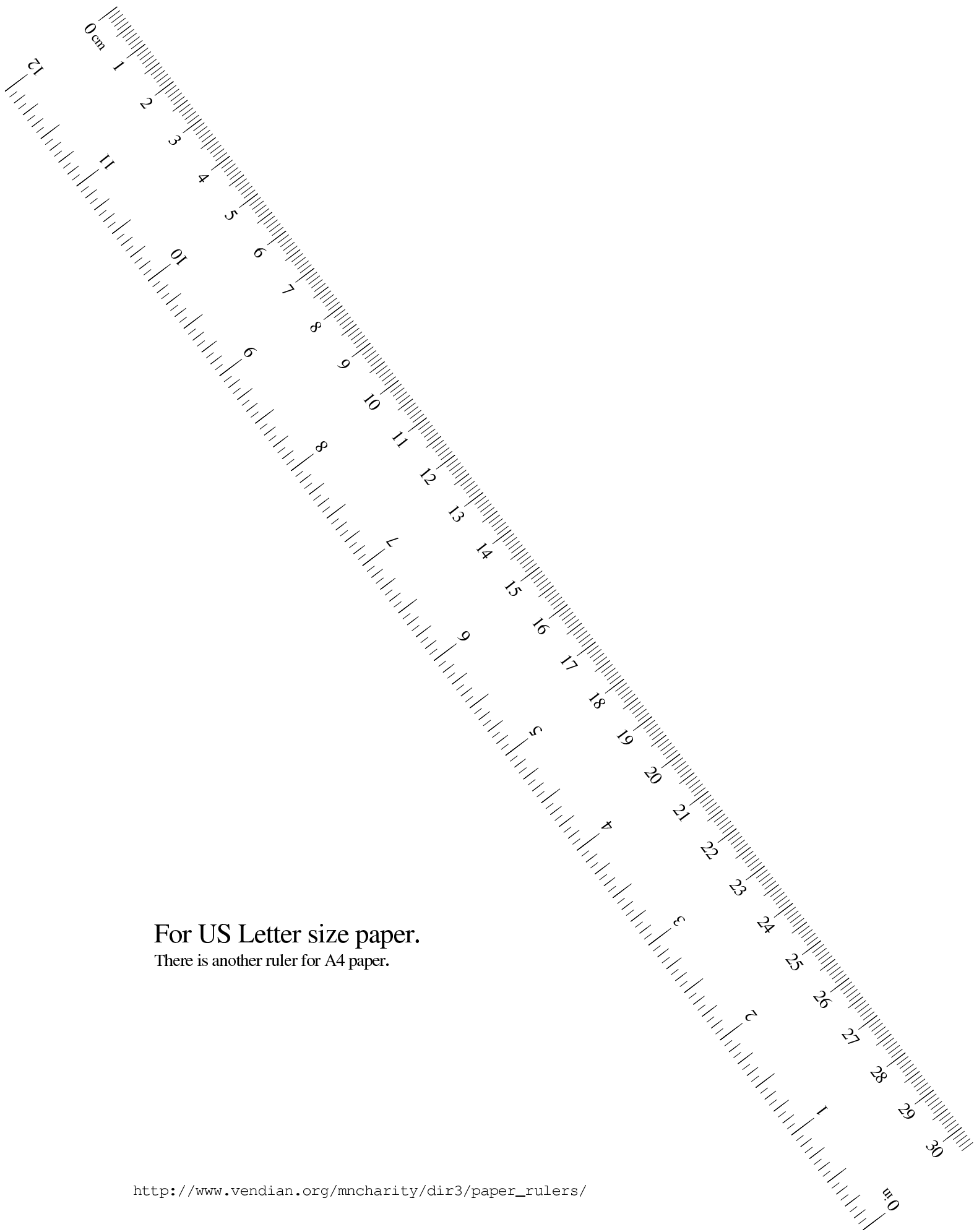
4e. Have the youth tell you if they accepted their hypothesis. Also have them determine a conclusion based on their results. For example, if all the tree rings were about the same size but one, have a reason that the one was different.

Wood Cookie Data

| Sample | Species (if known) | Radius (in cm) | Number of Rings | Average ring size |
|--------|--------------------|----------------|-----------------|-------------------|
| 1 | Yaupon | | | |
| 2 | Yaupon | | | |
| 3 | Pear | | | |
| 4 | Eastern Red Cedar | | | |

c.) Talk to a scientist about why he or she became a scientist.

Put out a message to your unit to see if of the parents are scientist - mostly likely someone in your unit is. If not, contact us via our Contact page (<https://bsastemnova.org/contact>) and we can help have a scientist visit, call or telecommute to talk to your Scouts.



For US Letter size paper.

There is another ruler for A4 paper.

Requirement 3: Act like a Scientist! Explore EACH of the following:

- A. With your counselor, choose a question you would like to investigate.**
- B. With your counselor, use the scientific method/process to investigate your question. Keep records of your question, the information you found, how you investigated and what your found out about your question.**
- C. Discuss your investigation and findings with your counselor.**

For this requirement, we will be suggesting an experiment that you can try with your youth. If you have a different experiment you like, please use our contact us page to send us info and we would like to include your experiment in our blog!

We will be experimenting with rocket fins. Below is our experiment written up in the Scientific Method Format! Most of the materials and information are from NASA and JTE's Make a Straw Rocket Project. Please see <https://www.jpl.nasa.gov/edu/learn/project/make-a-straw-rocket/> for the source material and more information. In our experiment we will focus more on the size of the fins than the size of the nosecone.

Observation or Topic of Interest: *Why do rockets have fins or arrows have feathers? While fins make anything look cooler, the question comes up as to why they are there. Do they serve a purpose or not? To answer this, we need to do some research and experimentation.*

Background Research: *Why do rockets have fins? In short, they help keep the rocket moving in a straight line. If you launch a rocket without fins, at a certain point it will start to wobble and then will start to flip in the air. However, if you put fins on it, when the rocket starts to wobble or turn, the fin will be exposed to more air and will start to drag, or have friction against the wind. Due to this, the rocket will start to turn back to the straight path it was on. If you could get slow motion on a rocket, you would see that it actually wobbles a bit the whole flight and the fins keep it returning to the straight path it needs.*

Here are some good videos and websites to learn more

* <https://www.youtube.com/watch?v=s5Nzpet8-nl>

* <https://www.youtube.com/watch?v=qCzF9OfYahc>

* <https://www.youtube.com/watch?v=e2gy6of2yaQ>

* <https://howthingsfly.si.edu/ask-an-explainer/how-do-size-shape-and-number-fins-affect-performance-rocket>

* <https://www.grc.nasa.gov/www/k-12/rocket/rktstab.html>

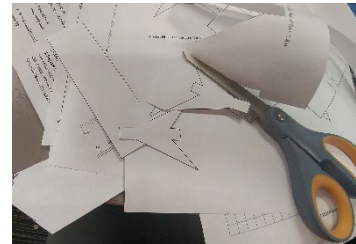
Question and Hypothesis: Ideally, the youth will have their own questions they want to ask and experiment on. If they have a good questions, go with that. If not, we already know that fins are needed on a rocket, so a good question might be "Does the length of the fin change how far the rocket flies?" That will be our question. My hypothesis is that yes, it will and my null hypothesis is that the length of fin will have no affect on how far a rocket flies.

Experiment and Results: Below is our experimental procedure modified from the NASA JTE Straw Rocket lesson (<https://www.jpl.nasa.gov/edu/learn/project/make-a-straw-rocket/>)

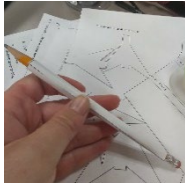
1. Collect the following materials per each Scout completing this experiment

- Pencil - included
- Scissors (can be with just the adult for younger Cub Scouts) – not included
- Tape – not included
- Soda Straw - included
- Ruler or measuring Tape - included
- Rocket Template and Data Log (download PDF on our Resources Page. - included

2. Cut out the three rocket bodies and the three different fins.

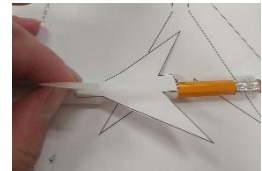


3. Loosely wrap one of the paper rocket body around the



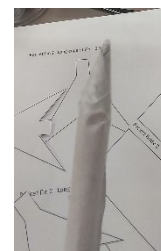
straw and tape the paper rocket body together. Repeat for the other rocket bodies. If the straw is the same size as the pencil, you can use the pencil to wrap and tape the rocket body.

4. Attach the fins to the end of the rocket. Line up the rectangles in the middle of the fin with the bottom of the rocket body and tape it to the rocket body. Nothing should stick out past the bottom of the rocket body and the rocket should easily slide off the pencil. Turn the rocket over and tape the matching fin to the other side of the rock, making a kind of "fin sandwich".



5. Bend the fins so that each is a 90 degree angle to its neighbor. If you look at the bottom of the rocket, the fins should look like a + sign.

6. Make the nose cone by putting the rocket on the pencil fins first and the twisting and pinching the top of the rocket body around the point of the pencil. Tape the nose cone to keep it from untwisting and air from escaping.



7. Measure the fin at its longest point. Record this measurement on your chart.

8. Take the rocket off the pencil and put onto the straw. If you have a bendy straw, make sure to put the rocket on the non bendy part.

9. Use tape to mark a launch line on the floor. Have the Cub Scouts line up at the launch line and once you have secured the launch path (make sure no one is in the launch path), give a countdown and have the Cub Scouts blow into the straw to launch the rocket.

10. Measure the distance each rocket flew and record.

11. Repeat for each fin length.



Conclusions: Science is not completed until a chart or graph is made. Analyze your results and see if the fin size changed the flight length. Finally, ask youth to tell you about new questions they have now that the experiment is done. All scientific articles end with "further research is needed on this topic." What is that further research for your Cub Scouts?

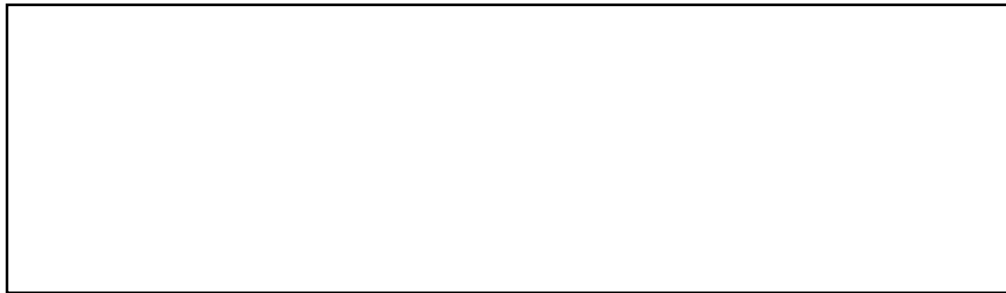
Rocket Flight Data Chart

| Rocket Fin Length on long edge | Distance Traveled Trial 1 | Distance Traveled Trial 2 | Distance Traveled Trail 3 | Average Distance Traveled |
|--------------------------------|---------------------------|---------------------------|---------------------------|---------------------------|
| | | | | |
| | | | | |
| | | | | |

Rocket Template



Rocket Body 1

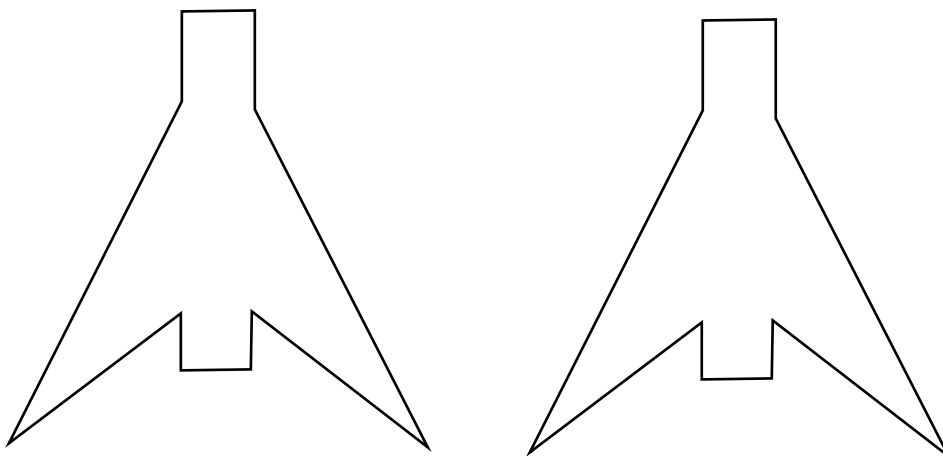


Rocket Body 2

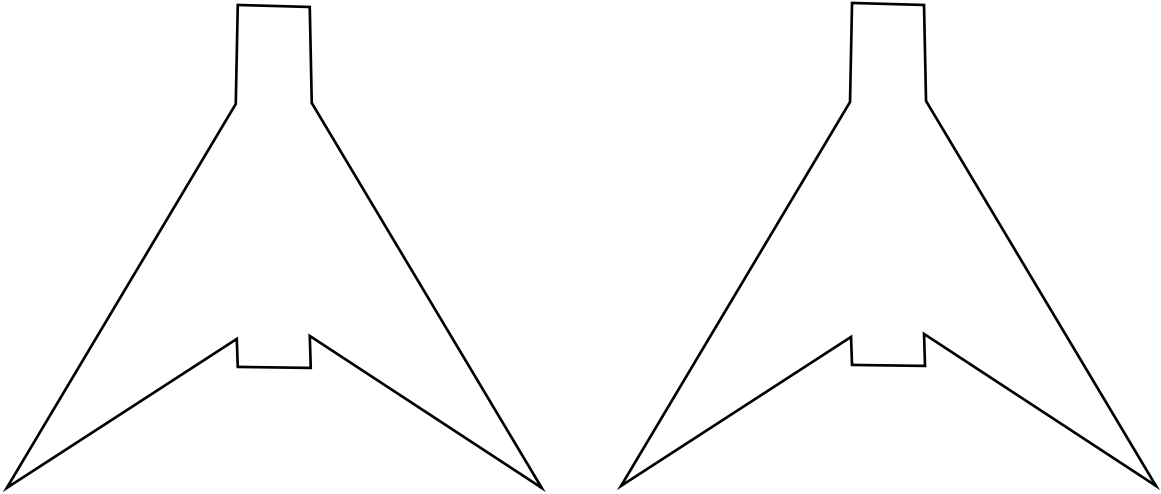


Rocket Body 3

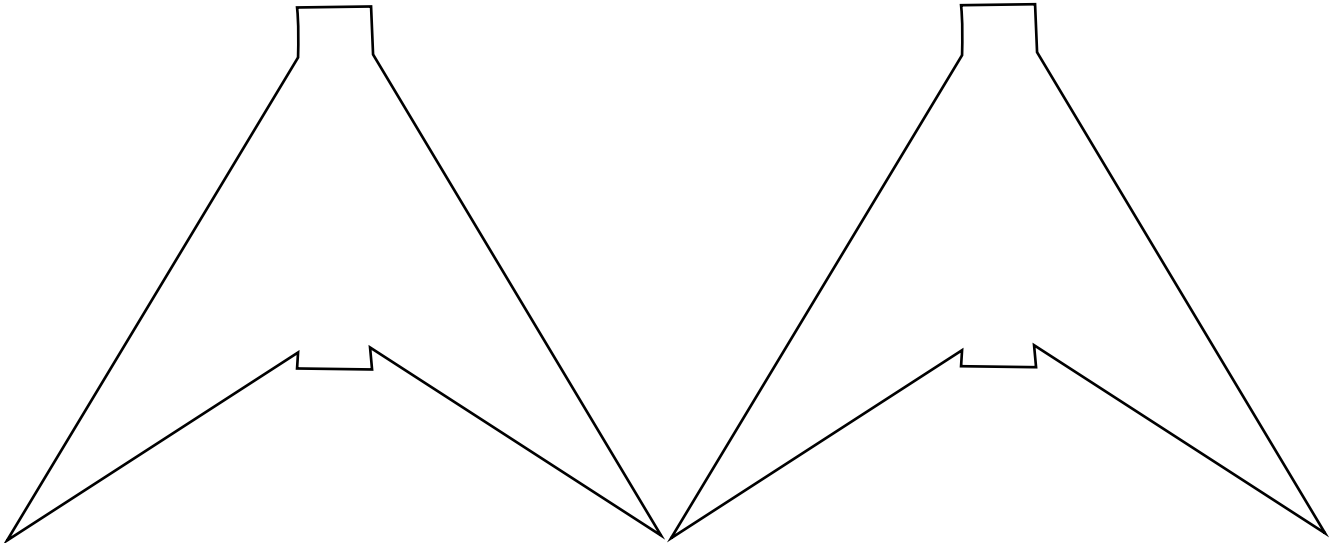
Rocket Fins 1 Long edge of fin = 1.8in



Rocket Fin 2 Long edge of Fin = 2.1 in



Rocket Fin 2 Long edge of Fin = 2.5 in



Science Everywhere Req 4:

“Visit a place where science is being done, used, or explained, such as one of the following: zoo, aquarium, water treatment plant, observatory, science museum, weather station, fish hatchery, or any other location where science is being done, used, or explained.

- During your visit, talk to someone in charge about science.
- Discuss with your counselor the science done, used, or explained at the place you visited.” -

There are a number of places in Austin and beyond where you can do this. Below are a few of our favorites.

[Thinkery in Austin](https://thinkeryaustin.org) <https://thinkeryaustin.org>

[Austin Science and Nature Center](http://www.austintexas.gov/department/austin-nature-and-science-center) <http://www.austintexas.gov/department/austin-nature-and-science-center>

[Bullock Museum](http://www.austintexas.gov/department/austin-nature-and-science-center) <http://www.austintexas.gov/department/austin-nature-and-science-center>

[Texas Advanced Computing Center](https://www.tacc.utexas.edu/education/tours) (UT's SuperComputer)
<https://www.tacc.utexas.edu/education/tours>

[City of Austin Wildlands Guided Hikes](https://www.austintexas.gov/water/wildland_vol/index.cfm)
https://www.austintexas.gov/water/wildland_vol/index.cfm

[Interspace Caverns](https://bsastemnova.org/ifly-classes) <https://bsastemnova.org/ifly-classes>

[iFly](https://bsastemnova.org/ifly-classes) <https://bsastemnova.org/ifly-classes>

[Witte Museum](https://www.wittemuseum.org/) <https://www.wittemuseum.org/>

[Hill Country Science Mill](https://www.sciencemill.org/) <https://www.sciencemill.org/>

[Houston Museum of Natural Science](https://www.sciencemill.org/) <https://www.sciencemill.org/>

[Space Center Houston](https://www.sciencemill.org/) <https://www.sciencemill.org/>

[USS Lexington](https://www.ussexington.com/) <https://www.ussexington.com/>

[Texas State Aquarium](https://www.texasstateaquarium.org) <https://www.texasstateaquarium.org>

[Houston Zoo](https://www.houstonzoo.org) <https://www.houstonzoo.org>

[Any State Park](https://tpwd.texas.gov/state-parks/) <https://tpwd.texas.gov/state-parks/>

Req 5. Discuss with your counselor how science affects your everyday life.

Some scouts need no further prompting than the question “how does science affect your everyday life?”. For others, the mentor will need to ask more specific questions to encourage the scout to express their thoughts. Parts of the discussion may be a review of the scout’s work on the previous requirements. “What did you read or watch and how does that science affect you?” “What science was involved with your Adventure?” Encourage the scout to think about their day (home, school, scouts, etc.) and talk about the science that they use every day. From their the alarm clock, light switch, and running water, their day starts with science. Ask questions like, “is there science in your clothes? Shoes? Car or bus? In the building materials in the school?” You may bring the discussion full circle to Scouting and ask about their last camping trip. “Is there science involved when they cook? In tents? Raingear? In the plants and trees around them?” Science is the way the world works, and the discussion should lead the scout to an understanding that science affects everything in their everyday life