

# ACTIVITY 19

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## ROCKET PROBLEMS

### Objective

Students use prior knowledge and creative thinking to solve problems.

### Standards

Science, Technology, Language Arts

### Materials

- Paper, 1 piece per student
- Markers and crayons
- Wooden blocks
- Items for nonstandard measurement

### Educator Information

- Read the following information and be prepared to share it with students.

*NASA scientists, engineers, and astronauts work daily to solve problems associated with International Space Station (ISS) and its construction. They find solutions when equipment does not work and develop designs to handle new challenges. These NASA workers use creative thinking to find solutions. Sometimes the task of finding a*

*solution to a problem is difficult. Often, NASA workers have to try many ideas to find one that solves the problem.*

- In this activity, give students an imaginary problem relating to the ISS and its construction. First, they have to identify the problem, and then develop a way to solve the problem. Solutions do not have to be realistic. Encourage students to be creative.
- Based on the ability level of the students, educators develop problems for the students to solve. For younger students, simple problems could include the following:
  1. *Students build a space station out of wooden blocks. Educators may need to limit the number of blocks that are used. Tell students that the space station has to have a laboratory and a living area. When the design is complete, have students describe their creation to the class. Encourage discussion. Use other items in the room to build a space station. Draw a picture of the space station.*
  2. *Ask students to find a way to measure the size of the space station they built. Tell students to find items in the classroom that can be used for nonstandard*



measurement. Encourage students to be creative. Have students measure the space station. Students share and explain measurements.

3. *Tell students they are going to live on the space station. Have them design and draw a picture of their living area on the station. Encourage them to include the items necessary to live on the station and the special items, such as pictures or toys, that they would want to have with them. Have students share design with the class.*
- For older or more advanced students, develop problems that are more challenging. Encourage students to be creative as they think of ways to solve the problems. Students do not have to be realistic. For more advanced students, problems could include the following:
    1. *A new piece of the space station is very large and heavy. Design a new rocket that can carry it into space. Draw the rocket and share it with the class.*
    2. *The robotic arm on the space shuttle does not work. Astronauts have to attach a new component to the space station. A new device to get the piece out of the orbiter payload bay and attach it to the station is needed. Draw a picture of the design and share it with the class.*
    3. *The space shuttle cannot dock, or connect, with the space station. The crew of the space station needs to be replaced with a new crew. Design a new device to get people from the station to the shuttle. Draw a picture of the design and describe it to the class.*
    4. *People from many countries build the ISS. Often these people do not speak the same language. A machine is required that will help people understand another language. Design and draw this machine. Share your ideas with the class.*
  - Ask students to tell their classmates about their designs and ideas. Suggest that students compare and contrast their designs.

- Develop additional problems that are appropriate for your students. Encourage students to be creative.
- To learn more about the people who work at NASA, visit the Quest web site, <http://quest.nasa.gov>.

## **Procedure**

1. Share information about people who work at NASA. Explain how they solve problems in space and on Earth.
2. Give students an imaginary problem relating to the ISS and its construction. Use one of the problems listed above or one that the educator develops.
3. Ask students to identify the problem and generate a solution. Encourage students to be creative.
4. Ask students to draw a picture of their solution to the problem. Depending upon their ability level, ask student to describe the solution orally or in writing.
5. Students show the picture to the class and tell or read how they would solve the problem. Encourage students to ask questions as their classmates share their solutions.
6. Have students generate other problems relating to space station construction. Encourage them to offer solutions to the problems.

## **Assessment**

- Observe students as they draw their pictures. Listen as they describe or read their solutions. Ask questions about how they solved the problem.



## Enrichment

- NASA scientists, engineers, and astronauts work together to solve problems. This is an example of cooperation. Give students another problem to solve. This time, let them work together in teams. Discuss the advantages of working together or cooperating. Discuss what happens when people do not cooperate well. Think of examples of people cooperating in the classroom.
- Define the word, *international*. Share with the class that the word international means many countries around the world. Many countries are cooperating to build the space station. The name of the space station reflects international cooperation. Share information on the ISS, and tell students the names of the sixteen partner nations (*Belgium, Brazil, Canada, Denmark, France, Germany, Italy, Japan, Netherlands, Norway, Russia, Spain, Sweden, Switzerland, United Kingdom, United States*). Use a map or a globe to point out the countries that are working together or cooperating to build the station. Use stickers or labels to mark the countries.
- Discuss that building the ISS requires cooperation or working together. Many people and nations have to work together to build the station and solve problems. Crews on the station have to cooperate to work and live together and find solutions to problems. Explain that cooperation is often necessary to accomplish a task or to get a job done. Ask students if they can think of other examples of people who cooperate. Examples may include sports teams or classroom, family, and community situations. Have students discuss what happens when people do not cooperate.
- Apply problem-solving skills to a real or imaginary classroom or home situation. Encourage students to be creative. For example: *There is a lion in the classroom. You have to devise a way to get him back to the zoo.* Another example: *The stapler does not work. You have to figure out a new way to hold papers together.*
- Many people work at NASA centers. They have to work together and cooperate to build the ISS and launch the space shuttle. Talk with students about the many jobs or careers that are available in the space program. Look at the background and qualifications of some people who work at NASA. Talk with students about what NASA workers studied in school. Ask students what job they might want to have at NASA. Have them draw a picture in a journal or on a sheet of paper to depict their future job. Using the sentence prompt, “*I want to be...*” have students or the educator write a student-generated sentence about a NASA job.
- Sometimes people describe creative solutions to problems as “thinking outside the box.” Ask students to generate ideas about what that expression means. Tell them it describes people who think of new ideas and creative ways to solve problems. Use the expression to describe students when they think of creative solutions or unique ideas in the classroom.
- Read books that include descriptions of people who work in the space program or at NASA. Selections could include *Astronaut: Living in Space* by Kate Hayden, *I Want to Be an Astronaut* by Byron Barton, or *Curious George Gets a Medal* by H. A. Rey. Encourage students to discuss different jobs in the space program.

