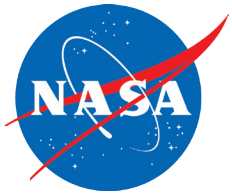
National Aeronautics and Space Administration



putting it all together

www.nasa.gov

PUTTING IT ALL TOGETHER

Students use their knowledge of energy and physics to construct a unique device that puts a marble in a cup.

ACTIVITY OBJECTIVES

- Students will design and create a Rube Goldberg device that will successfully put a marble in a cup.
- Students will construct their device using a variety of materials and a sequence of steps.
- Students will collaborate and communicate with team members throughout the process in order to develop their device.

MATH STANDARDS

- Determines probability using simulations or experiments.

SCIENCE STANDARDS

- Knows that all energy can be considered to be either kinetic energy, potential energy, or energy contained by a field.
- Understands general concepts related to gravitational force.
- Knows that scientists make the results of their investigations public; they describe the investigations in ways that enable others to repeat the investigations.
- Designs and conducts investigations.
- Knows that scientists and engineers often work in teams to accomplish a task.
- Knows that creativity, imagination, and a good knowledge base are all required in the work of science and engineering.

TECHNOLOGY STANDARDS

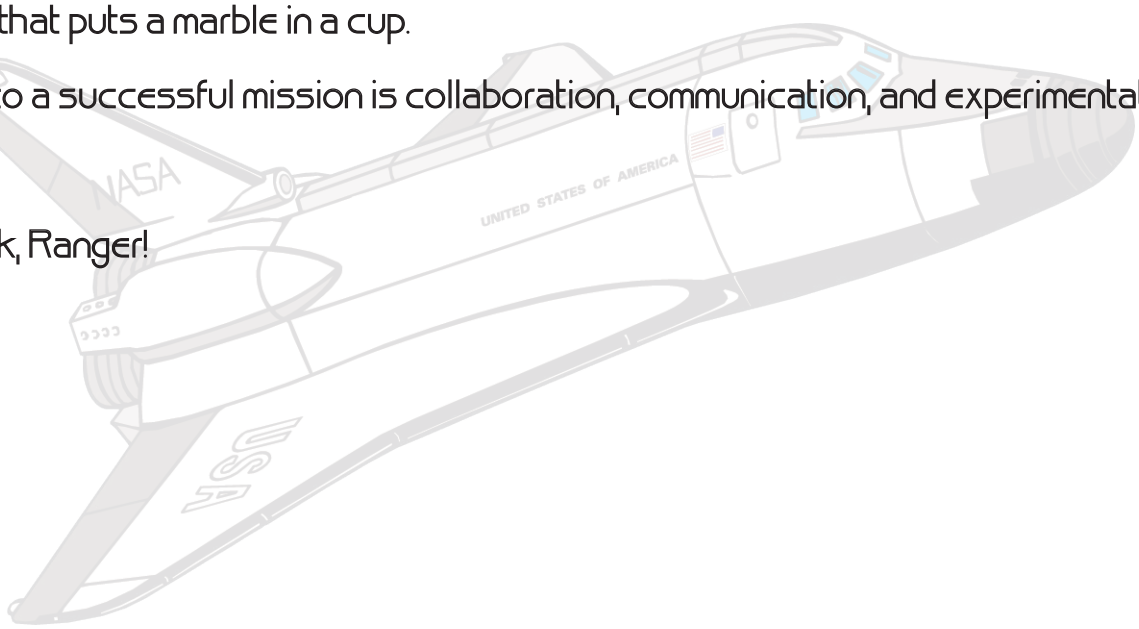
- Students will develop an understanding of the role of troubleshooting, research and development, invention and innovation, and experimentation in problem solving.
- Students will develop abilities to apply the design process.
- Students will develop an understanding of and be able to select and use energy and power technologies.

The construction and complexity of the International Space Station is mind-boggling! This incredible structure is the result of hundreds of hours of experimentation, human curiosity, teamwork, and PHYSICS!

Space Ranger, your mission, should you choose to accept it, is to collaborate with other Space Rangers and together utilize The Laws of Physics to construct a device that puts a marble in a cup.

The key to a successful mission is collaboration, communication, and experimentation.

Good luck, Ranger!



PROCEDURE

1. Build a device that incorporates at least 10 steps to put a marble in a cup. The more complicated and intricate your device is, the better.
2. Gather an assortment of materials to utilize for construction.
3. With your team of Space Rangers, examine and experiment with your construction materials.
4. As a team, brainstorm ways that these materials can interact with one another and be utilized to accomplish the goal of putting a marble in a cup.

SUGGESTED CONSTRUCTION MATERIALS

- Marbles
- Tape (duct, masking, transparent)
- Spoons
- Clothes hangers
- Rubber bands
- Cups
- Rulers
- Pencils
- Buttons
- Paper tubes
- Gears
- String
- Toy car/train tracks
- Bottles
- Corks
- Wooden dowels
- Wheels
- Other miscellaneous items
- "Foam pipe insulation cut in half" it makes great ramps.

DIRECTIONS

1. Explore the internet and research the work of Rube Goldberg.
2. Sketch out the initial design of your device on the provided Design Concept page.
3. Develop a construction plan and list the Space Ranger team members responsible for each section/phase of the project.
4. Test your device at various stages of construction. Discuss challenges and implement possible solutions.
5. Record successful steps.
6. In order to be successful, your device should be able to complete the task twice!
7. Using the form provided, illustrate your final device complete with the sequential steps that led you to accomplish the construction goal. You may use photography to document the construction project. If you select this option you must still have a written record of the steps your team took during construction.

TASK CARD:
PUTTING IT ALL TOGETHER

DESIGN CONCEPT

TASK CARD: PUTTING IT ALL TOGETHER

DESCRIPTION
(what action is taking place)

CONSTRUCTION STEPS
(sequential order)