Creative Problem Solving Instructions

Chapter 13 - Mission: Rescue the Moon Rover

This activity is a creative problem solving and design challenge, which means it's not just following the steps of a set experiment — it's about thinking of your own ideas and trying them out to solve a problem.

This kind of challenge is different because there's no single "right answer" or step-by-step guide. You have to think, test, and play with ideas to see what works.

✅ **Important to know**:
It's okay if it feels hard at first! Coming up with ideas and testing them can be tricky, but that's exactly what real inventors, engineers, and scientists do. If you get stuck, take a breath, keep thinking, and try another idea. Struggling is part of the process — and it often leads to the best discoveries!

✅ **Suggestions you can try or build from:**

- Add a long stick or handle to the wheel to give yourself more power to turn it.
- Wrap something grippy (like rubber bands or rough string) around the wheel to help it catch on the ground.
- Use a wound-up rubber band or string to store energy and release it to help spin the wheel (like a wind-up toy).
- Connect another wheel or part with gears, bands, or string to help share motion and pull the stuck wheel.
- Add weight or a spinning disk (like a flywheel) to give extra push when turning the wheel.
- Adjust the surface under the wheel (like adding sandpaper or tape) to see if more or less friction helps.

✅ **Tips as you work:**

- Don't worry if your first idea doesn't work — that's normal!
- Keep asking yourself: "What else could I try?" or "What happens if I change this?"
- Draw or write down your ideas as you go so you can remember what you've tested.

Mission: Rescue the Moon Rover

Welcome, young scientist!

Today, you are space engineers on a critical mission to rescue a stranded Moon Rover. The Moon Rover has encountered a problem where one of its wheels is stuck, and it can't move. Your mission is to figure out how rotational motion can be used to design a mechanism that will help the rover get moving again.

The Moon Rover is equipped with wheels that need to rotate to move. You need to create an experiment to understand how rotational motion works and how it can be used to design a solution to help the rover. Your experiment must demonstrate a clear understanding of rotational motion.

Good luck, space engineers!

We can't wait to see how you use rotational motion to save the Moon Rover! 🌕🚀

1 Research Rotational Motion

My notes on rotational motion

2 Experiment with Angles, Levers, Gears and Pulleys

My notes on angles, levers, gears, and pulleys

3 Design A Rescue Mechanism

My design ideas

4 Test & Refine

My test results

5 Final Design & Presentation Notes

My details, drawings, & summary of final design

> **Will your design rescue the Rover?**

Mission: Rescue the Moon Rover

****This experiment requires students to create their own experimental design. If the student is not yet comfortable designing their own experiment have them repeat previous experiments to review the scientific method, asking questions, listing materials, and collecting data.**

Suggested Materials

- Toy car or a small rover model
- Different types of wheels (e.g., round discs, gears, rubber wheels)
- Ruler
- Stopwatch
- Protractor
- Small incline (a piece of cardboard or a book)
- Masking tape
- Notepad and pencil
- Craft supplies (e.g., cardboard, straws, rubber bands, etc.)
- Glue or tape
- Optional: LEGO pieces or other building blocks

Suggestions for Guiding Student Exploration

Understand Rotational Motion

- Have your student start by exploring how different wheels rotate. Attach different types of wheels to a toy car or other rolling toy.
- Have them place the toy car on a flat surface and push it gently to see how each type of wheel affects the movement.
- Have them use a ruler to measure how far the car travels with each wheel type and record their findings.

Experiment with Angles, Gears, Levers, and Pulleys

- Have them use a protractor to set the incline at different angles (e.g., 10°, 20°, 30°) and place the toy car at the top of the incline and let it roll down. Use the stopwatch to time how long it takes to reach the bottom.
- Record the time for each angle and wheel type.

Design a Rescue Mechanism

- Help your student think about how they can use rotational motion to help the rover. Consider making a lever, pulley system, or a new wheel design.
- Use craft supplies to build a mechanism. Encourage them to be creative, play with ideas even if they sound crazy, and think like an engineer!
- Have student attach their mechanism to their Moon Rover model (the toy car) and test it on different surfaces (flat, inclined).

Test and Refine

- Have the test and refine the rescue mechanism multiple times. Encourage them to observe how well it helps your Moon Rover model (the toy car) move.
- Have them make adjustments to improve the performance. For example, try changing the size or type of wheels or modifying the angle of your incline.

Document Findings

- Have them draw pictures and write notes about their experiment and the rescue mechanism they built.
- Have them explain how rotational motion helped solve the problem and what changes they made during your experiment.

Presentation

- Have the prepare a short presentation about the mission. Explain the problem, their experiment, and how they designed the solution.
- Have them present their findings to their friends or family, showing how rotational motion helped rescue the Moon Rover.

Notes