Cabin Ramp Racers: A Brian Head Physics Adventure!

Subject: Physics (Forces and Motion)

Age Group: 7-Year-Old (Perfect for Troy!)

Location: Your Airbnb Cabin in Brian Head, UT

Core Concept: This lesson uses a fun, hands-on activity to explore the physics concepts of **gravity**, **inclined planes (ramps)**, and **friction** in a way that feels like play.

Materials Needed

- **Ramp-Building Supplies:** Sturdy cardboard pieces, couch cushions, pillows, large hardcover books, a cookie sheet, or even a flattened-out box.
- **"Racers":** A few different small objects that can roll or slide, such as toy cars (like Hot Wheels), different types of balls (bouncy ball, golf ball, tennis ball), a pinecone from outside, a can of soup, or a roll of tape.
- **Measuring Tool (Optional):** A tape measure, ruler, or even a piece of string to see how far things travel.
- **Friction Surfaces (for a challenge):** A towel, a t-shirt, or a small rug to place on the ramp.

Lesson Plan: Step-by-Step

Part 1: The Big Question (5 minutes)

Goal: To get Troy thinking and introduce the concept of gravity.

1. **Start with a question:** Hold up one of the "racers," like a toy car. Ask Troy, "If we are at the top of a ski slope here in Brian Head, what makes a skier go down the hill without even pushing?" Guide him toward the idea that something is "pulling" them down.
2. **Introduce the Superpower:** Explain that this invisible pulling force has a name: **Gravity**. Gravity is like a superpower the Earth has that pulls everything towards its center. It’s what keeps us on the ground and what will make our racers go!

Part 2: The Ramp Builder (15 minutes)

Goal: To apply creative thinking to build a testable structure.

1. **The Mission:** Announce, "Your mission, Engineer Troy, is to build a ramp! We need to create our own mini-hill right here in the cabin."
2. **Construction Time:** Let Troy choose the materials (pillows, books, cardboard) to build his first ramp. A great first ramp is one propped up by a few books or a pillow. Encourage him to be creative. There is no wrong way to build it!
3. **First Test:** Have him choose a racer and let it go from the top of the ramp. Celebrate the success! It worked!

Part 3: The Physics Race! (20 minutes)

Goal: To investigate how changing variables (steepness, surface) affects motion and to introduce friction.

1. **Challenge #1 - The Speed Test:** Ask Troy, "How can we make the car go *faster*?" Let him brainstorm. He will likely suggest making the ramp steeper.
    - **Experiment:** Help him make the ramp steeper by adding more books or a bigger pillow.
    - **Observe:** Race the car on the gentle ramp, then the steep ramp. What does he notice? He should see that a steeper ramp makes the car go faster because gravity can pull on it more directly.
2. **Challenge #2 - The Friction Factor:** Ask Troy, "What do you think would happen if our ramp wasn't smooth? What if it was a 'bumpy road'?"
    - **Experiment:** Have him place a towel or t-shirt over his ramp. Now, let the car go.
    - **Introduce the Word:** Explain that the force that slows things down when they rub against each other is called **friction**. The towel creates more friction than the smooth cardboard, so it slows the car down. Ask, "Can you think of other things with lots of friction?" (e.g., brakes on a bike, rubbing your hands together to get warm).
3. **Challenge #3 - The Great Race:** Have Troy set up two ramps side-by-side if possible. One can be steep, one gentle. Or one can have a friction surface, and one can be smooth. Let him race two different objects at the same time and predict which one will win and why.

Part 4: The Super Challenge (10 minutes)

Goal: To encourage creative problem-solving.

1. **The Final Mission:** Give Troy a final design challenge based on his interest.
    - "Can you build a ramp that has a **JUMP** at the end?" (Use a book or piece of cardboard to create a little lip at the bottom).
    - "Can you design a ramp that makes the car go the **FARTHEST** distance across the floor?" (This will involve finding the perfect balance between steepness for speed and a launch angle that isn't too high).
    - "Can you make a ramp with a **CURVE** in it?"
2. Let him build, test, and redesign as much as he wants. This is where the real engineering and learning happens!

Part 5: Engineer's Debrief (5 minutes)

Goal: To review what was learned in simple terms.

While looking at his final creation, ask some simple wrap-up questions:

- "So, what's the secret to making a really fast ramp?" (Making it steeper).
- "And what was that force that pulls everything down?" (Gravity).
- "What's the word for the force that slows things down, like when we used the towel?" (Friction).
- "Tell me about your final ramp. What makes it the coolest?" (Let him explain his design choices).

Congratulate him on being an awesome physics engineer for the day!