

**Time:**

60 minutes

**Explore:**

forces and motion, engineering design process (define a problem, imagine and plan, create, test, and improve)

**Materials:**

In addition to a ball (ping-pong, tennis, golf, or bouncy ball), you'll need a bunch of household items that have different structural elements: wide bases, thin bases, tubes, surfaces, fasteners, heavy things, and light things. If this is a competition, you'll want to have one set of the same materials for each team.

Here are some suggested materials, but feel free to use your own!

- ❑ **Large Objects:** cardboard tubes, cereal boxes, plastic bottles, paper plates, card stock, paper/plastic cups
- ❑ **Fasteners:** pipe cleaners, rubber bands, paper clips, tape
- ❑ **Long Objects:** straws, popsicle sticks/tongue depressors, toothpicks
- ❑ **Wildcard Ideas:** tinfoil, plastic wrap, sandwich bags

# Ups and Downs Education

IOWA PBS



[pbskids.org/ruff](http://pbskids.org/ruff)

**Kid Description:** Grab a grown-up and some friends for this building activity. Can you make a ramp that will roll a ball right to the target?

This activity is for two or more players to collaborate (or compete!) to build a ramp. It can be played indoors or outdoors.

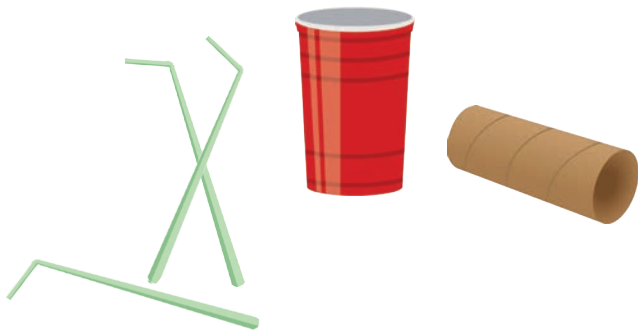


## Wonder

- ★ Sit in a circle and pass around the materials. Ask kids to use their senses to explore them.
  - **Ask:** What is this material?
  - **Ask:** How does each material look?
  - **Ask:** How does each material feel?
  - **Ask:** How does each material sound?

## Define a Problem

- ★ Explain the rules for the activity
    - **Explain:** Each team will work together to build a ramp that will send the ball as close as possible to the target. You'll get 15 minutes to build, test, and improve, and then it's time to share your ramps!
- Note:** If you'd like to create your own ramp challenge, or if kids want to define their own goals, go for it! You could try changing the time, distance, or other rules of the game.



## Imagine and Plan

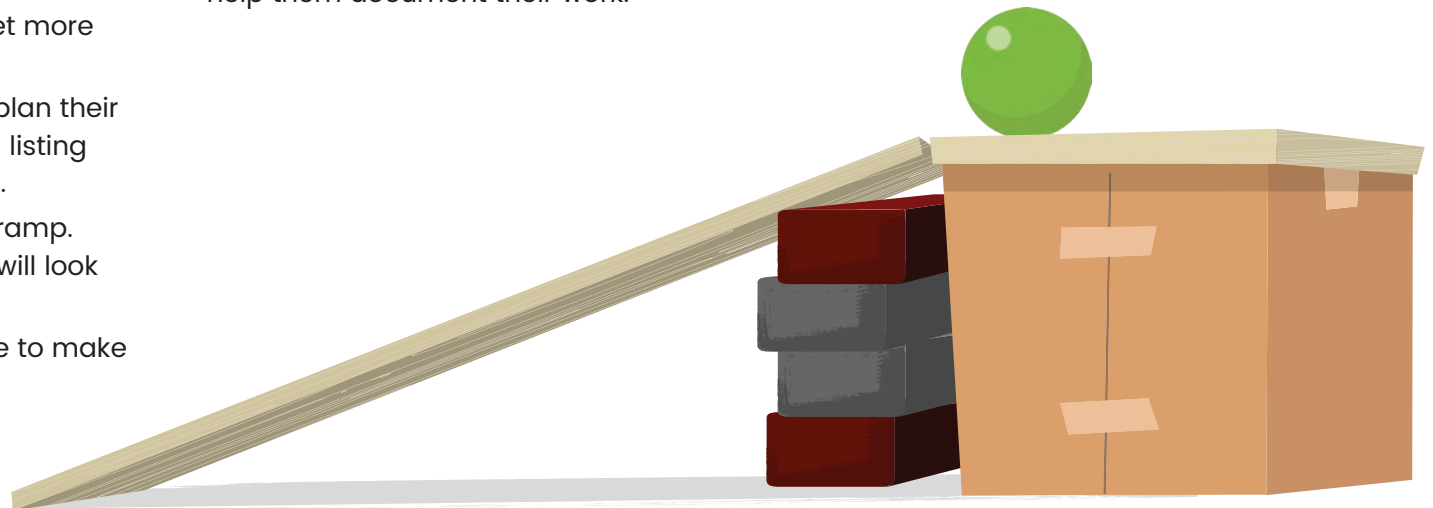
- ★ Set out the target six feet from the starting line where the kids will build their ramps.
- ★ Ask kids to choose the materials they think will be best for building their ramps.
  - **Show:** Here's the target; it's six feet away from where your ramps will be.
  - **Ask:** Based on your investigations, which materials do you predict would make the best ramp for the ball to reach this target? Pick out the materials you want to build with. You can always get more materials later!
- ★ Have the kids use the printout to plan their ramp design, sketching it out and listing the materials they're going to use.
  - **Ask:** Let's make a plan for your ramp. Can you draw what your ramp will look like on the printout?
  - **Ask:** What materials will you use to make your ramp? List them out here.

## Create

- ★ Set up the kids with their building materials at the starting line.
- ★ Set the timer for 15 minutes and tell the kids to start building!
- ★ If kids get stuck, try giving them a hint about how to build. For example:
  - **Hint:** You'll need to make sure your ramp is tall enough so the ball can get speed from gravity!
  - **Hint:** You'll need a way to guide the ball in the right direction!
  - **Hint:** Try rolling the ball while you're building to see what happens. That's called a "test". Don't wait until the end to start testing your ramps.
  - **Hint:** Use your tests to improve your design. You can always redesign your ramp if it isn't working!
- ★ While kids build, try taking a few pictures to help them document their work.

## Test

- ★ When time is up, ask players to roll the ball down their ramp towards the target.
- ★ If you can, try taking a video to document the test.
  - **Ask:** It's time to test out what you've built! Roll your ball down the ramp, and see how close it lands to the target.
  - **Ask:** Whose ball is closest to the target? That's a well-designed ramp!

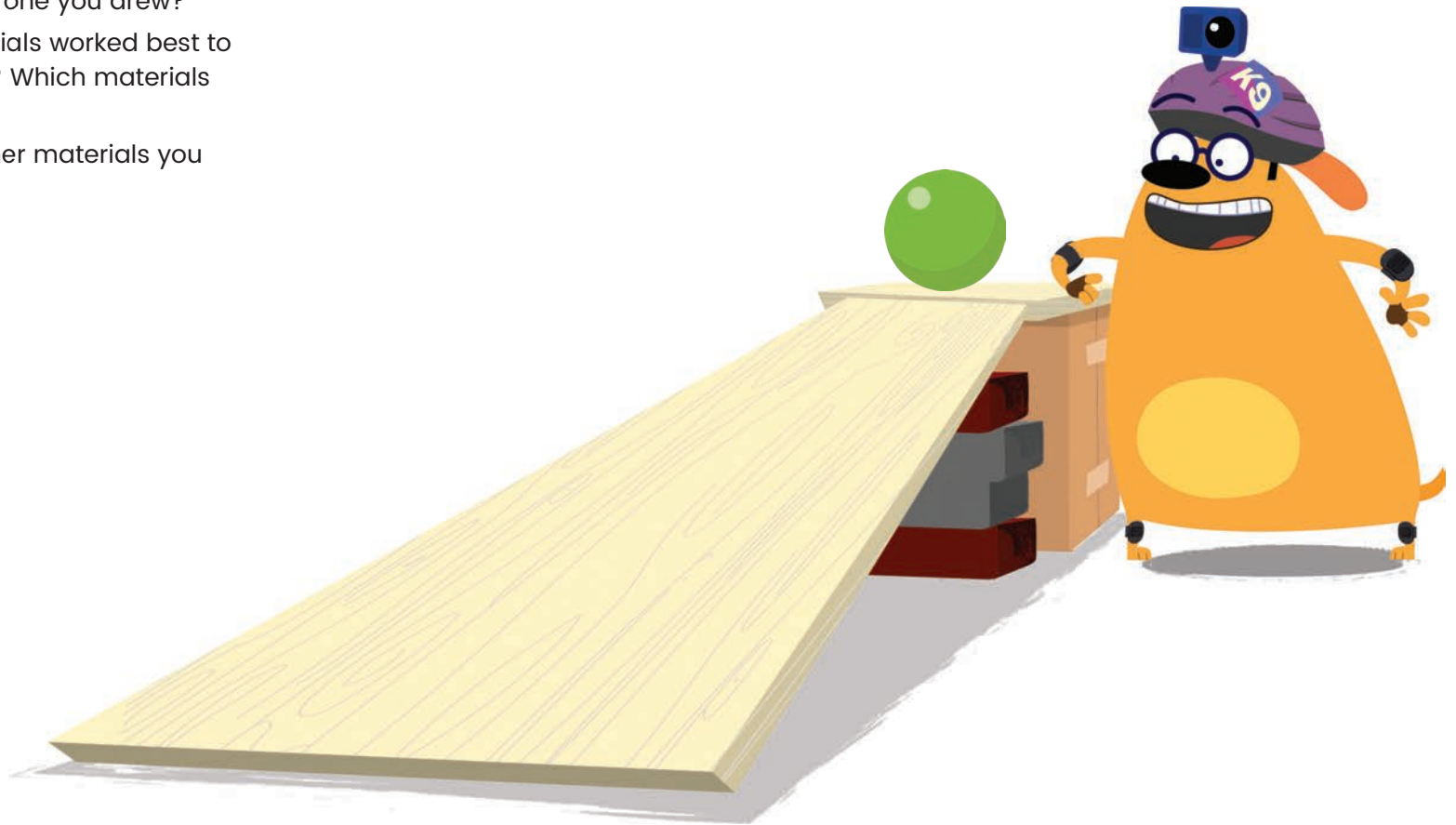


## Reflect

- ★ Have everyone sit in a circle near the starting line.
- ★ Ask kids to look at their drawing of their ramp, and compare it to the ramp they built.
  - **Ask:** How was the ramp you built different from the one you drew?
  - **Ask:** Which materials worked best to make your ramp? Which materials didn't work?
  - **Ask:** Are there other materials you would like to try?

## Improve

- ★ Ask kids to improve their ramp designs based on the results of their test.
  - **Ask:** How would you improve, or make your ramp better, so the ball can go farther? Spend a few minutes changing your design, then run the test again and see if you get a different result!



# Activity

# Ups and Downs



Draw your ramp in the space provided, and list which materials you're going to use. What do you predict will happen when you test your ramp?

[pbskids.org/ruff](http://pbskids.org/ruff)

## Materials:

1. \_\_\_\_\_
2. \_\_\_\_\_
3. \_\_\_\_\_
4. \_\_\_\_\_
5. \_\_\_\_\_
6. \_\_\_\_\_
7. \_\_\_\_\_
8. \_\_\_\_\_

## Prediction:



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