



# The Bounciest Ball Experiment

**Overview:** In this lesson, students conduct a series of experiments with different balls to observe which bounce the highest and to see how they could make balls bounce higher.

**Grades:** Preschool and K-2

**Length of Lesson:** Approximately 45 minutes

**Related Video:** “The Hawk Factor” episode

## Learning Goals:

After completing this lesson, students will be able to:

- Explain how to conduct an experiment and describe the steps involved.
- Compare and contrast different objects.
- Use a chart to record results.
- Discuss findings from an experiment.

## Related Goals from the Space Racers™ Curriculum:

### Scientific Inquiry

**Exploration and Investigation:** We obtain information and learn about the world through exploring objects and investigating how things work. Conducting scientific investigations, engaging in hands-on experiences, and asking open-ended questions can foster greater conceptual understanding of our world.

- Explore new things as a way to broaden one’s understanding of the world.
- Use prior knowledge and experiences to develop specific questions that will lead to information, solutions, and answers.
- Form theories/hypotheses/predictions to explain how and why things happen.
- Design and carry out simple cooperative investigations that apply learning from past experiences and support new discoveries.
- Discuss the findings of investigations.

**Observation:** Looking carefully is one way to learn about things around us.

- Take note of a variety of properties and describe as accurately as possible (e.g., number, shape, size, length, color, texture, weight, motion, temperature, other physical characteristics, etc.).
- Make comparisons to identify similarities and/or differences.
- Inspect/investigate in detail in order to sort, group, classify, or sequence according to size or other characteristics.
- Develop questions and predictions based on observations.
- Communicate findings verbally or by using pictures, graphs, charts, and/or representations.

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## Related Goals from the Space Racers™ Curriculum:

*(continued)*

**Experimentation:** Sometimes more can be learned by actually doing something to things and taking note of what happened. We use scientific testing and experimentation to seek reasons and evidence in an attempt to prove or disprove our ideas and hypotheses, to discover new information, and to draw conclusions.

- Form hypotheses/make predictions using prior knowledge and past experiences.
- Perform tests and observe any new findings.
- Collect data: e.g., ask questions, make observations, perform simple measurements using standard and/or non-standard units of measure, make estimations, etc.
- Organize data: e.g., log info in notebook, create a chart, etc.
- Analyze data: e.g., compare, contrast, sort, classify, etc.
- Describe things as accurately as possible in terms of their number, shape, texture, size, weight, color, motion, etc.
- Draw conclusions/discover new information; compare conclusions to original hypotheses.
- Communicate findings using pictures, graphs, charts, representations, and/or words.
- Model safe behaviors while experimenting.

## Materials:

- one large ball (such as a basketball), one small ball (like a superball) and one other ball.
- three additional balls (of different texture and size). Some suggestions: a tennis ball, ping pong ball, Nerf ball etc.
- a small scale
- paper and crayons
- a piece of string, yarn or ribbon 3-4 feet long
- large easel paper or a chalk board, white board, etc. on which to draw a chart

## Prep:

- Gather all the materials in the materials list.
- Review the “Bouncing Ball Chart” for an example of how to chart the results in Activity 2.

## Lesson Activities:

### Activity 1: Making Predictions and Testing Them

1. Hold up a big ball and a small ball. Ask your students to describe the two balls. Ask them what the two balls have in common (they are both round, they are both balls, etc.). Ask them to describe differences between the two balls (one is bigger- one is smaller, color, texture, etc.).
2. Ask your students which ball they think weighs more. Ask students to explain why they came to that conclusion.
3. Ask your students how they could find out which one weighs more. (*They could weigh both balls.*)
4. Put each ball on the scale, one at a time. Write down the weight of each.
5. Compare the weight of each ball. Discuss whether their predictions were correct.
6. Now bring out another ball. Based on the weight of the other balls, ask them if they think the new ball is lighter than both, heavier than both or in between. Ask students how they could gain more information about how heavy each object is before weighing it on the scale. (*They could hold the objects and feel them.*)

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7. Ask students to hold each of the balls and put them in the order from lightest to heaviest. Ask them how they can confirm which is lightest and which is heaviest. (*By weighing them.*)
8. Have them weigh the balls to confirm their predictions.

## Activity 2: Bounciest Ball Experiment

1. Take the three balls from Activity 1 and add three more balls. Lay them all out on the floor.
2. Ask students to predict which ones would bounce the highest.
3. Ask for volunteers to each hold one of the balls. Ask for a few students to be judges.
4. Now ask the volunteers to bounce the balls, starting at the same time.
5. After the volunteers have bounced the balls, ask the judges to select which one bounced the highest.
6. If the judges aren't sure, have the volunteers bounce the balls again and then ask the judges to decide which bounced the highest.
7. Ask students to discuss what could cause the balls to bounce at different heights.
8. Explain that in addition to the texture, size, shape, weight, etc. of the ball, the person bouncing the ball could affect how high it goes.
9. Ask the class how you could determine which ball bounces the highest without having the difference in different people's impact on the balls making a difference. (*You could have the same person bounce each ball.*)
10. Ask for a volunteer to bounce each ball, one at a time, and have the other students judge which ball bounced highest.

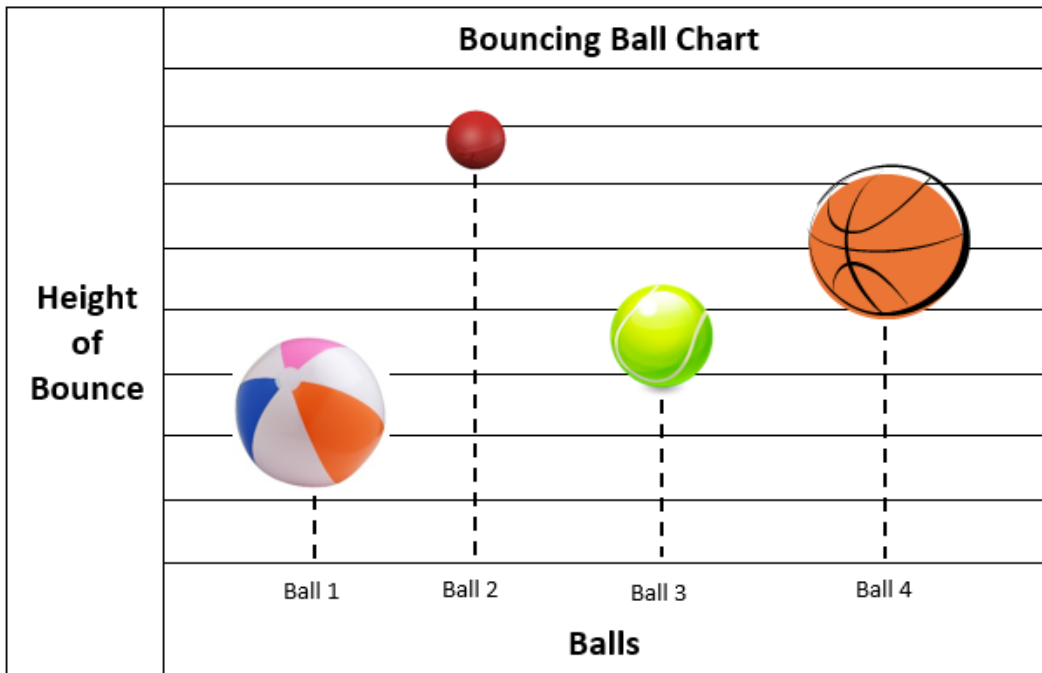
*Tip: To determine which ball bounces the highest, have one student hold a piece of string, yarn or ribbon (about 3-4 feet long) on one end and have another student hold the other end, making sure to pull the string tightly, so that it forms a straight line between the two students. Ask the students to hold the string at a low height (about 1 ½ feet off the ground).*

*Bounce several of the balls, one at a time. The balls that do not bounce higher than that string should then be eliminated from the competition. Have the students raise the string up a little higher and conduct the experiment with the remaining balls. Any balls that do not make it over that height are eliminated.*

*Keep raising the string and testing the bounce height of the balls, until only one ball is left. That ball is the winner of the "bounciest ball competition."*

11. Give students paper and crayons. Ask students to draw pictures of the balls that you just tested.
12. Create a chart on easel paper, a white board, chalk board, etc. and have students add the balls to the chart, to show the results of the bouncing ball experiments, having the ball that bounce the highest, highest up on the chart and balls that bounce the least, lowest down on the chart. (See the "Bouncing Ball Chart" for an example of how to create the chart. Note: This is just a sample of how to record your results. Your findings might be different than those shown in the chart.)
13. If there is disagreement about where to place the balls on the chart, redo the experiment to see which ball bounces the highest.

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## Activity 3: Bouncing Higher and Higher

1. Pick one of the balls and ask students to brainstorm some ways to make the ball bounce higher (Increase the force with which you bounce the ball to the ground, raise the height from which the ball is thrown, add more air to balls such as basketballs, into which air can be pumped, etc.)
2. Divide your students into groups of 4-5 students each. Give each group a ball. (Each group could have a similar ball or each have different types of balls.) Ask students to experiment with ways to increase the bounce of their balls.
3. Give students several minutes to test different ways to increase the bounce on their balls. (Encourage them to experiment with releasing the balls from different heights, adding different amount of pressure to the balls, etc.)
4. Then have students present their findings to the class, showing how to make their balls bounce as high as possible.
5. After all of the groups have presented their findings, ask students to discuss what they have learned from all of the results. (For example, increasing the height from which a ball is dropped, increases the height of the bounce.)

## Activity 4 (Optional): The Hawk Factor

1. View the Space Racers™ "The Hawk Factor" episode.
2. After watching the episode, ask your students to describe the experiment that was conducted in the episode (*Hawk and Raven tried flying with three different types of fuel to see which was the best.*)
3. Ask your students, which fuel made Hawk and Raven go faster (*the red fuel*).
4. Ask them what Coot and the Space Racers could have done to make sure that the red fuel was really the best. (*They could have repeated the experiment several times, to see if they always got the same results.*)

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5. Ask students how Coot and the Space Racers kept track of the results of the experiment. (*Ava created a chart, comparing the three fuels. The Space Racers and Coot referred to the chart to determine which fuel was the best.*)

## Wrap-up:

1. Lead a discussion about the experiments you conducted today. Ask students to discuss some of the things that they learned through the process.
2. Discuss the following steps that you followed when doing your experiments:
  - **made a prediction** (hypothesis) about what was going to happen
  - **conducted an experiment** to test the hypothesis
  - **modified the experiment** and re-tested as needed
  - **recorded the findings**
  - **created a chart** to compare the results
  - **discussed and reflected upon the results**
3. Ask students to describe their favorite part of the experiments with the balls.
4. Ask them to think of some other experiments that they could conduct with balls on another day. (*Some possible ideas to test: Which ball rolls furthest? Which one bounces the most number of times? Which one can slide down a playground slide the fastest? Which makes the most noise when bouncing?*)