



# Probability in Sports

## Probability



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<b>Grade Level</b>	8th Grade	<b>Time Frame</b>	2-3 class period(s)
<b>Subject</b>	Mathematics	<b>Duration</b>	90 minutes

### Essential Question

How can probability inform coaching staff decision-making for sporting events?

### Summary

In this lesson, students will play basketball in the classroom to gather data and calculate their statistical chances of making a successful shot. Next, students will step into the role of an NBA statistician and determine probability using real-world scores. Then, using probability analysis, students write a letter to persuade their team's coach on what to practice.

### Snapshot

#### Engage

Students watch a video of NBA highlights and discuss what they know about basketball.

#### Explore

Students "shoot baskets" to collect data. Then, they use the data to determine their own probability of making a successful shot.

#### Explain

As a class, students discuss how they analyzed their data, how it can be used, and what form—decimal, fraction, or percentage—is most helpful for basketball.

#### Extend

Stepping into the role of an NBA statistician for a chosen team, students gather real NBA data to determine the probability of their team making 2-point and 3-point shots.

#### Evaluate

Students summarize their findings in a letter to the coach of their team, using probability to persuade the coach on what to practice.

## Standards

*Oklahoma Academic Standards for Mathematics (Grade 8)*

**PA.D.2.1:** Calculate experimental probabilities and represent them as percents, fractions and decimals between 0 and 1 inclusive. Use experimental probabilities to make predictions when actual probabilities are unknown.

**PA.D.2.2:** Determine how samples are chosen (random, limited, biased) to draw and support conclusions about generalizing a sample to a population.

**PA.D.2.3:** Compare and contrast dependent and independent events.

## Attachments

- [Lesson Slides—Probability in Sports.pptx](#)
- [Shot Statistics—Probability in Sports - Spanish.docx](#)
- [Shot Statistics—Probability in Sports - Spanish.pdf](#)
- [Shot Statistics—Probability in Sports.docx](#)
- [Shot Statistics—Probability in Sports.pdf](#)
- [Statistician's First Day—Probability in Sports - Spanish.docx](#)
- [Statistician's First Day—Probability in Sports - Spanish.pdf](#)
- [Statistician's First Day—Probability in Sports.docx](#)
- [Statistician's First Day—Probability in Sports.pdf](#)

## Materials

- Classroom "basketballs" (such as crumpled paper, foam balls, etc.)
- Classroom "basketball hoop" (such as a trashcan, bowl, etc.)
- Probability in Sports lesson slides (attached)
- Shot Statistics handout (attached, one per pair of students)
- Statistician's First Day handout (attached, one per student)
- Internet-enabled devices for students
- Notebook paper
- Pencils

# Engage

## Teacher's Note: Lesson Preparation

Before class, set up your classroom basketball court. Use a trash can, bowl, or other container as the "basket." Use crumpled paper balls, foam balls, or something similar for your "basketballs." Mark a boundary line with tape from which students will shoot. Make sure there is enough distance between the basket and shooting line to pose a challenge but without being overly difficult. Check that the basket lines up with the boundary line. For larger classes, consider setting up more than one basketball court so that multiple groups can shoot simultaneously.

Use the attached slide show to guide the lesson. Begin with **slides 2 and 3**, introducing students to the lesson title and the Essential Question.

Ask students to write down everything they know about basketball, using the [Collective Brain Dump](#) strategy on **slide 5**. This might include rules, teams, players, equipment involved, etc. Remind students that, for this activity, writing ideas down is more important than proper grammar or sentence structure.

Allow 3–4 minutes for students to brainstorm. Once finished, ask for volunteers to share what they wrote down. Consider using a whiteboard space to list what students come up with for their collective brain dump.

Move to **slide 6** and show the NBA highlights [video](#). The full video is eight minutes long. Any specific length or video highlights can be used or cut, depending on your classroom needs.

### Embedded video

<https://www.youtube.com/watch?v=4FdIRPiL5vA>

## Explore

Move to the directions on **slide 8**. Now the students will collect their own real basketball statistics. Sort the class into pairs. Pass out the **Shot Statistics** handout, with one handout to each pair. For this activity, students should line up at the shooting line(s). The first player in each pair should shoot the "basketball" 10 times towards the basket. The second player should keep track of which shots were made or missed on the Shot Statistics handout. Once the first player shoots ten times, have each pair switch roles. The first player will now record the second player's ten shot attempts.

After each student has completed the activity, ask pairs to work together to find the statistical probability of each player making a successful shot. The probability should be represented in decimal, reduced fraction, and percentage forms.

# Explain

Move to **slide 10**. Ask the class for volunteers to discuss their findings. In addition, ask the following questions:

1. How did you find your probability?
2. Who has the highest chance of making a successful shot?
3. Which form (decimal, fraction, or percentage) would be most helpful for a basketball coach to use? Why?

## Possible Student Responses

Students may respond knowing that higher percentages indicate a greater rate of success, which means a higher statistical chance of making a shot. Pay attention to the form students use when talking about their own rates of success—decimals, fractions, or percentages. When discussing what form would be most helpful for a coach, allow students to weigh the benefits of each. Percentages, as a general rule, should be the best form of probability for a coach to use, as it is most easily understood in terms of successful vs. unsuccessful shots at a glance.

## Extend

Move to **slide 12** and pass out the **Statistician's First Day** handout to each student. Invite students to start their first day as an official NBA statistician. Using the link or QR code on the slide or handout, have students navigate to [this website](#). Following along with students on a projection screen if possible, ask each pair to scroll down to the "Division Standings" or "Conference Standings" chart and choose the team they'd like to work for. On the next page, have them select the "Schedule & Results" tab. At the bottom of the "Regular Season" heading, have students use the last four games played to fill out the first table on the handout.

Make sure that when a given date is selected, students navigate to the correct game, as the page will list all teams who played on that date. Students should find their team's city, and in the same box, select "Shot Chart." Here, students can use the chart under their team's name to find data for 2-point shots attempted (2PA), 2-point shots successfully made (2P), 3-point shots attempted (3PA), and 3-point shots successfully made (3P). Have students record these numbers on their handouts, as well as the date of the game next to "Game 1 (G1)". Repeat for games 2, 3, and 4.

### Optional: Finding Data Together

If you consider the activity or website too complex, consider choosing a team in advance and doing the activity above as a class. If pressed for time, you might also consider recording the numbers in advance for the class.

Ask students to use the data they collected to calculate the probability both shots for each game in simplified fraction and percentage forms. Then, students should calculate total probability of a successful shot across all games for both 2- and 3-point shots.

## Evaluate

Move to **slide 14**. Now that students have collected and analyzed the data, ask them to use the information to write a letter to their team's coach. Their goal is to persuade the coach to practice either 2-point or 3-point shots. Space is provided on the Statistician's First Day handout to write.

Remind students to be specific with their data and use the numbers they came up with.

## Resources

- K20 Center. (n.d.). Collective brain dump. Strategies. Retrieved from <https://learn.k20center.ou.edu/strategy/baee4e90c5fa1a7060ca04dd8b00450e>
- NBA's Best Ball Fakes | 2018-19 Nba Season | #NBAHandlesWeek. (2019). Retrieved from <https://www.youtube.com/watch?v=4FdIRPiL5vA>
- Sports Reference LLC (Ed.). (n.d.). NBA Games Played on June 13, 2019. Retrieved from <https://www.basketball-reference.com/boxscores/>.