
*Enrichment*
**Lesson:** Finding the probability of a future event

**Sixth Grade Objective**: 4.02 Use a sample space to determine the probability of an event.

**Review:**

The **probability** of an event is the measure of how likely it is that the event will occur.
Probability (P) = number of favorable outcomes / number of possible outcomes

For example, if a bag contains 13 marbles total, 10 blue and 3 red.
If a marble is chosen at random, the probability that it will be blue is:

Probability (P)= 10 – the number of blue marbles / 13 – the total number of marbles

What is the probability of choosing a green marble?

P(green)= 0 - the number of green marbles / 13 – the total number of marbles
*If the probability is zero then there is no possibility. It is impossible.*

Another example:

Mrs. Jones brought a cooler of drinks for her son's baseball game. In the cooler there are 6 bottles of water, 5 bottles of orange Gatorade and 6 bottles of cherry Gatorade. One bottle is pulled at random by one of the players. Find the probability of the following:

P (of getting bottled water): 6 – the number of bottled waters / 17 – the number of total bottles

P= 6/17

P (of getting an orange Gatorade): 5 - the number of orange Gatorades / 17 – the number of total bottles

P= 5/17

P( of getting a cherry Gatorade): 6 - the number of cherry Gatorades / 17 – the number of total bottles

P= 6/17

P (bottled water, orange or cherry) 17 – the number of water, orange and cherry / 17 – the number of total bottles / 17/17 = 1
*If the probability is one then it is a certainty*

**Lesson:**
Now that you understand and know how to find the probability of an event you can now make predictions of future events.

For example, a basketball player shoots the ball 25 times and sinks it 12 times. If he keeps shooting at the same rate, how many baskets would he make if he shoots 300 times?

*First, it should be noted that 12 out of 25 shots is close to ½. You should make a note of this so that you can estimate and see if your answer is reasonable.*

$$\frac{\text{Number of baskets made}}{\text{Number of attempts}} \quad \frac{12}{25} = \frac{?}{300}$$

$$\frac{12}{25} = \frac{\mathbf{144}}{300}$$

He would make 144 baskets.

Using probabilities is a great way to make a 'best guess.' It is not what will definitely happen. As in the above example, athletes get injuries, go into slumps, and also get on hot streaks. That being said would you rather have a player on your team that you predict could make 144 shots in 300 tries or one that makes 220 shots in 300 attempts. You can use the probability of future events to make decisions or sway opinion.

Baseball fans use statistics to compare and analyze players. These statistics not only show past performance but can be an indicator of future performance.

**Batting Average**

**Number of Hits (divided by) Number of At Bats**

Batting average: Easily the most common statistic in baseball and the most understood - even outside of the game. It has been historically used as the benchmark for hitters since the late 1800's making it historically rich, easy to understand, easy to compute and almost everyone knows what a .300 hitter is.

** *Batting averages are written in decimal form to the thousandths place.*

To determine the batting average of a hitter: $\frac{\text{Number of hits}}{\text{Number of at bats}}$

Ex.

Sarah has had a great season. She has had 20 hits in 40 at bats. Her batting average would be:

$$\frac{20}{40}$$

$$20 \div 40 = 0.500$$

Knowing her batting average can help us make predictions. If Sarah gets 6 at bats per game, how many hits is she getting per game?

One way of solving the problem is to use equivalent fractions/ratios.

$$\frac{\text{Number of hits}}{\text{Number of at bats}} \quad \frac{20}{40} = \frac{\mathbf{?}}{6}$$

$$\frac{20}{40} = \frac{\mathbf{3}}{6}$$

Another way to solve this problem is to multiply the batting average by the number of at bats.

*Batting average x at bats = hits*

.500 x 6 = 3

With her batting average, a good prediction is 3 hits per game.

**Try these on your own!**

Use the following information to solve the problems

1. Joe made 25 shots at the basket. He made 18 of them during the game. At this rate, the coach wants to know the probability of how many shots Joe would make in 50 attempts.

2. Matt and Joe are on the same team. Matt did not get as much playing time as Joe. Matt shot 10 times. He made 8 of them. The coach wants to know the probability of how many shots Matt would make in 50 attempts.

3. Analyze the data. What should the coach do? Should Matt's play time be increased? Why?

**Check your answers**

1. Baskets made $\frac{18}{25}$ = $\frac{?}{50}$
   Shots attempted

   $\frac{18}{25}$ = $\frac{\mathbf{36}}{50}$

   Joe would make 36 baskets.

2. Baskets made $\frac{8}{10}$ = $\frac{?}{50}$
   Shots attempted

   $\frac{8}{10}$ = $\frac{40}{50}$

   Matt would make 40 baskets.

3. *Answers will vary*. Matt should get more play time than he currently gets. Using these numbers Matt should score more points than Joe.

**Quiz Yourself**

1. Pedro had 9 hits in his first 15 at bats during the first 3 games of the season. In the fourth game of the season he has maintained the same batting average. He had 5 at bats. What is Pedro's batting average?

2. Using the information in question 1, how many hits did Pedro have in the fourth game?

3. In the next game Pedro's team collects 10 hits in 30 at bats. At this rate, how many at bats does the tem need in the next two games to get 15 total hits?

**Check your answers.**

1. There are a couple of way to figure this problem. Either way is fine.
   a. To find the batting average you divide the number of hits by the number of at bats:

      $9 \div 15 = .6$ or $12 \div 20 = .6$

      Batting average is written to the thousandths place so:

      **Pedro's batting average is .600**

2. Since the batting average, or ratio between hits and at bats remain the same, you can figure the number of at bats in the fourth game using equivalent fractions.

   $$\frac{\text{Number of hits}}{\text{Number of at bats}} \quad \frac{9}{15} = \frac{?}{5}$$

   $$\frac{9}{15} = \frac{\mathbf{3}}{5}$$

   Or you can multiply the batting average by the number of at bats
   $(.600)5 =$ **3**

   **Pedro made 3 hits in the fourth game**.

3. $$\frac{\text{Number of hits}}{\text{Number of at bats}} \quad \frac{10}{30} = \frac{15}{?}$$

   $$\frac{10}{30} = \frac{15}{\mathbf{45}}$$

   Subtract the at bats they have already had to find out how many more at bats they need to have.

   $45 - 30 =$ **15**

   **Pedro's team needs 15 at bats in the next two games.**