OKLAHOMA STATE DEPARTMENT OF EDUCATION — CHAMPION EXCELLENCE

What Are the Odds?

Standard 12

The student will explain and evaluate the financial impact and consequences of gambling.

Lesson Objectives

- Recognize gambling as a form of risk.
- Calculate the probabilities of winning in games of chance.

Personal Financial Literacy Vocabulary

Dependent event: The outcome of one event affects the outcome of another, changing the probability of the second event.

Gambling: Taking risks with personal finances or personal assets.

Independent event: The outcome of one event has no effect on the outcome of another; both events have the same probability.

Predictability: Telling or forecasting about something in advance of its occurrence by means of special knowledge or inference.

Probability: The chance or likelihood that something will happen.

Introduction

Simone, Paula, and Randy meet at the local coffee shop every afternoon to work on their homework. Randy picks up a coin and starts flipping it in the air, letting it land on the table. He suddenly realizes that he has flipped seven heads in a row.

If Randy decides to flip it once more, will his next flip most likely be heads or tails? Or is it equally likely that it could be heads or tails?

Paula says heads because the first seven were heads, so the next one will probably be heads too. Randy says tails. The first seven were heads, so the next one is sure to be tails. Simone says that it could be either heads or tails because both are equally likely.

Who is correct?

Lesson

Gambling can be exciting, challenging and stimulating! You may be one of those people who get a "rush" when taking a big chance, or you may be someone who gets too nervous or fearful when taking a big risk. Generally, you will have the same reaction to gambling as you do when taking a big risk. By nature, some people are less willing to take a chance than others. When dealing with your money, it pays to understand the potential risks associated with gambling.

What comes to mind when you hear the word "gamble"? Do you picture lotteries, bingo games, poker, slot machines or other types of games? For most of us, that is a common reaction. Legalized forms of gambling have become rather mainstream in the United States, with almost every state participating in some form of gaming activities. While gambling can be a form of entertainment, it can also be a financial trap that creates financial losses for you and your family. In fact, a small minority of those who gamble become highly addicted and may need help to stop.

Gambling is basically playing a game of chance. It requires you to wager a certain amount of money or personal belongings on something that has an uncertain outcome. Some gambling involves games of luck where the results depend primarily on chance. In other words, your ability to play the game is not taken into consideration and you have no control over the results. These types of games include bingo, the lottery, and slot machines. With games of luck, each individual outcome is unique and independent of the previous chance. On the other hand, a game of skill allows you to use your skills or knowledge to have some control over the outcome. While there is no guarantee about the outcome, your odds of winning can be improved if you practice and gain a better understanding of how the game is played. Games of skill include chess, sports, and some card games.
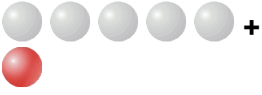
Calculating the Odds

When participating in any gambling activity, you and the sponsor are both "playing the odds." The sponsor, whether the state or a casino, hopes it wins and you, of course, hope you win. Because gambling is a significant source of income for the sponsor, the odds will almost always favor the sponsor, not you. Games of chance – slot machines, blackjack, poker, roulette wheels, lotteries, scratch tickets, and so forth – are set up to ensure the sponsor wins. The odds favoring them is by design, and not an accident.

Suppose you have a friend who likes to play the roulette wheel at the casino. If he spends day after day playing, he will consistently lose over time. Of course, he may also go home one night with a stash of cash because each time he plays the outcome is less predictable. While he may beat the odds when winning, he may also lose a bundle of money in the process. The casino set up the game that way to ensure it consistently makes a profit. Without making a profit, there is no incentive for the casino to remain open.

Lotteries like Powerball or Pick 3 are much the same. Even though you may hear about someone winning a big amount, you do not hear how many people purchased tickets and lost money to make the big payout happen.

So, why do people continue playing when they know the odds are against them? Well, they are just like you. When you make a decision to do something, you believe the potential benefits of doing it will be greater than the costs. Otherwise, you would not choose to do it. In other words, you think you can beat the odds. You will be the "one in a million" who wins the jackpot.

The table below is from the Powerball Web site. It shows the odds of winning in the Powerball game. Notice the odds of winning the Grand Prize compared to the odds of winning only $4. But also notice, that winning $4 is not guaranteed. There is still a good chance you will not have a winning ticket.

Match	Prize	Odds
⚪⚪⚪⚪⚪ + 🔴	Grand Prize	1 in 292,201,338.00
⚪⚪⚪⚪⚪	$1,000,000	1 in 11,688,053.52
⚪⚪⚪⚪ + 🔴	$50,000	1 in 913,129.18
⚪⚪⚪⚪	$100	1 in 36,525.17
⚪⚪⚪ + 🔴	$100	1 in 14,494.11
⚪⚪⚪	$7	1 in 579.76
⚪⚪ + 🔴	$7	1 in 701.33
⚪ + 🔴	$4	1 in 91.98
🔴	$4	1 in 38.32

The overall odds of winning a prize are 1 in 24.87.
The odds presented here are based on a $2 play (rounded to two decimal places).
http://www.powerball.com/powerball/pb_prizes.asp

Powerball is a random game. It does not know who purchases a ticket or where they buy it. It only knows that a number was selected by someone, somewhere. The only way to improve your odds of winning is to buy more tickets, but the odds are still high and hitting the jackpot is still a question of fate. However, you may increase your odds of winning one of the smaller amounts because there are more small prize winners than large prize winners. Even so, there is no guarantee of having a winning ticket in the Powerball drawing.

Betting on horses is a little different. Suppose you hear there is "seven to one" odds on a particular horse in a horse race. You think it sounds good, so you bet $20 that the horse will win. Basically, you have agreed to pay the track $20 if you lose, and it will pay you $140 if you win. With 7:1 odds, you have about a 15 percent chance of winning (100 / 7 = 14.28). The odds of winning depend on how many horses are in the race. If there were only one horse, go for it! That would be "one to one" odds, or a sure thing. As more horses are added, the odds of winning change and it becomes more unlikely that you will have a winning bet. Unlike the Powerball, however, it is guaranteed that one of the horses will win the race.

The Odds of Winning

The odds of winning in most games of chance are pretty low, regardless of much fun people are having in those commercials. As a general rule, the higher the odds, the higher the potential payout. That rule is based on incentives: if the odds are high, the risk of playing is high. If you want people to take high risk, you need potentially high rewards.

Probability looks at how likely it is for something to happen. For example, if you pull one card out of a deck of cards, what is the probability you will draw an ace? The answer is 4 out of 52. There are 52 cards in a deck and 4 aces. Another way to put it: you have a 1 in 13 chance because 52/4 = 13. If you have a 1 in 13 chance of drawing an ace, then you have a 12/13 chance of NOT drawing an ace. The probability of drawing an ace is relatively low.

If you decide to play a Pick 3 lottery game where you have to guess the exact three numbers, your probability of winning is 1 in 1000. You can figure this out by noting that the probability of getting the first number right is 1/10. The probability of getting all three right is then 1/10 x 1/10 x 1/10 = 1/1000.

Independent Versus Dependent Events

Gambling and games of chance rely on the concept of independent and dependent events. Flipping a coin is an example of an independent event. The probability of getting heads does not change, regardless of how many times you flip the coin. After all, there are only two sides to the coin. When the coin is flipped and the first seven flips are heads, the eighth flip still has the probability of 1 in 2 of being heads – or being tails. Each coin flip is independent of the other, and the probability of each flip is the same, no matter how many times you flip it

REMINDER

The odds of winning in most games of chance are pretty low, regardless of much fun people are having in those commercials. As a general rule, the higher the odds, the higher the potential payout.

Most card games are different. When playing Poker or Blackjack, each successive hand is dependent on the previous ones. For example, you have a 4 in 52 chance of getting an ace at the beginning of the game. If the dealer gives you an ace on the first card dealt, the next person has a 3 in 51 chance of getting an ace as the next card dealt because there are only four aces in one deck of cards. Once you get an ace, it is not available for you or the next person to get it again during the game.

When playing Poker, the hand with the highest payout is a royal flush which consists of a 10, jack, queen, king, and ace in the same suit. It is the best hand is because you have the lowest probability of getting one. You can calculate your odds of getting a royal flush by following these steps:

- You need five spades, hearts, diamonds, or clubs. The probability of getting the first card you need is 5 in 52.
- To get the second card you need in the same suit, the probability is 4 in 51. Getting the third card is a probability is 3 in 50; the fourth card is 2 in 49, and the last card is 1 in 48.
- The probability of being dealt a royal flush is rather small. In fact, it is:

$$\frac{5}{52} \times \frac{4}{51} \times \frac{3}{50} \times \frac{2}{49} \times \frac{1}{48} = \frac{1}{2,598,960}$$

Basing your financial future on luck is not very reliable. It is similar to the idea of flipping a coin to see what happens; maybe you will win and maybe you will not. That is another way of saying your ability to win is based on the chance, or the probability, that something will happen.

Perhaps you have heard someone say that investing in the stock market is a form of gambling – but is it really? Informed investors are making financial decisions based upon their knowledge about what they need to meet their financial goals. While those decisions have a level of risk, they are not the same as flipping a coin with no control over the outcome. Decisions about saving and investing are based on predictability, not probability. Predictability means you have some knowledge about the choices you make. For example, if you know a mutual fund has a good history of increased value, you can make some predictions about the future value of the fund. It does not guarantee future earnings, but it does give you a basis for making the decision.

Weather forecasters rely on predictability when they make predictions about the weather. They know the chance something will happen based on current conditions by using specific computer models. Even though they are not always right, they are making "educated" guesses about what they expect to happen. As a general rule, it will happen if all of the elements come together as predicted. However, that does not always happen, making some of their predictions seem rather foolish. Even though using predictability offers no guarantees, it is definitely more reliable than merely flipping a coin.

Conclusion

Gambling with your future is high risk. While it may fun and exciting to play the odds, the key word is "play." Money used for gambling, lotteries, or other games of chance should be money you can afford to set aside for fun—not money you need to pay your bills or feed your family. Gambling, like any other choice you make, has costs and benefits. Understanding the high cost of risk will help you decide if gambling is something you can afford to do.

FINAL NOTE: Obviously, Simone was right! Paula is assuming that the pattern will continue because Randy is on a roll. But there is no guarantee that will happen. Randy is certain that his streak will change because it seems unlikely he would continue getting heads. But again, there is no guarantee that will happen either.

Simone knows the odds are 50/50. The coin only has two sides. Every time it is flipped, each side has an equal potential of landing face up. The coin has no memory and no way to know how it landed with previous flips.

The same is true for games of chance. There is no guarantee that you will win every time. You may have a winning streak, but nothing says it will last.

Name: _____ Class Period: _____

Risky Business Review 12.1

Answer the following questions and give the completed lesson to your teacher to review.

1. Gambling is best defined as
   a. playing a game with a guaranteed winner.
   b. taking risks with your money or assets in hopes of winning something.
   c. determining whether or not something will happen.
   d. an illegal activity.

2. Which of the following is not generally considered a game of chance?
   a. Bingo
   b. Buying a lottery ticket
   c. Chess
   d. The roulette wheel

3. Which of the following statements is true?
   a. Weather forecasters rely on probability.
   b. Games of skills have guaranteed outcomes.
   c. The stock market is a form of gambling.
   d. Most, if not all, casino games are set so that the casino wins more than the players.

4. Probability is best defined as
   a. how likely it is that something will happen.
   b. making choices based on past events.
   c. forecasting the future.
   d. taking a chance.

5. An example of an independent event is
   a. a game of blackjack.
   b. a game of poker.
   c. the lottery.
   d. flipping a coin.

Name: _____ Class Period: _____

Gambling on a Flip Activity 12.1

Directions: Complete the table below. You will need a coin with heads and tails for this activity.

1. You are testing your luck at a game of chance. In the first column of the chart below, determine if each flip of the coin will be a head or a tail before flipping your coin. Write H for head or T for tail in column 1.

Coin Flip	Your Prediction (H or T) Column 1	Did flip match prediction? YES or NO Column 2	+100 for correct prediction Column 3	-100 for incorrect prediction Column 4
1				
2				
3				
4				
5				
6				
7				

8				
9				
10				

2. After making your predictions, flip your coin and record whether it is a head or a tail. In the second column, write YES if your flip matches your prediction and NO if your flip does not match your prediction.

3. In the next column, enter 100 points if your flip matched your prediction.

4. In the last column, enter 100 points if your flip did not match your prediction.

5. Total the number of points in Column 3 and enter your results below. Total the number of points in Column 4 and enter your results below. Subtract the total number of points in Column 4 from the total number of points in Column 2. If your answer is positive, you win! If your answer is negative, sorry. Did you win or lose? Explain your answer.

Column 3 Total	Column 4 Total	Balance

6. Put a dollar sign in front of your totals. You have just gambled with $1,000. Did you win or lose? What are key points relating to this lesson and this activity?