



Probability and Games of Chance

Playing games of chance is an activity that can involve the use of mathematical concepts like probability. In fact the study of probability emerged out of interest in understanding games of chance. Developing an understanding of probability in the context of reflecting on the relative value given to certain things helps students learn both the utility of probability and skills to manage risks involved in games of chance. This lesson is meant to help students develop an understanding of basic probability concepts and how they can be applied to think critically about gambling.

Instructional Strategies

1. Introduce students to the [Game of Pig](#) and play the probability experiment with them as a class. For the purposes of this lesson, it is suggested that you carefully explain the rules so students understand they are trying to accumulate as many points as possible. This requires they stay in the game in order to get points but stop before they risk losing those points when a 1 is thrown. Do not explain much more about probability at this point.
2. After playing the game, have students work in pairs to engage in various probability experiments.
 - a. Ask students to toss a coin 10 times and record how many times it lands on 'tails' and how many times it lands on 'heads' and have them discuss the results. Then have them repeat the experiment multiple times and again discuss the results.
 - b. Ask students to roll a die 18 times and record how many times each number (1-6) is rolled and then discuss the results. Have them repeat the experiment and again discuss the results.
 - c. After the students have conducted these experiments, you might choose to collate the results of all of their experiments. Then compare the collated results to some of the individual experiment results. (In the collated results, the numbers for all alternatives should be closer to equal.)
3. Have students watch the [Basic Probability](#) video, and then have them work in groups to answer the following problems:
 - a. What is the probability of rolling a 5 on single roll of a die? What is the probability of rolling a 5 if you roll the die 2 times? What is the probability of rolling a 5 if you roll the die 6 times? How many 5s are you likely to roll if you roll the die 12 times? Now try rolling a die twelve times. How many 5s did you roll? Discuss the results.
 - b. If you toss a coin 30 times, how many times should it land on 'heads' and how many times should it land on 'tails'? Now toss a coin 30 times and record the results. Explain the results.
 - c. If the overall odds of winning something on a scratch and win ticket is 1 in 4, what is my probability of winning something if I buy 2 tickets? Am I guaranteed a win if I buy 4 tickets? Why or why not?
4. Ask students to think about an item that they value and have them write down (or draw) what it is. Ask them if they would be willing to risk it to win a prize and, if so, what the prize might have to be, and have them write (or draw) that as well. If a student is not willing to risk the item for any prize, have them consider a different less valuable item. Then pose the following scenarios and have students record 'yes' or 'no' for each scenario.

Note to teacher:

The video and the accompanying problems introduce theoretical probability and encourage comparison with experimental probability. Therefore, you may wish to skip this exercise for grade 4 and 5 students and go directly to #4 below.



- a. Would you be willing to risk your valuable item if you could win the prize by rolling a 6 on one roll of a die? If you do not roll a 6 you lose the item and do not win the prize.
- b. Would you be willing to risk your valuable item if you could win the prize by rolling a 1 or 6 on one roll of a die? If you do not roll a 1 or 6 you lose the item and do not win the prize.
- c. Would you be willing to risk your valuable item if you could win the prize by rolling an even number on one roll of a die? If you do not roll an even number you lose the item and do not win the prize.
- d. Would you be willing to risk your valuable item if you could win the prize by rolling any number other than a 3 or 5 on one roll of a die? If you roll a 3 or 5 you lose the item and do not win the prize.

After students have recorded their responses to each scenario, ask them to reflect on their own reasons for the decisions they made. Then facilitate a class discussion on the role probability might have played in their decision making process. What other factors might have influenced their decisions?

Gambling literacy

Big ideas

- As humans, both individually and as communities, we need to learn how to manage gambling in our midst
- We can learn how to control gambling by examining the different ways people have thought about it, engaging in critical self-reflection and listening to each other

Competencies

- Explore and appreciate the diverse cognitive, social, emotional and physical factors that impact gambling behaviour
- Develop personal and social skills to reflect on and manage personal behaviour and choices related to gambling

For a complete look at the gambling literacy competencies, as defined by the Centre for Addictions Research of BC, see: www.uvic.ca/research/centres/carbc/assets/docs/iminds/hs-gambling-curriculum.pdf

Links to Curriculum

First Peoples' principles of learning

- Learning ultimately supports the well-being of the self, the family, the community, the land, the spirits, and the ancestors
- Learning involves recognizing the consequences of one's actions

Mathematics 4/5

Big idea

- Analyzing and interpreting experiments in data probability develops an understanding of chance

Competencies

- Develop, construct, and apply mathematical understanding through play, inquiry, and problem solving
- Visualize to explore mathematical concepts
- Communicate mathematical thinking in many ways
- Use mathematical vocabulary and language to contribute to mathematical discussions
- Reflect on mathematical thinking



Mathematics 6

Big idea

- Data from the results of an experiment can be used to predict the theoretical probability of an event and to compare and interpret

Competencies

- Inductively and deductively reason and use logic to explore, make connections, predict, analyze, generalize, and make conclusions
- Develop and apply mental math strategies and estimate amounts and outcomes
- Develop, construct, and apply mathematical understanding through play, inquiry, and problem solving
- Engage in problem-solving experiences that are connected to place, story, and cultural practices relevant to the local community
- Visualize and describe the mathematical concepts
- Explore, apply, and connect concepts to each other, to other disciplines, and to the real world
- Use mathematical arguments to support personal choices and anticipate consequences