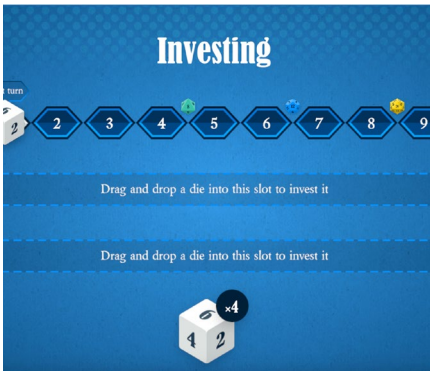

MIDDLE SCHOOL
Game Activity

Title
Risk and Roll

LEARNING OBJECTIVE(S)

Students will be able to:

- **Model** simple and compound probabilities using dice.
- **Compare** the risk of various financial choices.
- **Explain** how understanding probability relates to financial decision-making.
- **Describe** how insurance helps transfer risk in real life.

Content Area

Math: Probability

Grades

6–8

Overview

This lesson begins with students deciding between guaranteed outcomes and risky chances, using examples like flipping a coin or rolling a die. Students then participate in a dice-based activity where they make financial choices and track their results to see how probability affects outcomes. After reflecting on their personal risk tolerance, students work in small groups to analyze real-world financial scenarios that involve different levels of risk and share their findings. The activity concludes with a discussion in which the teacher connects probability, risk awareness, and smart decision-making to everyday financial choices students may face.

Themes

Personal Finance: Financial risk-taking, risk tolerance, decision-making, saving, investing, insurance

Math: Probability, chance outcomes

Common Core Math Standards

- **MP1**: Make sense of problems and persevere in solving them.
- **MP2**: Reason abstractly and quantitatively.
- **MP3**: Construct viable arguments and critique the reasoning of others.
- **7.SP.C.5**: Understand that the probability of a chance event is a number between 0 and 1 and can be used to predict frequency over time.
- **7.SP.C.7**: Develop a probability model and use it to find probabilities of events.

- **7.SP.C.8**: Find probabilities of compound events using organized lists, tables, tree diagrams, and simulation.

National Standards for Personal Financial Education

Council for Economic Education and Jump$tart Coalition, 2021

- **III. Saving 8-3**: Financial institutions pay interest to depositors and loan out the money to borrowers who pay interest on their loans.
- **IV. Investing 8-1**: Investors in financial assets expect an increase in value over time (capital gain) and/or receipt of regular income, such as interest or dividends.
- **IV. Investing 8-6**: Different types of investments expose investors to different degrees of risk.
- **VI. Managing Risk 8-1**: Financial loss can occur from unexpected events that damage health, wealth, income, property, and/or future opportunities.
- **VI. Managing Risk 8-2**: Insurance is a financial product that allows people to pay a fee (premium) to transfer the cost of a potential financial loss to an insurance company.
- **VI. Managing Risk 8-5**: People can choose to avoid, reduce, retain, or transfer risk through the purchase of insurance. Each option has different costs and benefits.
- **VI. Managing Risk 8-6**: Extended warranties and service contracts provide protection against certain product mechanical failures during the contract period.
- **VI. Managing Risk 12-1**: People vary with respect to their willingness to accept risk and in how much they are willing to pay for insurance that will allow them to minimize future financial loss.

National Standards for Business Education

National Business Education Association, 2023

- **Personal Finance I.1.5**: Recognize the consequences of economic choices.
- **Personal Finance IV.1.3**: Differentiate between saving and investing.
- **Personal Finance VIII.1.1**: Identify risks in life and how to gain protection against the consequences of risk.
- **Personal Finance VIII.1.4**: Evaluate insurance as a risk management strategy.

Connect

How does this connect to *Financia: A Dice Quest*?

Students will encounter situations in the game where they must decide between safer moves with guaranteed small gains or riskier choices with the potential for bigger rewards. This lesson builds their ability to evaluate risk and probability, helping them make more strategic decisions during gameplay based on their comfort with uncertainty.

How does this connect to students?

From riding a bike without a helmet to spending money without saving for emergencies, students experience risk in everyday life. This lesson helps them recognize risks, use probability to better predict outcomes, and match their financial decisions to their own personal comfort with risk—a skill they will use throughout their lives.

How does this connect to middle school math?

By modeling real-world financial decisions with dice, students apply probability concepts to situations where outcomes are uncertain. They strengthen their ability to reason about chance events and expected outcomes, directly supporting middle school standards for understanding and using probability models to make predictions and informed decisions.

Key Terms

Personal Finance: Uncertainty, outcome, risk, reward, risk tolerance, insurance, decision-making, saving, investing, warranty

Math: Probability, chance event, expected value

Prepare

Background: Many financial decisions involve an element of **uncertainty**. Some choices offer a guaranteed **outcome**, while others involve **risk**—a situation where the result is unknown and could lead to a gain or a loss. **Probability** is the branch of mathematics that measures how likely an event is to happen, expressed as a number between 0 (impossible) and 1 (certain), as a percentage between 0% and 100%, or as a fraction. In the real world, understanding probability helps people weigh the potential risks and **rewards** of financial decisions, from saving and investing to purchasing **insurance** or starting a business. **Risk tolerance**—an individual's comfort level with uncertainty and potential loss—plays an important role in shaping personal money choices.

This lesson provides students with a hands-on exploration of probability through a financial **decision-making** lens. Students will use dice-based scenarios to experience how chance affects outcomes. In doing so, they will begin to get a sense of their personal tolerance for risk. Teachers are encouraged to actively facilitate discussion after each round to help students see patterns and reflect on how probability influenced their decisions and outcomes. Examples of more complex probability scenarios are provided. Consider what level of probability calculations your students can tackle in advance of the lesson. Similarly, the level of complexity of the Risky Situations discussions may be adjusted based on student ability, emphasizing conceptual understanding over formal calculations where appropriate.

Materials

- **6-sided dice**—one per student or pair of students (If no dice are available, use an online alternative such as this.)
- **Risk and Roll** Student Capture Sheet—one per student
- **Guaranteed Reward vs. Risky Chance** Handout—one for educator
- **Risky Situations** Handout—one cut into cards
- **Risky Situations** Answer Key—one for educator
- Financia: A Dice Quest (optional)

Engage

- Pose the following question to students: *If you could choose between winning $5 for sure or taking a chance to win $20 but risk getting nothing, which would you pick?* Provide no further details about what the chance might involve.
- Allow time for students to consider their options and then direct students to stay seated if they would take the guaranteed $5 and stand up if they would take the chance for $20.
- Count the number of seated and standing students and record this information.
- Engage students in a short discussion by calling on both standing and seated volunteers. Ask each one why they made their choice and/or what they were thinking about when making their decision.
- Pose a revised version of the previous question: *If you could choose between winning $5 for sure or taking a chance to win $20 by flipping a coin and having it land on heads, which would you pick?* Repeat the process of having students stay seated for a guaranteed $5 and stand for a chance to win $20.
- Count the number of students in each category and record it. Compare it to the previous results.
- Call on volunteers who changed their responses and ask them to explain their rationales.
- Repeat the question once more, but this time make the chance of winning contingent on rolling a three on a six-sided die. Count and compare the number of students giving each response and discuss why the number willing to take the risk might be less this time (the likelihood of rolling a particular number on a die is less than landing on heads when flipping a coin).

Teach

- Explain that this activity will explore how probability affects decision-making when taking financial risks.
- Define probability as a way to measure how likely an event is to happen. It is expressed as a number between 0 and 1 or a percentage between 0% and 100%. A probability of 0 (or 0%) means the event is impossible, while a probability of 1 (or 100%) means the event is sure to happen.
- Ask students how they would represent the probability of flipping a coin and landing on heads. If needed, explain that the chance is one out of two (the number of possible outcomes), which is expressed as 0.5 or 50%.
- Challenge students to determine how they would represent the probability of rolling a three on a six-sided die. If needed, explain that the chance is one out of six possible outcomes, which is expressed as approximately 0.167 or 16.7%.
- Explain that understanding probability can help people make better financial decisions because it helps them predict how likely different outcomes are.
- Tell students that in the next part of the activity, they will have a chance to make decisions involving financial risk and test out their outcomes using dice.

- Review that a standard die has six sides and that each number has an equal chance of being rolled.
- Distribute a **Risk and Roll Student Capture Sheet** along with a six-sided die to each student or pair of students, depending on available materials. If using an online alternative, direct students to the website or app on available devices.
- Display or announce the scenario for the first round: *Take $3 automatically or roll a die. If you roll a 5 or 6, you win $10; if you roll anything else, you win nothing*.
- Instruct students to record their decision before rolling (automatic $3 or roll for $10). Emphasize that they are not to change their decision after seeing what they roll.
- Ask for a show of hands: Who is going with the guaranteed $3? Who is taking a risk?
- After all students have made their choice, direct them to roll their dice and record the number they rolled in the "Your Roll" column. Explain that the "Financial Outcome" should be $3 if they played it safe, $10 if they rolled a 5 or 6, and $0 if they took the chance and rolled something other than a 5 or 6.
- Tell students that the balance will be the same as the financial outcome for this first round.
- Direct students to raise their hands if they are happy with the outcome of this round. If so, they should put a check under the smiling face. If they are disappointed, they should put a check under the frowning face.
- Facilitate a short discussion: What do you notice about the outcomes? Did most students who took the risk win or lose? What was the probability of getting the $10? (Answer: 2 in 6, which simplifies to 1 in 3 and translates to 0.33 or 33%)
- Explain that with each round, students will choose between a guaranteed reward and a risky chance.
- Repeat the process with additional rounds and scenarios, differentiating based on students' math ability. Examples can be found on the **Guaranteed Reward vs. Risky Chance Handout**.
- After each round, have students record their decision, roll, and outcome.
- Pause after three or four rounds to ask one or more of the following questions: Has anyone changed their strategy based on what happened in earlier rounds? Why or why not? How does the number or numbers you have to roll impact your choice? How does the difference between the guaranteed amount and the winning amount impact your choice?
- Continue using additional scenarios until students have completed eight rounds. Select from examples found on the **Guaranteed Reward vs. Risky Chance Handout** or create new ones. Review the probability of each event and pause periodically for discussion.

Facilitation Tips

Some probabilities are easier to determine than others. Draw pictures, list potential outcomes, or make tree diagrams to help students determine the probability of each event. In ***Financia: A Dice Quest***, players can earn dice with more than six sides. Consider offering students scenarios that use dice with six, eight, twelve, or twenty sides, like those used later in the game.

- After completing eight rounds, direct students to answer the questions at the bottom of the student capture sheet.
    - Did your decisions change? Did you take more risk, less risk, or about the same throughout all of the rounds? Why?
    - On a scale of 1 to 10, how would you rate your willingness to take financial risks? (one being low and 10 being high)

- Introduce the concept that people have varying levels of comfort with risk, known as risk tolerance. Someone with a higher risk tolerance is more willing to take chances for a bigger reward, while someone with a lower risk tolerance prefers safer, more certain outcomes.
- Share that those who rated themselves with a lower number likely have a lower tolerance for financial risk, while those with higher numbers have a higher tolerance for risk.
- Explain that risk tolerance often comes into play when making real-life financial decisions. Some financial decisions involve choosing between predictable or guaranteed outcomes, and others involve more risk.
- Divide students into small groups. Distribute one card from the **Risky Situations Handout** to each group.
- Challenge students to think about how the concepts of guaranteed outcomes and risky chances relate to the money decision their group has been assigned. Direct them to consider what the risk is and what, if any, probabilities might a person consider when making their decision.
- Allow time for each group to discuss their assigned Risky Situation card.
- Call on groups to share their situation and highlights of their decision with the class. Ask follow-up questions to deepen the discussion, such as:
    - What additional information might help you make this decision?
    - Are there risks hidden in the “safe” choice, too?
    - How might someone’s risk tolerance affect which choice they would make?

Conclude

- Lead a short class discussion to help students connect the various financial decisions they explored. Ask students what all these financial decisions have in common and guide them to realize that almost every financial decision involves some degree of risk. Probability can help you predict, but never guarantee, outcomes.
- Remind students that understanding risk and thinking about probability can help them:
    - Protect themselves when necessary (insurance, warranties, saving).
    - Take smart risks when it’s worth it (investing, business opportunities).
    - Match financial decisions to their personal risk tolerance.
- Reinforce the idea that being aware of risk doesn’t mean avoiding all risks. Instead, it means understanding what could happen and making informed choices.
- Invite students to respond to one of the prompts below using a preferred exit-ticket strategy.
    - Describe a real-life situation where you would feel comfortable taking a financial risk and a situation where you would want to play it safe. Explain why you would feel differently in each case.
    - List:
        - 3 risks you might face with money decisions
        - 2 ways probability could help you make a better choice
        - 1 piece of advice you would give someone about handling financial risks
    - Complete both sentences:
        - One time when taking a financial risk could be a smart move is...
        - One time when playing it safe with your money might be the better choice is...

Extend

- **Summary:** Invite students to create a "postcard" to their future selves about what they learned about financial risks and probability, including a short message, key takeaway, and optional drawing or slogan.
- **Writing:** Ask students to create a simple "Risk Tolerance Meter" showing whether they prefer low, medium, or high risk, and write a short explanation of how they could use that knowledge in future money decisions.
- **Research:** Challenge students to research a real-world example where probability plays a role in financial decision-making, such as insurance companies, investing, or lotteries, and create a short written or visual summary of what they find.
- **Family:** Encourage students to interview a family member about a financial decision that involved risk, such as buying insurance, investing, or starting a business, and share what they learned about how the decision was made.
- **Technology:** Direct students to use an online dice roller, coin flip simulator, or random number generator to create and test their own probability scenarios, recording and analyzing the outcomes across multiple trials.

Risk and Roll

STUDENT CAPTURE SHEET

Directions: For each round, complete the table with your decision, the number you rolled, and the financial outcome (how much money you made, lost, etc.). Calculate your balance (how much you have as a result of each new round). Finally, put a checkmark under the smiling face if you are happy with your original decision, or the frowning face if you're disappointed.

Round #	Decision	Your Roll	Financial Outcome	Balance	😀	☹️
1						
2						
3						
4						
5						
6						
7						
8						

Did your decisions change? Did you take more risk, less risk, or about the same throughout all of the rounds? Why?

On a scale of 1 to 10, how would you rate your willingness to take financial risks?

1	2	3	4	5	6	7	8	9	10
Take No Risks			Take Some Risks			Take Many Risks			Take All the Risks

Guaranteed Reward vs. Risky Chance

The following scenarios can be used during the **Risk and Roll** student activity:

- Take $2 automatically or roll a die. If you roll a 1, 2, or 3, you win $6.
- Take $4 automatically or roll a die. If you roll exactly a 6, you win $15.
- Take $2 automatically or roll a die. If you roll an odd number, you win $5. (Probability: 3 out of 6, 0.5, or 50%)
- Take $1 automatically or roll a die. If you roll a 1, you win $8; otherwise, you win nothing. (Probability: 1 out of 6, 0.167, or 16.7%)
- Take $3 automatically or roll a die. If you roll a 2, 3, 4, or 5, you win $6. (Probability: 4 out of 6, 0.667, or 66.7%)
- Take $2 automatically or roll a die. If you roll exactly a 6, you win $12. (Probability: 1 out of 6, 0.167, or 16.7%)
- Take $1 automatically or roll a die. If you roll a 1, 2, or 6, you win $7. (Probability: 3 out of 6, 0.5, or 50%)
- Take $1 automatically or roll a die. If you roll an even number, you win $4. (Probability: 3 out of 6, 0.5, or 50%)
- Take $5 automatically or roll a die. If you roll a 5 or 6, you win $15. (Probability: 2 out of 6, 0.333, or about 33.3%)
- Take $6 automatically or roll a die twice. If you roll two 1's in a row, you win $50. (Probability: (1/6) × (1/6) = 1/36, 0.028 or 2.8%)
- Take $10 automatically or roll two times. If you roll two of the same number, you win $20. (Probability: 6 out of 36 combinations, 0.167, or 16.7%)
- Take $4 automatically or roll two dice. If you roll a total of 7, you win $15. (Probability: 6 out of 36 combinations, 0.167, or 16.7%)

Risky Situations

STUDENT CAPTURE SHEET

Directions: Cut into cards and distribute one card to each group during the activity.

Potential Sneaker Sale

The sneakers you've been wanting were just released. Do you buy them now at full price to guarantee your size, or wait for a sale and risk your size selling out?

Investment in a Friend's Business

Your friend asks you to invest in their new T-shirt business. Do you invest your money in hopes of profits, or keep it safe in savings?

Trip Insurance Decision

Your family is planning a big vacation. Do you pay extra for trip insurance or take the risk of losing the money if something goes wrong?

Lending to a Friend

A classmate asks to borrow $20 and promises to pay you back $25 in three weeks. Do you lend the money, or keep your $20 safe?

Backpack Quality

It's back-to-school season and you need a backpack. Do you buy a cheaper backpack that might wear out, or pay more for one with a lifetime warranty?

Saving vs. Investing

You just won $1,000 in a contest. Do you save it in the bank to grow slowly, or buy stocks that could rise or fall in value?

New Phone Accessories

Your older brother just bought a brand-new phone. Should he spend extra on a good case and screen protector, or skip it and hope nothing happens?

50/50 Raffle

At the home football game, there's a 50/50 raffle. Do you spend $5 for a chance to win big, or spend it at the concession stand for a guaranteed treat?

Lemonade Stand

You want to start a lemonade stand but don't have the cash for supplies. Do you borrow money and risk owing, or save up first and start debt-free?

Bike Lock Protection

You just got a new bike. Do you buy the cheapest lock and hope it works, or pay more for a heavy-duty lock to protect your bike?

Video Game Preorder

A new video game is launching soon. Do you pre-order it before reading reviews, or wait for reviews even if it means waiting longer?

Investment Decisions

You have money saved to invest. Do you put it all into one risky investment, or spread it across several to lower your risk?

Risky Situations

ANSWER KEY

Directions: Cut into cards and distribute one card to each group during the activity.

Potential Sneaker Sale

Guaranteed Option: Buy now

Risky Choice: Wait for a sale

Investment in a Friend's Business

Guaranteed Option: Put money in savings

Risky Choice: Invest in a friends' business

Trip Insurance Decision

Guaranteed Option: Purchase trip insurance

Risky Choice: Do not purchase trip insurance

Lending to a Friend

Guaranteed Option: Keep your money

Risky Choice: Lend your friend money

Backpack Quality

Guaranteed Option: Lifetime warranty

Risky Choice: Less expensive backpack

Saving vs. Investing

Guaranteed Option: Put money in a savings account

Risky Choice: Buy stocks

New Phone Accessories

Guaranteed Option: Phone case and screen protector

Risky Choice: No protection

50/50 Raffle

Guaranteed Option: Concession stand treat

Risky Choice: 50/50 raffle

Lemonade Stand

Guaranteed Option: Save money

Risky Choice: Borrow money

Bike Lock Protection

Guaranteed Option: Heavy duty lock

Risky Choice: Less expensive lock

Video Game Preorder

Guaranteed Option: Wait for reviews

Risky Choice: Preorder the game

Investment Decisions

Guaranteed Option: N/A (Multiple stocks still carry risk but not as much as a single stock.)

Risky Choice: One stock