

Unit Title: Expected Value and the Stock Exchange Game

Grade Level: 10-12

Subject Area: Math

Duration/Length/Number of class periods: 3 days

Description:

This lesson's activity and discussion introduce and develop the idea of expected value. The discussion helps students investigate the definition and formula of expected value. The lesson will culminate in a Stock Exchange activity that requires students to calculate expected value.

Established Goals:

9.10.4 Calculate experimental probabilities by performing simulation or experiments involving a probability model and using relative frequencies.

9.10.9 Analyze decisions and strategies using probability concepts.

9.10.10 Weigh the possible outcomes of a decision by assigning probabilities to payoff values and finding expected values.

What Enduring Understandings are desired?

Probability helps us to analyze the change that an event occurs, and it provides a framework from which to make decisions about future events based on known information.

What Essential Questions will be considered?

How do people use data to influence others?

How can predictions be made based on data?

Why would someone choose to purchase stock from one company rather than another?

Students will know / be able to:

- understand the difference between theoretical and experimental probability,
- calculate the expected value of an event,
- use experimental probabilities to make inferences about particular scenarios.

Description <i>Units must include at least one of each formative, summative, introductory activity and learning activity. Check the appropriate box; one per row.</i>	Formative	Summative	Introductory Activity	Learning Activity	Student Technology Used	Teacher Technology Used	ISTE Standard
Day 1 Intro: Diamond Game Using a deck of cards, students will guess the suit of the next card turned over. If they guess correctly, the ‘students’ get a point, if they guess incorrectly, the ‘teacher’ gets a point. This leads to a discussion of fairness.			x		Classkick	Classkick	6c
Lesson: Teacher lesson on introduction to basic probability, including discussions on both theoretical and experimental probability. Students revisit the intro activity to redesign the activity to be fair.				x		Smart-notebook	1c
Exit ticket: Students complete the Desmos activity: https://teacher.desmos.com/activitybuilder/custom/59233c9aefd17610dbbd684e	x				Desmos	Desmos	3d, 5a
Day 2 Intro Present the student with the following scenario: <i>A bet on a single number in roulette has a 1/38 chance of success. Would we play this game if we were only offered a 1-to-1 payout on this bet—that is, a chance to win \$1 for each \$1 we wager? What would the payout have to be to make this game fair?</i>			x		Classkick	Classkick	4d, 6c

Day 2 Lesson Students will work through the Flocabulary activity to reinforce the concept of calculating expected value. <i>*This may require a paid account*</i> (Alternative would be to use the Kahn Academy video for instructional purposes)					Flocabulary/Kahn Academy		1c
Day 2 Knowledge Check: Desmos student activity: https://teacher.desmos.com/activitybuilder/custom/60090a8d3423672c717bcf24?collections=5f5e5446339f76609a43052a	x				Desmos	Desmos	3d, 5a
Day 3 Stock Exchange activity and assessment In groups of 2, students complete a series of 3 activities. • Enter the probability of 0.1 for Player 1, and the probability of 0.3 for Player 2. Enter the payoff of 5 (points) for Player 1, and the payoff of 3 for Player 2. Run the program at least 100 times and observe which player wins more. Why does it happen? • Without changing the probabilities, change payoffs in such a way that the game is fair. Do it in several different ways. Run the program many times to see if it is fair indeed. How did you determine what payoffs would result in a fair game? • Reset the payoffs and the probabilities in your own way. What would be the expected value for each player? Use Question #1 and Question #2 forms below the applet to have the computer check your expected payoffs. Run the program many (100 or more) times to see if the average payoff per game gets close to your prediction. Teams present their findings to the class as a graded summative assessment.		x			Virtual simulator		3d, 4a, 5b, 6a, 6b, 6c, 7b, 7c,

Materials, tools and resources: 1-1 Chromebooks
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Additional credit given to: