

Probability: Expected ValueII.C Student Activity Sheet 10: Expected Allowance

Yvonne gets \$15 a week for allowance. She also loves to play basketball. Yvonne wants to convince her father to try something new with her allowance based on her basket-shooting talent, hoping that it will increase what she receives. Yvonne suggests that instead of getting \$15, she attempt shooting baskets each week for her allowance.

- If she misses the first basket, she gets only \$5.
- If she makes (succeeds with) the first basket, she gets \$15 and a chance to make another basket for an additional \$10.

Yvonne can make a basket 40% of the time

1. To help Yvonne's father decide whether to use the new allowance plan, find the probability of Yvonne making 0 baskets, 1 basket, and 2 baskets. Justify your reasoning with an appropriate model.
2. How many times in a year do you expect Yvonne to get \$5? \$15? \$25?
3. How much allowance should Yvonne expect to receive in a year?
4. Should Yvonne's father accept the deal? Justify your reasoning.

Yvonne practiced shooting baskets all year. She can now make a basket 60% of the time. Yvonne offers her father the same deal.

5. What is the probability of Yvonne making 0 baskets? 1 basket? 2 baskets?
6. How much money do you expect Yvonne to receive in a year?

Reinforcement

Yvonne's younger sister, Lisa, wants her father to offer her the same deal. Lisa can make a basket 20% of the time.

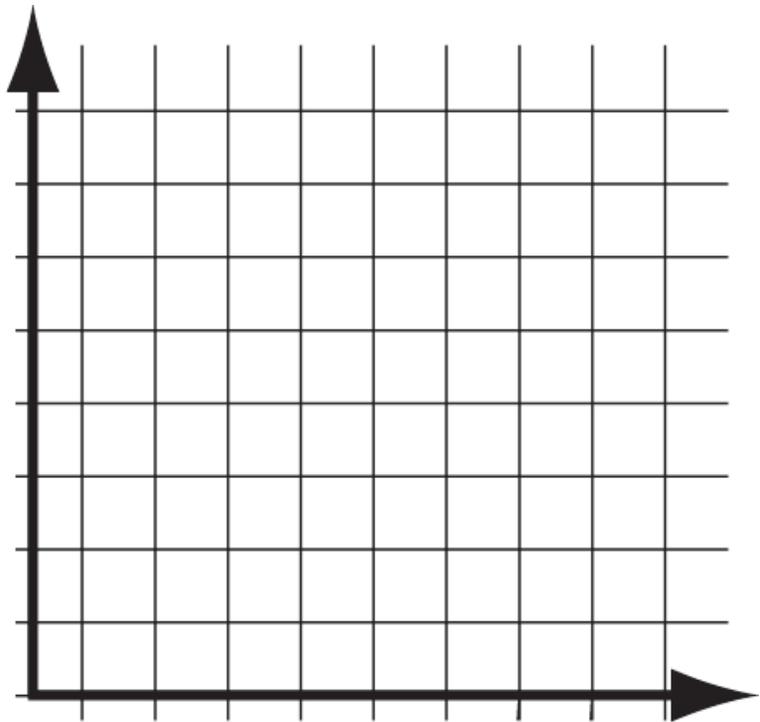
7. How many times do you expect Lisa to receive \$5? \$15? 25? Justify your reasoning using an appropriate model.

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8. You have now looked at Yvonne’s situation (with a 40% shooting percentage) and Lisa’s (with a 20% shooting percentage) to determine what percent of the time they are each likely to receive \$5, \$15, and \$25 in allowance. Make a table and a graph that show the relationship between these shooting percentages and the amount of allowance earned, as well as other possible shooting percentages related to the amount of allowance earned. Describe how this relationship changes based on a person’s shooting percentage.

Percentage of Making a Basket	Amount of Allowance			
	\$5	\$15	\$25	Average Allowance Per Week



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9. Lisa's ability to make a basket improved to 30%. Using your graph, what average weekly allowance should she expect? What is the actual average amount Lisa should expect?
10. If Yvonne wants to earn an average weekly allowance of \$15, what percentage of baskets must she make?
11. Yvonne's father figured out that he had been giving Yvonne \$20 per week for her allowance. What percentage of the baskets is Yvonne making? What information did you use to answer this question?
12. **EXTENSION:** Research popular basketball players or teams to find current percentages associated with making free throws, 2-point shots, and 3-point shots. Create a geometric probability model of a scenario using the player or team to make the given shot in a particular situation. Provide explanations as needed for sharing with others in the class.

(**Note:** Basketball statistics do not break out the 2-point percentage in its own category in the same way that free throws and 3-pointers are broken out. Instead 2- and 3-point goals are combined in the Field Goals Made [FGM] category. Determine the number of 2-point shots made by subtracting the 3-point shots made from the FGM.)

13. **MINI-PROJECT:** Design a carnival game that is of interest to your age group.
 - Make a scale model of the game.
 - Include a report with your model that details the following:
 - a. Experimental and theoretical probability of winning the game
 - b. Expenses
 - c. Expected payoff
 - d. Profit
 - e. Rules of the game
 - f. Prizes and how to earn the prizes
 - g. Why the game should be selected for the carnival