

SAS 10 – Expected Value

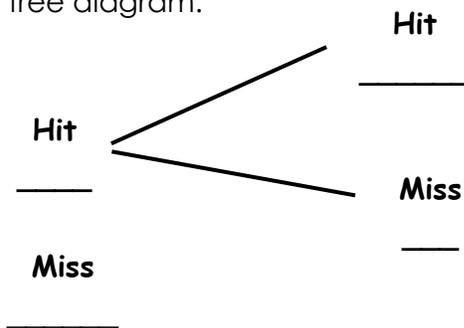
Part 1: Candace's Deal

Candace Parker gets \$15 a week for allowance. She also loves to play basketball. Candace wants to convince her father to try something new with her allowance based on her free-throw shooting abilities, hoping that it will increase what she receives each week. Candace suggests that instead of getting \$15, she attempt two free-throws each week for her allowance.

- If she misses the first free-throw, she gets only \$5 and no chance for a second shot.
- If she makes the first free-throw, she gets \$15 and a chance to make a second free-throw for an additional \$10.

Candace can currently make free-throws 40% of the time.

1. To help Candace's father decide whether to use the new allowance plan, find the probability of Candace making 0 free-throws, 1 free-throw, and 2 free-throws. Justify your reasoning with a tree diagram. Because she has different probabilities it will be a weighted tree diagram. Fill in the probabilities on the tree diagram.



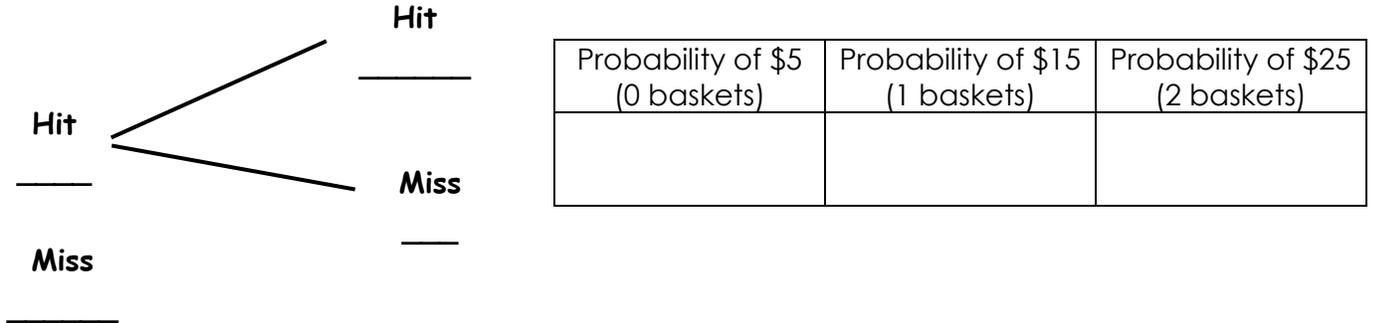
Probability of \$5 (0 baskets)	Probability of \$15 (1 baskets)	Probability of \$25 (2 baskets)

2. How much money do you expect Candace to make any given week?
3. How much do you expect Candace to make in a year? *(52 weeks in a year)*
4. How much allowance was Candace making before this deal?
5. Should Candace's father accept the deal? Justify your reasoning

Part 2: Candace's Practice Paid Off

Candace practiced shooting free-throws for an entire year. She can now make a free-throw 60% of the time. Candace offers her father the same deal.

6. What is the probability of Candace making 0 free-throws? 1 free-throw? 2 free-throws?



7. Now that she is better at free throws, how much money do you expect Candace to receive in a year?

8. Should her father take the deal now? Justify your reasoning.

Part 3: Candace's Friend Sheryl

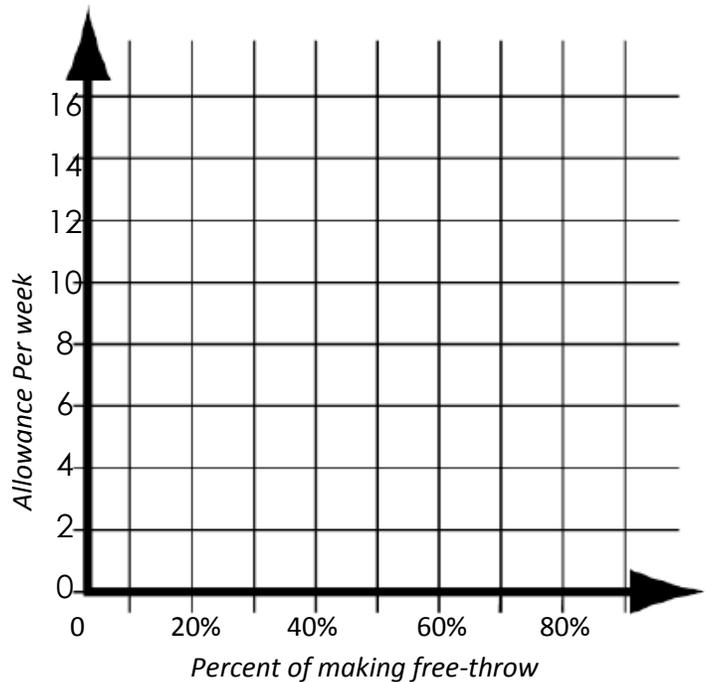
Candace's friend, Sheryl Swoops, wants her father to offer her the same deal. Sheryl can make a free-throw 20% of the time. Create a tree diagram that shows the possible outcomes

9. How much do you expect Sheryl to make in a week?

10. How much do you expect her to make in a year?

You have now looked at Candace's situation (with a 40% & 60% shooting percentages) and Sheryl'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. Fill in the table below.

Free-Throw % (x)	Average Allowance Per Week (y)
Sheryl (20%)	
Candace (40%)	
Candace (60%)	



- Sheryl's ability to make a free-throw improved to 30%. Using your graph, what average weekly allowance should she expect?
- If Candace wants to earn an average weekly allowance of \$15, what percentage of free-throws must she make? Use the graph to estimate a number then justify your answer with expected value.
- Candace's father figured out that he had been giving Candace \$20 per week for her allowance. What percentage of free-throws is Candace making? Justify your answer using expected values. (your answer should round to \$20 as a whole number)

14. Harry made a carnival game where you have to throw a ball into a basket. The probability of making the first shot is 45% and the probability of the second shot is 25%. Everybody takes 2 shots. Draw a tree diagram that shows the different outcomes

Probability of missing both shots	Probability of Miss first shot/ Make second shot	Probability of Make first shot/miss second shot	Probability of making both shots

Harry is planning on giving away the following prizes.

- No shots - no money
- Make First Shot only- \$1
- Make Second shot only - \$2
- Make both shots- \$7

15. Janet plays the game. What can she expect to win if she plays the game?

16. If it costs \$1 to play the game would Janet have a positive or a negative expected value? Should she play the game? Why or why not?

17. What would you suggest Harry charge to play his game? Why?