One-and-One Revisited

Purpose:
Participants will determine the expected value of a situation.

Overview:
In pairs, participants will determine the expected value of Michele going to the free-throw line 100 times in a one-and-one situation. Participants will first guess the number of points they expect Michele to score in 100 trials; then they will compute the expected value.

TExES Mathematics 4-8 Competencies. The beginning teacher:

IV.013.B Uses the concepts and principles of probability to describe the outcome of simple and compound events.

TEKS Mathematics Objectives. The student is expected to:

4.13.B Use a pair of numbers to compare favorable outcomes to all possible outcomes.
5.12.A Use fractions to describe the results of an experiment.
7.11.B Make inferences and convincing arguments based on an analysis of given or collected data.
8.11.A Find the probabilities of compound events (dependent and independent).
8.11.B Use theoretical probabilities and experimental results to make predictions and decisions.

Terms.
Probability, sample space, event, expected value

Materials.
- Activity sheet

Transparencies.
- *One-and-One Revisited*

Activity Sheet(s).
- *One-and-One Revisited*

Procedure:

Steps	Questions/Math Notes
1. Read aloud the One-and-One Revisited Problem (Transparency #??) two times. Ask participants to write their guesses on Post-It Notes and post them on a designated wall.	*How many points do you think Michele will score in 100 trials?* *What information did you base your guess on? How did you derive your guess?*
2. Ask participants to work in pairs to determine how many points Michele would expect to score in 100 trials.	*What did the tree diagram of this situation look like when we previously worked on this problem? Explain.*
3. Ask participants to determine the expected value of the situation.	*What are the events and their probabilities?* P(miss) = 0.40 P(hit, miss) = 0.6 x 0.4 = 0.24 P(hit, hit) = 0.6 x 0.6 = 0.36 *How can you use the probabilities of each event to determine the expected value?*
4. Select 1-2 small groups to present their solution. Ask them to include (a) a tree diagram that shows the possible outcomes, (b) the probabilities of each event, and (c) the expected value of 100 trials.	*Did your guess match the actual expected value of 100 trials?* *How did you*

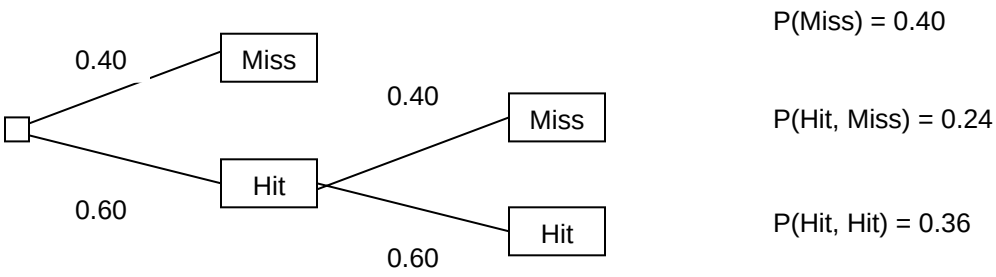
Sample Space: {(miss), (hit, miss), (hit, hit)}

Area Model

Error!

Miss 0.40	Hit 0.60	
P(Miss) 0.40	P(Hit, Hit) = 0.36	0.60
	P(Hit, Miss) = 0.24	0.40

Tree Diagram:



Solution:
Expected Value = (2 points) (0.36) + (1 point) (0.24) + (0 points) (0.40) = 0.72 + 0.24 + 0 = 0.96
In one trial, Michele can expect to score 0.96 of a point. This doesn't make much sense.

In 100 trials, Michele can expect to score 96 points.

References:
Phillips, E., Lappan, G., Winter, M. J., & Fitzgerald, W. (1986). Activity 7: Expected value. *Middle grades mathematics project: Probability* (pp. 115-128). Menlo Park, CA: Addison-Wesley.