

S-MD.2,5 Sounds Really Good! (sort of...)

Alignments to Content Standards: S-MD.A.2 S-MD.B.5

Task

A friend of yours, Phil, writes to you asking about a new scratch-off lottery game. It costs \$10 to play this game. There are two outcomes for the game (win, lose) and the probability that a player wins a game is 60%. A win results in \$15, for a net win of \$5.

The probability distribution for X = the amount of money a player wins (or loses) in a single game is as follows:

X	Probability of X
+\$5	.60
-\$10	.40

- Compute the expected value of X .
- Your friend wants to know if he should play this game many, many times to make some extra money because the 60% chance of winning \$5 sounds really good. Based on your calculation in part (a), complete the following message to your friend Phil that **clearly recommends whether or not he should play this game many, many times** and **explains how the value you computed in part (a) led you to that conclusion**.

Phil:

Regarding your idea that you should play this new lottery game many, many times to

make some extra money, I think...

IM Commentary

The purpose of this task is to have students compute and interpret an expected value, and then use the information provided by the expected value to make a decision. The task is designed to encourage students to communicate their findings in a non-technical form in context, ideally convincing Phil not to go through with his strategy of playing the game many, many times.

After students have had a chance to write a response in part (b), you might want to have students engage in a small group or whole class discussion where responses are shared and critiqued. Then students can be given an opportunity to revise their responses in part (b) to strengthen them based on the discussion.

Note: the outcomes above occurs when a ticket costs \$10 and a winning ticket says "You win \$15." As an extension of the task, students may want to consider the potential popularity of a \$10 scratch-off lottery game that is advertised as "Over half the tickets are \$15 winners!"

[Edit this solution](#)

Solution

a. $E(X) = 5 \cdot .60 + (-10) \cdot .40 = 3 - 4 = -1$. This means there is an average loss of \$1 per game in the long run.

b. The message should tell Phil not to go forward with his plan of playing the game many, many times as the plan will not make money for him in the long run as he had hoped. The message should communicate in non-technical terms that a player will lose a dollar per game on average in the long run, and thus there is no long term gain to be made from playing the game many, many times.



