**7.5 Expected Value – Overview**

**Expected Value**

Definition: The **expected value** of an event *X* is the long term average (the value we would expect to happen if we performed the experiment many, many times).

How to calculate it:

* In words: Multiply each outcome (*x* value) by its probability and add them together.
* Formula:

,

where is the outcome and is the probability of .

**Example 1**: In soccer, you earn a certain number of points based on the result of a game. This is shown in the table below. Calculate the expected value of the number of points earned for a single game.

|  |  |
| --- | --- |
| ***X*** | ***P(X)*** |
| Win = 3 | 0.3 |
| Tie = 1 | 0.5 |
| Loss = 0 | 0.2 |

**Sum of Expected Values**: To find the combined expected value of multiple events, we can simply add the individual expected values.

**Example 1 (continued)**: Find the expected value for the total number of points earned in a season if the season has 12 games.

**Example 2**: Jim likes to day-trade on the Internet. On a good day, he averages a $1400 gain. On a bad day, he averages a $900 loss. Suppose that he has good days 30% of the time, bad days 50% of the time, and the rest of the time he breaks even. What is the expected value for one day of Jim’s day-trading hobby?

*Strategy*: First make table

* Think about possible X values
* THEN the probabilities

**Example 3**: Suppose that you and a friend are playing cards and decide to make a bet. If your friend draws two hearts in succession from a standard deck of 52 cards without replacing the first card, you give him $10. Otherwise, he pays you $20. If the same bet was made 15 times, how much would you expect to win or lose? Round your answer to the nearest cent, if necessary.

**Odds**

Definition**: Odds** are another way to express probability.

* We can express this as a ratio (fraction) of probabilities.
* Odds and Probability are NOT interchangeable terms.

Odds in favor of an event *A*: Odds against an event *A*:

Notation: Odds are generally written as a ratio of two integers, such as 5:1, which is read “5 to 1”.

**Example 4:** Suppose the probability of a soccer team winning a playoff game is 0.20. What are the odds of winning? Express your answer in the form a:b.

*Strategy*: First write the probability as a fraction

THEN think about parts

**Example 5**: If the odds on a bet are 18:1 against, what is the probability of winning? Express your answer as a fraction.

*Strategy*: To convert from odds to a probability