The Theoretical and Experimental Probability of Simple Events

Lesson Summary	Students will expand their knowledge of theoretical and experimental probability conducting an experiment of simple events

Major Topic and SOL

    Math SOL (2009)   8.12

Length of Unit   1 Hour

Student Objectives

In Mathematics the student will be able to:

- learn the difference between theoretical probability and experimental probability

In Language the students will be able to:

- state their understanding of the difference between theoretical and experimental probability both to other students as well as the teacher

21st Century Skills

- Critical-Thinking and Problem Solving
- Communication
- Collaboration
- Contextual Learning

Assessment Evidence

- To assess the students for understanding, the teacher will collect the students' reflection paragraphs.
  - o This serves as an excellent 'class work' grade that truly shows the students interpretation of what was discussed.

Supplies/Materials/Technology

- Definitions/examples of theoretical and experimental probabilities
- Media to display said examples
- Experimental probabilities activity sheet
- One set per 3-4 student group of the following
  - o A coin

> ○ A Styrofoam/paper cup
> ○ A 5 space spinner

Lesson Plan

Motivation & Building Background:

- By this point students should be well-versed in how probability is found for simple events.
    - ○ The students should have learned that a simple event, such as a coin-flip, is considered a 50-50 chance because there is an even 50% chance of a 'Heads' appearing as well as a 50% chance of a 'Tails' to appear.

Presentation

- To present this lesson begin by telling the students that they will be completing a group activity with probability.
    - ○ Take time to explain the process of the activity clearly so as not to discourage the students from enjoying the lesson.
    - ○ The students will be placed into groups of 3-4 and will be given three items (a coin, a cup, and a spinner) and an activity sheet.
    - ○ Once they have been given the items they will conduct a number of events and record the outcomes.
    - ○ Prior to completing the events the students should take a moment and discuss the probability of the outcomes for each item.
    - ○ The students will flip a coin twenty times, drop a cup twenty times, and spin the spinner twenty times.
- Ideally, the students will state that the coin flip should be heads and tails ten times a piece. In the same fashion the students will believe that the cup will land on the small end a third of the time, the large end a third of the time, and the side a third of the time. Finally, the students should find that the probability of the spinner to land on any single color should be one-fifth or twenty percent.
- When the students have had a chance to conduct the trials, the teacher should ask the students to stay in their groups and be ready to share their results.
    - ○ One-by-one the students should state how many outcomes they received for each event.
    - ○ Once the students have all shared, the teacher should ask the students why their predicted outcomes did not match the results of the experiments.
    - ○ The students will ideally share ideas such as 'it was close to the predicted amount' or 'it doesn't have to be perfect'.
- At this point begins a mini-discussion/teacher-guided lesson on theoretical v. experimental probabilities.

- o The teacher should state- among other things- that the probabilities that we discuss regularly as 'the desired outcomes over the total outcomes' are simply the theoretical odds of something happening.
    - ▪ This is a great moment to expand students' understandings of fractions by saying that probabilities are just fractions.
  - o Additionally, the teacher should state that the coin-flip and the spinner were very close to their projected probabilities because they are 'fair'. The cup flip will inevitably be off from the projected probability because it is 'not fair'- that is the event will favor one outcome considerably more often than another.
- At this time the teacher can ask the students to write a quick paragraph of their understanding of this difference or to provide additional examples of theoretical/experimental probabilities or 'fair'/'unfair' events.

Probability: **Name:_____**

Record Outcomes:

Activity 1: Flipping Coin

Total Number of Heads:
Total Number of Tails:
Total Number Outcomes:

Activity 2: Cup Drop
Drop cup from waist high
Tally the outcomes
Repeat 20 times

Small End	Large End	Side

Activity 3: Spinner
Spin 20 times and record the outcomes