Tetrahedron Dice

The purpose of this activity is to introduce you to the concepts of classical probability using a four-sided die.

Directions: Using the tetrahedron die you cut out and assembled, complete each of the following tasks:

1. A **probability experiment** is a process that occurs by chance and that leads to a well-defined result. For example, the process of rolling a tetrahedron die is a probability experiment.

   The **outcome** is the result of a single trial of a probability experiment. For a tetrahedron die, the outcome of the roll of a tetrahedron die is the number at the base of the pyramid. For example, in the figure on the right, the outcome of the roll is a 2.

   Roll your tetrahedron die 5 times and record each outcome below.

2. The **sample space** is all possible outcomes of a probability experiment. Find all of the possible outcomes for rolling a tetrahedron die. (You do not need to roll the die to do this.)

3. Find the sample space for rolling **two** tetrahedron dice. (Hint: A roll of 1 on the first die and a 3 on the second die is different from a roll of 3 on the first die and a roll of a 1 on the second die.)
4. A **tree diagram** is a device consisting of line segments beginning from a starting point and also from the outcome point. It is used to determine all possible outcomes of a probability experiment. (See Figure 3 on page 258). Draw the tree diagram for rolling two tetrahedron die.

5. An **event** consists of a set of outcomes of a probability experiment.

   An event with one outcome is called a **simple event**. For example, obtaining a roll of a 2 on the tetrahedron die is a simple event.

   An event with more than one outcome is called a **compound event**. For example, obtaining a roll of an odd number on the tetrahedron die is a compound event. State the outcomes of this compound event.
**Classical Probability**

In **classical probability**, we use the sample spaces (all possible outcomes) to determine the numerical probability that an event will happen. That means it is possible to determine the probabilities without actually doing an experiment. Classical probability assumes that all outcomes in the sample space are *equally likely to occur*.

If an experiment has $n$ equally likely outcomes and if the number of ways that an event $E$ can occur is $m$, then the probability of $E$, $P(E)$, is

$$P(E) = \frac{\text{Number of outcomes that } E \text{ can occur}}{\text{Total number of possible outcomes}} = \frac{m}{n}$$

So, if $S$ is the sample space of this experiment,

$$P(E) = \frac{n(E)}{n(S)}$$

where $n(E)$ is the number of outcomes in $E$ and $n(S)$ is the number of outcomes in the sample space $S$.

$P(E)$ stands for “the probability of event $E$ occurring.”

6. Determine the probability of getting a 2 when rolling a tetrahedron die.

7. Determine the probability of getting an odd number when rolling a tetrahedron die.

8. Use the sample space in item 3 to determine the probability of getting the same number when rolling two tetrahedron dice.