Unit #3: Random Variables

Content Area: **Mathematics**
Course(s): **Probability**
Time Period: **Semester 1 & 2**
Length: **4 weeks**
Status: **Published**

Standards -

MA.S-MD.A.1	Define a random variable for a quantity of interest by assigning a numerical value to each event in a sample space; graph the corresponding probability distribution using the same graphical displays as for data distributions.
MA.S-MD.A.2	Calculate the expected value of a random variable; interpret it as the mean of the probability distribution.
MA.S-MD.A.3	Develop a probability distribution for a random variable defined for a sample space in which theoretical probabilities can be calculated; find the expected value.
MA.S-MD.A.4	Develop a probability distribution for a random variable defined for a sample space in which probabilities are assigned empirically; find the expected value.
MA.S-MD.B.6	Use probabilities to make fair decisions (e.g., drawing by lots, using a random number generator).
MA.S-MD.B.7	Analyze decisions and strategies using probability concepts (e.g., product testing, medical testing, pulling a hockey goalie at the end of a game).

Enduring Understandings

1. A random variable is a quantity having a numerical value for each member of a group, especially one whose values occur according to a frequency distribution.

2. A histogram is a graphical representation of the distribution of data. It is an estimate of the probability distribution of a continuous variable (quantitative variable) and was first introduced by Karl Pearson.

3. A binomial random variable with parameters *n* and *p* is the discrete probability distribution of the number of successes in a sequence of *n* independent yes/no experiments, each of which yields success with probability *p*.

4. A **hypergeometric distribution** is a discrete probability distribution that describes the probability of k successes in n draws, *without* replacement, from a finite population of size N containing exactly successes, wherein each draw is either a success or a failure.

5. **Poisson distribution** (French pronunciation [pwasɔ̃]; in English usually /ˈpwɑːsɒn/), named after French mathematician Siméon Denis Poisson, is a discrete probability distribution that expresses the probability of a given number of events occurring in a fixed interval of time and/or space if these events occur with a known average rate and independently of the time since the last event.

Essential Questions

1. What is a random variable and how can we use them to calculate probabilities?
2. In what situations can we use a binomial random variable to find the probability of events?
3. When is it appropriate to use a hypergeometric random variable to find the probability of events?
4. How can we use the Poisson random variable to find the probability of events?

Knowledge and Skills

Students will be able to:

- Define a random variable and use it to find various probabilities
- Determine the most appropriate random variable to use given a specific situation
- Use random variables to find the probability distribution of a random experiment.
- Create histograms to give a visual representation of the probabilities associated with a random experiment

Resources

Online resources which include, but not limited to: Delta Math and Class Kick.