# 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 <u>discrete probability distribution</u> of the number of successes in a sequence of n <u>independent</u> yes/no experiments, each of which yields success with <u>probability</u> 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 K successes, wherein each draw is either a success or a failure.

5. **Poisson distribution** (French pronunciation [pwaso]; in English usually <u>/'pwa:son</u>), named after <u>French</u> mathematician <u>Siméon Denis Poisson</u>, is a <u>discrete probability distribution</u> 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 <u>independently</u> 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.