# Unit \#3: Random Variables 

| Content Area: | Mathematics |
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| Course(s): | Probability |
| Time Period: | Semester $\mathbf{1}$ \& $\mathbf{2}$ |
| 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 <br> event in a sample space; graph the corresponding probability distribution using the same <br> graphical displays as for data distributions. |
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| MA.S-MD.A. 2 | Calculate the expected value of a random variable; interpret it as the mean of the <br> probability distribution. |
| MA.S-MD.A. 3 | Develop a probability distribution for a random variable defined for a sample space in <br> 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 <br> 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 <br> generator). |
| MA.S-MD.B. 7 | Analyze decisions and strategies using probability concepts (e.g., product testing, medical <br> 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 $K$ successes, wherein each draw is either a success or a failure.
5. Poisson distribution (French pronunciation [pwasõ]; in English usually /'pwa:spn/), 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.

