

# Unit #3: Random Variables

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

## Standards -

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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

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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 [[pwasɔ̃](#)]; in English usually [/'pwa:sn/](#)), 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**

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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**

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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**

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