



# Lesson 16: Normal Distributions

## Overview

In this lesson, we'll investigate one of the most prevalent probability distributions in the natural world, namely the **normal distribution**. Just as we have for other probability distributions, we'll explore the normal distribution's properties, as well as learn how to calculate normal probabilities.

## Objectives

Upon completion of this lesson, you should be able to:

- To define the probability density function of a normal random variable.
- To learn the characteristics of a typical normal curve.
- To learn how to transform a normal random variable  $X$  into the standard normal random variable  $Z$ .
- To learn how to calculate the probability that a normal random variable  $X$  falls between two values  $a$  and  $b$ , below a value  $c$ , or above a value  $d$ .
- To learn how to read standard normal probability tables.
- To learn how to find the value  $x$  associated with a cumulative normal probability.
- To explore the key properties, such as the moment-generating function, mean and variance, of a normal random variable.
- To investigate the relationship between the standard normal random variable and a chi-square random variable with one degree of freedom.
- To learn how to interpret a  $Z$ -value.
- To learn why the Empirical Rule holds true.
- To understand the steps involved in each of the proofs in the lesson.
- To be able to apply the methods learned in the lesson to new problems.

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### Lesson

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