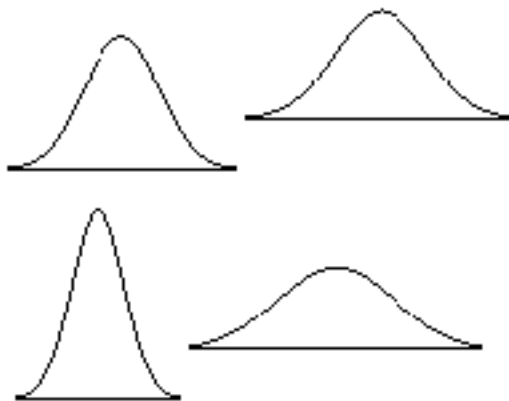


NORMAL DISTRIBUTION

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The normal distribution is a probability function that describes how the values of a variable are distributed. It is a symmetric distribution where most of the observations cluster around the central peak and the probabilities for values further away from the mean taper off equally in both directions. Extreme values in both tails of the distribution are similarly unlikely.

Normal distributions are a family of distributions with a symmetrical bell shape:-



The area under each of the curves above is the same and most of the values occur in the middle of the curve. The mean and standard deviation of a normal distribution control how tall and wide it is.

The standard normal distribution (z distribution) is a normal distribution with a mean of 0 and a standard deviation of 1. Any point (x) from a normal distribution can be converted to the standard normal distribution (z) with the formula $z = (x - \text{mean}) / \text{standard deviation}$. z for any particular x value shows how many standard deviations x is away from the mean for all x values. For example, if 1.4m is the height of a school pupil where the mean for pupils of his age/sex/ethnicity is 1.2m with a standard deviation of 0.4 then $z = (1.4 - 1.2) / 0.4 = 0.5$, i.e. the pupil is half a standard deviation from the mean (value at centre of curve).

Parameters of the Normal Distribution

Mean

The mean is the central tendency of the distribution. It defines the location of the peak for normal distributions. Most values cluster around the mean. On a graph, changing the mean shifts the entire curve left or right on the X-axis.

Standard deviation

The standard deviation is a measure of variability. It defines the width of the normal distribution. The standard deviation determines how far away from the mean the values tend to fall. It represents the typical distance between the observations and the average.

Common Properties for All Forms of the Normal Distribution

1. Despite the different shapes, all forms of the normal distribution have the following characteristic properties.
2. They're all symmetric. The normal distribution cannot model skewed distributions.
3. The mean, median, and mode are all equal.
4. Half of the population is less than the mean and half is greater than the mean.
5. The Empirical Rule allows you to determine the proportion of values that fall within certain distances from the mean.