## Descriptive Statistics Equations

<table>
<thead>
<tr>
<th>Variable</th>
<th>Definition</th>
<th>Equation</th>
<th>Variable Legend</th>
</tr>
</thead>
</table>
| **Population Mean** | The quotient of the sum of all the values in a population, and the size of the population; the arithmetic average | $\mu = \frac{1}{N} \sum_{i=1}^{N} X_i$ | $\mu = \text{mean}$  
$\Sigma = \text{summation}$  
$N = \text{population size}$  
$X_i = \text{the } i^{th}$ member of the population |
| **Sample Mean** | The quotient of the sum of all the values in a sample, and the size of the sample; the arithmetic average. | $\bar{x} = \frac{1}{n} \sum_{i=1}^{n} x_i$ | $\bar{x} = \text{sample mean}$  
$\Sigma = \text{summation}$  
$n = \text{sample size}$  
$x_i = \text{the } i^{th}$ member of the sample |
| **Q** | Proportion of population that doesn’t have a certain characteristic | $Q = 1 - P$ | $P = \text{proportion with attribute}$  
$Q = \text{proportion without attribute}$ |
| **q** | Proportion of sample that doesn’t have a certain characteristic | $q = 1 - p$ | $p = \text{proportion of sample with attribute}$  
$q = \text{proportion of sample without attribute}$ |
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| Population Variance          | The average squared deviation from the population mean.                    | $\sigma^2 = \frac{\sum(X_i - \mu)^2}{N}$                               | $\sigma^2 = \text{variance}$  
  $\mu = \text{mean}$  
  $\Sigma = \text{summation}$  
  $N = \text{population size}$  
  $X_i = \text{the } i^{th}$  
  \text{member of the population}$ |
| Variance of a Proportion     | The average squared deviation from the population proportion.              | $\sigma^2 = \frac{PQ}{n}$                                               | $\sigma^2 = \text{variance}$  
  $P = \text{proportion with attribute}$  
  $Q = \text{proportion without attribute}$  
  $n = \text{sample size}$ |
| Population Standard Deviation| Square root of the variance; shows how much variation or "dispersion" exists from the mean. | $\sigma = \sqrt{\frac{\sum(X_i - \mu)^2}{N}}$                         | $\sigma = \text{standard deviation}$  
  $N = \text{population size}$  
  $X_i = \text{the } i^{th}$  
  \text{member of the population}$  
  $\mu = \text{mean}$ |
| Sample Variance              | The average squared deviation from the sample mean.                        | $s^2 = \frac{\sum(x_i - \bar{x})^2}{n-1}$                             | $s^2 = \text{sample variance}$  
  $\bar{x} = \text{sample mean}$  
  $\Sigma = \text{summation}$  
  $n = \text{sample size}$  
  $x_i = \text{the } i^{th}$  
  \text{member of the population}$ |
| Variance of a Sample Proportion| The average squared deviation from a sample proportion                   | $s^2 = \frac{pq}{n-1}$                                                 | $s^2 = \text{sample variance}$  
  $p = \text{proportion of sample with attribute}$  
  $q = \text{proportion of sample without attribute}$  
  $n = \text{sample size}$  
  $x_i = \text{the } i^{th}$  
  \text{member of the population}$ |
| Sample Standard Deviation    | Square root of the sample variance shows how much variation or "dispersion"| $s = \sqrt{\frac{\sum(x_i - \bar{x})^2}{n-1}}$                         | $s = \text{sample std deviation}$  
  $\bar{x} = \text{sample mean}$  
  $\Sigma = \text{summation}$  
  $n = \text{sample size}$  
  $x_i = \text{the } i^{th}$  
  \text{member of the population}$ |
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<tr>
<th></th>
<th>exists from the sample mean.</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Range</strong></td>
<td>The difference between the largest data value and the smallest data value.</td>
<td>$Range = Max Value \ - Min Value$</td>
</tr>
</tbody>
</table>