Getting Prepared for Statistics

This document and accompanying videos will help you get comfortable with math again, in preparation for taking your statistics class.

Thanks to past RN to BSN students, this document was developed due to their suggestion to have a quick review of math before they had to dive-in to statistics, many of them not having had a math class in 20-some years.

Topics that will be covered in this workshop are listed below. We will not discuss the more complex statistical issues, as that will be saved for your statistics course.

Videos covering this material are available online at http://www.viterbo.edu/administration_and_services/academic_resource_center/Math_Resources.aspx under the heading “Getting Prepared for Statistics”

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I. Percentages

A. Convert a decimal to a percent.
   Multiply by 100, and affix the % symbol.

   Ex. Convert 0.250 to a percentage.

   Hint: How many spaces are you moving the decimal point, and in what direction?

B. Convert a fraction to a percent.
   Divide the numerator by the denominator to get an equivalent decimal number, then multiply by 100 and affix the % symbol.

   Ex. Convert \( \frac{3}{4} \) to a percent.

C. Convert a percentage to a decimal.
   Delete the % symbol, and divide by 100. (Percentage means “per 100.”)

   Ex. Convert 85% to a decimal.

   Hint: How many spaces are you moving the decimal point, and in what direction?

D. Find some percent of an amount.
   Drop the % symbol and divide the percentage value by 100, then multiply.

   Ex. What is 6% of 1200 responses?

   (show work here)

E. Additional Practice
   1) What is 15% of 620?
   2) Convert 5% to an equivalent decimal.
   3) Convert 0.01 to an equivalent percentage.
   4) Convert the fraction 987/1068 to an equivalent percentage. Express the answer to the nearest tenth of a percent.
II. Probability

To find the probability of an event occurring, you will need to know how many times that particular event occurred, and how many trials there were overall.

The formula that is used to estimate the probability of an event occurring is

\[ P(A) = \frac{\text{number of times } A \text{ occurred}}{\text{number of times the trial was repeated}} \]

1. When Mendel conducted his famous genetics experiments with peas, one sample of offspring consisted of 428 green peas and 152 yellow peas, for a total of 580 peas. Based on those results, use the formula above to estimate the probability of getting an offspring pea that is green. Write your answer as a fraction, decimal, and percentage.

Another definition for probability that can be used assumes that each of the simple events is equally likely, such as rolling a fair die. Letting “s” equal the number of ways A can occur, and “n” equal the number of different simple events, you can write

\[ P(A) = \frac{\text{number of ways } A \text{ can occur}}{\text{number of different simple events}} = \frac{s}{n} \]

Solve the following proportions. Give your answers as fractions, decimals, and percentages.

2. Given a fair, 6-sided die, what is the probability of rolling a 2?

3. Calculate the probability of a birth resulting in a baby girl.

4. Calculate the probability that a family with two children will have two boys.
III. Symbols You Will Encounter

**KNOW YOUR GREEK!**

<table>
<thead>
<tr>
<th>SAMPLE</th>
<th>POPULATION</th>
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<tbody>
<tr>
<td>$\bar{x}$</td>
<td>$\mu$</td>
</tr>
<tr>
<td>“x bar”</td>
<td>“mu”</td>
</tr>
<tr>
<td>$S$</td>
<td>$\sigma$</td>
</tr>
<tr>
<td>Standard Deviation</td>
<td>“sigma”</td>
</tr>
<tr>
<td>$S^2$</td>
<td>$\sigma^2$</td>
</tr>
<tr>
<td>Variance</td>
<td>“sigma squared”</td>
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<tr>
<td>$\hat{p}$</td>
<td>$P$</td>
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<tr>
<td>“p hat”</td>
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<tr>
<td>$n$</td>
<td>$N$</td>
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<tr>
<td>Number of people or items in...</td>
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Generally speaking, Greek letters are used to describe statistics of the population and English letters for the sample.

\[ \sum \] (capital sigma) indicates that you are to sum all the numbers represented by the variable that follows the symbol.

*Sometimes the summation expression is part of a larger equation.*

For example, $\bar{x} = \frac{\sum x}{n}$.

Solve the equation above given $x$ values of

\[
\begin{align*}
5.40 & \\
1.10 & \\
0.42 & \\
0.73 & \\
0.48 & \\
1.10 & 
\end{align*}
\]
IV. Translations

The following information is mostly utilized in Section 5-3: Binomial Distributions

Goal: To be able to write a statement using inequality symbols.
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<td>&lt;</td>
<td>less than</td>
<td>≤</td>
<td>less than or equal to</td>
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<tr>
<td>&gt;</td>
<td>greater than</td>
<td>≥</td>
<td>greater than or equal to</td>
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1. AT LEAST
List values of \( x \) that are AT LEAST 120. _______________________________

How would you write “\( x \) is at least 120” using inequality symbols? ____________

2. AT MOST
List values of \( x \) that are AT MOST 105. _______________________________

How would you write “\( x \) is at most 105” using inequality symbols? ____________

3. NO MORE THAN (or NOT MORE THAN or NOT GREATER THAN)
List values of \( x \) that are NO MORE THAN 92. _______________________________

How would you write “\( x \) is not more than 92” using inequality symbols? ____________

4. MORE THAN
List values of \( x \) that are MORE THAN 196. _______________________________

How would you write “\( x \) is MORE THAN 196” using inequality symbols? ____________

Is 196 included as a value you can choose?? _________

5. LESS THAN
List values of \( x \) that are LESS THAN 57. _______________________________

How would you write “\( x \) is LESS THAN 57” using inequality symbols? ____________

Is 57 included as a value you can choose?? _________
V. Getting Acquainted with your Calculator

A. Exponents

The goal in this section is to be able to evaluate expressions when exponents are used.

Recognize that $5^3$ means $5 \times 5 \times 5$, which equals 125. In other words, writing expressions using exponents is shorthand for repeated multiplication. There should be a key on your calculator that allows you to raise a number to a power. It may look like $x^y$ or $y^x$, or you may have a $^\wedge$ key which raises a number to a power. **Determine how you need to type $5^3$ in your calculator so that you get an answer of 125.**

**Practice:**
Evaluate the following:

1. $3^5$
2. $0.8^2$
3. $0.05^3$

B. Order of Operations & Equations

Goal: To be aware of which operations to do first given a sequence of mathematical operations.

1. Evaluate $\mu \pm 2\sigma$ when $\mu = 130$ and $\sigma = 15$.

2. If $\sigma = \sqrt{npq}$, solve for $\sigma$ when $n = 12$, $p = 0.8$ and $q = 1-p$. 

3. Solve the equation below for $z$ when $\bar{x} = 175$, $\mu = 172$, $\sigma = 29$, and $n = 20$.

$$Z = \frac{\bar{x} - \mu}{\sigma \sqrt{n}}$$

Round your answer to the nearest 100th.

4. Using the equation

$$E = \frac{z\alpha}{2} \sqrt{\frac{\hat{p} \hat{q}}{n}}$$

solve for $E$ when $z\alpha = 1.96$, $\hat{p} = \frac{123}{280}$ and $\hat{q} = 1 - \hat{p}$, and $n = 280$.

5. Solve for $\bar{p}$ given $\bar{p} = \frac{x_1 + x_2}{n_1 + n_2}$ and $x_1 = 67$, $n_1 = 73$, $x_2 = 60$, $n_2 = 83$. 


6. Given the data set \{12, 15, 16, 18, 19\} compute

\[
\bar{x} = \frac{\Sigma x}{n} \quad \text{and then} \quad \sqrt{\frac{\Sigma (x-\bar{x})^2}{n-1}}
\]

<table>
<thead>
<tr>
<th>(x)</th>
<th>(x - \bar{x})</th>
<th>((x - \bar{x})^2)</th>
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<tr>
<td>(\Sigma)</td>
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C. Making Predictions (from Chapter 10)

If the relationship between calorie content of a cereal and its sugar content is represented by the equation

\[
y = 3.46 + 1.01x
\]

where \(x\) is the sugar content, what would be the best predicted calorie content for a cereal with 0.40 grams of sugar?