

7400.685-080 - Research Methods in FCS
School of Family and Consumer Sciences
<http://www3.uakron.edu/witt/rmfcs/rmfcs.htm>
Spring Semesters - Tuesday Evenings 5:20-7:55pm in 209 Schrank Hall South
Instructor: David D. Witt, Ph.D.
Statistic of the Week - No. 1
Preparatory Notes and Review of Elementary Things

1. Arithmetic Operations

Addition: $(6 + 4) = 10$ is known as an "operation".

Now everyone knows how to add and subtract.

In *statisticspeak*, we only add – we never subtract.

So : $(7) + (-5) = 2$ is seven plus negative five equals two

$(-8) + (-3) = -11$ is negative eight plus negative three equals negative eleven

Be sure that you add the signs of numbers as well as the numbers themselves.

Multiplication and Division:

When multiplying positive and negative numbers, be sure to note the following:

- A Positive times a Positive equals a Positive $2 \times 2 = 4$
- A Negative times a Negative equals a Positive $-2 \times -2 = 4$
- A Negative times a Positive equals a Negative $-2 \times 2 = -4$
- A Positive times a Negative equals a Negative $2 \times -2 = -4$

The same holds true for dividing:

- $4 / 2 = 2$ 4 divided by 2 equals 2
- $4 / -2 = -2$ 4 divided by negative 2 equals negative 2
- $-4 / 2 = -2$ Negative 4 divided by 2 equals negative 2
- $-4 / -2 = 2$ Negative 4 divided by negative 2 equals 2

2. Use of Parentheses: When a problem requires several operations of different kinds, and the order is not specified by parentheses, then parentheses are “understood”:

- multiplication and division are performed first

- followed by addition & subtraction.

Thus, when solving a problem, like finding the answer to $3(2) + 3 + (8 / 2)$

$$3(2) + 3 + (8 / 2) = (6) + 3 + (4) \\ = 6 + 3 + 4 = 13$$

.... and always show all your work!!!!

Sometimes "nested" parentheses occur. In these cases, operations inside parentheses should be performed

$$\text{first: } 2 + 6(12 - 3) - 7(3 + 2) = (2 + 6(9) - 7(5)) \\ = (2 + 56 - 35) \\ = (58 - 35) = 23$$

TERMINOLOGY

1. The Sigma or Σ means that you are to sum (add) the values of the "term" following the Sigma for each case. This is known as **Summation Notation** and looks like this:

- ΣX means to add the values of the term X that have been taken for a sample of respondents.
- The "Sum of the Xs" is used as part of the operation used to calculate a Mean.
- If we measured each person's height (X) for the entire class, the value of ΣX would be the added heights of (David + Carla + Brenda + Heather + ... + Gretchen) in inches, centimeters, or whatever.

2. **Quantitative Data** - any information collected as part of a research project and expressed in quantitative form, or as numbers.

3. **Statistics** - a set of mathematical operations for organizing and analyzing SAMPLE data.

4. **Descriptive Statistics** - the branch of statistics concerned with either:

- summarizing the distribution of a single variable, or
- measuring the relationship between two or more variables

5. **Inferential Statistics** - the branch of statistics concerned with making generalizations from Samples to Populations. We "infer" characteristics of sample data to be true for whole populations.

6. **Level of Measurement** - the mathematical properties of a variable as determined by its measurement.

-Nominal Level Measures are Categories or classes of things (Piaget's Preoperational Stage)

Ex: boys and girls, kitties and puppies, cops and robbers, PhDs - MAs - MSs - BAs

-Ordinal Level Measures are categories or classes where higher numerical scores mean more of the concept has been measured.

Ex. low-medium-high, off-on, yes-no, lower-working-middle-upper class, love.

-Interval Level Measures have ordinal properties plus an equal interval between any two scores. Interval measures are additive because the "scores" or values are equally spaced out.

Ex. the inches on a ruler, age in years, density of mass, pounds per square inch. Temperature ...

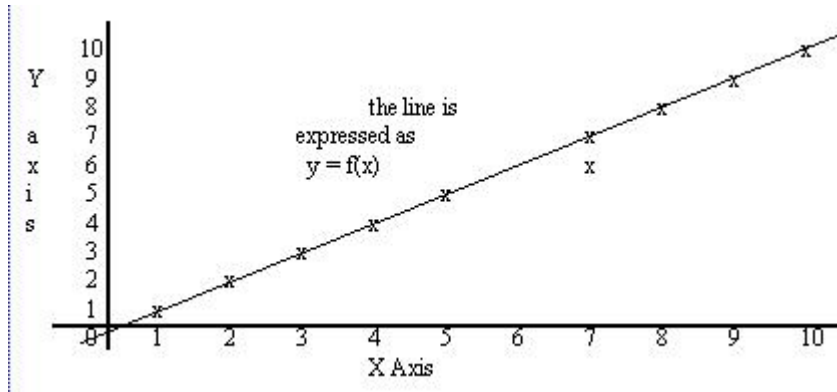
-Ratio Level Measures have interval properties with the addition of a lowest score of zero.

7. **An Association** refers to the "relationship" between two (or more) variables. Two variables are said to be associated if the **distribution** of one (**dependent variable**) *changes for the various categories or values of the other(s)* (**independent variable – more on this below**).

- A Positive Association means that as the values of the independent variable increase, the values of the dependent variable increase.
- A Negative Association is just the opposite - as the independent variable increases, the dependent variable decreases.

8. **The Cartesian Plane** – also known as, Cartesian Coordinates, or the **xy axis** – was formulated by the French philosopher and mathematician, **Rene Decartes**, to help him discover the nature of causation and the reasons why human life exists, the Cartesian planes represent the first step in linear methods.

A Cartesian Plane with a plotted **positive association** is shown below: Notice that the plotted point where **x=4 and y=4** lies along the same slope as the plotted point where **x=10 and y=10**.



Establishing that two variables are associated in this manner is the first step towards understanding the nature of causation.

- The X axis is generally thought of as the independent variable
- The Y axis is generally viewed as the dependent (caused) variable

9. **Linear Relationship** - Think of the line above as the operation **y = f(x)**, or y as a function of x. This just means that y can be expressed in x terms, that is:
for every 1 point change in x there is a 1 point change in y).

A relationship between two variables is linear if the observation points in the "scatterplot" can be approximated with a straight line (scatterplot just means all the coordinates are pin pointed on the plane).

10. **The Normal Curve** - .a.k.a. the *Bell Shaped Curve* , the *Normal* distribution. The Normal Curve is the basis of most of the statistics we will be using in our class. When you thought about the "curve" in your undergraduate days, this is the curve you were supposed to be thinking about.

Every time a measurement is taken from a sample of respondents it is said to have a DISTRIBUTION along the curve. The distribution is normal if it possesses some characteristics. In cases where the distribution of values of a variable is NORMAL, a NORMAL CURVE can be produced when the values of the variable are plotted, or distributed in these percentages.

