

Homework 2  
Summation Notation Homework Answers

1. In your own words, what are ingredients, amounts, operations, and order in reference to statistical formulas?
  - Ingredients = Variables, Amounts = Individual Scores for a given variable,
  - Operations = Arithmetic/Mathematical manipulations (add, subtract, multiply, divide, etc.)
  - Order = the Order of Operations (PEMA or PEMDAS = Parentheses, Exponents, Multiplication/Division, Addition/Subtraction)
  
2. The data set (X) found in Table 2.4 represents the number of school terms 10 social science majors have put off taking a required statistics class. The second data set, Y, is each student's measured level of math/statistics anxiety. Use these data sets to complete the following exercises on algebraic order and summation notation.

Subject #	X	Y	$X^2$	$Y_2$	X-1	Y-1	$(Y-1)_2$
1	1	3	1	9	0	2	4
2	2	3	4	9	1	2	4
3	2	3	4	9	1	2	4
4	3	2	9	4	2	1	1
5	3	4	9	16	2	3	9
6	2	4	4	16	1	3	9
7	3	5	9	25	2	4	16
8	3	5	9	25	2	4	16
9	4	5	16	25	3	4	16
10	4	7	16	49	3	6	36
$\Sigma$	27	41	81	187	17	31	115

- a.  $\Sigma X = 27$       b.  $\Sigma Y = 41$       c.  $(\Sigma X)^2 = (27)^2 = 729$       d.  $(\Sigma Y)^2 = (41)^2 = 1681$
- e.  $\Sigma X^2 = 81$       f.  $\Sigma Y^2 = 187$       g.  $\Sigma X^2 - 1 = 81 - 1 = 80$       h.  $(\Sigma Y)^2 - 1 = (41)^2 - 1 = 1680$
- i.  $\Sigma(X-1) = 17$       j.  $\Sigma(Y-1)^2 = 115$       k.  $(\Sigma X)(\Sigma Y) = (27)(41) = 1107$

l.  $\Sigma Xi_{i=3}^{N=7} = 2 + 3 + 3 + 2 + 3 = 13$

m.  $\Sigma Yi_{i=2}^{N=5} = 3 + 3 + 2 + 4 = 12$

n.  $\Sigma Yi_{i=3}^{N=9} = 3 + 2 + 4 + 4 + 5 + 5 + 5 = 28$

3. For each of the following variables, define what level of measurement they are: nominal, ordinal, interval-ratio.

- |                        |                         |   |
|------------------------|-------------------------|---|
| a. age (I/R)           | b. hair color (Nominal) | c. an attitudinal scale (Ordinal/ but mostly considered I/R by the Social Sciences) |
| d. height (I/R)        | e. IQ (I/R)             | f. religion (Nominal)   |
| g. your name (Nominal) | h. gender (Nominal)     | i. income (I/R)   |

4. Now determine if these same variables are discrete or continuous.

- a. age (Continuous)                      b. hair color (Discrete)                      c. an attitudinal scale (Discrete/ but mostly considered Continuous by the Social Sciences)
- d. height (Continuous)                      e. IQ (Continuous)                      f. religion (Discrete)
- g. your name (Discrete)                      h. gender (Discrete)                      i. income (Continuous)

Subject #	X	Y	X <sup>2</sup>	Y <sub>2</sub>	X-1	Y-1	(Y-1) <sub>2</sub>	XY	(X+Y)
1	1	17	1	289	0	16	256	17	18
2	2	15	4	225	1	14	196	30	17
3	4	14	16	196	3	13	169	56	18
4	4	12	16	144	3	11	121	48	16
5	5	11	25	121	4	10	100	55	16
6	6	8	36	64	5	7	49	48	14
7	7	7	49	49	6	6	36	49	14
8	7	7	49	49	6	6	36	49	14
9	9	6	81	36	8	5	25	54	15
10	10	3	100	9	9	2	4	30	13
11	11	2	121	4	10	1	1	22	13
12	12	2	144	4	11	1	1	24	14
$\Sigma$	78	104	642	1190	66	92	994	482	182

5. The data set (X) found in Table 2.5 represents the number of school terms 10 social science majors have put off taking a required statistics class. The second data set, Y, is each student's measured level of math/statistics anxiety. Use these data sets to complete the following exercises on algebraic order and summation notation.

- a.  $\Sigma X = 78$                       b.  $\Sigma Y = 104$                       c.  $(\Sigma X)^2 = 6084$                       d.  $(\Sigma Y)^2 = 10,816$
- e.  $\Sigma X^2 = 642$                       f.  $\Sigma Y^2 = 1190$                       g.  $\Sigma X^2 - 1 = 641$                       h.  $(\Sigma Y)^2 - 1 = 10,815$
- i.  $\Sigma(X-1) = 66$                       j.  $\Sigma(Y-1)^2 = 994$                       k.  $(\Sigma X)(\Sigma Y) = 8112$                       l.  $\Sigma XY = 482$
- m.  $\Sigma(X + Y) = 182$                       n.  $\Sigma X + \Sigma Y = 182$
- o.  $\Sigma Xi_{i=3}^{N=12} = 4 + 4 + 5 + 6 + 7 + 7 + 9 + 10 + 11 + 12 = 75$
- p.  $\Sigma Yi_{i=2}^{N=7} = 15 + 14 + 12 + 11 + 8 + 7 = 67$
- q.  $\Sigma Yi_{i=5}^{N=9} = 11 + 8 + 7 + 7 + 6 = 39$

6. For the following use Summation Notation Symbols to express as formula what is being asked for in words. Be sure to appropriately employ the rules of algebraic order.

- a. Add all the scores for measure Y and then square the value. =  $(\Sigma Y)^2$
- b. Square all of the scores for measure X and then add them up. =  $\Sigma X^2$
- c. Square all of the scores for measure Y. Next, add them up. Finally, subtract 1 from this value. =  $\Sigma Y^2 - 1$
- d. Add all the scores for measure X, then add all of the scores for measure Y, and then multiply the two sums together. =  $(\Sigma X)(\Sigma Y)$
- d. Multiply each of the scores for measure X by their corresponding score for measure Y, then add the resulting values up. =  $\Sigma XY$