

**Introductory
Statistics for
Research
AGG 3842**

SUMMATION NOTATION: Sigma Notation

a) Σ sigma is a summation operator which is used to condense a sum expression

- E.g. $x_1 + x_2 + x_3 + x_4 + x_5$ can be condensed as (from video):

For $i = 1, 2, \dots, 5$

- In this case, i is an index of the summation. The value it takes in this case ranges from $i=1$ to $i=5$
- The bottom number indicates where you start adding from.
- The top number indicates where you end.

b) The quantities being summed may be:

I. Individual variates (x_i)

E.g. for $i = 1, 2, 3, 4$

$$x_1 + x_2 + x_3 + x_4 =$$

II. Product variates ($x_i y_i$)

$$x_1 y_1 + x_2 y_2 + x_3 y_3 + x_4 y_4 =$$

III. Sum variates ($x_i + y_i$)

$$(x_1 + y_1) + (x_2 + y_2) + (x_3 + y_3) + (x_4 + y_4) =$$

IV. May involve constants

$$ax_1 + ax_2 + ax_3 + ax_4 =$$

- **Example** : The following is a representation of measuring maize yield (Kg) with more than 1 observation in each treatment

	Fertilizer level			
Planting Date	0Kg	10Kg	20Kg	
Nov 1	X_{111}	X_{121}	X_{131}	
	X_{112}	X_{122}	X_{132}	
Dec 2	X_{211}	X_{221}	X_{231}	
	X_{212}	X_{222}	X_{232}	

- x_{ij} for $l = 1, 2$ and $j = 1, 2, 3$
- This gives us a grand total of:

- Write sigma notations for the following:
 - 1) Total maize yield planted in December, that received 20kg of fertilizer
 - 2) Total maize yield planted in December, that received 0kg of fertilizer
 - 3) Total maize yield planted in November, that received 10kg of fertilizer