

## 11.4: Chapter 11 Formulas

### One-Way ANOVA

$$H_0 : \mu_1 = \mu_2 = \mu_3 = \dots = \mu_k$$

$H_1$  : At least one mean is different.

Source	$SS$ = Sum of Squares	$df$	$MS$ = Mean Square	F
Between (Factor)	$\sum n_i (\bar{x}_i - \bar{x}_{GM})^2$	$k - 1$	$MSB = \frac{SSB}{k-1}$	$F = \frac{MSB}{MSW}$
Within (Error)	$\sum (n_i - 1) s_i^2$	$N - k$	$MSW = \frac{SSW}{N-k}$	
<b>Total</b>	<b>SST</b>	<b><math>N - 1</math></b>		

$\bar{x}_i$  = sample mean from the  $i^{th}$  group

$n_i$  = sample size of the  $i^{th}$  group

$k$  = number of groups

$s_i^2$  = sample variance from the  $i^{th}$  group

$$N = n_1 + n_2 + \dots + n_k$$

$$\bar{x}_{GM} = \frac{\sum x_i}{N}$$

### Bonferroni Test

$$H_0 : \mu_i = \mu_j$$

$$H_1 : \mu_i \neq \mu_j$$

$$\text{Bonferroni test statistic: } t = \frac{\bar{x}_i - \bar{x}_j}{\sqrt{MSW \left( \frac{1}{n_i} + \frac{1}{n_j} \right)}}$$

Multiply p-value by  $m = {}_k C_2$ , divide area for critical value by  $m = {}_k C_2$ .

### Two-Way ANOVA

Row Effect (Factor A):	$H_0$ : The <u>row variable</u> has no effect on the average _____. $H_1$ : The <u>row variable</u> has an effect on the average _____.
Column Effect (Factor B):	$H_0$ : The <u>column variable</u> has no effect on the average _____. $H_1$ : The <u>column variable</u> has an effect on the average _____.
Interaction Effect (A×B):	$H_0$ : There is no interaction effect between <u>row variable</u> and <u>column variable</u> on the average _____. $H_1$ : There is an interaction effect between <u>row variable</u> and <u>column variable</u> on the average _____.

Source	$SS$	$df$	$MS$	F
A (row factor)	$SS_A$	$a - 1$	$MS_A = \frac{SS_A}{df_A}$	$F_A = \frac{MS_A}{MSE}$

Source	$SS$	$df$	$MS$	F
$B$ (column factor)	$SS_B$	$b - 1$	$MS_B = \frac{SS_B}{df_B}$	$F_B = \frac{MS_B}{MSE}$
$A \times B$ (interaction)	$SS_{A \times B}$	$(a - 1)(b - 1)$	$MS_{A \times B} = \frac{SS_{A \times B}}{df_{A \times B}}$	$F_{A \times B} = \frac{MS_{A \times B}}{MSE}$
Error (within)	$SSE$	$ab(n - 1)$	$MSE = \frac{SSE}{df_E}$	
Total	$SST$	$N - 1$		

This page titled [11.4: Chapter 11 Formulas](#) is shared under a [CC BY-SA 4.0](#) license and was authored, remixed, and/or curated by [Rachel Webb](#).