Homework 8

# 8.1 Full Factorial Design

## An expanded version of the dice quality assurance example introduced in class considers the effect of two controlled factors:

## Dice color: red, blue, green, or purple

## Rolling hand: right or left

## on the outcome variable measuring the sum of two dice.

## List required experimental trials for a full factorial design.

Solution:

Full Factorial Design for Dice & Rolling Hand

|  |  |  |  |
| --- | --- | --- | --- |
| Trial | Run | Dice Color | Hand |
| 1 | 2 | Red | Right |
| 2 | 5 | Red | Left |
| 3 | 7 | Blue | Right |
| 4 | 1 | Blue | Left |
| 5 | 8 | Green | Right |
| 6 | 3 | Green | Left |
| 7 | 6 | Purple | Right |
| 8 | 4 | Purple | Left |
|  |  |  |  |

# 8.2 Video Game Sales

## The attached file vgsales.csv contains a list of video game titles released between 2008 and 2010 having greater than 100,000 sales on Sony PlayStation 3 (PS3), Nintendo Wii, or Microsoft Xbox 360 (X360) platforms. Organize the data in a format suitable for a one-way ANOVA to investigate whether the **platform** is a significant factor for **global sales.**

## Calculate the sample mean global sales (GA Sales) *X̅*j for each platform.

Solution:

|  |  |  |  |
| --- | --- | --- | --- |
| **Platform** | **Sum of Global\_Sales** | **Count of Global\_Sales** | **Average** |
| PS3 | 396.45 | 482 | 0.8225 |
| Wii | 516.4 | 861 | 0.5998 |
| X360 | 427.66 | 501 | 0.8536 |

Data is gathered using Pivot table.

## Calculate the following values for a one-way ANOVA:

## Sum of squares of columns (SSC)

Solution:

Sum square of columns: 26.37

## Mean square of columns (MSC)

Solution:

Mean square of columns: 13.18

## Sum of squares of error (SSE)

Solution:

Sum square of error: 6796.01

## Mean square of error (MSE)

Solution:

Mean square of error: 3.69

## Calculate the F statistic and p-value for the following hypothesis test:

## H0: all platforms have equal mean global sales

## Ha: at least one platform differs from the others.

## Discuss the results of the hypothesis test (what can be concluded?).

Solution:

P-value: 0.0283 or 2.83%

P value is very small so we can conclude that all platforms have UNEQUAL global sale. We can reject the H0 hypothesis.

# 8.3 Baseball Salary Analysis

## The attached file Salaries.csv contains a list of the top 200 salaries for baseball players in the American League (AL) and National League (NL) during the 2013-2016 seasons. Organize the data in a format suitable for a two-way ANOVA to investigate whether the year and/or league are significant factors for salaries controlling for interaction effects.

## Calculate the mean salary X̅i for each year.

Solution:

|  |  |  |  |
| --- | --- | --- | --- |
| **Year** | **Sum of salary** | **Count of salary** | **Average of salary** |
| 2013 | 2,782,949,864 | 400 | 6,957,374.66 |
| 2014 | 2,926,378,857 | 400 | 7,315,947.14 |
| 2015 | 3,202,569,748 | 400 | 8,006,424.37 |
| 2016 | 3,429,054,931 | 400 | 8,572,637.33 |

## Calculate the mean salary X̅j for each league.

Solution:

|  |  |  |  |
| --- | --- | --- | --- |
| **League Name** | **Sum of salary** | **Count of salary** | **Average of salary** |
| AL | 6,331,513,237.00 | 800.00 | 7,914,391.55 |
| NL | 6,009,440,163.00 | 800.00 | 7,511,800.20 |

## Calculate the F statistic and p-value for the following hypothesis test:

## H0: the mean salary for each year are all equal

## Ha: at least one year's mean salary differs from the others

## Discuss the results of the hypothesis test (what can be concluded?).

Solution:

The p-value this hypothesis is 0.0004 or 0.04% which is quite low. We can reject the H0 hypothesis.

## Calculate the F statistic and p-value for the following hypothesis test:

## H0: the mean salary for both leagues are all equal

## Ha: at least one league's mean salary differs from the others

## Discuss the results of the hypothesis test (what can be concluded?).

Solution:

The p-value this hypothesis is 0.168 or 16.8% which is acceptable. We can accept the H0 hypothesis.

## Calculate the F statistic and p-value for the following hypothesis test:

## H0: all interactions between year and league are zero

## Ha: there is at least one nonzero interaction between year and league

## Discuss the results of the hypothesis test (what can be concluded?).

Solution:

The p-value this hypothesis is 0.213 or 21.3% which is acceptable. We can accept the H0 hypothesis.