homeworkStat631

Jessica Grover

2/7/2022

#Problem 1 Q1. How many treatments are there? Ans. There are 4 treatments.

Q2. How many randomizations are used? Ans. 29 randomizations are used.

Q3. Is this a balanced design? Ans. This is not a balanced design as we can see that observations are not of equal number.

Q4. Does this experiment allow us to estimate error? why is it? Ans. Yes, this experiment allow us to estimate error. The reason is that if we take difference between any two responses is low, so the accuracy of prediction is high.

#Problem 2 Q1. How many randomizations are used? Ans. 02 ramdomizations are used.

Q2. Is this a balanced design? Ans. Yes this is a balanced design as we can see that observations are of equal number.

Q3. What are the experimental units? How many are there? Ans. Experimental units are the things to which we apply the treatments. There are 12 experimental units.

Q4. How many responses do we have? Ans. We have 48 responses.

Q5. Are all responses statistically independent? Ans. Yes the responses are statically independent as the treatment of one subject won’t affect the treatment of other subjects.

#Problem 5

library(pacman)  
p\_load(gtools, knitr)

control <- c(54,123,248)  
treatment <- c(256,159,149)  
print(mean(treatment)-mean(control))

## [1] 46.33333

print(choose(6,3))

## [1] 20

combns\_all = as.data.frame(combinations(n = 6, r = 3, v = c(treatment,control),  
repeats.allowed=FALSE))  
combns\_all$sumOfTreatment <- apply(combns\_all, 1, sum)  
combns\_all$sum\_total <- sum(c(treatment,control))

combns\_all$sumOfControl <- combns\_all$sum\_total-combns\_all$sumOfTreatment

combns\_all$meanOfTreatment <- combns\_all$sumOfTreatment/3  
combns\_all$meanOfControl <- combns\_all$sumOfControl/3

combns\_all$meanOfDiff <- abs(combns\_all$meanOfTreatment-combns\_all$meanOfControl)  
kable(head(combns\_all))

| V1 | V2 | V3 | sumOfTreatment | sum\_total | sumOfControl | meanOfTreatment | meanOfControl | meanOfDiff |
| --- | --- | --- | --- | --- | --- | --- | --- | --- |
| 54 | 123 | 149 | 326 | 989 | 663 | 108.6667 | 221.0000 | 112.33333 |
| 54 | 123 | 159 | 336 | 989 | 653 | 112.0000 | 217.6667 | 105.66667 |
| 54 | 123 | 248 | 425 | 989 | 564 | 141.6667 | 188.0000 | 46.33333 |
| 54 | 123 | 256 | 433 | 989 | 556 | 144.3333 | 185.3333 | 41.00000 |
| 54 | 149 | 159 | 362 | 989 | 627 | 120.6667 | 209.0000 | 88.33333 |
| 54 | 149 | 248 | 451 | 989 | 538 | 150.3333 | 179.3333 | 29.00000 |

print(nrow(combns\_all[which(combns\_all$meanOfDiff >= 46.33333),]))

## [1] 8

print(nrow(combns\_all))

## [1] 20

The randomization p-value is 8/20 = 0.4. We fail to reject the null hypothesis at α = 0.05 significance.

#Problem 6

H0: µ1=µ2 H1: µ1!=µ2

a1<-c(11.176,7.089,8.097,11.739,11.291,10.759,6.467,8.315)  
a2<-c(5.263,6.748,7.461,7.015,8.133,7.418,3.772,8.963)  
  
n1<-8  
n2<-8

summary(a1)

## Min. 1st Qu. Median Mean 3rd Qu. Max.   
## 6.467 7.845 9.537 9.367 11.205 11.739

summary(a2)

## Min. 1st Qu. Median Mean 3rd Qu. Max.   
## 3.772 6.377 7.216 6.847 7.629 8.963

m<-print(sd(a1)\*\*2)

## [1] 4.40817

n<-print(sd(a2)\*\*2)

## [1] 2.690999

t.test(a1,a2)

##   
## Welch Two Sample t-test  
##   
## data: a1 and a2  
## t = 2.6751, df = 13.226, p-value = 0.01885  
## alternative hypothesis: true difference in means is not equal to 0  
## 95 percent confidence interval:  
## 0.4884278 4.5515722  
## sample estimates:  
## mean of x mean of y   
## 9.366625 6.846625

power.t.test(delta=-2.5,sd=1.86,power=0.9)

##   
## Two-sample t test power calculation   
##   
## n = 12.67474  
## delta = 2.5  
## sd = 1.86  
## sig.level = 0.05  
## power = 0.9  
## alternative = two.sided  
##   
## NOTE: n is number in \*each\* group

power.t.test(delta = -1.5,sd=1.86,power=0.9)

##   
## Two-sample t test power calculation   
##   
## n = 33.30276  
## delta = 1.5  
## sd = 1.86  
## sig.level = 0.05  
## power = 0.9  
## alternative = two.sided  
##   
## NOTE: n is number in \*each\* group