# 8

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**Question 1**

```
data1 <- read.csv("/Users/nikhilgopal/Desktop/1.csv")

model <- lm(bp~rt, data = data1)

ttest <- t.test(data1$bp[data1$rt=="Placebo"], data1$bp[data1$rt=="Medication"])

summary(ttest)
```

```
##             Length Class  Mode
## statistic   1      -none- numeric
## parameter   1      -none- numeric
## p.value     1      -none- numeric
## conf.int    2      -none- numeric
## estimate    2      -none- numeric
## null.value  1      -none- numeric
## stderr      1      -none- numeric
## alternative 1      -none- character
## method      1      -none- character
## data.name   1      -none- character
```

There is a statistically significant difference in the 2 means, placebo group has a higher blood pressure than treatment group.

**Question 2**

```
data2 <-read.csv("/Users/nikhilgopal/Desktop/2.csv")

data2$order_of_runs = as.factor(data2$order_of_runs)

modell <- lm(time~treatment_amount+order_of_runs, data = data2)

summary(modell)
```

```
##
## Call:
## lm(formula = time ~ treatment_amount + order_of_runs, data = data2)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
```

```
## -1.02866 -0.22580  0.00319  0.26014  0.81637
##
## Coefficients:
##                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)        8.03207    0.05710 140.666   <2e-16 ***
## treatment_amount   0.01702    0.06407   0.266    0.791
## order_of_runs2    -0.96947    0.06869 -14.115   <2e-16 ***
## order_of_runs3    -2.10816    0.06869 -30.693   <2e-16 ***
## order_of_runs4    -3.06203    0.06869 -44.581   <2e-16 ***
## order_of_runs5    -4.01773    0.06869 -58.495   <2e-16 ***
## order_of_runs6    -4.96533    0.06869 -72.291   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## Residual standard error: 0.3434 on 293 degrees of freedom
## Multiple R-squared:  0.9619, Adjusted R-squared:  0.9611
## F-statistic:  1232 on 6 and 293 DF,  p-value: < 2.2e-16
```

It appears that this model fits the data very well, with an r^2 of 0.96. Treatment amount has a small effect on maze completion time, as an increase of 1 unit treatment will result in a 0.02 second increase in time. However, doses are increased by relatively small amounts that are nowhere close to 1 unit, so the effect of treatment is essentially negligible. The model shows that order of runs seems to be the most important variable that affects time. In the model, I made order of runs a factor so that R treated it as categorical instead of quantitative data.

**Question 3**

```
data3 <- read.csv("/Users/nikhilgopal/Desktop/3.csv")

data3$amily = as.factor(data3$amily)
data3$subject = as.factor(data3$subject)

modelll <- lm(y~subject+amily+subject*amily, data = data3)

summary(modelll)
```

```
##
## Call:
## lm(formula = y ~ subject + amily + subject * amily, data = data3)
##
## Residuals:
##      Min       1Q   Median       3Q      Max
## -2.01360 -0.43824 -0.01622  0.42416  1.93580
##
## Coefficients:
##                   Estimate Std. Error t value Pr(>|t|)
## (Intercept)       10.91667    0.52638  20.739  < 2e-16 ***
## subject2          -2.45927    0.74441  -3.304 0.001258 **
## subject3          -0.26463    0.74441  -0.355 0.722845
## amily2            -1.11027    0.74441  -1.491 0.138464
## amily3             0.36727    0.74441   0.493 0.622658
## amily4             0.26193    0.74441   0.352 0.725557
## amily5            -0.69903    0.74441  -0.939 0.349598
## amily6            -0.45957    0.74441  -0.617 0.538172
```

```
## amily7           -1.26407    0.74441  -1.698 0.092087 .
## amily8           -1.78897    0.74441  -2.403 0.017784 *
## amily9           -1.30837    0.74441  -1.758 0.081370 .
## amily10          -1.12503    0.74441  -1.511 0.133341
## amily11           0.42057    0.74441   0.565 0.573154
## amily12          -0.14943    0.74441  -0.201 0.841242
## amily13           1.38927    0.74441   1.866 0.064447 .
## amily14          -1.83460    0.74441  -2.464 0.015137 *
## amily15          -2.22427    0.74441  -2.988 0.003407 **
## amily16           0.41450    0.74441   0.557 0.578692
## amily17          -1.91317    0.74441  -2.570 0.011392 *
## amily18          -2.26440    0.74441  -3.042 0.002888 **
## amily19          -0.21037    0.74441  -0.283 0.777975
## amily20           0.88280    0.74441   1.186 0.238006
## subject2:amily2   3.21093    1.05276   3.050 0.002817 **
## subject3:amily2   0.77190    1.05276   0.733 0.464858
## subject2:amily3   0.20107    1.05276   0.191 0.848856
## subject3:amily3  -0.11237    1.05276  -0.107 0.915177
## subject2:amily4  -0.17987    1.05276  -0.171 0.864628
## subject3:amily4  -0.02427    1.05276  -0.023 0.981648
## subject2:amily5   0.95167    1.05276   0.904 0.367822
## subject3:amily5  -1.73143    1.05276  -1.645 0.102658
## subject2:amily6   1.56077    1.05276   1.483 0.140817
## subject3:amily6  -0.53337    1.05276  -0.507 0.613340
## subject2:amily7   3.66177    1.05276   3.478 0.000704 ***
## subject3:amily7   1.26397    1.05276   1.201 0.232263
## subject2:amily8   2.21417    1.05276   2.103 0.037538 *
## subject3:amily8   1.30847    1.05276   1.243 0.216332
## subject2:amily9   3.83143    1.05276   3.639 0.000404 ***
## subject3:amily9   1.18043    1.05276   1.121 0.264411
## subject2:amily10  1.28207    1.05276   1.218 0.225684
## subject3:amily10 -0.01430    1.05276  -0.014 0.989185
## subject2:amily11 -0.03633    1.05276  -0.035 0.972526
## subject3:amily11  0.11203    1.05276   0.106 0.915428
## subject2:amily12 -0.11980    1.05276  -0.114 0.909590
## subject3:amily12  1.44677    1.05276   1.374 0.171923
## subject2:amily13 -0.45453    1.05276  -0.432 0.666695
## subject3:amily13 -3.96497    1.05276  -3.766 0.000258 ***
## subject2:amily14  4.20203    1.05276   3.991 0.000114 ***
## subject3:amily14  2.79397    1.05276   2.654 0.009034 **
## subject2:amily15  3.80770    1.05276   3.617 0.000437 ***
## subject3:amily15  1.82907    1.05276   1.737 0.084883 .
## subject2:amily16  2.03503    1.05276   1.933 0.055587 .
## subject3:amily16 -1.12530    1.05276  -1.069 0.287259
## subject2:amily17  1.41540    1.05276   1.344 0.181334
## subject3:amily17  0.63727    1.05276   0.605 0.546104
## subject2:amily18  3.58283    1.05276   3.403 0.000906 ***
## subject3:amily18  2.50370    1.05276   2.378 0.018975 *
## subject2:amily19  1.11713    1.05276   1.061 0.290755
## subject3:amily19  0.39347    1.05276   0.374 0.709252
## subject2:amily20  0.31753    1.05276   0.302 0.763464
## subject3:amily20 -1.47223    1.05276  -1.398 0.164557
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
```

```
##
## Residual standard error: 0.9117 on 120 degrees of freedom
## Multiple R-squared:  0.6696, Adjusted R-squared:  0.5071
## F-statistic: 4.121 on 59 and 120 DF,  p-value: 2.516e-11
```