```
> library(readr)

Frat_Data_22 <- read_csv("~/Spring 2017/Stat 590/Group Project/Frat.Data.22.csv",
        col_types = cols(Council = col_factor(levels = c("2",
        "3", "4", "5")), Failure = col_factor(levels = c("0",
        "1")), GPA = col_number(), I = col_number(),
        II = col_number(), III = col_number(),
        IV = col_number(), IX = col_number(),
        V = col_number(), VI = col_number(),
        VII = col_number(), VIII = col_number(),
        X = col_number(), gender = col_factor(levels = c("0",
        "1")), member.count = col_number(),
        name = col_skip(), totalcomp = col_number()))

> All.new2 = glm(data=Frat_Data_22, Failure ~ Council + member.count + member.count*totalcomp +
totalcomp , family=binomial("logit"))

> summary(All.new2)

Call:
glm(formula = Failure ~ Council + member.count + member.count *
    totalcomp + totalcomp, family = binomial("logit"), data = Frat_Data_22)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-1.7646  -0.5302  -0.2350   0.1377   1.9572

Coefficients:
                    Estimate Std. Error z value Pr(>|z|)
(Intercept)          1.227e+01  5.286e+00   2.321  0.02026 *
Council3             1.624e+00  1.239e+00   1.310  0.19011
Council4             2.691e+00  1.498e+00   1.797  0.07235 .
Council5            -2.000e+01  1.948e+03  -0.010  0.99181
member.count        -1.399e-01  1.200e-01  -1.166  0.24365
totalcomp           -1.038e+00  3.802e-01  -2.729  0.00634 **
member.count:totalcomp  1.133e-02  8.278e-03   1.369  0.17112
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 65.702  on 56  degrees of freedom
Residual deviance: 38.118  on 50  degrees of freedom
AIC: 52.118

Number of Fisher Scoring iterations: 17
```

```
> anova(All.new2, test= "Chisq")
Analysis of Deviance Table

Model: binomial, link: logit

Response: Failure

Terms added sequentially (first to last)


                    Df Deviance Resid. Df Resid. Dev  Pr(>Chi)
NULL                                    56     65.702
Council              3   7.1817        53     58.520   0.06633 .
member.count         1   0.7950        52     57.725   0.37259
totalcomp            1  17.4207        51     40.305 2.996e-05 ***
member.count:totalcomp  1   2.1863        50     38.118   0.13924
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1


> fitted2 <- predict(All.new, newdata=Frat_Data_22)
> fitted2.1 <- ifelse(fitted2 > 0.5, 1, 0)
> missclass <- mean(fitted2.1 !=Frat_Data_22$Failure)
> print(paste('Accuracy', 1-missclass))
[1] "Accuracy 0.824561403508772"
```

```
> cbind(Frat_Data_22$Failure, fitted2.1, fitted2)
   fitted2.1      fitted2
1  1        0 -18.53024845
2  1        0  -5.05357886
3  1        0  -1.65145049
4  1        0  -1.93572533
5  1        0 -20.28699145
6  1        0  -0.90363676
7  1        0  -2.16416931
8  2        1   6.60119712
9  1        0  -3.85485069
10 2        1   7.11563672
11 1        0 -18.21175924
12 1        0  -2.11071199
13 2        0  -0.07301219
14 1        0 -18.58687585
15 2        0  -1.22034515
16 2        1   0.53507360
17 1        0  -1.29525036
18 1        0  -0.60599595
19 1        0  -0.99587833
20 1        0  -4.09441800
21 1        0 -18.79921565
22 2        1   7.00794572
23 1        0  -1.99799137
24 2        1   1.81624240
25 1        0  -0.94208272
26 1        0 -18.53971062
27 1        0 -18.67211057
28 1        0  -3.41147162
29 1        1   0.67587625
30 1        0  -3.89712039
31 1        0  -4.37246765
32 1        0  -2.84149502
33 1        0  -5.08254370
34 1        0  -0.35603654
35 2        0  -1.03634431
36 1        0  -2.04568536
37 1        0  -2.36544181
38 2        1   1.08559638
39 1        0  -4.21716844
40 1        0  -3.34450110
41 1        0 -18.29934777
42 2        0   0.43216186
```

```
43 2        0   0.06711961
44 1        0   0.25721501
45 1        0  -0.54640598
46 2        0   0.33292179
47 1        0   0.13982282
48 1        0 -18.09512175
49 1        0   0.04341335
50 1        0  -3.97556921
51 1        0  -0.50936851
52 1        0  -0.20372702
53 2        0  -1.13825978
54 1        0  -3.00027692
55 2        0  -2.19881704
56 2        0  -0.56855492
57 1        0 -18.47215052
```

```
>
```

```
> All.new = glm(data=Frat_Data_22, Failure ~ totalcomp + GPA + gender + member.count + Council,
family=binomial("logit"))
> summary(All.new)

Call:
glm(formula = Failure ~ totalcomp + GPA + gender + member.count +
    Council, family = binomial("logit"), data = Frat_Data_22)

Deviance Residuals:
    Min      1Q  Median      3Q     Max
-1.5623  -0.5194  -0.1957   0.2139   2.0852

Coefficients:
             Estimate Std. Error z value Pr(>|z|)
(Intercept)  11.59311    8.62533   1.344  0.17892
totalcomp    -0.65815    0.24576  -2.678  0.00741 **
GPA          -1.82967    3.23060  -0.566  0.57115
gender1       0.43334    1.31669   0.329  0.74207
member.count  0.02654    0.01906   1.393  0.16376
Council3      2.11586    1.33047   1.590  0.11177
Council4      2.15357    1.80192   1.195  0.23203
Council5    -16.66279 1987.24789  -0.008  0.99331
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 65.702  on 56  degrees of freedom
Residual deviance: 39.933  on 49  degrees of freedom
AIC: 55.933

Number of Fisher Scoring iterations: 17

> All.new = glm(data=Frat_Data_22, Failure ~ totalcomp + Council + Council*totalcomp +
totalcomp*gender + GPA + gender + member.count, family=binomial("logit"))
> summary(All.new)

Call:
glm(formula = Failure ~ totalcomp + Council + Council * totalcomp +
    totalcomp * gender + GPA + gender + member.count, family = binomial("logit"),
    data = Frat_Data_22)

Deviance Residuals:
    Min      1Q  Median      3Q     Max
-1.4745  -0.5192  -0.1711   0.0403   2.1466

Coefficients:
                    Estimate Std. Error z value Pr(>|z|)
```

```
(Intercept)         1.418e+01  1.029e+01   1.378   0.1681
totalcomp          -5.637e-01  2.998e-01  -1.880   0.0601 .
Council3            1.110e+01  1.090e+01   1.018   0.3086
Council4           -2.964e+00  1.499e+01  -0.198   0.8433
Council5           -1.755e+01  3.341e+04  -0.001   0.9996
gender1            -5.327e+00  1.425e+01  -0.374   0.7084
GPA                -3.247e+00  3.553e+00  -0.914   0.3608
member.count                3.040e-02  2.088e-02   1.456   0.1455
totalcomp:Council3 -6.224e-01  7.619e-01  -0.817   0.4140
totalcomp:Council4  2.794e-01  9.849e-01   0.284   0.7766
totalcomp:Council5 -2.337e-02  1.932e+03   0.000   1.0000
totalcomp:gender1   3.991e-01  9.344e-01   0.427   0.6693
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

(Dispersion parameter for binomial family taken to be 1)

        Null deviance: 65.702  on 56  degrees of freedom
Residual deviance: 38.334  on 45  degrees of freedom
AIC: 62.334

Number of Fisher Scoring iterations: 17

> anova(All.new, test= "Chisq")
Analysis of Deviance Table

Model: binomial, link: logit

Response: Failure

Terms added sequentially (first to last)


                    Df Deviance Resid. Df Resid. Dev  Pr(>Chi)
NULL                              56        65.702
totalcomp           1  18.7486        55        46.953 1.491e-05 ***
Council             3   4.7879        52        42.166    0.1880
gender              1   0.1152        51        42.050    0.7343
GPA                 1   0.1819       50         41.868  0.6697
member.count                1   1.9359        49        39.933    0.1641
totalcomp:Council   3   1.4141     46        38.518    0.7022
totalcomp:gender    1   0.1846     45        38.334    0.6674
---
Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.

> Data.GPA = glm(data=Frat_Data_22, Failure ~ Council*GPA + member.count*GPA +
member.count*totalcomp + totalcomp*GPA + GPA , family=binomial("logit"))
> summary(Data.GPA)
```

```
Call:
glm(formula = Failure ~ Council * GPA + member.count * GPA +
    member.count * totalcomp + totalcomp * GPA + GPA, family = binomial("logit"),
    data = Frat_Data_22)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-1.7167  -0.6037  -0.1183   0.1516   1.8860

Coefficients:
                        Estimate Std. Error z value Pr(>|z|)
(Intercept)          -3.561e+01  5.960e+01  -0.598    0.550
Council3              1.111e+01  3.703e+01   0.300    0.764
Council4             -5.455e+00  3.337e+01  -0.163    0.870
Council5              9.141e+00  1.280e+05   0.000    1.000
GPA                  1.725e+01  2.221e+01   0.777    0.437
member.count         -1.557e-01  6.942e-01  -0.224    0.823
totalcomp             2.714e+00  4.262e+00   0.637    0.524
Council3:GPA         -3.236e+00  1.301e+01  -0.249    0.804
Council4:GPA          2.892e+00  1.212e+01   0.239    0.811
Council5:GPA         -8.972e+00  4.052e+04   0.000    1.000
GPA:member.count     -8.573e-03  2.733e-01  -0.031    0.975
member.count:totalcomp  1.469e-02  1.260e-02   1.166    0.244
GPA:totalcomp        -1.353e+00  1.557e+00  -0.869    0.385

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 65.702  on 56  degrees of freedom
Residual deviance: 36.933  on 44  degrees of freedom
AIC: 62.933

Number of Fisher Scoring iterations: 17

> anova(Data, Data.GPA)
Analysis of Deviance Table

Model 1: Failure ~ Council + member.count + member.count * totalcomp +
    totalcomp + GPA
Model 2: Failure ~ Council * GPA + member.count * GPA + member.count *
    totalcomp + totalcomp * GPA + GPA
  Resid. Df Resid. Dev Df Deviance
1        49     37.904
2        44     36.933  5  0.97091
> Data.Comp = glm(data=Frat_Data_22, Failure ~ totalcomp , family=binomial("logit"))
> anova(Data, Data.Comp)
Analysis of Deviance Table
```

```
Model 1: Failure ~ Council + member.count + member.count * totalcomp +
    totalcomp + GPA
Model 2: Failure ~ totalcomp
  Resid. Df Resid. Dev Df Deviance
1        49     37.904
2        55     46.953 -6  -9.0498
> Data.CompI = glm(data=Frat_Data_22, Failure ~ Council*totalcomp + member.count*totalcomp +
member.count*totalcomp + totalcomp*GPA +totalcomp, family=binomial("logit"))
> anova(Data, Data.CompI)
Analysis of Deviance Table

Model 1: Failure ~ Council + member.count + member.count * totalcomp +
    totalcomp + GPA
Model 2: Failure ~ Council * totalcomp + member.count * totalcomp + member.count *
    totalcomp + totalcomp * GPA + totalcomp
  Resid. Df Resid. Dev Df Deviance
1        49     37.904
2        45     35.267  4   2.6372

> anova(Data.CompI, test ="Chisq")
Analysis of Deviance Table

Model: binomial, link: logit

Response: Failure

Terms added sequentially (first to last)


                    Df Deviance Resid. Df Resid. Dev  Pr(>Chi)
NULL                                    56     65.702
Council              3   7.1817        53     58.520   0.06633
totalcomp            1  16.3548        52     42.166 5.252e-05
member.count         1   1.8609        51     40.305   0.17253
GPA                  1   0.2638        50     40.041   0.60754
Council:totalcomp    3   1.2746        47     38.766   0.73517
totalcomp:member.count  1   2.9007        46     35.866   0.08854
totalcomp:GPA        1   0.5991        45     35.267   0.43892

NULL
Council              .
totalcomp            ***
member.count
GPA
Council:totalcomp
totalcomp:member.count .
totalcomp:GPA
---
```

```
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
> Data.Conc = glm(data=Frat_Data_22, Failure ~ Council*totalcomp + member.count*Council +
Council*totalcomp + Council*GPA + Council, family=binomial("logit"))
Warning message:
glm.fit: fitted probabilities numerically 0 or 1 occurred
> anova(Data.Conc, test ="Chisq")
Analysis of Deviance Table

Model: binomial, link: logit

Response: Failure

Terms added sequentially (first to last)


                    Df Deviance Resid. Df Resid. Dev  Pr(>Chi)
NULL                                    56     65.702
Council              3   7.1817        53     58.520  0.066326 .
totalcomp            1  16.3548        52     42.166 5.252e-05 ***
member.count         1   1.8609        51     40.305  0.172525
GPA                  1   0.2638        50     40.041  0.607544
Council:totalcomp    3   1.2746        47     38.766  0.735171
Council:member.count  3  11.5013        44     27.265  0.009302 **
Council:GPA          3   4.1140        41     23.151  0.249409
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1
Warning message:
glm.fit: fitted probabilities numerically 0 or 1 occurred
> summary(Data.Conc)

Call:
glm(formula = Failure ~ Council * totalcomp + member.count *
    Council + Council * totalcomp + Council * GPA + Council,
    family = binomial("logit"), data = Frat_Data_22)

Deviance Residuals:
     Min        1Q    Median        3Q       Max
-1.58942  -0.30223  -0.00001   0.00000   1.66893

Coefficients:
                     Estimate Std. Error z value Pr(>|z|)
(Intercept)         7.714e+00  1.035e+01   0.745   0.4561
Council3           -3.224e+02  4.772e+05  -0.001   0.9995
Council4           -2.583e+03  7.221e+05  -0.004   0.9971
Council5           -3.128e+01  3.127e+06   0.000   1.0000
totalcomp          -5.416e-01  2.938e-01  -1.844   0.0652 .
member.count       -7.145e-03  2.911e-02  -0.245   0.8061
GPA                -4.449e-01  3.911e+00  -0.114   0.9094
```

```
Council3:totalcomp    -6.133e+01  1.538e+04  -0.004   0.9968
Council4:totalcomp     4.936e+01  1.436e+04   0.003   0.9973
Council5:totalcomp     5.416e-01  5.890e+04   0.000   1.0000
Council3:member.count  1.542e+00  5.243e+02   0.003   0.9977
Council4:member.count -8.244e+01  2.268e+04  -0.004   0.9971
Council5:member.count  7.145e-03  1.362e+03   0.000   1.0000
Council3:GPA           4.113e+02  2.215e+05   0.002   0.9985
Council4:GPA           9.716e+02  2.795e+05   0.003   0.9972
Council5:GPA           4.449e-01  1.258e+06   0.000   1.0000
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 65.702  on 56  degrees of freedom
Residual deviance: 23.151  on 41  degrees of freedom
AIC: 55.151

Number of Fisher Scoring iterations: 22

> anova(Data, Data.Conc)
Analysis of Deviance Table

Model 1: Failure ~ Council + member.count + member.count * totalcomp +
    totalcomp + GPA
Model 2: Failure ~ Council * totalcomp + member.count * Council + Council *
    totalcomp + Council * GPA + Council
  Resid. Df Resid. Dev Df Deviance
1        49     37.904
2        41     23.151  8   14.753
> Data.Comp* = glm(data=Frat_Data_22, Failure ~ member.count*Council + totalcomp,
family=binomial("logit"))
Error: unexpected '=' in "Data.Comp* ="
> Data.Comp2 = glm(data=Frat_Data_22, Failure ~ member.count*Council + totalcomp,
family=binomial("logit"))
> summary(Data.Comp2)

Call:
glm(formula = Failure ~ member.count * Council + totalcomp, family = binomial("logit"),
    data = Frat_Data_22)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-1.9397  -0.5305  -0.1813   0.1270   1.7140

Coefficients:
                    Estimate Std. Error z value Pr(>|z|)
(Intercept)          8.364e+00  3.323e+00   2.517  0.01183 *
```

```
member.count          -7.541e-03  3.034e-02  -0.249  0.80369
Council3               1.387e-01  1.724e+00   0.080  0.93588
Council4               4.740e+00  3.527e+00   1.344  0.17899
Council5              -1.742e+01  1.209e+04  -0.001  0.99885
totalcomp             -6.898e-01  2.388e-01  -2.888  0.00387 **
member.count:Council3  6.834e-02  5.681e-02   1.203  0.22896
member.count:Council4 -3.197e-01  3.517e-01  -0.909  0.36340
member.count:Council5  2.735e-02  1.016e+02   0.000  0.99979
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 65.702  on 56  degrees of freedom
Residual deviance: 36.215  on 48  degrees of freedom
AIC: 54.215

Number of Fisher Scoring iterations: 17

> anova(Data, Data.Comp2)
Analysis of Deviance Table

Model 1: Failure ~ Council + member.count + member.count * totalcomp +
    totalcomp + GPA
Model 2: Failure ~ member.count * Council + totalcomp
  Resid. Df Resid. Dev Df Deviance
1        49     37.904
2        48     36.215  1   1.6892
> anova(Data.Comp, Data.Comp2)
Analysis of Deviance Table

Model 1: Failure ~ totalcomp
Model 2: Failure ~ member.count * Council + totalcomp
  Resid. Df Resid. Dev Df Deviance
1        55     46.953
2        48     36.215  7   10.739
> summary(Data.Comp2)

Call:
glm(formula = Failure ~ member.count * Council + totalcomp, family = binomial("logit"),
    data = Frat_Data_22)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-1.9397  -0.5305  -0.1813   0.1270   1.7140

Coefficients:
                      Estimate Std. Error z value Pr(>|z|)
```

```
(Intercept)           8.364e+00  3.323e+00   2.517  0.01183 *
member.count         -7.541e-03  3.034e-02  -0.249  0.80369
Council3              1.387e-01  1.724e+00   0.080  0.93588
Council4              4.740e+00  3.527e+00   1.344  0.17899
Council5             -1.742e+01  1.209e+04  -0.001  0.99885
totalcomp            -6.898e-01  2.388e-01  -2.888  0.00387 **
member.count:Council3  6.834e-02  5.681e-02   1.203  0.22896
member.count:Council4 -3.197e-01  3.517e-01  -0.909  0.36340
member.count:Council5  2.735e-02  1.016e+02   0.000  0.99979
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 65.702  on 56  degrees of freedom
Residual deviance: 36.215  on 48  degrees of freedom
AIC: 54.215

Number of Fisher Scoring iterations: 17


> Data.Count = glm(data=Frat_Data_22, Failure ~ member.count*totalcomp +
member.count*Council + Council*member.count + member.count*GPA + member.count,
family=binomial("logit"))
> summary(Data.Count)

Call:
glm(formula = Failure ~ member.count * totalcomp + member.count *
    Council + Council * member.count + member.count * GPA + member.count,
    family = binomial("logit"), data = Frat_Data_22)

Deviance Residuals:
    Min       1Q   Median       3Q      Max
-2.0065  -0.4929  -0.2117   0.1853   1.7470

Coefficients:
                          Estimate Std. Error z value Pr(>|z|)
(Intercept)             -1.346e+00  2.000e+01  -0.067   0.9463
member.count             2.921e-01  5.563e-01   0.525   0.5995
totalcomp               -9.827e-01  4.868e-01  -2.019   0.0435 *
Council3                 6.941e-01  1.951e+00   0.356   0.7220
Council4                 7.756e+00  5.913e+00   1.312   0.1896
Council5                -1.680e+01  1.108e+04  -0.002   0.9988
GPA                      4.661e+00  8.126e+00   0.574   0.5663
member.count:totalcomp   1.031e-02  1.383e-02   0.745   0.4563
```

```
member.count:Council3   4.717e-02  6.965e-02   0.677   0.4982
member.count:Council4  -4.503e-01  4.175e-01  -1.079   0.2807
member.count:Council5   1.950e-02  9.294e+01   0.000   0.9998
member.count:GPA       -1.504e-01  2.197e-01  -0.684   0.4938
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 65.702  on 56  degrees of freedom
Residual deviance: 35.525  on 45  degrees of freedom
AIC: 59.525

Number of Fisher Scoring iterations: 17
```