Stats*3510 - Assignment 2
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```
dir = "C:\\Users\\...\\Stat3510 - Environmental Risk Analysis\\Assignment 2\\"
file1 = "Mine_Stability.csv"
dfMineStab = read.table(file=paste(dir,file1, sep=""), header=TRUE, sep=',')
```

a)

```
MineStabFull.model = glm(Stability~Depth+Width+Height+Uniaxial.Compression.Strength,
family = binomial, data = dfMineStab)
summary(MineStabFull.model)
```

```
Coefficients:
                             Estimate Std. Error z value Pr(>|z|)
(Intercept)                  -1.50222    2.23899  -0.671   0.5023
Depth                        -0.01976    0.01271  -1.555   0.1199
Width                         0.64231    0.28421   2.260   0.0238 *
Height                       -1.49845    0.65898  -2.274   0.0230 *
Uniaxial.Compression.Strength  0.11941    0.07480   1.596   0.1104
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 40.168  on 28  degrees of freedom
Residual deviance: 24.772  on 24  degrees of freedom
AIC: 34.772

Number of Fisher Scoring iterations: 6
```

b)

There is a significant relationship between the estimated stability of a coal mine pillar and the width (p=0.0238) and height (p=0.0230) of the pillar after adjusting for all other variables.

c)

```
MineStabRed.model = glm(Stability~Height+Width, family = binomial, data = dfMineStab)
summary(MineStabRed.model)
```

```
Coefficients:
            Estimate Std. Error z value Pr(>|z|)
(Intercept)   1.0277     1.1520   0.892   0.3723
Height       -0.8777     0.3950  -2.222   0.0263 *
Width         0.3203     0.1510   2.122   0.0339 *
---
Signif. codes:  0 ‘***’ 0.001 ‘**’ 0.01 ‘*’ 0.05 ‘.’ 0.1 ‘ ’ 1

(Dispersion parameter for binomial family taken to be 1)

    Null deviance: 40.168  on 28  degrees of freedom
Residual deviance: 29.311  on 26  degrees of freedom
AIC: 35.311

Number of Fisher Scoring iterations: 6
```

d)

The coefficient of height (B1 = -0.8777) and width (B2 = 0.3203) have a multiplicative effect on the odds of success for the stability of a coal mine pillar. For a 1 unit increase in height, the odds of the event is multiplied by e^(-0.8777) and for a 1 unit increase in width, the odds of the event is multiplied by e^(0.3203)

e)

anova(MineStabRed.model, MineStabFull.model, test = "Chisq")

```
Analysis of Deviance Table

Model 1: Stability ~ Height + Width
Model 2: Stability ~ Depth + Width + Height + Uniaxial.Compression.Strength
  Resid. Df Resid. Dev Df Deviance Pr(>Chi)
1        26     29.311
2        24     24.772  2    4.539   0.1034
> # c
```

Ho: The reduced model containing only height and width is adequate to
Ha: The full model is required

There is insufficient evidence (p = 0.1034) to reject the null hypothesis. The reduced model, containing only height and width, is adequate.

f)

Odds = p = e^(1.0277+(-0.8777)(X1)+0.3203(X2))/(1+e^(1.0277+(-0.8777)(X1)+0.3203(X2)))
= 0.1031

The estimated probability (odds) that a coal mine pillar will be stable using our reduced model, with a height of 4m and a width of 1m is approximately 10.31%.