Flipped Assignment 17

Group 5

2022/4/21

Input Data and Function Definition

```
setwd('G:/OneDrive - Texas Tech University/IE 5344 Statistical Data Analysis/Flipped Assignment 17')
data_1 <- read.csv('data-13-1.csv', header = TRUE)
data_3 <- read.csv('data-13-3.csv', header = TRUE)
head(data_1)
```

```
##     x y
## 1 400 0
## 2 220 1
## 3 490 0
## 4 210 1
## 5 500 0
## 6 270 0
```

```
head(data_3)
```

```
##      x   n  r
## 1 2500  50 10
## 2 2700  70 17
## 3 2900 100 30
## 4 3100  60 21
## 5 3300  40 18
## 6 3500  85 43
```

13.1

```
fit_1 <- glm(y~x, data_1, family = binomial())
summary(fit_1)
```

```
##
## Call:
## glm(formula = y ~ x, family = binomial(), data = data_1)
##
## Deviance Residuals:
##     Min       1Q   Median       3Q      Max
## -2.0620  -0.4868   0.3915   0.5476   2.1682
##
## Coefficients:
##              Estimate Std. Error z value Pr(>|z|)
## (Intercept)  6.070884   2.108996   2.879  0.00399 **
## x           -0.017705   0.006076  -2.914  0.00357 **
## ---
```

```
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 34.617  on 24  degrees of freedom
## Residual deviance: 20.364  on 23  degrees of freedom
## AIC: 24.364
##
## Number of Fisher Scoring iterations: 4
```

```
predict(fit_1,data.frame(x=c(350)), type='response')
```

```
##         1
## 0.4686013
```

So, the expected probability of a hit when the target speed is 350 knots is 0.4686013.

13.3

```
Failure <- data_3$r
n <- data_3$n
Success <- n - Failure
data_3$s <- Success
fit_2 <- glm(cbind(Failure, Success) ~ x, data_3, family = binomial())
summary(fit_2)
```

```
##
## Call:
## glm(formula = cbind(Failure, Success) ~ x, family = binomial(),
##     data = data_3)
##
## Deviance Residuals:
##      Min        1Q    Median        3Q       Max
## -0.29475  -0.11129   0.04162   0.08847   0.35016
##
## Coefficients:
##               Estimate Std. Error z value Pr(>|z|)
## (Intercept) -5.3397115  0.5456932  -9.785   <2e-16 ***
## x            0.0015484  0.0001575   9.829   <2e-16 ***
## ---
## Signif. codes:  0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1
##
## (Dispersion parameter for binomial family taken to be 1)
##
##     Null deviance: 112.83207  on 9  degrees of freedom
## Residual deviance:   0.37192  on 8  degrees of freedom
## AIC: 49.088
##
## Number of Fisher Scoring iterations: 3
```

Part a.

```
predict(fit_2,data.frame(x=c(3500)),type = 'response')
```

```
##        1
```

```
## 0.519941
```

So, the expected probability that a fastener will fail under a load of 3500psi is 0.519941.

Part b.

```
p <- predict(fit_2, data.frame(x = c(4000)), type = 'response')
p
```

```
##         1
## 0.7014104
```

```
Pr_10 <- pbinom(10, size=25, prob = p)
Pr_10
```

```
## [1] 0.001687081
```

```
Pr_18 <- pbinom(18, size=25, prob = p)
Pr_18
```

```
## [1] 0.6536887
```

In a sample of 25 fasteners at 4000 psi, the expected probability that 10 or less will fail is 0.001687081.