15.WAIS

```
library(mosaic)
```

Exercise 15.WAIS.

Referring to exercise 15.3 in Agresti, one of the WAIS subtests called *picture completion*, asks questions about 20 pictures that have one vital detail missing. It is considered a test of attention to fine detail.

The observations for 20 subjects on (x,y), where x=picture completion score(0-20) and y=symptoms of senility(1=yes):

```
pictSen <-
read.table("https://asta.math.aau.dk/datasets?file=pictSen.csv",header=T)
pictSen
```

```
##    pictComplScore senility
## 1               7        1
## 2               5        1
## 3               3        1
## 4               8        1
## 5               1        1
## 6               2        1
## 7               9        1
## 8               3        1
## 9               6        1
## 10              4        1
## 11              6        0
## 12              9        0
## 13              7        0
## 14              7        0
## 15             10        0
## 16             12        0
## 17             14        0
## 18              8        0
## 19              8        0
## 20             11        0
```

- Assume a simple logistic model and estimate the logistic regression equation.

```
mod <- glm(senility ~ pictComplScore, data = pictSen, family = binomial)
coef(summary(mod))
```

```
##                 Estimate Std. Error   z value   Pr(>|z|)
## (Intercept)     5.426569  2.6279764  2.064923 0.03893027
## pictComplScore -0.772115  0.3578408 -2.157706 0.03095074
```

- Why is there a significant effect of picture completion on symptoms?
  - **p-value is small.**
- Estimate the probability that symptoms are present when (i) x=0, (ii) x=20.
  - (i) `ilogit(5.4266)`=0.9956212.

  - (ii) `ilogit(5.4266-0.7721*20)`=4.4704128×10^{-5}.
- Over what range of x-scores is the estimated probability of senility greater than 50%?
  - It is greater than 50% for any score below:

```
a <- 5.4266
b <- -0.7721
-a/b
```

```
## [1] 7.028364
```

- Estimate the effect of a one-unit increase in picture completion on the odds of senility symptoms.
  - For every one-unit increase in picture completion the odds decrease approximately 50%:

```
exp(b)-1
```

```
## [1] -0.5379582
```

- Provide a 95% confidence interval of this effect.
  - From the model output we know the std. error of the effect is 0.358. An approximate 95% confidence interval is:

```
exp(b+c(-2, 2)*0.358)-1
```

```
## [1] -0.77419873 -0.05455541
```