**Homework 1 solution**

January 23, 2014 STA 5172

## Theoretical problem

Let $y$ denote the number of offsprings. Clearly, $P(AA) = 1/3$. By Bayes' Theorem

$$P(AA \mid y = 3) = \frac{P(y = 3 \mid AA)P(AA)}{P(y = 3)}$$

Also, since the offspring will definitely inherit 'A' if one of the parents is AA, $P(y = 3 \mid AA) = 1$.
By the law of total probability, $P(y = 3) = P(y = 3 \mid AA)P(AA) + P(y = 3 \mid Aa)P(Aa)$
$P(Aa) = 2/3$ and $P(y = 3 \mid Aa) = (1/2)^3 = 1/8$
Hence, $P(AA \mid y = 3) = 0.80$ and $P(Aa \mid y = 3) = 0.20$.

## Brief code for the applied problem

```
#Study to understand the effect of FEV on smoking adjusting for age

fevdat=read.table("fev.txt",header=T)
attach(fevdat)
aa=rep(0,654)

for (i in 1:654)
{ if (a[i]<=7){aa[i] = 0}

  if ((a[i]> 7) & (a[i] <= 12)){aa[i] = 1}

  if (a[i]> 12){aa[i] = 2}
}

aan=aa[smoke==0]
fevn=fev[smoke==0]
boxplot(fevn~aan)

aay=aa[smoke==1]
fevy=fev[smoke==1]
boxplot(fevy~aay)
```