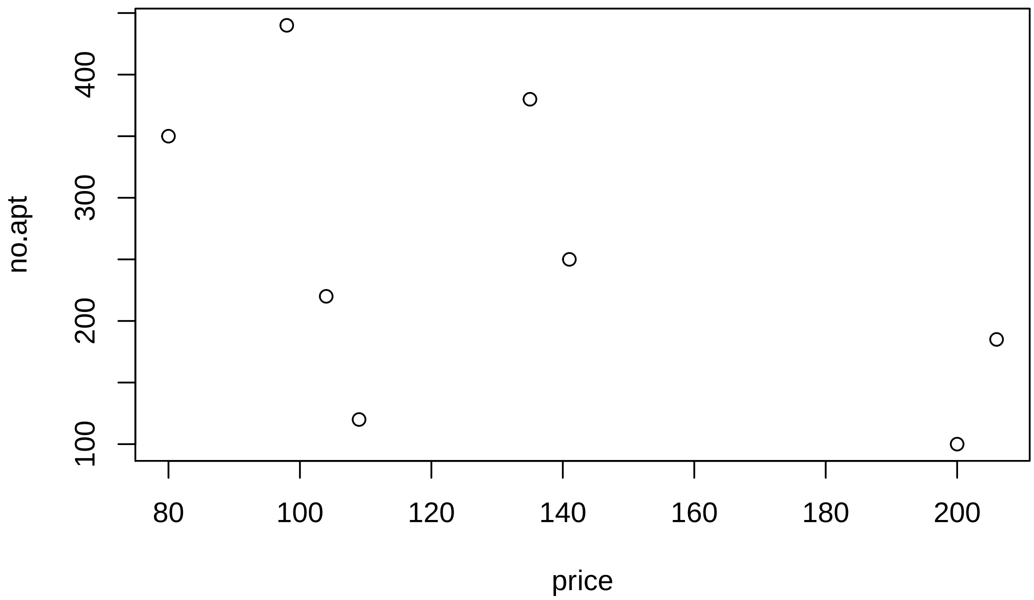
NDH802 Solutions to rec. exercises Chap 2 and 3

Huong

1.4

```
#Data
price = c(104, 135, 80, 200, 98, 206, 141, 109)
no.apt = c(220, 380,350, 100, 440, 185, 250, 120)
plot(price, no.apt)
```



2.4

```
data_q2.4 = c(2.51, 3.74, 4.15, 5.33, 6.18, 6.65, 6.92, 6.95, 7.18, 7.54)
mean(data_q2.4)
```

```
## [1] 5.715
```

```
median(data_q2.4)
```

```
## [1] 6.415
```

2.12

```
data_q2.12 = c(5, 9, 10, 2, 7, 9, 14)
var(data_q2.12)
```

```
## [1] 14.66667
```

```
sd(data_q2.12)
```

```
## [1] 3.829708
```

2.20

```
eur_usd = c(1.1410, 1.1363, 1.1351, 1.1324, 1.1276, 1.1332, 1.1266)
usd_jyp = c(109.95, 109.96, 109.80, 109.77, 110.41, 110.48, 110.00)
mean(eur_usd) < mean(usd_jyp)
```

```
## [1] TRUE
```

```
sd(eur_usd) < sd(usd_jyp)
```

```
## [1] TRUE
```

3.7

a.

Pairs				
1. M1,M2	5. M2,M1	9. M3,M1	13. T1,M1	17. T2,M1
2. M1,M3	6. M2,M3	10.M3,M2	14. T1,M2	18. T2,M2
3. M1,T1	7. M2,T1	11. M3,T1	15. T1,M3	19. T2,M3
4. M1,T2	8. M2,T2	12. M3,T2	16. T1,T2	20. T2,T1

b. Event A is that at least one of the two cars selected is a Toyota. Outcomes 3, 4, 7, 8, 11-20.

c. Event B is that the two cars selected are of the same model. Outcomes 1, 2, 5, 6, 9, 10, 16, 20.

d. The complement of A is the event that the customers do not select at least one Toyota. That is, no one chose Toyota. Equivalently, both of them chose Mercedes. Outcomes 1, 2, 5, 6, 9, 10.

e. $(A \cap B) \cup (\bar{A} \cap B) = (A \cup \bar{A}) \cap B = B$. Alternatively, we can see:

- $(A \cap B)$: Outcomes 16, 20.
- $(\bar{A} \cap B)$: Outcomes 1, 2, 5, 6, 9, 10.
- $(A \cap B) \cup (\bar{A} \cap B)$: Outcomes 1, 2, 5, 6, 9, 10, 16, or 20; which is event B.

d. $A \cup (\bar{A} \cap B) = (A \cup \bar{A}) \cap (A \cup B) = A \cup B$. Alternatively, we can see:

- $(\bar{A} \cap B)$: Outcomes 1, 2, 5, 6, 9, 10.
- $A \cup (\bar{A} \cap B)$: Outcomes 1-20, which is $A \cup B$.

3.19

$$\begin{aligned} P(A \cap B) &= P(A) + P(B) - P(A \cup B) \\ &= 0.3 + 0.7 - 0.9 = 0.1 \end{aligned}$$

3.108

Let A be the event where the passengers are carrying more liquor than is allowed and B be the event where the TPS identifies it. We have $P(A) = 0.2, P(B \mid A) = 0.8$ and $P(B|\bar{A}) = 0.2$. By Bayes's theorem:

$$\begin{aligned} P(A \mid B) &= \frac{P(B \mid A) * P(A)}{P(B)} \\ &= \frac{P(B \mid A) * P(A)}{P(B \mid A) * P(A) + P(B \mid \bar{A}) * P(\bar{A})} \\ &= \frac{0.8 * 0.2}{0.8 * 0.2 + 0.2 * 0.8} = 0.5 \end{aligned}$$

In case you wonder, this is normally called the law of total probability, which is quite handy:

$$\begin{aligned} P(B) &= P(A \cap B) + P(\bar{A} \cap B) \quad \text{(See Exercise 3.7e)} \\ &= P(B \mid A) * P(A) + P(B \mid \bar{A}) * P(\bar{A}) \end{aligned}$$