Chapter 2

2.1

Suppose,

$X_1 = 1, X_2 = 3, X_3 = 0, X_4 = -2, X_5 = 4, X_6 = -1, X_7 = 5, X_8 = 2, X_9 = 10.$

```
x <- c(1, 3, 0, -2, 4, -1, 5, 2, 10)
```

Find:

a.) $\sum X_i$

```
sum(x)
```

```
[1] 22
```

b.) $\sum_{i=3}^{5} X_i$

```
sum( x[3:5] )
```

```
[1] 2
```

c.) $\sum_{i=1}^{4} X_i^3$

```
sum(x[1:4]^3)
```

```
[1] 20
```

d.) $(\sum X_i)^2$

```
(sum(x))^2
```

```
[1] 484
```

e.) $\sum 3$

```
3 * length(x)
```

```
[1] 27
```

f.) $\sum (X_i - 7)$

```
sum(x - 7)
```

```
[1] -41
```

g.) $3\sum_{i=1}^{5} X_i - \sum_{i=6}^{9} X_i$

```
3 * sum( x[1:5] ) - sum( x[6:9] )
```

```
[1] 2
```

h.) $\sum 10X$

```
sum( 10 * x)
```

```
[1] 220
```

i.) $\sum_{i=2}^{6} iX_i$

```
i <- 2:6
sum( i * x[i]  )
```

```
[1] 12
```

j.) $\sum 6$

```
6 * length(x)
```

```
[1] 54
```

2.2

Express the following in summation notation.

a.) $X_1 + \frac{X_2}{2} + \frac{X_3}{3} + \frac{X_4}{4}$

$\ldots = \frac{X_1}{1} + \frac{X_2}{2} + \frac{X_3}{3} + \frac{X_4}{4}$

$\ldots = \sum^{4}{}_{i=1} \frac{X_i}{i}$

b.) $U_1 + U_2^2 + U_3^3 + U_4^4$

$\ldots = U_1^1 + U_2^2 + U_3^3 + U_4^4$

$\ldots = \sum_{i=1}^{4} U_i^i$

c.) $(Y_1 + Y_2 + Y_3)^4$

$(\sum_{i=1}^{3} Y_i)^4$

2.3

Show by numerical example that $\sum X_i^2$ is not necessarily equal to $(\sum X_i{}^2)$.

2.4

Find the mean and median of the following sets of numbers.

a.) -1, 0, 3, 0, 2, -5.

b.) 2, 2, 3, 10, 100, 1,000

2.5

The final exam scores for 15 students are: 73, 74, 92, 98, 100, 72, 74, 85, 76, 94, 89, 73, 76, 99.

Compute the mean, 20% trimmed mean, and median using R.

2.6

The average of 23 numbers is 14.7. What is the sum of these numbers?

2.7

Consider the 10 values: 3, 6, 8, 12, 23, 26, 37, 42, 49, 63.

The mean is $\bar{X} = 26.9$

a.) What is the value of the mean if the largest value, 63, is increased to 100?

b.) What is the mean if 633 is increased to 1,000?

c.) What do these results illustrate about the mean?

2.8

Repeat the previous exercise, only compute the median instead.

2.9

In general, how many values must be altered to make the sample mean arbitrarily large?

2.10

What is the minimum number of values that must be altered to make the 20% trimmed mean and sample median arbitrarily large?