1. Security guard Shyamala has a log book of the institute bus. In the log book she keeps track of the kilometer reading before each time driver Sakshi fills petrol. The last 10 readings are:

   65311, 65624, 65908, 66219, 66499, 66821, 67145, 67447, 67786, 68103

   (a) Enter these numbers into R as a variable `kreading`. Use the function `diff` on the data. What does it give?

   ```
   > kreading = c(65311, 65624, 65908, 66219, 66499, 66821, 67145, 67447)
   > differences = diff(kreading)
   ```

   Write down, x, the number of kilometers between each time Sakshi fills up pertrol.

   Solution: Recomputing the above commands:

   ```
   > kreading = c(65311, 65624, 65908, 66219, 66499, 66821, 67145, 67447)
   > differences = diff(kreading)
   >  differences
   ```

   ```
   [1] 313 284 311 280 322 324 302
   ```

   The command `diff` computes the iterated differences with a default `lag`=1.For example if

   ```
   > differences2 = diff(kreading, lag =2)
   >  differences2
   ```

   ```
   [1] 597 595 591 602 646 626
   ```

   x is the vector `differences`. So Sakshi fills petrol successively $313, 284, 311, 280, 322, 324, 302$ kilometers. □

   (b) Use the `max` to find the maximum number of kilometers, the `mean` function to find the average number of kilometers and the `min` to get the minimum number of kiolmeters Sakshi has driven between two fill-ups.

   Solution: As indicated in the question the execution of the respective commands on the vector `differences` will yield the answer.

   ```
   > max = max(differences)
   > max
   ```

   ```
   [1] 324
   ```

   The maximum number of kilometers, Sakshi has driven between two fill-ups is 324.

   ```
   > min = min(differences)
   > min
   ```

   ```
   [1] 280
   ```

   The minimum number of kilometers, Sakshi has driven between two fill-ups is 280.

   ```
   > mean = mean(differences)
   > mean
   ```

   ```
   [1] 305.1429
   ```

   The mean number of kilometers, Sakshi has driven between two fill-ups is 305.1429 □

2. Jaldi Suppandi, a D-block student resident started tracking his commute time for two weeks and finds the following times in minutes

   7, 6, 10, 8, 7, 9, 15, 6, 4, 10, 8, 6, 9, 10

(a) Enter this into R as a variable `Jaldicommutes`. Use the function `max` to find the longest commute time, the function `mean` to find the average and the function `min` to find the minimum.

Solution:

```
> Jaldicommutes = c(7, 6,  10, 8, 7, 9, 15, 6, 4, 10, 8, 6, 9,10)
> LongestCommuteTime = max(Jaldicommutes)
> LongestCommuteTime

[1] 15

> LeastCommuteTime = min(Jaldicommutes)
> LeastCommuteTime

[1] 4

> AverageCommuteTime = mean(Jaldicommutes)
> AverageCommuteTime

[1] 8.214286
```

Jaldi's longest commute time is,

```
[1] 15
```

Jaldi's least commute time is,

```
[1] 4
```

Jaldi's average commute time is,

```
[1] 8.214286
```

(b) When confronted by Slowpoke Siva, Jaldi realises that entry 4 was a mistake. It should have been 14 (as he had to return midway since he forgot his H.W.). How can you fix this? Do so, and then find the new average.

(c) What do you get? What percent of your commutes are less than 17 minutes? How can you answer this with R?

Solution: We can fix this by changing the entry 4 which appears at position 9 to 14 and then recomputing the average time.

```
> NewJaldicommutes = Jaldicommutes
> NewJaldicommutes

 [1]  7  6 10  8  7  9 15  6  4 10  8  6  9 10

> NewJaldicommutes[9]=14
> NewJaldicommutes

 [1]  7  6 10  8  7  9 15  6 14 10  8  6  9 10

> NewAverage = mean(NewJaldicommutes)
```

The new average time of Jaldi is

```
> NewAverage

[1] 8.928571
```

3. What does the below command provide in R ?

```
> sum( Jaldicommutes >= 9)
```

Solution 2(b) and 2(c): The command counts the number of entries in the vector `Jaldicommutes` that are greater than or equal to 9

```
> sum( Jaldicommutes >= 9)


[1] 6
```

As we can see there are 6. If we were to check it on the revised version then we find 7.

```
> sum( NewJaldicommutes >= 9)


[1] 7
```

We see that all times are less than 17. If we were to do it in `R` then to calculate the percent of `Jaldicommutes` that are less than 17 minuteswe can first count the number that are below 17 and divide by the length, times a 100.

```
> Count = sum(Jaldicommutes <= 17)
> Length = length(Jaldicommutes)
> Percent = Count/Length*100
```

The percent of times the commute time is less than 17 is given by

```
> Percent


[1] 100
```

If we use the revised commute time then we get

```
> Count = sum(NewJaldicommutes <= 17)
> Length = length(NewJaldicommutes)
> NewPercent = Count/Length*100
```

The (new) percent of times the commute time is less than 17 is given by

```
> NewPercent


[1] 100
```

□

4. Naina's cell phone bill varies from month to month. Suppose in her first year of Super Math (hons.) program, under the Drop-atmost 10-calls monthly plan, the following monthly amounts were incurred:

   460, 330, 390, 370, 460, 300, 480, 320, 490, 350, 300, 480

   (a) Enter this data into a variable called `Nainabill`. Use the `sum` command to find the amount spent by Naina that year on the cell phone.

   Solution :

   ```
   > Nainabill = c(460, 330, 390, 370, 460, 300, 480, 320, 490, 350, 300, 480)
   > Totalbill = sum(Nainabill)
   ```

   The total bill paid by Naina is

   ```
   [1] 4730
   ```

(b) Using R find out what is the smallest amount she spent in a month and the largest amount she spent in a month ?

Solution

```
> smallestbill = min(Nainabill)
> largestbill = max(Nainabill)
```

The smallest monthly bill paid by Naina is

```
[1] 300
```

The largest monthly bill paid by Naina is

```
[1] 490
```

□

(c) How many months was the amount greater than Rs 400? What percentage was this?

Solution : As done earlier, to calculate the percent of `Nainabill` that are greater than 400 we can first count the number that are greater than 400 and divide by the length, times a 100.

```
> Count = sum(Nainabill > 400)
> Length = length(Nainabill)
> Percent = Count/Length*100
```

The number of months where the amount was greater than Rs 400 is

```
[1] 5
```

The same in percentage is

```
[1] 41.66667
```

□

(d) If her monthly stipend from PRESPIRE fellowship was Rs 3000. Using R store her balance(after paying her phone bill) in a variable called `freemoney`. Find the average amount available each month for her other expenses.

Solution : We can use the vector subtraction effect in `R` to calculate Freemoney

```
> stipend = 3000
> Freemoney = 3000-Nainabill
> AverageFreemoneypermonth= mean(Freemoney)
```

Then the Freemoney is

```
> Freemoney
 [1] 2540 2670 2610 2630 2540 2700 2520 2680 2510 2650 2700 2520
```

andthe average amount available each month for her expenses is

```
> AverageFreemoneypermonth
[1] 2605.833
```

□