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R 2
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R assignment 2

4.1

a. Store the following vector of 15 values as an object in your workspace: c(6,9,7,3,6,7,9,6,3,6,6,7,1,9,1) . Identify the following elements:

```
foo <- c(6,9,7,3,6,7,9,6,3,6,6,7,1,9,1)
```

The elements in the vector foo will display TRUE or FALSE i-iv for each element, depending on the condition given.

i. Those equal to 6

```
foo == 6
 [1]  TRUE FALSE FALSE FALSE  TRUE FALSE FALSE  TRUE FALSE  TRUE  TRUE
[12] FALSE FALSE FALSE FALSE
```

ii. Those greater than or equal to 6

```
foo >= 6
 [1]  TRUE  TRUE  TRUE FALSE  TRUE  TRUE  TRUE  TRUE FALSE  TRUE  TRUE
[12]  TRUE FALSE  TRUE FALSE
```

iii. Those less than 6 + 2

```
foo < 6 + 2
 [1]  TRUE FALSE  TRUE  TRUE  TRUE  TRUE FALSE  TRUE  TRUE  TRUE  TRUE
[12]  TRUE  TRUE FALSE  TRUE
```

iv. Those not equal to 6

```
foo != 6
 [1] FALSE  TRUE  TRUE  TRUE FALSE  TRUE  TRUE FALSE  TRUE FALSE FALSE
[12]  TRUE  TRUE  TRUE  TRUE
```

b. Create a new vector from the one used in (a) by deleting its first three elements. With this new vector, fill a 2 × 2 × 3 array.

```
> foo <- c(6,9,7,3,6,7,9,6,3,6,6,7,1,9,1)
> foo <- foo[-1:-3]
>
> arr <- array(foo, c(2, 2, 3))
```

As with (a), the elements in the 3 dimensional array below show TRUE or FALSE depending on the condition given.

Examine the array for the following entries:

i. Those less than or equal to 6 divided by 2, plus 4

```
> arr <= ((6/2) + 4)
, , 1

     [,1]  [,2]
[1,] TRUE  TRUE
[2,] TRUE FALSE

, , 2

     [,1] [,2]
[1,] TRUE TRUE
[2,] TRUE TRUE

, , 3

     [,1]  [,2]
[1,] TRUE FALSE
[2,] TRUE  TRUE
```

ii. Those less than or equal to 6 divided by 2, plus 4, after increasing every element in the array by 2

```
> arr <- arr + 2
>
> arr <= ((6/2) + 4)
, , 1

      [,1]  [,2]
[1,]  TRUE FALSE
[2,] FALSE FALSE

, , 2

      [,1]  [,2]
[1,] FALSE FALSE
[2,]  TRUE FALSE

, , 3

      [,1]  [,2]
[1,] FALSE FALSE
[2,]  TRUE  TRUE
```

c. Confirm the specific locations of elements equal to 0 in the 10 × 10 identity matrix I 10 (see Section 3.3).

The FALSE diagonal below are equal to 1.

```
> A <- diag(x=10)
> A == 0
       [,1]  [,2]  [,3]  [,4]  [,5]  [,6]  [,7]  [,8]  [,9] [,10]
 [1,] FALSE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE
 [2,]  TRUE FALSE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE
 [3,]  TRUE  TRUE FALSE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE
 [4,]  TRUE  TRUE  TRUE FALSE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE
 [5,]  TRUE  TRUE  TRUE  TRUE FALSE  TRUE  TRUE  TRUE  TRUE  TRUE
 [6,]  TRUE  TRUE  TRUE  TRUE  TRUE FALSE  TRUE  TRUE  TRUE  TRUE
 [7,]  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE FALSE  TRUE  TRUE  TRUE
 [8,]  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE FALSE  TRUE  TRUE
 [9,]  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE FALSE  TRUE
[10,]  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE  TRUE FALSE
```

d. Check whether any of the values of the logical arrays created in (b) are TRUE . If they are, check whether they are all TRUE .

Using the same conditions from (b), we check if any of the conditions are TRUE followed by checking if all of the conditions are TRUE. In both cases, there's at least one case that's TRUE and at least one case that's FALSE.

```
> arr <- arr <= ((6/2) + 4)
>
> any(arr)
[1] TRUE
> all(arr)
[1] FALSE
> arr <- arr + 2
>
> arr <- arr <= ((6/2) + 4)
>
> any(arr)
[1] TRUE
> all(arr)
[1] FALSE
```

e. By extracting the diagonal elements of the logical matrix created in (c), use any to confirm there are no TRUE entries.

FALSE is returned because all of the diagonal entries are 1.

```
> A <- diag(x=10)
> any(diag(A[,]) == 0)
[1] FALSE
```

16.2 (not d)

Every Saturday, at the same time, an individual stands by the side of a road and tallies the number of cars going by within a 120-minute window. Based on previous knowledge, she believes that the mean number of cars going by during this time is exactly 107. Let X represent the appropriate Poisson random variable of the number of cars passing her position in each Saturday session.

a. What is the probability that more than 100 cars pass her on any given Saturday?

```
> A <- 1-ppois(100,107)
> A
[1] 0.7319128
```

b. Determine the probability that no cars pass.

```
> A <- ppois(0,107)
> A
[1] 3.39227e-47
```

c. Plot the relevant Poisson mass function over the values in $60 \leq x \leq 150$.

```
> B <- rpois(n=500,107)
> plot(B,xlim=c(60,150), col=rgb(0.4,0.4,0.8,0.6),pch=16 , cex=1.3)
```