

CS544 Assignment1 Solutions

Part1

In [2]:

```
scores <- c(45, 80, 83, 78, 75, 77, 79, 83, 83, 100)
```

1a

Using indexing, show the expression for accessing the first and last items. The code should not hardcode the value 10 for the number of items.

In [3]:

```
scores[c(1, length(scores))]
```

```
45 100
```

1b

Using comparison operators, write the expression for scores less than the mean computed in 1a)

In [4]:

```
mean <- 78.3  
scores < mean
```

```
TRUE FALSE FALSE TRUE TRUE TRUE FALSE FALSE FALSE  
FALSE
```

1c

Using logical indexing and the expression from b), return all the scores less than the mean computed in 1a)

In [5]:

```
scores[scores < mean]
```

```
45 78 75 77
```

1d

Using rep function, create a sequence, as the same length as scores, of alternating TRUE, FALSE values. Using this sequence, return every other element from the scores. The code should not hardcode the value 10 for the number of scores. You can assume that there are even number of values in scores.

In [6]:

```
scores[rep(c(TRUE, FALSE), length(scores)/2)]
```

45 83 75 79 83

1e

Using the paste function with LETTERS, show the code for the following output. The code should not hardcode the value 10 for the number of scores.

In [7]:

```
paste(LETTERS[1:length(scores)], scores, sep="=")
```

'A=45' 'B=80' 'C=83' 'D=78' 'E=75' 'F=77' 'G=79' 'H=83' 'I=83'
'J=100'

1f

Create a matrix of size 2 x 5 using the scores data. The first five values belong to the first row of the matrix. Assign the result to the variable, scores.matrix, and display the result.

In [8]:

```
scores.matrix <- matrix(scores, nrow=2, ncol=5, byrow = TRUE)  
scores.matrix
```

45	80	83	78	75
77	79	83	83	100

1g

Without hardcoding the value 5, show the code for displaying the first and last columns of the matrix.

In [9]:

```
scores.matrix[, c(1, ncol(scores.matrix))]
```

45	75
77	100

1h

Assign row names for the scores.matrix as Student_1, Student_2,... and column names as Quiz_1, Quiz_2 The code should not hard code the values 2 and 5.

In [10]:

```
row.names <- paste("Student", 1:nrow(scores.matrix), sep="_")
col.names <- paste("Quiz", 1:ncol(scores.matrix), sep="_")
dimnames(scores.matrix) <- list(row.names, col.names)
scores.matrix
```

	Quiz_1	Quiz_2	Quiz_3	Quiz_4	Quiz_5
Student_1	45	80	83	78	75
Student_2	77	79	83	83	100

Part 2

In [11]:

```
weather.info <- data.frame(
  Month = c("January", "February", "March", "April", "May",
"June",
           "July", "August", "September", "October", "November",
"December" ),
  Monthly_Avg = c(4.7, 6.1, 12.8, 23.9, 35.5, 45.0, 49.1, 48.1, 41.6, 30.2,
20.7, 10.1),
  DailyMax_Avg = c(13.6, 14.7, 20.7, 30.4, 41.3, 50.4, 54.1, 53.3, 47.1, 36.
4, 28.1, 18.4),
  DailyMin_Avg = c(-4.1, -2.4, 5.0, 17.4, 29.8, 39.5, 44.0, 43.0, 36.1, 24.0
, 13.3, 1.7),
  Record_High = c(48, 43, 54, 60, 66, 72, 71, 72, 69, 62, 52, 47),
  Record_Low = c(-47, -46, -38, -20, -2, 8, 24, 20, 9, -5, -20, -46))

weather.info
```

Month	Monthly_Avg	DailyMax_Avg	DailyMin_Avg	Record_High	Record_Low
January	4.7	13.6	-4.1	48	-47
February	6.1	14.7	-2.4	43	-46
March	12.8	20.7	5.0	54	-38
April	23.9	30.4	17.4	60	-20
May	35.5	41.3	29.8	66	-2
June	45.0	50.4	39.5	72	8
July	49.1	54.1	44.0	71	24
August	48.1	53.3	43.0	72	20
September	41.6	47.1	36.1	69	9
October	30.2	36.4	24.0	62	-5
November	20.7	28.1	13.3	52	-20
December	10.1	18.4	1.7	47	-46

2b

Show the summary for Monthly_Avg, DailyMax_Avg, DailyMin_Avg, Record_High, and Record_Low.

In [12]:

```
summary(weather.info$Monthly_Avg)
summary(weather.info$DailyMax_Avg)
summary(weather.info$DailyMin_Avg)
summary(weather.info$Record_High)
summary(weather.info$Record_Low)
```

Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
4.70	12.13	27.05	27.32	42.45	49.10
Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
13.60	20.12	33.40	34.04	47.92	54.10
Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
-4.100	4.175	20.700	20.610	36.950	44.000
Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
43.00	51.00	61.00	59.67	69.50	72.00
Min.	1st Qu.	Median	Mean	3rd Qu.	Max.
-47.00	-40.00	-12.50	-13.58	8.25	24.00

In [12]:

```
# or
summary(weather.info[names(weather.info)[-1]])
```

Monthly_Avg	DailyMax_Avg	DailyMin_Avg	Record_High
Min. : 4.70	Min. :13.60	Min. : -4.100	Min. :43.00
1st Qu.:12.12	1st Qu.:20.12	1st Qu.: 4.175	1st Qu.:51.00
Median :27.05	Median :33.40	Median :20.700	Median :61.00
Mean :27.32	Mean :34.04	Mean :20.608	Mean :59.67
3rd Qu.:42.45	3rd Qu.:47.92	3rd Qu.:36.950	3rd Qu.:69.50
Max. :49.10	Max. :54.10	Max. :44.000	Max. :72.00
Record_Low			
Min. : -47.00			
1st Qu.: -40.00			
Median : -12.50			
Mean : -13.58			
3rd Qu.: 8.25			
Max. : 24.00			

2c

Show the data frame sliced using the columns Month, Record_High, and Record_Low.

In [13]:

```
weather.info[, c("Month", "Record_High", "Record_Low")]
```

Month	Record_High	Record_Low
January	48	-47
February	43	-46
March	54	-38
April	60	-20
May	66	-2
June	72	8
July	71	24
August	72	20
September	69	9
October	62	-5
November	52	-20
December	47	-46

In [14]:

```
# or

weather.info[c("Month", "Record_High", "Record_Low")]
```

Month	Record_High	Record_Low
January	48	-47
February	43	-46
March	54	-38
April	60	-20
May	66	-2
June	72	8
July	71	24
August	72	20
September	69	9
October	62	-5
November	52	-20
December	47	-46

2d

Show the data frame sliced using the first and last row. Do not hard code 12 in the expression, i.e., the code should work for a data frame of any size.

In [15]:

```
weather.info[c(1, nrow(weather.info)), ]
```

	Month	Monthly_Avg	DailyMax_Avg	DailyMin_Avg	Record_High	Record_Lo
1	January	4.7	13.6	-4.1	48	-47
12	December	10.1	18.4	1.7	47	-46

2e

Show all rows of the data frame whose DailyMax_Avg is greater than 50.

In [16]:

```
weather.info[weather.info$DailyMax_Avg > 50, ]
```

	Month	Monthly_Avg	DailyMax_Avg	DailyMin_Avg	Record_High	Record_Low
6	June	45.0	50.4	39.5	72	8
7	July	49.1	54.1	44.0	71	24
8	August	48.1	53.3	43.0	72	20

2f

Modify the data by adding a new column, Record_Deviation, showing the difference between the Record_High and Record_Low. Display the new resulting data frame.

In [15]:

```
weather.info$Record_Deviation <- weather.info$Record_High - weather.info$Record_Low
weather.info
```

Month	Monthly_Avg	DailyMax_Avg	DailyMin_Avg	Record_High	Record_Low
January	4.7	13.6	-4.1	48	-47
February	6.1	14.7	-2.4	43	-46
March	12.8	20.7	5.0	54	-38
April	23.9	30.4	17.4	60	-20
May	35.5	41.3	29.8	66	-2
June	45.0	50.4	39.5	72	8
July	49.1	54.1	44.0	71	24
August	48.1	53.3	43.0	72	20
September	41.6	47.1	36.1	69	9
October	30.2	36.4	24.0	62	-5
November	20.7	28.1	13.3	52	-20
December	10.1	18.4	1.7	47	-46