HW2: Programming in Base R

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Task 1: Basic Vector Practice

Question 1

```
#create pre and post measurement vectors
pre <- c(130, 128, 116, 124, 133, 134, 118, 126, 114,
         127, 141, 138, 128, 140, 137, 131, 120, 128, 139, 135
)

post <- c(114, 98, 113, 99, 107, 116, 113, 111, 119, 117, 101,
          119, 130, 122, 106, 106, 124, 102, 117, 113
)
```

Question 2

```
#Create subject names
subject <- paste("Subject", 1:20, sep = "_")

#Assign names to both vectors
names(pre) <- subject
names(post) <- subject
```

Question 3

```r
#Calculate change in blood pressure
diff_op <- post - pre

#Print the change in blood pressure
diff_op
```

```
 Subject_1  Subject_2  Subject_3  Subject_4  Subject_5  Subject_6  Subject_7
       -16        -30         -3        -25        -26        -18         -5
 Subject_8  Subject_9 Subject_10 Subject_11 Subject_12 Subject_13 Subject_14
       -15          5        -10        -40        -19          2        -18
Subject_15 Subject_16 Subject_17 Subject_18 Subject_19 Subject_20
       -31        -25          4        -26        -22        -22
```

Question 4

```r
#Average decrease in blood pressure
meandiff <- mean(diff_op)

#Print the mean difference
meandiff
```

```
[1] -17
```

Question 5

```r
#determine which subjects had a decrease in blood pressure
which(diff_op < 0, useNames = TRUE)
```

```
 Subject_1  Subject_2  Subject_3  Subject_4  Subject_5  Subject_6  Subject_7
         1          2          3          4          5          6          7
 Subject_8 Subject_10 Subject_11 Subject_12 Subject_14 Subject_15 Subject_16
         8         10         11         12         14         15         16
Subject_18 Subject_19 Subject_20
        18         19         20
```

Question 6

```
#create and print the subset vector of differences
decreased <- diff_op[-c(9, 13, 17)]
decreased
```

```
 Subject_1  Subject_2  Subject_3  Subject_4  Subject_5  Subject_6  Subject_7
       -16        -30         -3        -25        -26        -18         -5
 Subject_8 Subject_10 Subject_11 Subject_12 Subject_14 Subject_15 Subject_16
       -15        -10        -40        -19        -18        -31        -25
Subject_18 Subject_19 Subject_20
       -26        -22        -22
```

Question 7

```
#Average decrease in bp for those who had a decrease in bp post treatment
mean(decreased)
```

```
[1] -20.64706
```

Task 2: Basic Data Frame Practice

Question 1

```
#Create dataframe with 4 columns corresponding to the vectors create in Task 1
BP_dataframe <- data.frame(
  patient = subject,
  pre_bp = pre,
  post_bp = post,
  diff_bp = diff_op,
  row.names = NULL)
```

Question 2

```
#Return only the rows where the diff_bp is negative
subset(BP_dataframe, diff_bp < 0)
```

```
      patient pre_bp post_bp diff_bp
1   Subject_1    130     114     -16
2   Subject_2    128      98     -30
3   Subject_3    116     113      -3
4   Subject_4    124      99     -25
5   Subject_5    133     107     -26
6   Subject_6    134     116     -18
7   Subject_7    118     113      -5
8   Subject_8    126     111     -15
10 Subject_10    127     117     -10
11 Subject_11    141     101     -40
12 Subject_12    138     119     -19
14 Subject_14    140     122     -18
15 Subject_15    137     106     -31
16 Subject_16    131     106     -25
18 Subject_18    128     102     -26
19 Subject_19    139     117     -22
20 Subject_20    135     113     -22
```

Question 3

```
#Create new column corresponding to TRUE if post_bp is less than 120
BP_dataframe$post_under_120 <- ifelse(
  BP_dataframe$post_bp < 120, "TRUE", "FALSE"
  )
```

Question 4

```
#Print Nice table
knitr :: kable(BP_dataframe)
```

patient	pre_bp	post_bp	diff_bp	post_under_120
Subject_1	130	114	-16	TRUE

patient	pre_bp	post_bp	diff_bp	post_under_120
Subject_2	128	98	-30	TRUE
Subject_3	116	113	-3	TRUE
Subject_4	124	99	-25	TRUE
Subject_5	133	107	-26	TRUE
Subject_6	134	116	-18	TRUE
Subject_7	118	113	-5	TRUE
Subject_8	126	111	-15	TRUE
Subject_9	114	119	5	TRUE
Subject_10	127	117	-10	TRUE
Subject_11	141	101	-40	TRUE
Subject_12	138	119	-19	TRUE
Subject_13	128	130	2	FALSE
Subject_14	140	122	-18	FALSE
Subject_15	137	106	-31	TRUE
Subject_16	131	106	-25	TRUE
Subject_17	120	124	4	FALSE
Subject_18	128	102	-26	TRUE
Subject_19	139	117	-22	TRUE
Subject_20	135	113	-22	TRUE

Task 3: List Practice

Question 1

```
#Create placebo vectors
pre_placebo <- c(138, 135, 147, 117, 152, 134, 114, 121, 131, 130)
post_placebo <- c(105, 136, 123, 130, 134, 143, 135, 139, 120, 124)

#calculate the difference
diff_bp_placebo <- post_placebo - pre_placebo

#create subject names
subject_placebo <- paste("Subject", 1:10, sep = "_")

#assign subject names
names(pre_placebo) <- subject_placebo
names(post_placebo) <- subject_placebo
```

```r
#Create dataframe with 4 columns corresponding to the vectors
BP_dataframe_placebo <- data.frame(
  patient = subject_placebo,
  pre_bp = pre_placebo,
  post_bp = post_placebo,
  diff_bp = diff_bp_placebo,
  row.names = NULL)

#Add the column corresponding to TRUE if post_bp is less than 120
BP_dataframe_placebo$post_under_120 <- ifelse(
  BP_dataframe_placebo$post_bp < 120,
  "TRUE", "FALSE"
)
#Nicely print the dataframe
knitr :: kable(BP_dataframe_placebo)
```

patient	pre_bp	post_bp	diff_bp	post_under_120
Subject_1	138	105	-33	TRUE
Subject_2	135	136	1	FALSE
Subject_3	147	123	-24	FALSE
Subject_4	117	130	13	FALSE
Subject_5	152	134	-18	FALSE
Subject_6	134	143	9	FALSE
Subject_7	114	135	21	FALSE
Subject_8	121	139	18	FALSE
Subject_9	131	120	-11	FALSE
Subject_10	130	124	-6	FALSE

Question 2

```r
#Create a list with 2 elements
list_bp <- list(treatment = BP_dataframe, placebo = BP_dataframe_placebo)

#print the list
list_bp
```

```
$treatment
      patient pre_bp post_bp diff_bp post_under_120
```

```
1   Subject_1    130     114     -16           TRUE
2   Subject_2    128      98     -30           TRUE
3   Subject_3    116     113      -3           TRUE
4   Subject_4    124      99     -25           TRUE
5   Subject_5    133     107     -26           TRUE
6   Subject_6    134     116     -18           TRUE
7   Subject_7    118     113      -5           TRUE
8   Subject_8    126     111     -15           TRUE
9   Subject_9    114     119       5           TRUE
10 Subject_10    127     117     -10           TRUE
11 Subject_11    141     101     -40           TRUE
12 Subject_12    138     119     -19           TRUE
13 Subject_13    128     130       2          FALSE
14 Subject_14    140     122     -18          FALSE
15 Subject_15    137     106     -31           TRUE
16 Subject_16    131     106     -25           TRUE
17 Subject_17    120     124       4          FALSE
18 Subject_18    128     102     -26           TRUE
19 Subject_19    139     117     -22           TRUE
20 Subject_20    135     113     -22           TRUE

$placebo
      patient pre_bp post_bp diff_bp post_under_120
1   Subject_1    138     105     -33           TRUE
2   Subject_2    135     136       1          FALSE
3   Subject_3    147     123     -24          FALSE
4   Subject_4    117     130      13          FALSE
5   Subject_5    152     134     -18          FALSE
6   Subject_6    134     143       9          FALSE
7   Subject_7    114     135      21          FALSE
8   Subject_8    121     139      18          FALSE
9   Subject_9    131     120     -11          FALSE
10 Subject_10    130     124      -6          FALSE
```

Question 3

```
#1st way to access the first element
list_bp[[1]]
```

```
      patient pre_bp post_bp diff_bp post_under_120
```

```
1   Subject_1    130     114     -16           TRUE
2   Subject_2    128      98     -30           TRUE
3   Subject_3    116     113      -3           TRUE
4   Subject_4    124      99     -25           TRUE
5   Subject_5    133     107     -26           TRUE
6   Subject_6    134     116     -18           TRUE
7   Subject_7    118     113      -5           TRUE
8   Subject_8    126     111     -15           TRUE
9   Subject_9    114     119       5           TRUE
10 Subject_10    127     117     -10           TRUE
11 Subject_11    141     101     -40           TRUE
12 Subject_12    138     119     -19           TRUE
13 Subject_13    128     130       2          FALSE
14 Subject_14    140     122     -18          FALSE
15 Subject_15    137     106     -31           TRUE
16 Subject_16    131     106     -25           TRUE
17 Subject_17    120     124       4          FALSE
18 Subject_18    128     102     -26           TRUE
19 Subject_19    139     117     -22           TRUE
20 Subject_20    135     113     -22           TRUE
```

```
#2nd way to access the first element
list_bp$treatment
```

```
      patient pre_bp post_bp diff_bp post_under_120
1   Subject_1    130     114     -16           TRUE
2   Subject_2    128      98     -30           TRUE
3   Subject_3    116     113      -3           TRUE
4   Subject_4    124      99     -25           TRUE
5   Subject_5    133     107     -26           TRUE
6   Subject_6    134     116     -18           TRUE
7   Subject_7    118     113      -5           TRUE
8   Subject_8    126     111     -15           TRUE
9   Subject_9    114     119       5           TRUE
10 Subject_10    127     117     -10           TRUE
11 Subject_11    141     101     -40           TRUE
12 Subject_12    138     119     -19           TRUE
13 Subject_13    128     130       2          FALSE
14 Subject_14    140     122     -18          FALSE
15 Subject_15    137     106     -31           TRUE
16 Subject_16    131     106     -25           TRUE
17 Subject_17    120     124       4          FALSE
```

```
18 Subject_18    128     102     -26           TRUE
19 Subject_19    139     117     -22           TRUE
20 Subject_20    135     113     -22           TRUE
```

```
#3rd way to access the first element
list_bp[["treatment"]]
```

```
      patient pre_bp post_bp diff_bp post_under_120
1   Subject_1    130     114     -16           TRUE
2   Subject_2    128      98     -30           TRUE
3   Subject_3    116     113      -3           TRUE
4   Subject_4    124      99     -25           TRUE
5   Subject_5    133     107     -26           TRUE
6   Subject_6    134     116     -18           TRUE
7   Subject_7    118     113      -5           TRUE
8   Subject_8    126     111     -15           TRUE
9   Subject_9    114     119       5           TRUE
10 Subject_10    127     117     -10           TRUE
11 Subject_11    141     101     -40           TRUE
12 Subject_12    138     119     -19           TRUE
13 Subject_13    128     130       2          FALSE
14 Subject_14    140     122     -18          FALSE
15 Subject_15    137     106     -31           TRUE
16 Subject_16    131     106     -25           TRUE
17 Subject_17    120     124       4          FALSE
18 Subject_18    128     102     -26           TRUE
19 Subject_19    139     117     -22           TRUE
20 Subject_20    135     113     -22           TRUE
```

Question 4

```
#Access the placebo data frame and print the pre_bp column on one line
list_bp[[2]]$pre_bp
```

```
 [1] 138 135 147 117 152 134 114 121 131 130
```

```
#Alternatively, print the whole column (if desired)
list_bp[[2]]["pre_bp"]
```

```
   pre_bp
1     138
2     135
3     147
4     117
5     152
6     134
7     114
8     121
9     131
10    130
```

Task 4: Control Flow Practice

Question 1

```r
#Add "status" column to both-- treatment and placebo-- elements of list_bp
list_bp$treatment$status <- character(20)
list_bp$placebo$status <- character(10)
```

Question 2

```r
for (i in 1:nrow(list_bp$treatment)) {
  bp <- list_bp$treatment$post_bp[i] #simplify accessing each element

  if (bp <= 120) {
    list_bp$treatment$status[i] <- "optimal"
  } else if (bp <= 130) {
    list_bp$treatment$status[i] <- "borderline"
  } else if (bp > 130) {
    list_bp$treatment$status[i] <- "high"
  } else {
    list_bp$treatment$status[i] <- "Erorr"
  }
}
```

Question 3

```
#same as question 2 but for the placebo element in the list
for (i in 1:nrow(list_bp$placebo)) {
  bp2 <- list_bp$placebo$post_bp[i] #simplify accessing each element

  if (bp2 <= 120) {
    list_bp$placebo$status[i] <- "optimal"
  } else if (bp2 <= 130) {
    list_bp$placebo$status[i] <- "borderline"
  } else if (bp2 > 130) {
    list_bp$placebo$status[i] <- "high"
  } else {
    list_bp$placebo$status[i] <- "Erorr"
  }
}

#Print my updated list
list_bp
```

```
$treatment
      patient pre_bp post_bp diff_bp post_under_120     status
1   Subject_1    130     114     -16           TRUE    optimal
2   Subject_2    128      98     -30           TRUE    optimal
3   Subject_3    116     113      -3           TRUE    optimal
4   Subject_4    124      99     -25           TRUE    optimal
5   Subject_5    133     107     -26           TRUE    optimal
6   Subject_6    134     116     -18           TRUE    optimal
7   Subject_7    118     113      -5           TRUE    optimal
8   Subject_8    126     111     -15           TRUE    optimal
9   Subject_9    114     119       5           TRUE    optimal
10 Subject_10    127     117     -10           TRUE    optimal
11 Subject_11    141     101     -40           TRUE    optimal
12 Subject_12    138     119     -19           TRUE    optimal
13 Subject_13    128     130       2          FALSE borderline
14 Subject_14    140     122     -18          FALSE borderline
15 Subject_15    137     106     -31           TRUE    optimal
16 Subject_16    131     106     -25           TRUE    optimal
17 Subject_17    120     124       4          FALSE borderline
18 Subject_18    128     102     -26           TRUE    optimal
19 Subject_19    139     117     -22           TRUE    optimal
```

```
20 Subject_20    135     113     -22           TRUE    optimal

$placebo
      patient pre_bp post_bp diff_bp post_under_120     status
1   Subject_1    138     105     -33           TRUE    optimal
2   Subject_2    135     136       1          FALSE       high
3   Subject_3    147     123     -24          FALSE borderline
4   Subject_4    117     130      13          FALSE borderline
5   Subject_5    152     134     -18          FALSE       high
6   Subject_6    134     143       9          FALSE       high
7   Subject_7    114     135      21          FALSE       high
8   Subject_8    121     139      18          FALSE       high
9   Subject_9    131     120     -11          FALSE    optimal
10 Subject_10    130     124      -6          FALSE borderline
```

Task 5

Question 1

```r
#Define the function with no default data and "mean" as the default stat
summarize_bp <- function(list_bp, stat = "mean") {
  my_fun <- get(stat)

  #simplify the 2 elements of list_bp
  treat <- list_bp$treatment
  placebo <- list_bp$placebo

  #compute the statistics for the columns of interest
  stat_values <- c(
    my_fun(treat$pre_bp),
    my_fun(treat$post_bp),
    my_fun(treat$diff_bp),
    my_fun(placebo$pre_bp),
    my_fun(placebo$post_bp),
    my_fun(placebo$diff_bp)
  )

  #create dynamic names
  stat_names <- paste0(
    stat, "_",
```

```
    c("trtment_pre", "trtment_post", "trtment_diff",
      "placebo_pre", "placebo_post", "placebo_diff")
  )

  #assign names and return
  names(stat_values) <- stat_names
  return(stat_values)
}

#Apply function
summarize_bp(list_bp)
```

```
 mean_trtment_pre mean_trtment_post mean_trtment_diff  mean_placebo_pre
           129.35            112.35            -17.00            131.90
mean_placebo_post mean_placebo_diff
           128.90             -3.00
```

```
summarize_bp(list_bp, stat = "var")
```

```
 var_trtment_pre var_trtment_post var_trtment_diff  var_placebo_pre
        64.55526         74.76579        153.68421        149.87778
var_placebo_post var_placebo_diff
       124.98889        341.33333
```

```
summarize_bp(list_bp, stat = "sd")
```

```
 sd_trtment_pre sd_trtment_post sd_trtment_diff  sd_placebo_pre sd_placebo_post
       8.034629        8.646721       12.396944       12.242458       11.179843
sd_placebo_diff
      18.475209
```

```
summarize_bp(list_bp, stat = "min")
```

```
 min_trtment_pre min_trtment_post min_trtment_diff  min_placebo_pre
             114              98             -40             114
min_placebo_post min_placebo_diff
             105             -33
```

```r
summarize_bp(list_bp, stat = "max")
```

```
 max_trtment_pre max_trtment_post max_trtment_diff  max_placebo_pre
             141              130                 5              152
max_placebo_post max_placebo_diff
             143               21
```