Homework 2: Programming in Base R

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Task 1: Basic Vector Practice

Question 1

Pre and Post blood pressure measurements in a medical experiment in 2 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

Assigning subject names to vector elements

```
subname <- paste("Subject", 1:20, sep = '_')
names(pre) <- subname
names(post) <- subname
```

Question 3

Change in blood pressure from pre- to post-treatments.

```
diff_op <- (pre - post)

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

Mean decrease in blood pressure across all patients.

```
mean(diff_op)
```

```
[1] 17
```

Question 5

Only patients that had a decrease in blood pressure.

```
which(diff_op > 0)
```

```
 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

Subset patients out with a positive decrease.

```
positivediff_op <- diff_op [diff_op > 0]
print(positivediff_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_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

The average difference in blood pressure in patients where blood pressure decreased.

```r
mean(positivediff_op)
```

```
[1] 20.64706
```

Task 2: Basic Data Frame Practice

Question 1

Build data frame using treatment results from Task 1.

```r
patient <- names(pre)
pre_bp <- pre
post_bp <- post
diff_bp <- diff_op
bp_df <- data.frame(patient,pre_bp,post_bp,diff_bp,row.names = NULL)
bp_df
```

```
      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
9   Subject_9    114     119      -5
10 Subject_10    127     117      10
11 Subject_11    141     101      40
12 Subject_12    138     119      19
13 Subject_13    128     130      -2
14 Subject_14    140     122      18
15 Subject_15    137     106      31
16 Subject_16    131     106      25
17 Subject_17    120     124      -4
18 Subject_18    128     102      26
19 Subject_19    139     117      22
20 Subject_20    135     113      22
```

Question 2

Displaying patients with a rise in blood pressure.

```
negbp_diff <- bp_df [bp_df$diff_bp < 0,,drop=FALSE]
negbp_diff
```

```
      patient pre_bp post_bp diff_bp
9   Subject_9    114     119      -5
13 Subject_13    128     130      -2
17 Subject_17    120     124      -4
```

Question 3

Adding a column to indicate patients with a post blood pressure < 120.

```
bp_df$post_bp_norm <- bp_df$post_bp < 120

knitr::kable(bp_df)
```

patient	pre_bp	post_bp	diff_bp	post_bp_norm
Subject_1	130	114	16	TRUE
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

patient	pre_bp	post_bp	diff_bp	post_bp_norm
Subject_20	135	113	22	TRUE

##Task 3: List Practice

###Question 1

Second data frame to show pre- and post-bp in patients who took placebo.

```
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)

subname2 <- paste("Subject", 1:10, sep = '_')
names(pre_placebo) <- subname2
names(post_placebo) <-subname2

diff_placebo <- (pre_placebo - post_placebo)

patient <- subname2
pre_bp <- pre_placebo
post_bp <- post_placebo
diff_bp <- diff_placebo
bp_df_placebo <- data.frame(patient,pre_bp,post_bp,diff_bp,row.names = NULL)

bp_df_placebo$postbpnormal <- bp_df_placebo$post_bp < 120

bp_df_placebo
```

```
      patient pre_bp post_bp diff_bp postbpnormal
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 2

Create a list with both treatment and placebo elements.

```
bp_list <- list(treatment = bp_df,placebo = bp_df_placebo)
print(bp_list)
```

```
$treatment
      patient pre_bp post_bp diff_bp post_bp_norm
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 postbpnormal
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

Accessing first list element using:

- Single square brackets

```
bp_list[1]
```

```
$treatment
      patient pre_bp post_bp diff_bp post_bp_norm
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
```

- Double Square Brackets

```
bp_list[[1]]
```

```
      patient pre_bp post_bp diff_bp post_bp_norm
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
```

- By Name

```
bp_list$treatment
```

```
      patient pre_bp post_bp diff_bp post_bp_norm
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 placebo, pre-bp column in 1 line

```
bp_list$treatment$pre_bp
```

```
 [1] 130 128 116 124 133 134 118 126 114 127 141 138 128 140 137 131 120 128 139
[20] 135
```

Task 4 Control Flow Practice

Quesiton 3

Create new column for characterization of bp.

- Optimal: ≤ 120
- Borderline: $120 < \text{bp} \leq 130$
- High: > 130

```
bp_list$treatment$status <-character(20)
bp_list$placebo$status <-character(10)
```

Question 2

Create loop for status in treatment element.

```
for (i in 1:nrow(bp_list$treatment)){
if (bp_list$treatment$post_bp[i] <= 120){
    bp_list$treatment$status[i] <-"optimal"
}
  else if (bp_list$treatment$post_bp[i] >120 && bp_list$treatment$post_bp[i]<=130){
     bp_list$treatment$status[i] <-"borderline"

}
  else if (bp_list$treatment$post_bp[i] >130){
     bp_list$treatment$status[i] <-"high"

}
}
bp_list$treatment
```

```
      patient pre_bp post_bp diff_bp post_bp_norm     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
```

Question 3

Repeat above loop for placebo element.

```
for (i in 1:nrow(bp_list$placebo)){
if (bp_list$placebo$post_bp[i] <= 120){
    bp_list$placebo$status[i] <-"optimal"
}
  else if (bp_list$placebo$post_bp[i] >120 && bp_list$placebo$post_bp[i]<=130){
     bp_list$placebo$status[i] <-"borderline"

}
  else if (bp_list$placebo$post_bp[i] >130){
     bp_list$placebo$status[i] <-"high"

}
}
bp_list$placebo
```

```
      patient pre_bp post_bp diff_bp postbpnormal     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: Function Writing

Question 1

Writing a Function that can input mean, var, SD, min, max and output the results for pre-, post-, and difference in blood pressure for both groups.

```r
statbp_func <- function(bp_list, stat="mean"){  #function using the bp_list,
  #then we can pick stat. Mean should be defaulted.

  df_choice <- c("treatment","placebo") #2 df to reference from list
  bp_type <- c('pre_bp', 'post_bp', 'diff_bp') #where to get numbers from

  values <-c() #need to make 2 vectors for results to go into
  stat_name <-c()

  my_fun <- get(stat) #function to apply statistic as desired

  #need loop to get the right data frame and then the stat of choice

  for (i in df_choice) {
      for (j in bp_type){

        num_column <- as.numeric(as.character(bp_list[[i]][[j]]))

        value <- my_fun (num_column, na.rm=T)
        values <- c(values, value)
        name <- paste(stat, j, sep="_")
        stat_name <- c(stat_name, name)
      }
  }
```

```
  #use the other vectors and results to return the data for each group
  names(values) <-stat_name
  return (values)
   }
```

Applying mean.

```
statbp_func_print <- statbp_func(bp_list, "mean")

statbp_func_print
```

```
 mean_pre_bp mean_post_bp mean_diff_bp  mean_pre_bp mean_post_bp mean_diff_bp
      129.35       112.35        17.00       131.90       128.90         3.00
```

Applying variance.

```
statbp_func_print <- statbp_func(bp_list, "var")

statbp_func_print
```

```
 var_pre_bp var_post_bp var_diff_bp  var_pre_bp var_post_bp var_diff_bp
   64.55526    74.76579   153.68421   149.87778   124.98889   341.33333
```

Applying standard deviation.

```
statbp_func_print <- statbp_func(bp_list, "sd")

statbp_func_print
```

```
 sd_pre_bp sd_post_bp sd_diff_bp  sd_pre_bp sd_post_bp sd_diff_bp
  8.034629   8.646721  12.396944  12.242458  11.179843  18.475209
```

Applying min.

```
statbp_func_print <- statbp_func(bp_list, "min")

statbp_func_print
```

```
 min_pre_bp min_post_bp min_diff_bp  min_pre_bp min_post_bp min_diff_bp
        114          98          -5         114         105         -21
```

Applying max.

```
statbp_func_print <- statbp_func(bp_list, "max")

statbp_func_print
```

```
 max_pre_bp max_post_bp max_diff_bp  max_pre_bp max_post_bp max_diff_bp
        141         130          40         152         143          33
```