Programming in Base R

Task 1: Basic Vector practice

Question 1

```
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

```
names_obj <- paste("Subject", 1:20, sep = "_")

names(pre) <- names_obj
names(post) <- names_obj
```

Question 3

```
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(diff_op)
```

```
[1] 17
```

Question 5

```
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

```
diff_op[which(diff_op > 0)]
```

```
 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

```
mean(diff_op[which(diff_op > 0)])
```

```
[1] 20.64706
```

Task 2: Basic Data Frame practice

Question 1

```
bp_data_frame <- data.frame(names_obj, pre, post, diff_op)
bp_data_frame
```

```
           names_obj pre post diff_op
Subject_1   Subject_1 130  114      16
Subject_2   Subject_2 128   98      30
Subject_3   Subject_3 116  113       3
Subject_4   Subject_4 124   99      25
Subject_5   Subject_5 133  107      26
Subject_6   Subject_6 134  116      18
Subject_7   Subject_7 118  113       5
Subject_8   Subject_8 126  111      15
Subject_9   Subject_9 114  119      -5
Subject_10 Subject_10 127  117      10
Subject_11 Subject_11 141  101      40
Subject_12 Subject_12 138  119      19
Subject_13 Subject_13 128  130      -2
Subject_14 Subject_14 140  122      18
Subject_15 Subject_15 137  106      31
Subject_16 Subject_16 131  106      25
Subject_17 Subject_17 120  124      -4
Subject_18 Subject_18 128  102      26
Subject_19 Subject_19 139  117      22
Subject_20 Subject_20 135  113      22
```

Question 2

```
bp_data_frame[bp_data_frame$diff_op < 0,]
```

```
           names_obj pre post diff_op
Subject_9   Subject_9 114  119      -5
Subject_13 Subject_13 128  130      -2
Subject_17 Subject_17 120  124      -4
```

Question 3

```
bp_data_frame$normal <- (bp_data_frame$post < 120)
```

Question 4

```
knitr::kable(bp_data_frame)
```

	names_obj	pre	post	diff_op	normal
Subject_1	Subject_1	130	114	16	TRUE
Subject_2	Subject_2	128	98	30	TRUE
Subject_3	Subject_3	116	113	3	TRUE
Subject_4	Subject_4	124	99	25	TRUE
Subject_5	Subject_5	133	107	26	TRUE
Subject_6	Subject_6	134	116	18	TRUE
Subject_7	Subject_7	118	113	5	TRUE
Subject_8	Subject_8	126	111	15	TRUE
Subject_9	Subject_9	114	119	-5	TRUE
Subject_10	Subject_10	127	117	10	TRUE
Subject_11	Subject_11	141	101	40	TRUE
Subject_12	Subject_12	138	119	19	TRUE
Subject_13	Subject_13	128	130	-2	FALSE
Subject_14	Subject_14	140	122	18	FALSE
Subject_15	Subject_15	137	106	31	TRUE
Subject_16	Subject_16	131	106	25	TRUE
Subject_17	Subject_17	120	124	-4	FALSE
Subject_18	Subject_18	128	102	26	TRUE
Subject_19	Subject_19	139	117	22	TRUE
Subject_20	Subject_20	135	113	22	TRUE

Task 3: List Practice

Question 1

```
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)
diff_placebo <- pre_placebo - post_placebo
```

```r
names_pla <- paste("Subject", 1:10, sep = "_")

bp_df_placebo <- data.frame(names_pla, pre_placebo, post_placebo, diff_placebo)
bp_df_placebo$normal <- (bp_df_placebo$post_placebo < 120)
```

Question 2

```r
bp_list <- list(treatment = bp_data_frame, placebo = bp_df_placebo)
```

Question 3

```r
bp_list[1]
```

```
$treatment
            names_obj pre post diff_op normal
Subject_1   Subject_1 130  114      16   TRUE
Subject_2   Subject_2 128   98      30   TRUE
Subject_3   Subject_3 116  113       3   TRUE
Subject_4   Subject_4 124   99      25   TRUE
Subject_5   Subject_5 133  107      26   TRUE
Subject_6   Subject_6 134  116      18   TRUE
Subject_7   Subject_7 118  113       5   TRUE
Subject_8   Subject_8 126  111      15   TRUE
Subject_9   Subject_9 114  119      -5   TRUE
Subject_10 Subject_10 127  117      10   TRUE
Subject_11 Subject_11 141  101      40   TRUE
Subject_12 Subject_12 138  119      19   TRUE
Subject_13 Subject_13 128  130      -2  FALSE
Subject_14 Subject_14 140  122      18  FALSE
Subject_15 Subject_15 137  106      31   TRUE
Subject_16 Subject_16 131  106      25   TRUE
Subject_17 Subject_17 120  124      -4  FALSE
Subject_18 Subject_18 128  102      26   TRUE
Subject_19 Subject_19 139  117      22   TRUE
Subject_20 Subject_20 135  113      22   TRUE
```

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

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

```
bp_list$treatment
```

```
            names_obj pre post diff_op normal
Subject_1   Subject_1 130  114      16   TRUE
Subject_2   Subject_2 128   98      30   TRUE
Subject_3   Subject_3 116  113       3   TRUE
Subject_4   Subject_4 124   99      25   TRUE
Subject_5   Subject_5 133  107      26   TRUE
Subject_6   Subject_6 134  116      18   TRUE
Subject_7   Subject_7 118  113       5   TRUE
Subject_8   Subject_8 126  111      15   TRUE
Subject_9   Subject_9 114  119      -5   TRUE
Subject_10 Subject_10 127  117      10   TRUE
Subject_11 Subject_11 141  101      40   TRUE
Subject_12 Subject_12 138  119      19   TRUE
Subject_13 Subject_13 128  130      -2  FALSE
Subject_14 Subject_14 140  122      18  FALSE
Subject_15 Subject_15 137  106      31   TRUE
Subject_16 Subject_16 131  106      25   TRUE
```

```
Subject_17 Subject_17 120  124      -4  FALSE
Subject_18 Subject_18 128  102      26   TRUE
Subject_19 Subject_19 139  117      22   TRUE
Subject_20 Subject_20 135  113      22   TRUE
```

Question 4

```
bp_list$placebo[,2]
```

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

Task 4: Control Flow Practice

Question 1

```
bp_data_frame$status <- character(20)
bp_df_placebo$status <- character(10)

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

Question 2

```
for(i in 1:nrow(bp_list$treatment)){
  bp = bp_list$treatment[i,3]
  if(bp > 130){
    bp_list$treatment[i,6] = "High"
  } else if(120 < bp & bp <= 130){
    bp_list$treatment[i,6] = "Borderline"
  } else if(bp <= 120){
    bp_list$treatment[i,6] = "Optimal"
  }
}

bp_list$treatment
```

```
            names_obj pre post diff_op normal     status
Subject_1   Subject_1 130  114      16   TRUE    Optimal
Subject_2   Subject_2 128   98      30   TRUE    Optimal
Subject_3   Subject_3 116  113       3   TRUE    Optimal
Subject_4   Subject_4 124   99      25   TRUE    Optimal
Subject_5   Subject_5 133  107      26   TRUE    Optimal
Subject_6   Subject_6 134  116      18   TRUE    Optimal
Subject_7   Subject_7 118  113       5   TRUE    Optimal
Subject_8   Subject_8 126  111      15   TRUE    Optimal
Subject_9   Subject_9 114  119      -5   TRUE    Optimal
Subject_10 Subject_10 127  117      10   TRUE    Optimal
Subject_11 Subject_11 141  101      40   TRUE    Optimal
Subject_12 Subject_12 138  119      19   TRUE    Optimal
Subject_13 Subject_13 128  130      -2  FALSE Borderline
Subject_14 Subject_14 140  122      18  FALSE Borderline
Subject_15 Subject_15 137  106      31   TRUE    Optimal
Subject_16 Subject_16 131  106      25   TRUE    Optimal
Subject_17 Subject_17 120  124      -4  FALSE Borderline
Subject_18 Subject_18 128  102      26   TRUE    Optimal
Subject_19 Subject_19 139  117      22   TRUE    Optimal
Subject_20 Subject_20 135  113      22   TRUE    Optimal
```

Question 3

```r
for(i in 1:nrow(bp_list$placebo)){
  bp = bp_list$placebo[i,3]
  if(bp > 130){
    bp_list$placebo[i,6] = "High"
  } else if(120 < bp & bp <= 130){
    bp_list$placebo[i,6] = "Borderline"
  } else if(bp <= 120){
    bp_list$placebo[i,6] = "Optimal"
  }
}

bp_list$placebo
```

```
   names_pla pre_placebo post_placebo diff_placebo normal     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

```
my_function <- function(list, stat = "mean"){
  my_fun <- get(stat)

  names1 <- paste("treat", c("pre", "post", "diff"), stat, sep = "_")
  names2 <- paste("placebo", c("pre", "post", "diff"), stat, sep = "_")
  names <- c(names1, names2)

  values <- c()

  for(i in c(2:4)){
    trt_value <- my_fun(list$treatment[[i]])
    values <- c(values, trt_value)
  }

  for(i in c(2:4)){
    pla_value <- my_fun(list$placebo[[i]])
    values <- c(values, pla_value)
  }

  names(values) <- names
  return(values)
}

my_function(bp_list)
```

```
   treat_pre_mean   treat_post_mean   treat_diff_mean  placebo_pre_mean
           129.35            112.35             17.00            131.90
placebo_post_mean placebo_diff_mean
           128.90              3.00
```

```r
my_function(bp_list, "var")
```

```
   treat_pre_var   treat_post_var   treat_diff_var  placebo_pre_var
        64.55526         74.76579        153.68421        149.87778
placebo_post_var placebo_diff_var
       124.98889        341.33333
```

```r
my_function(bp_list, "sd")
```

```
   treat_pre_sd   treat_post_sd   treat_diff_sd  placebo_pre_sd placebo_post_sd
       8.034629        8.646721       12.396944       12.242458       11.179843
placebo_diff_sd
      18.475209
```

```r
my_function(bp_list, "min")
```

```
   treat_pre_min   treat_post_min   treat_diff_min  placebo_pre_min
             114               98               -5              114
placebo_post_min placebo_diff_min
             105              -21
```

```r
my_function(bp_list, "max")
```

```
   treat_pre_max   treat_post_max   treat_diff_max  placebo_pre_max
             141              130               40              152
placebo_post_max placebo_diff_max
             143               33
```