

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, 125, 119, 122)
post <- c(114, 98, 113, 99, 107, 116, 113, 111, 119, 117, 101, 119, 130, 122, 106, 106, 124, 120, 115, 110)
```

Question 2

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

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

Question 3

```
#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

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

#Print the mean difference
meandiff
```

```
[1] -17
```

Question 5

```
#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 blood pressure for those who had a decrease in blood pressure 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
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

patient	pre_bp	post_bp	diff_bp	post_under_120
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

#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

```
#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

```
#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

```
for (i in 1:nrow(list_bp$treatment)) {
  bp <- list_bp$treatment$post_bp[i] #create a simple phrase to access each element of post_bp

  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] <- "Errorr"
  }
}
```

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] #create a simple phrase to access each element of post_bp

  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] <- "Errorr"
  }
}

```

```

#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

```
#Define the function with no default data and "mean" as the default stat
summarize_bp <- function(list_bp, stat = "mean") {
  bp_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(
    bp_fun(treat$pre_bp),
    bp_fun(treat$post_bp),
    bp_fun(treat$diff_bp),
    bp_fun(placebo$pre_bp),
    bp_fun(placebo$post_bp),
    bp_fun(placebo$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
```

```
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
```