```
9   9 Mujahid  50  65000    Finance                89
10 10    Asik  27  40000         IT                75
   Experience Constant_Column Bonus High_Performer
1           2               1 440.0           TRUE
2           5               1 506.0           TRUE
3          10               1 510.0           TRUE
4           3               1 351.0          FALSE
5           8               1 630.0           TRUE
6           4               1 488.8           TRUE
7           2               1 412.8           TRUE
8           1               1 544.0          FALSE
9           1               1 578.5           TRUE
10          6               1 300.0          FALSE
> data[data$High_Performer, ]
  ID    Name Age Salary Department Performance_Score
1  1  Shihab  25  50000         HR                88
2  2   Kabir  30  55000    Finance                92
3  3  Mahbub  35  60000         IT                85
5  5  Nusrat  28  70000         IT                90
6  6    Mumu  32  52000    Finance                94
7  7   Meraj  45  48000         IT                86
9  9 Mujahid  50  65000    Finance                89
  Experience Constant_Column Bonus High_Performer
1          2               1 440.0           TRUE
2          5               1 506.0           TRUE
3         10               1 510.0           TRUE
5          8               1 630.0           TRUE
6          4               1 488.8           TRUE
7          2               1 412.8           TRUE
9          1               1 578.5           TRUE
>
> data$Low_Performer <- !data$High_Performer
> data
   ID    Name Age Salary Department Performance_Score
1   1  Shihab  25  50000         HR                88
2   2   Kabir  30  55000    Finance                92
3   3  Mahbub  35  60000         IT                85
4   4  Pranto  40  45000         HR                78
5   5  Nusrat  28  70000         IT                90
6   6    Mumu  32  52000    Finance                94
7   7   Meraj  45  48000         IT                86
8   8   Supto  29  68000         HR                80
```

```
9   9 Mujahid  50  65000    Finance                89
10 10    Asik  27  40000         IT                75
   Experience Constant_Column Bonus High_Performer
1           2               1 440.0           TRUE
2           5               1 506.0           TRUE
3          10               1 510.0           TRUE
4           3               1 351.0          FALSE
5           8               1 630.0           TRUE
6           4               1 488.8           TRUE
7           2               1 412.8           TRUE
8           1               1 544.0          FALSE
9           1               1 578.5           TRUE
10          6               1 300.0          FALSE
   Low_Performer
1          FALSE
2          FALSE
3          FALSE
4           TRUE
5          FALSE
6          FALSE
7          FALSE
8           TRUE
9          FALSE
10          TRUE
> # Add a new column with a computed value
> data3 <- data %>%
+  mutate(
+    Experience = c(2, 5, 10, 3, 8, 4, 2, 1, 1, 6),    # Add a new column with a
existing values
+    Constant_Column = 1,                              # Add a constant value
+    High_Performer = Performance_Score >= 85,         # Add a column using conditional
logic
+    Low_Performer = !High_Performer,                  # Add a column using conditional
logic
+    Bonus = Salary * Performance_Score * 0.0001       # Add a calculated column
+  )
> # Removing columns ----------------------------------------------------------
>
> ## Base R ####
>
> # Remove a column by assigning NULL
> data3$Constant_Column <- NULL
```

```
> data3
   ID    Name Age Salary Department Performance_Score
1   1  Shihab  25  50000         HR                88
2   2   Kabir  30  55000    Finance                92
3   3  Mahbub  35  60000         IT                85
4   4  Pranto  40  45000         HR                78
5   5  Nusrat  28  70000         IT                90
6   6    Mumu  32  52000    Finance                94
7   7   Meraj  45  48000         IT                86
8   8   Supto  29  68000         HR                80
9   9 Mujahid  50  65000    Finance                89
10 10    Asik  27  40000         IT                75
   Experience Bonus High_Performer Low_Performer
1           2 440.0           TRUE         FALSE
2           5 506.0           TRUE         FALSE
3          10 510.0           TRUE         FALSE
4           3 351.0          FALSE          TRUE
5           8 630.0           TRUE         FALSE
6           4 488.8           TRUE         FALSE
7           2 412.8           TRUE         FALSE
8           1 544.0          FALSE          TRUE
9           1 578.5           TRUE         FALSE
10          6 300.0          FALSE          TRUE
> # Remove multiple columns using subset
> data3 <- data3[ , !(names(data3) %in% c("High_Performer", "Low_Performer",
"Experience"))]
> data3
   ID    Name Age Salary Department Performance_Score
1   1  Shihab  25  50000         HR                88
2   2   Kabir  30  55000    Finance                92
3   3  Mahbub  35  60000         IT                85
4   4  Pranto  40  45000         HR                78
5   5  Nusrat  28  70000         IT                90
6   6    Mumu  32  52000    Finance                94
7   7   Meraj  45  48000         IT                86
8   8   Supto  29  68000         HR                80
9   9 Mujahid  50  65000    Finance                89
10 10    Asik  27  40000         IT                75
   Bonus
1  440.0
2  506.0
3  510.0
```

```
4  351.0
5  630.0
6  488.8
7  412.8
8  544.0
9  578.5
10 300.0
> data
   ID    Name Age Salary Department Performance_Score
1   1  Shihab  25  50000         HR                88
2   2   Kabir  30  55000    Finance                92
3   3  Mahbub  35  60000         IT                85
4   4  Pranto  40  45000         HR                78
5   5  Nusrat  28  70000         IT                90
6   6    Mumu  32  52000    Finance                94
7   7   Meraj  45  48000         IT                86
8   8   Supto  29  68000         HR                80
9   9 Mujahid  50  65000    Finance                89
10 10    Asik  27  40000         IT                75
   Experience Constant_Column Bonus High_Performer
1           2               1 440.0           TRUE
2           5               1 506.0           TRUE
3          10               1 510.0           TRUE
4           3               1 351.0          FALSE
5           8               1 630.0           TRUE
6           4               1 488.8           TRUE
7           2               1 412.8           TRUE
8           1               1 544.0          FALSE
9           1               1 578.5           TRUE
10          6               1 300.0          FALSE
   Low_Performer
1          FALSE
2          FALSE
3          FALSE
4           TRUE
5          FALSE
6          FALSE
7          FALSE
8           TRUE
9          FALSE
10          TRUE
> data
```

```
   ID    Name Age Salary Department Performance_Score
1   1  Shihab  25  50000         HR                88
2   2   Kabir  30  55000    Finance                92
3   3  Mahbub  35  60000         IT                85
4   4  Pranto  40  45000         HR                78
5   5  Nusrat  28  70000         IT                90
6   6    Mumu  32  52000    Finance                94
7   7   Meraj  45  48000         IT                86
8   8   Supto  29  68000         HR                80
9   9 Mujahid  50  65000    Finance                89
10 10    Asik  27  40000         IT                75
   Experience Constant_Column Bonus High_Performer
1           2               1 440.0           TRUE
2           5               1 506.0           TRUE
3          10               1 510.0           TRUE
4           3               1 351.0          FALSE
5           8               1 630.0           TRUE
6           4               1 488.8           TRUE
7           2               1 412.8           TRUE
8           1               1 544.0          FALSE
9           1               1 578.5           TRUE
10          6               1 300.0          FALSE
   Low_Performer
1          FALSE
2          FALSE
3          FALSE
4           TRUE
5          FALSE
6          FALSE
7          FALSE
8           TRUE
9          FALSE
10          TRUE
> # Remove a single column
> data <- data %>% select(-Performance_Score)
> data
   ID    Name Age Salary Department Experience
1   1  Shihab  25  50000         HR          2
2   2   Kabir  30  55000    Finance          5
3   3  Mahbub  35  60000         IT         10
4   4  Pranto  40  45000         HR          3
5   5  Nusrat  28  70000         IT          8
```

```
6   6    Mumu  32  52000    Finance          4
7   7   Meraj  45  48000         IT          2
8   8   Supto  29  68000         HR          1
9   9 Mujahid  50  65000    Finance          1
10 10    Asik  27  40000         IT          6
   Constant_Column Bonus High_Performer Low_Performer
1                1 440.0           TRUE         FALSE
2                1 506.0           TRUE         FALSE
3                1 510.0           TRUE         FALSE
4                1 351.0          FALSE          TRUE
5                1 630.0           TRUE         FALSE
6                1 488.8           TRUE         FALSE
7                1 412.8           TRUE         FALSE
8                1 544.0          FALSE          TRUE
9                1 578.5           TRUE         FALSE
10               1 300.0          FALSE          TRUE
> # Remove multiple columns
> data <- data %>% select(-c(Department, Age))
> data
   ID    Name Salary Experience Constant_Column Bonus
1   1  Shihab  50000          2               1 440.0
2   2   Kabir  55000          5               1 506.0
3   3  Mahbub  60000         10               1 510.0
4   4  Pranto  45000          3               1 351.0
5   5  Nusrat  70000          8               1 630.0
6   6    Mumu  52000          4               1 488.8
7   7   Meraj  48000          2               1 412.8
8   8   Supto  68000          1               1 544.0
9   9 Mujahid  65000          1               1 578.5
10 10    Asik  40000          6               1 300.0
   High_Performer Low_Performer
1            TRUE         FALSE
2            TRUE         FALSE
3            TRUE         FALSE
4           FALSE          TRUE
5            TRUE         FALSE
6            TRUE         FALSE
7            TRUE         FALSE
8           FALSE          TRUE
9            TRUE         FALSE
10          FALSE          TRUE
> # Remove columns based on a condition
```

```
> data %>% select(-where(is.character))
   ID Salary Experience Constant_Column Bonus
1   1  50000          2               1 440.0
2   2  55000          5               1 506.0
3   3  60000         10               1 510.0
4   4  45000          3               1 351.0
5   5  70000          8               1 630.0
6   6  52000          4               1 488.8
7   7  48000          2               1 412.8
8   8  68000          1               1 544.0
9   9  65000          1               1 578.5
10 10  40000          6               1 300.0
   High_Performer Low_Performer
1            TRUE         FALSE
2            TRUE         FALSE
3            TRUE         FALSE
4           FALSE          TRUE
5            TRUE         FALSE
6            TRUE         FALSE
7            TRUE         FALSE
8           FALSE          TRUE
9            TRUE         FALSE
10          FALSE          TRUE
> data
   ID    Name Salary Experience Constant_Column Bonus
1   1  Shihab  50000          2               1 440.0
2   2   Kabir  55000          5               1 506.0
3   3  Mahbub  60000         10               1 510.0
4   4  Pranto  45000          3               1 351.0
5   5  Nusrat  70000          8               1 630.0
6   6    Mumu  52000          4               1 488.8
7   7   Meraj  48000          2               1 412.8
8   8   Supto  68000          1               1 544.0
9   9 Mujahid  65000          1               1 578.5
10 10    Asik  40000          6               1 300.0
   High_Performer Low_Performer
1            TRUE         FALSE
2            TRUE         FALSE
3            TRUE         FALSE
4           FALSE          TRUE
5            TRUE         FALSE
6            TRUE         FALSE
```

```
7            TRUE         FALSE
8           FALSE          TRUE
9            TRUE         FALSE
10          FALSE          TRUE
> data <- data.frame(
+  ID = 1:10,
+  Name = c("Shihab", "Kabir", "Mahbub", "Pranto", "Nusrat",
+           "Mumu", "Meraj", "Supto", "Mujahid", "Asik"),
+  Age = c(25, 30, 35, 40, 28, 32, 45, 29, 50, 27),
+  Salary = c(50000, 55000, 60000, 45000, 70000,
+             52000, 48000, 68000, 65000, 40000),
+  Department = c("HR", "Finance", "IT", "HR", "IT",
+                 "Finance", "IT", "HR", "Finance", "IT"),
+  Performance_Score = c(88, 92, 85, 78, 90, 94, 86, 80, 89, 75)
+ )
> print(data)
   ID    Name Age Salary Department Performance_Score
1   1  Shihab  25  50000         HR                88
2   2   Kabir  30  55000    Finance                92
3   3  Mahbub  35  60000         IT                85
4   4  Pranto  40  45000         HR                78
5   5  Nusrat  28  70000         IT                90
6   6    Mumu  32  52000    Finance                94
7   7   Meraj  45  48000         IT                86
8   8   Supto  29  68000         HR                80
9   9 Mujahid  50  65000    Finance                89
10 10    Asik  27  40000         IT                75
> # Rename a column
> colnames(data)[which(colnames(data) == "Salary")] <- "Monthly_Salary"
> data
   ID    Name Age Monthly_Salary Department
1   1  Shihab  25          50000         HR
2   2   Kabir  30          55000    Finance
3   3  Mahbub  35          60000         IT
4   4  Pranto  40          45000         HR
5   5  Nusrat  28          70000         IT
6   6    Mumu  32          52000    Finance
7   7   Meraj  45          48000         IT
8   8   Supto  29          68000         HR
9   9 Mujahid  50          65000    Finance
10 10    Asik  27          40000         IT
   Performance_Score
```

```
1                 88
2                 92
3                 85
4                 78
5                 90
6                 94
7                 86
8                 80
9                 89
10                75
> # Modify an existing column
> data$Age <- data$Age + 1
> data
   ID    Name Age Monthly_Salary Department
1   1  Shihab  26          50000         HR
2   2   Kabir  31          55000    Finance
3   3  Mahbub  36          60000         IT
4   4  Pranto  41          45000         HR
5   5  Nusrat  29          70000         IT
6   6    Mumu  33          52000    Finance
7   7   Meraj  46          48000         IT
8   8   Supto  30          68000         HR
9   9 Mujahid  51          65000    Finance
10 10    Asik  28          40000         IT
   Performance_Score
1                 88
2                 92
3                 85
4                 78
5                 90
6                 94
7                 86
8                 80
9                 89
10                75
> data
   ID    Name Age Monthly_Salary Department
1   1  Shihab  26          50000         HR
2   2   Kabir  31          55000    Finance
3   3  Mahbub  36          60000         IT
4   4  Pranto  41          45000         HR
5   5  Nusrat  29          70000         IT
```

```
6   6    Mumu  33          52000    Finance
7   7   Meraj  46          48000         IT
8   8   Supto  30          68000         HR
9   9 Mujahid  51          65000    Finance
10 10    Asik  28          40000         IT
   Performance_Score
1                 88
2                 92
3                 85
4                 78
5                 90
6                 94
7                 86
8                 80
9                 89
10                75
> data[data$Name == "Shihab", "Performance_Score"] <- 80
> data
   ID    Name Age Monthly_Salary Department
1   1  Shihab  26          50000         HR
2   2   Kabir  31          55000    Finance
3   3  Mahbub  36          60000         IT
4   4  Pranto  41          45000         HR
5   5  Nusrat  29          70000         IT
6   6    Mumu  33          52000    Finance
7   7   Meraj  46          48000         IT
8   8   Supto  30          68000         HR
9   9 Mujahid  51          65000    Finance
10 10    Asik  28          40000         IT
   Performance_Score
1                 80
2                 92
3                 85
4                 78
5                 90
6                 94
7                 86
8                 80
9                 89
10                75
> data <- data.frame(
+  ID = 1:10,
```

```
+  Name = c("Shihab", "Kabir", "Mahbub", "Pranto", "Nusrat",
+           "Mumu", "Meraj", "Supto", "Mujahid", "Asik"),
+  Age = c(25, 30, 35, 40, 28, 32, 45, 29, 50, 27),
+  Salary = c(50000, 55000, 60000, 45000, 70000,
+             52000, 48000, 68000, 65000, 40000),
+  Department = c("HR", "Finance", "IT", "HR", "IT",
+                 "Finance", "IT", "HR", "Finance", "IT"),
+  Performance_Score = c(88, 92, 85, 78, 90, 94, 86, 80, 89, 75)
+ )
> new_row <- data.frame(
+  ID = 11,
+  Name = "Nadia",
+  Age = 26,
+  Salary = 60000,
+  Department = factor("IT"),
+  Performance_Score = 88
+ )
> new_row
  ID  Name Age Salary Department Performance_Score
1 11 Nadia  26  60000         IT                88
> data <- bind_rows(data, new_row)
> data
   ID    Name Age Salary Department Performance_Score
1   1  Shihab  25  50000         HR                88
2   2   Kabir  30  55000    Finance                92
3   3  Mahbub  35  60000         IT                85
4   4  Pranto  40  45000         HR                78
5   5  Nusrat  28  70000         IT                90
6   6    Mumu  32  52000    Finance                94
7   7   Meraj  45  48000         IT                86
8   8   Supto  29  68000         HR                80
9   9 Mujahid  50  65000    Finance                89
10 10    Asik  27  40000         IT                75
11 11   Nadia  26  60000         IT                88
> data <- data %>% filter(Name != "Nadia")
> data %>% filter(Name != "Nadia")
   ID    Name Age Salary Department Performance_Score
1   1  Shihab  25  50000         HR                88
2   2   Kabir  30  55000    Finance                92
3   3  Mahbub  35  60000         IT                85
4   4  Pranto  40  45000         HR                78
5   5  Nusrat  28  70000         IT                90
```

```
6   6    Mumu  32  52000    Finance                94
7   7   Meraj  45  48000         IT                86
8   8   Supto  29  68000         HR                80
9   9 Mujahid  50  65000    Finance                89
10 10    Asik  27  40000         IT                75
> data <- data.frame(
+  ID = 1:10,
+  Name = c("Shihab", "Kabir", "Mahbub", "Pranto", "Nusrat",
+           "Mumu", "Meraj", "Supto", "Mujahid", "Asik"),
+  Age = c(25, 30, 35, 40, 28, 32, 45, 29, 50, 27),
+  Salary = c(50000, 55000, 60000, 45000, 70000,
+             52000, 48000, 68000, 65000, 40000),
+  Department = c("HR", "Finance", "IT", "HR", "IT",
+                 "Finance", "IT", "HR", "Finance", "IT"),
+  Performance_Score = c(88, 92, 85, 78, 90, 94, 86, 80, 89, 75)
+ )
> # Update values in specific rows
> data %>% mutate(
+  Performance_Score = if_else(Name == "Shihab", 80, if_else(
+    Department == "HR", 60, Performance_Score
+  ))
+ )
   ID    Name Age Salary Department Performance_Score
1   1  Shihab  25  50000         HR                80
2   2   Kabir  30  55000    Finance                92
3   3  Mahbub  35  60000         IT                85
4   4  Pranto  40  45000         HR                60
5   5  Nusrat  28  70000         IT                90
6   6    Mumu  32  52000    Finance                94
7   7   Meraj  45  48000         IT                86
8   8   Supto  29  68000         HR                60
9   9 Mujahid  50  65000    Finance                89
10 10    Asik  27  40000         IT                75
> data %>% mutate(
+  Performance_Score = if_else(Name == "Shihab", 80, if_else(
+    Department == "HR", 60, Performance_Score
+  ))
+ )
   ID    Name Age Salary Department Performance_Score
1   1  Shihab  25  50000         HR                80
2   2   Kabir  30  55000    Finance                92
3   3  Mahbub  35  60000         IT                85
```

```
4   4  Pranto  40  45000         HR                60
5   5  Nusrat  28  70000         IT                90
6   6    Mumu  32  52000    Finance                94
7   7   Meraj  45  48000         IT                86
8   8   Supto  29  68000         HR                60
9   9 Mujahid  50  65000    Finance                89
10 10    Asik  27  40000         IT                75
> data %>%
+  arrange(Performance_Score)
   ID    Name Age Salary Department Performance_Score
1  10    Asik  27  40000         IT                75
2   4  Pranto  40  45000         HR                78
3   8   Supto  29  68000         HR                80
4   3  Mahbub  35  60000         IT                85
5   7   Meraj  45  48000         IT                86
6   1  Shihab  25  50000         HR                88
7   9 Mujahid  50  65000    Finance                89
8   5  Nusrat  28  70000         IT                90
9   2   Kabir  30  55000    Finance                92
10  6    Mumu  32  52000    Finance                94
> data %>%
+  arrange(desc(Performance_Score))
   ID    Name Age Salary Department Performance_Score
1   6    Mumu  32  52000    Finance                94
2   2   Kabir  30  55000    Finance                92
3   5  Nusrat  28  70000         IT                90
4   9 Mujahid  50  65000    Finance                89
5   1  Shihab  25  50000         HR                88
6   7   Meraj  45  48000         IT                86
7   3  Mahbub  35  60000         IT                85
8   8   Supto  29  68000         HR                80
9   4  Pranto  40  45000         HR                78
10 10    Asik  27  40000         IT                75
> data %>%
+  arrange(Department, desc(Performance_Score))
   ID    Name Age Salary Department Performance_Score
1   6    Mumu  32  52000    Finance                94
2   2   Kabir  30  55000    Finance                92
3   9 Mujahid  50  65000    Finance                89
4   1  Shihab  25  50000         HR                88
5   8   Supto  29  68000         HR                80
6   4  Pranto  40  45000         HR                78
```

```
7   5  Nusrat  28  70000         IT                90
8   7   Meraj  45  48000         IT                86
9   3  Mahbub  35  60000         IT                85
10 10    Asik  27  40000         IT                75
> data_wide <- data.frame(
+  country = c("BD", "Ghana", "UK", "Canada"),
+  continent = c("Asia", "Africa", "Europe", "North America"),
+  GDP_1960 = c(10, 20, 30, 40),
+  GDP_1970 = c(13, 23, 33, 45),
+  GDP_2010 = c(15, 25, 35, 60),
+  stringsAsFactors = FALSE
+ )
> data_wide
  country     continent GDP_1960 GDP_1970 GDP_2010
1      BD          Asia       10       13       15
2   Ghana        Africa       20       23       25
3      UK        Europe       30       33       35
4  Canada North America       40       45       60
> data_long <- data_wide %>%
+  tidyr::pivot_longer(cols = starts_with("GDP_"),   # Selecting columns starting with
"GDP_"
+                      names_to = "Year",            # The name of the new column that
will hold the years
+                      names_prefix = "GDP_",        # Remove "GDP_" from the column
names
+                      values_to = "GDP"             # The name of the new column that
will hold the GDP values
+  )
Error in loadNamespace(x) : there is no package called 'tidyr'
> install.packages("tidyr")
also installing the dependencies 'purrr', 'cpp11'

trying URL 'https://cran.rstudio.com/bin/windows/contrib/4.4/purrr_1.0.2.zip'
Content type 'application/zip' length 513726 bytes (501 KB)
downloaded 501 KB

trying URL 'https://cran.rstudio.com/bin/windows/contrib/4.4/cpp11_0.5.1.zip'
Content type 'application/zip' length 310612 bytes (303 KB)
downloaded 303 KB

trying URL 'https://cran.rstudio.com/bin/windows/contrib/4.4/tidyr_1.3.1.zip'
Content type 'application/zip' length 1272747 bytes (1.2 MB)
```

```
downloaded 1.2 MB

package 'purrr' successfully unpacked and MD5 sums checked
package 'cpp11' successfully unpacked and MD5 sums checked
package 'tidyr' successfully unpacked and MD5 sums checked

The downloaded binary packages are in
       C:\Users\ACER\AppData\Local\Temp\RtmpQBlkS5\downloaded_packages
> data_long
Error: object 'data_long' not found
> data_long <- data_wide %>%
+   tidyr::pivot_longer(cols = starts_with("GDP_"),    # Selecting columns starting with
"GDP_"
+                       names_to = "Year",             # The name of the new column that
will hold the years
+                       names_prefix = "GDP_",         # Remove "GDP_" from the column
names
+                       values_to = "GDP"              # The name of the new column that
will hold the GDP values
+   )
> data_long
# A tibble: 12 × 4
   country continent     Year    GDP
   <chr>   <chr>         <chr> <dbl>
 1 BD      Asia          1960     10
 2 BD      Asia          1970     13
 3 BD      Asia          2010     15
 4 Ghana   Africa        1960     20
 5 Ghana   Africa        1970     23
 6 Ghana   Africa        2010     25
 7 UK      Europe        1960     30
 8 UK      Europe        1970     33
 9 UK      Europe        2010     35
10 Canada  North America 1960     40
11 Canada  North America 1970     45
12 Canada  North America 2010     60
> data_wide_back <- data_long %>%
+   pivot_wider(names_from = "Year",    # Columns created based on unique values in the
"Year" column
+               values_from = "GDP"     # Values for each "Year" will come from the
"GDP" column
+   )
```

```
Error in pivot_wider(., names_from = "Year", values_from = "GDP") :
  could not find function "pivot_wider"
> data_wide_back <- data_long %>%
+  pivot_wider(names_from = "Year",    # Columns created based on unique values in the
"Year" column
+              values_from = "GDP"     # Values for each "Year" will come from the
"GDP" column
+  )
Error in pivot_wider(., names_from = "Year", values_from = "GDP") :
  could not find function "pivot_wider"
> data_wide_back <- data_long %>%
+  pivot_wider(names_from = "Year",    # Columns created based on unique values in the
"Year" column
+              values_from = "GDP"     # Values for each "Year" will come from the
"GDP" column
+  )
Error in pivot_wider(., names_from = "Year", values_from = "GDP") :
  could not find function "pivot_wider"
> data_wide_back <- data_long %>%
+  filter(Year != "1960") %>%
+  pivot_wider(names_from = "Year",    # Columns created based on unique values in the
"Year" column
+              values_from = "GDP",    # Values for each "Year" will come from the
"GDP" column
+              names_prefix = "GDP_"
+  )
Error in pivot_wider(., names_from = "Year", values_from = "GDP", names_prefix =
"GDP_") :
  could not find function "pivot_wider"
> # install.packages("tidyr")
> library(tidyr)
> data_wide_back <- data_long %>%
+  pivot_wider(names_from = "Year",    # Columns created based on unique values in the
"Year" column
+              values_from = "GDP"     # Values for each "Year" will come from the
"GDP" column
+  )
> data_wide_back
# A tibble: 4 × 5
  country continent     `1960` `1970` `2010`
  <chr>   <chr>          <dbl>  <dbl>  <dbl>
1 BD      Asia              10     13     15
```

```
2 Ghana   Africa            20     23     25
3 UK      Europe            30     33     35
4 Canada  North America     40     45     60
> data_wide_back <- data_long %>%
+  filter(Year != "1960") %>%
+  pivot_wider(names_from = "Year",   # Columns created based on unique values in the
"Year" column
+              values_from = "GDP",   # Values for each "Year" will come from the
"GDP" column
+              names_prefix = "GDP_"
+  )
> data_wide_back
# A tibble: 4 × 4
  country continent     GDP_1970 GDP_2010
  <chr>   <chr>            <dbl>    <dbl>
1 BD      Asia                13       15
2 Ghana   Africa              23       25
3 UK      Europe              33       35
4 Canada  North America       45       60
> # Sample dataset 1
> employees <- data.frame(
+  ID = c(1, 2, 3, 4, 5),
+  Name = c("Shihab", "Kabir", "Mahbub", "Pranto", "Nusrat"),
+  Department = c("HR", "IT", "Finance", "IT", "HR")
+ )
> employees
  ID   Name Department
1  1 Shihab         HR
2  2  Kabir         IT
3  3 Mahbub    Finance
4  4 Pranto         IT
5  5 Nusrat         HR
> # Sample dataset 2
> salaries <- data.frame(
+  ID = c(1, 2, 3, 4, 6),
+  Salary = c(50000, 60000, 70000, 75000, 40000)
+ )
> employees
  ID   Name Department
1  1 Shihab         HR
2  2  Kabir         IT
3  3 Mahbub    Finance
```

```
4  4 Pranto         IT
5  5 Nusrat         HR
> salaries
  ID Salary
1  1  50000
2  2  60000
3  3  70000
4  4  75000
5  6  40000
> left_join(employees, salaries, by = "ID")
  ID   Name Department Salary
1  1 Shihab         HR  50000
2  2  Kabir         IT  60000
3  3 Mahbub    Finance  70000
4  4 Pranto         IT  75000
5  5 Nusrat         HR     NA
> inner_join(employees, salaries, by = "ID")
  ID   Name Department Salary
1  1 Shihab         HR  50000
2  2  Kabir         IT  60000
3  3 Mahbub    Finance  70000
4  4 Pranto         IT  75000
> right_join(employees, salaries, by = "ID")
  ID   Name Department Salary
1  1 Shihab         HR  50000
2  2  Kabir         IT  60000
3  3 Mahbub    Finance  70000
4  4 Pranto         IT  75000
5  6   <NA>       <NA>  40000
> full_join(employees, salaries, by = "ID")
  ID   Name Department Salary
1  1 Shihab         HR  50000
2  2  Kabir         IT  60000
3  3 Mahbub    Finance  70000
4  4 Pranto         IT  75000
5  5 Nusrat         HR     NA
6  6   <NA>       <NA>  40000
> source("D:/RProgramming/Class6/Self/Class6(inClass).R")
   ID    Name Age Salary Department Performance_Score
1   1  Shihab  25  50000         HR                88
2   2   Kabir  30  55000    Finance                92
3   3  Mahbub  35  60000         IT                85
```

4	4	Pranto	40	45000	HR	78
5	5	Nusrat	28	70000	IT	90
6	6	Mumu	32	52000	Finance	94
7	7	Meraj	45	48000	IT	86
8	8	Supto	29	68000	HR	80
9	9	Mujahid	50	65000	Finance	89
10	10	Asik	27	40000	IT	75