

# SETH L.U.J and SIR M.V COLLEGE

## PRAC: 11 12 13 14 15

**AIM:- 11 Reshaping data using pivot\_longer()/pivot\_wider() (R).**

The screenshot displays the RStudio interface with the following components:

- Source Editor:** Contains R code for reading data, pivoting, and printing results.
- Environment:** Lists objects in the workspace: category\_pivot, df, long\_df, Student\_Marks, and wide\_df.
- Console:** Shows the execution output, including the original wide data and the resulting long format data.
- Files Panel:** Shows the file explorer with various files and folders.

```
19 print("---- 2. Long Format (pivot_longer) ----")
20 print(head(long_df, 9)) # show first 9 rows (3 metrics per student)
21
22 # 3. PIVOT_WIDER: Spread back to wide format
23 wide_df <- long_df %>%
24   pivot_wider(
25     names_from = Metric,
26     values_from = value
27   )
28
29
30
```

```
> library(dplyr)
> library(tidyverse)
> # 1. SETUP: Read student marks data and add StudentID
> df <- read_csv("C:/Users/mvlu1/downloads/Student_Marks.csv", na.strings = c("", "NA")) %>%
+   mutate(StudentID = row_number()) %>%
+   select(StudentID, number_courses, time_study, Marks)
>
> print("---- 1. Original Wide Data ----")
> print(head(df))
  StudentID number_courses time_study Marks
1         1             3    4.508 19.202
2         2             4    0.096  7.734
3         3             4    3.133 13.811
4         4             6    7.909 53.018
5         5             8    7.811 55.299
6         6             6    3.211 17.822
>
> # 2. PIVOT_LONGER: Stack study metrics and marks into long format
> long_df <- df %>%
+   pivot_longer(
+     cols = c(number_courses, time_study, Marks),
+     names_to = "Metric",
+     values_to = "value"
+   )
>
> print("---- 2. Long Format (pivot_longer) ----")
```

The Environment pane shows the following objects:

Object	Obs.	Vars.
category_pivot	100	7
df	100	4
long_df	300	3
Student_Marks	100	3
wide_df	100	4

The Console output shows the first 6 rows of the original wide data:

StudentID	number_courses	time_study	Marks
1	3	4.508	19.202
2	4	0.096	7.734
3	4	3.133	13.811
4	6	7.909	53.018
5	8	7.811	55.299
6	6	3.211	17.822

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S075

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## PRAC: 11 12 13 14 15

The first screenshot shows the RStudio interface with the following code in the script editor:

```
19 print("---- 2. Long Format (pivot_longer) ----")
20 print(head(long_df, 9)) # show first 9 rows (3 metrics per student)
21
22 # 3. PIVOT_WIDER: Spread back to wide format
23 wide_df <- long_df %>%
24   pivot_wider(
25     names_from = Metric,
26     values_from = value
27   )
28
29
30
```

The console output shows the result of the pivot\_wider() function:

```
[1] "---- 2. Long Format (pivot_longer) ----"
[1] "---- 2. Long Format (pivot_longer) ----"
# A tibble: 9 x 3
  StudentID Metric      value
  <int> <chr> <dbl>
1 1 number_courses 3
2 1 time_study 4.51
3 1 Marks 19.2
4 2 number_courses 4
5 2 time_study 0.096
6 2 Marks 7.73
7 3 number_courses 4
8 3 time_study 3.13
9 3 Marks 13.8
```

The Environment pane shows the following data objects:

Object	Obs	Var
category_pivot	100	7
df	100	4
long_df	300	3
Student_Marks	100	3
wide_df	100	4

The second screenshot shows the RStudio interface with the following code in the script editor:

```
19 print("---- 3. Wide Format (Back to Original) ----")
20 print(head(wide_df))
21
22 # 4. PIVOT_LONGER: Spread back to long format
23 long_df <- wide_df %>%
24   pivot_longer(
25     names_from = Metric,
26     values_from = value
27   )
28
29
30
```

The console output shows the result of the pivot\_longer() function:

```
[1] "---- 3. Wide Format (Back to Original) ----"
[1] "---- 3. Wide Format (Back to Original) ----"
# A tibble: 6 x 4
  StudentID number_courses time_study Marks
  <int> <dbl> <dbl> <dbl>
1 1 3 4.51 19.2
2 2 4 0.096 7.73
3 3 4 3.13 13.8
4 4 6 7.91 53.0
5 5 8 7.81 55.3
6 6 6 3.21 17.8
```

The Environment pane shows the following data objects:

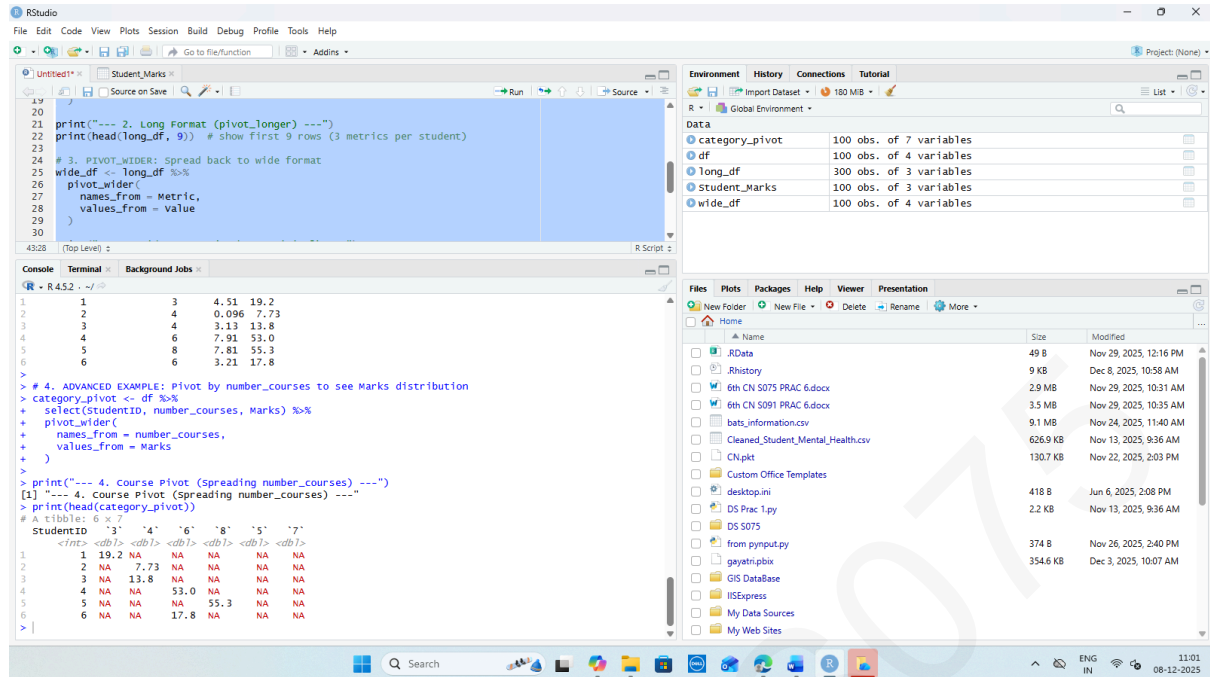
Object	Obs	Var
category_pivot	100	7
df	100	4
long_df	300	3
Student_Marks	100	3
wide_df	100	4

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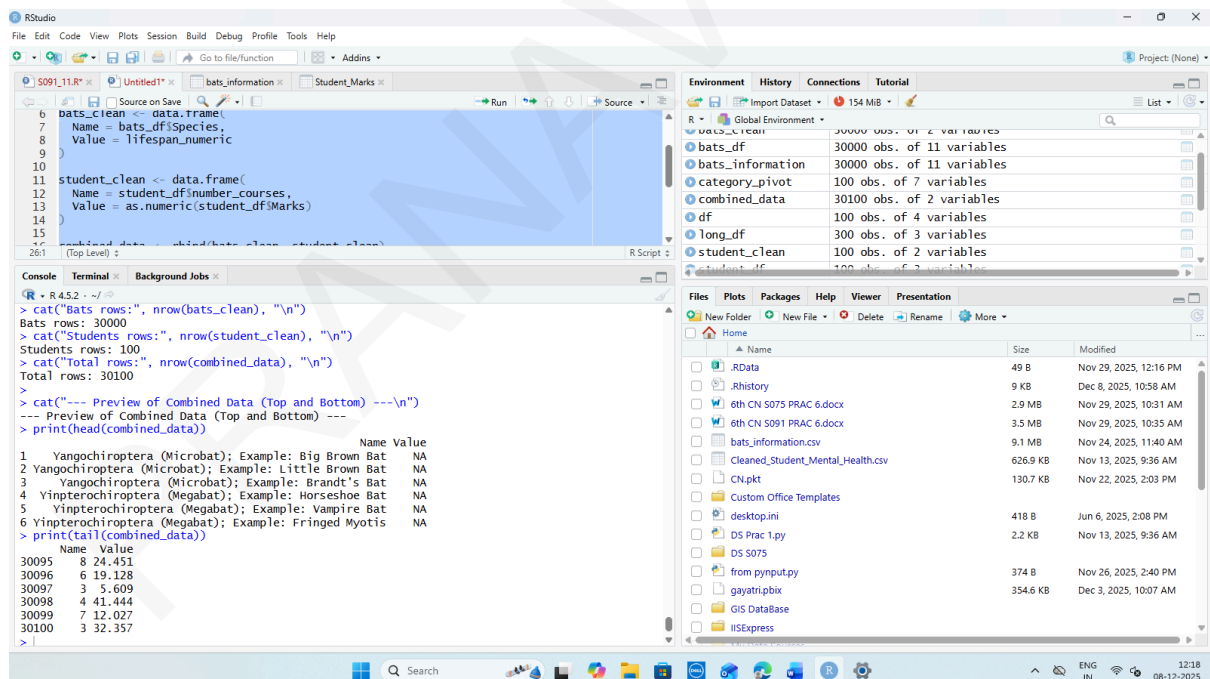
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## PRAC: 11 12 13 14 15



## 12 Combining datasets vertically (concatenation) using rbind() (R).



AIM:- 13 Identifying and handling duplicates using distinct() (R).

OUTPUT:-

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```
RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Addins
Source
Console Terminal Background Jobs
R - R 4.5.2 - ~/
> bats_df <- read.csv("C:/Users/mvlu/Downloads/bats_information.csv")
>
> bats_clean <- data.frame(
+   Name = bats_df$Species,
+   Value = as.numeric(sub(".*", "", bats_df$Average.Lifespan))
+ )
Warning message:
In data.frame(Name = bats_df$Species, Value = as.numeric(sub(".*", "", :
  NA's introduced by coercion
> print("--- Original Data ---")
[1] "--- Original Data ---"
> print(bats_clean)
      Name Value
1  Yangochiroptera (Microbat); Example: Big Brown Bat    NA
2  Yangochiroptera (Microbat); Example: Little Brown Bat    NA
3  Yangochiroptera (Microbat); Example: Brandt's Bat    NA
4  Yinpterochiroptera (Megabat); Example: Horseshoe Bat    NA
5  Yinpterochiroptera (Megabat); Example: Vampire Bat    NA
6  Yinpterochiroptera (Megabat); Example: Fringed Myotis    NA
7  Yinpterochiroptera (Megabat); Example: Horseshoe Bat    NA
8  Yinpterochiroptera (Megabat); Example: Brandt's Bat    NA
9  Yangochiroptera (Microbat); Example: Big Brown Bat    NA
10 Yangochiroptera (Microbat); Example: Horseshoe Bat    NA
11 Yangochiroptera (Microbat); Example: Big Brown Bat    NA
12 Yinpterochiroptera (Megabat); Example: Little Brown Bat    NA
13 Yinpterochiroptera (Megabat); Example: Brandt's Bat    NA
14 Yinpterochiroptera (Megabat); Example: Little Brown Bat    NA
15 Yangochiroptera (Microbat); Example: Little Brown Bat    NA
16 Yangochiroptera (Microbat); Example: Bumblebee Bat    NA
17 Yangochiroptera (Microbat); Example: Horseshoe Bat    NA
18 Yangochiroptera (Microbat); Example: Horseshoe Bat    NA
19 Yinpterochiroptera (Megabat); Example: Fringed Myotis    NA
20 Yinpterochiroptera (Megabat); Example: Big Brown Bat    NA
21 Yangochiroptera (Microbat); Example: Fringed Myotis    NA
22 Yangochiroptera (Microbat); Example: Big Brown Bat    NA
```

```
RStudio
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Addins
Source
Console Terminal Background Jobs
R - R 4.5.2 - ~/
492 Yangochiroptera (Microbat); Example: Spectral Bat    NA
493 Yinpterochiroptera (Megabat); Example: Little Brown Bat    NA
494 Yangochiroptera (Microbat); Example: Fringed Myotis    NA
495 Yinpterochiroptera (Megabat); Example: Little Brown Bat    NA
496 Yinpterochiroptera (Megabat); Example: Egyptian Fruit Bat    NA
497 Yangochiroptera (Microbat); Example: Fringed Myotis    NA
498 Yangochiroptera (Microbat); Example: Egyptian Fruit Bat    NA
499 Yangochiroptera (Microbat); Example: Big Brown Bat    NA
500 Yangochiroptera (Microbat); Example: Bumblebee Bat    NA
[ reached 'max' / getOption("max.print") -- omitted 29500 rows ]
> duplicates_report <- bats_clean %>%
+   group_by(Name, Value) %>%
+   count() %>%
+   filter(n > 1)
> print("--- Duplicate Rows ---")
[1] "--- Duplicate Rows ---"
> print(duplicates_report)
# A tibble: 18 x 3
# Groups:   Name, Value [18]
   Name                                     Value n
   <chr>                                     <dbl> <int>
1 Yangochiroptera (Microbat); Example: Big Brown Bat    NA    1672
2 Yangochiroptera (Microbat); Example: Brandt's Bat    NA    1687
3 Yangochiroptera (Microbat); Example: Bumblebee Bat    NA    1690
4 Yangochiroptera (Microbat); Example: Egyptian Fruit Bat    NA    1709
5 Yangochiroptera (Microbat); Example: Fringed Myotis    NA    1749
6 Yangochiroptera (Microbat); Example: Horseshoe Bat    NA    1636
7 Yangochiroptera (Microbat); Example: Little Brown Bat    NA    1644
8 Yangochiroptera (Microbat); Example: Spectral Bat    NA    1592
9 Yangochiroptera (Microbat); Example: Vampire Bat    NA    1696
10 Yinpterochiroptera (Megabat); Example: Big Brown Bat    NA    1693
11 Yinpterochiroptera (Megabat); Example: Brandt's Bat    NA    1723
12 Yinpterochiroptera (Megabat); Example: Bumblebee Bat    NA    1617
13 Yinpterochiroptera (Megabat); Example: Egyptian Fruit Bat    NA    1657
14 Yinpterochiroptera (Megabat); Example: Fringed Myotis    NA    1732
15 Yinpterochiroptera (Megabat); Example: Horseshoe Bat    NA    1653
```

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S075

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## PRAC: 11 12 13 14 15

```
R - R4.5.2 ~ / ~
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Addins
Project: (None)

Source
Console Terminal Background Jobs
R - R4.5.2 ~ / ~
# Groups: Name, Value [18]
#>   Name Value n
#>   <chr> <dbl> <int>
#> 1 Yangochiroptera (Microbat); Example: Big Brown Bat NA 1672
#> 2 Yangochiroptera (Microbat); Example: Brandt's Bat NA 1687
#> 3 Yangochiroptera (Microbat); Example: Bumblebee Bat NA 1690
#> 4 Yangochiroptera (Microbat); Example: Egyptian Fruit Bat NA 1709
#> 5 Yangochiroptera (Microbat); Example: Fringed Myotis NA 1749
#> 6 Yangochiroptera (Microbat); Example: Horseshoe Bat NA 1636
#> 7 Yangochiroptera (Microbat); Example: Little Brown Bat NA 1644
#> 8 Yangochiroptera (Microbat); Example: Spectral Bat NA 1592
#> 9 Yangochiroptera (Microbat); Example: Vampire Bat NA 1696
#> 10 Yinpterochiroptera (Megabat); Example: Big Brown Bat NA 1693
#> 11 Yinpterochiroptera (Megabat); Example: Brandt's Bat NA 1723
#> 12 Yinpterochiroptera (Megabat); Example: Bumblebee Bat NA 1617
#> 13 Yinpterochiroptera (Megabat); Example: Egyptian Fruit Bat NA 1657
#> 14 Yinpterochiroptera (Megabat); Example: Fringed Myotis NA 1732
#> 15 Yinpterochiroptera (Megabat); Example: Horseshoe Bat NA 1653
#> 16 Yinpterochiroptera (Megabat); Example: Little Brown Bat NA 1660
#> 17 Yinpterochiroptera (Megabat); Example: Spectral Bat NA 1577
#> 18 Yinpterochiroptera (Megabat); Example: Vampire Bat NA 1613
#>
#> clean_exact <- bats_clean %>%
#>   + distinct()
#>
#> print("--- Exact Duplicates Removed ---")
[1] "--- Exact Duplicates Removed ---"
#> print(clean_exact)
#>
#>   Name Value
#> 1 Yangochiroptera (Microbat); Example: Big Brown Bat NA
#> 2 Yangochiroptera (Microbat); Example: Little Brown Bat NA
#> 3 Yangochiroptera (Microbat); Example: Brandt's Bat NA
#> 4 Yinpterochiroptera (Megabat); Example: Horseshoe Bat NA
#> 5 Yinpterochiroptera (Megabat); Example: Vampire Bat NA
#> 6 Yinpterochiroptera (Megabat); Example: Fringed Myotis NA
#> 7 Yinpterochiroptera (Megabat); Example: Brandt's Bat NA
#> 8 Yangochiroptera (Microbat); Example: Horseshoe Bat NA
#> 9 Yinpterochiroptera (Megabat); Example: Little Brown Bat NA
```

```
R - R4.5.2 ~ / ~
File Edit Code View Plots Session Build Debug Profile Tools Help
Go to file/function Addins
Project: (None)

Source
Console Terminal Background Jobs
R - R4.5.2 ~ / ~
#>   Name Value
#> 1 Yangochiroptera (Microbat); Example: Horseshoe Bat NA
#> 2 Yinpterochiroptera (Megabat); Example: Little Brown Bat NA
#> 3 Yangochiroptera (Microbat); Example: Bumblebee Bat NA
#> 4 Yinpterochiroptera (Megabat); Example: Big Brown Bat NA
#> 5 Yangochiroptera (Microbat); Example: Fringed Myotis NA
#> 6 Yinpterochiroptera (Megabat); Example: Spectral Bat NA
#> 7 Yinpterochiroptera (Megabat); Example: Bumblebee Bat NA
#> 8 Yangochiroptera (Microbat); Example: Spectral Bat NA
#> 9 Yangochiroptera (Microbat); Example: Vampire Bat NA
#> 10 Yinpterochiroptera (Megabat); Example: Egyptian Fruit Bat NA
#>
#> unique_names <- bats_clean %>%
#>   + distinct(Name, .keep_all = TRUE)
#>
#> print("--- Unique Names Only ---")
[1] "--- Unique Names Only ---"
#> print(unique_names)
#>
#>   Name Value
#> 1 Yangochiroptera (Microbat); Example: Big Brown Bat NA
#> 2 Yangochiroptera (Microbat); Example: Little Brown Bat NA
#> 3 Yangochiroptera (Microbat); Example: Brandt's Bat NA
#> 4 Yinpterochiroptera (Megabat); Example: Horseshoe Bat NA
#> 5 Yinpterochiroptera (Megabat); Example: Vampire Bat NA
#> 6 Yinpterochiroptera (Megabat); Example: Fringed Myotis NA
#> 7 Yinpterochiroptera (Megabat); Example: Spectral Bat NA
#> 8 Yangochiroptera (Microbat); Example: Horseshoe Bat NA
#> 9 Yinpterochiroptera (Megabat); Example: Little Brown Bat NA
#> 10 Yangochiroptera (Microbat); Example: Bumblebee Bat NA
#> 11 Yinpterochiroptera (Megabat); Example: Big Brown Bat NA
#> 12 Yangochiroptera (Microbat); Example: Fringed Myotis NA
#> 13 Yangochiroptera (Microbat); Example: Spectral Bat NA
#> 14 Yinpterochiroptera (Megabat); Example: Bumblebee Bat NA
#> 15 Yinpterochiroptera (Megabat); Example: Spectral Bat NA
#> 16 Yangochiroptera (Microbat); Example: Egyptian Fruit Bat NA
#> 17 Yangochiroptera (Microbat); Example: Vampire Bat NA
#> 18 Yinpterochiroptera (Megabat); Example: Egyptian Fruit Bat NA
```

14 Extracting date components using lubridate:: functions (R).

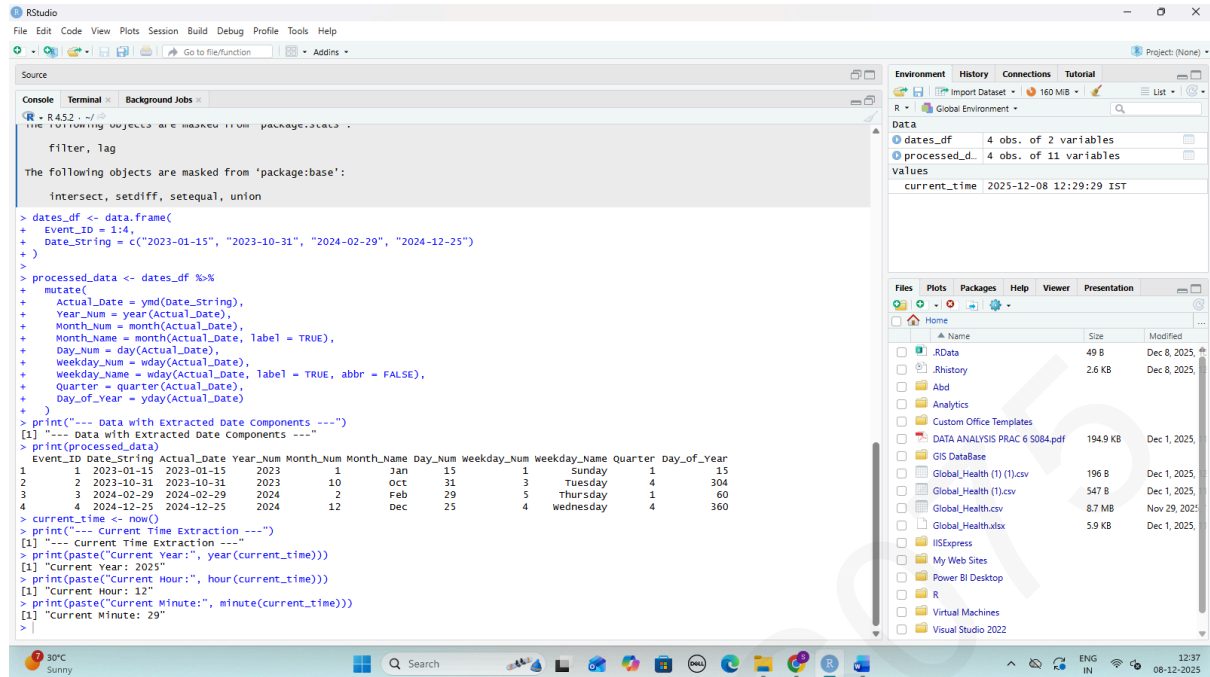
OUTPUT:-

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The screenshot shows the RStudio interface with the following content:

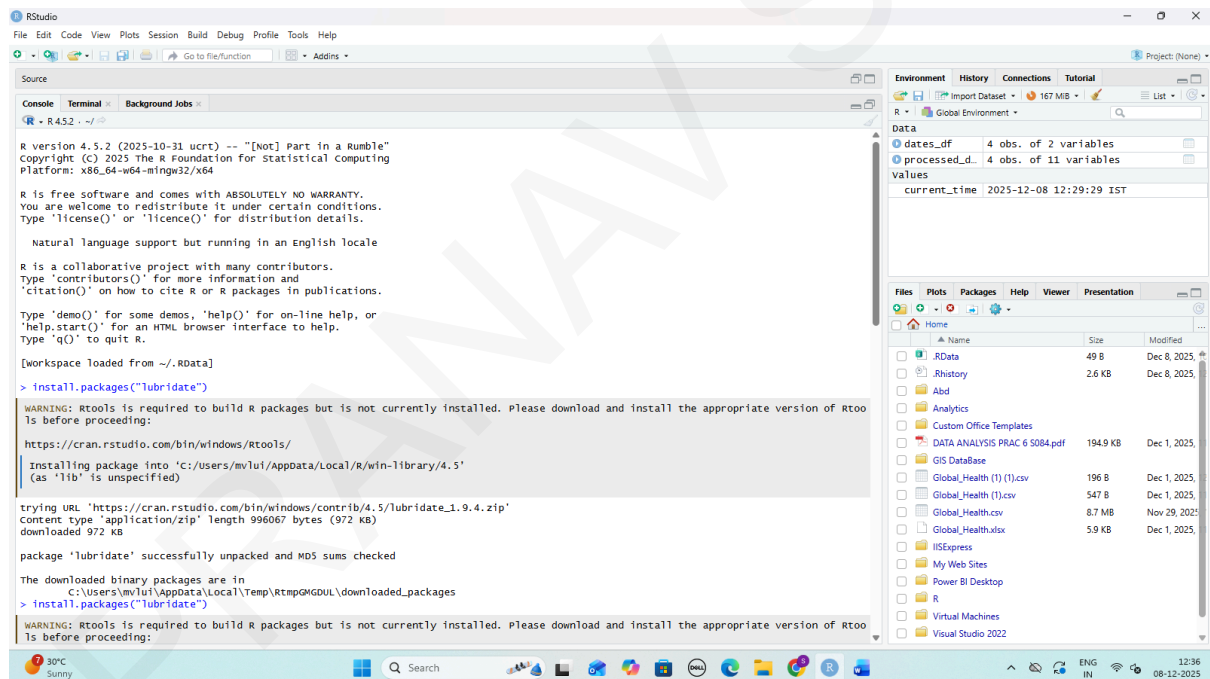
```
R - R4.5.2 - ~/ -  
File Edit Code View Plots Session Build Debug Profile Tools Help  
Go to file/function Addins  
Source  
Console Terminal Background Jobs  
The following objects are masked from 'package:base':  
filter, tag  
The following objects are masked from 'package:base':  
intersect, setdiff, setequal, union  
> dates_df <- data.frame(  
+   Event_ID = 1:4,  
+   Date_String = c("2023-01-15", "2023-10-31", "2024-02-29", "2024-12-25")  
+ )  
>  
> processed_data <- dates_df %>%  
+   mutate(  
+     Actual_Date = ymd(Date_String),  
+     Year_Num = year(Actual_Date),  
+     Month_Num = month(Actual_Date),  
+     Month_Name = month(Actual_Date, label = TRUE),  
+     Day_Num = day(Actual_Date),  
+     Weekday_Num = wday(Actual_Date),  
+     Weekday_Name = wday(Actual_Date, label = TRUE, abbr = FALSE),  
+     Quarter = quarter(Actual_Date),  
+     Day_of_Year = yday(Actual_Date)  
+   )  
> print("---- Data with Extracted Date Components ----")  
[1] "---- Data with Extracted Date Components ----"  
> print(processed_data)  
Event_ID Date_String Actual_Date Year_Num Month_Num Month_Name Day_Num Weekday_Num Weekday_Name Quarter Day_of_Year  
1 1 2023-01-15 2023-01-15 2023 1 Jan 15 1 Sunday 1 15  
2 2 2023-10-31 2023-10-31 2023 10 Oct 31 3 Tuesday 4 304  
3 3 2024-02-29 2024-02-29 2024 2 Feb 29 5 Thursday 1 60  
4 4 2024-12-25 2024-12-25 2024 12 Dec 25 4 Wednesday 4 360  
> current_time <- now()  
> print("---- Current Time Extraction ----")  
[1] "---- Current Time Extraction ----"  
> print(paste("Current Year:", year(current_time)))  
[1] "Current Year: 2025"  
> print(paste("Current Hour:", hour(current_time)))  
[1] "Current Hour: 12"  
> print(paste("Current Minute:", minute(current_time)))  
[1] "Current Minute: 29"  
>
```

Environment pane:

Object	Size	Modified
dates_df	4 obs. of 2 variables	
processed_data	4 obs. of 11 variables	
current_time	2025-12-08 12:29:29 IST	

Files pane:

Name	Size	Modified
RData	49 B	Dec 8, 2025
Rhistory	2.6 KB	Dec 8, 2025
Abd		
Analytics		
Custom Office Templates		
DATA ANALYSIS PRAC 6 5084.pdf	194.9 KB	Dec 1, 2025
GIS DataBase		
Global_Health (1) (1).csv	196 B	Dec 1, 2025
Global_Health (1).csv	547 B	Dec 1, 2025
Global_Health.csv	8.7 MB	Nov 29, 2025
Global_Health.xlsx	5.9 KB	Dec 1, 2025
IIExpress		
My Web Sites		
Power BI Desktop		
R		
Virtual Machines		
Visual Studio 2022		



The screenshot shows the RStudio interface with the following content:

```
R - R4.5.2 - ~/ -  
File Edit Code View Plots Session Build Debug Profile Tools Help  
Go to file/function Addins  
Source  
Console Terminal Background Jobs  
R version 4.5.2 (2025-10-31 ucrt) -- "[Not] Part in a Rumble"  
Copyright (C) 2025 The R Foundation for Statistical Computing  
Platform: x86_64-mingw32/x64  
R is free software and comes with ABSOLUTELY NO WARRANTY.  
You are welcome to redistribute it under certain conditions.  
Type 'license()' or 'licence()' for distribution details.  
Natural language support but running in an English locale  
R is a collaborative project with many contributors.  
Type 'contributors()' for more information and  
'citation()' on how to cite R or R packages in publications.  
Type 'demo()' for some demos, 'help()' for on-line help, or  
'help.start()' for an HTML browser interface to help.  
Type 'q()' to quit R.  
[workspace loaded from ~/.RData]  
> install.packages("lubridate")  
WARNING: Rtools is required to build R packages but is not currently installed. Please download and install the appropriate version of Rtools before proceeding:  
https://cran.rstudio.com/bin/windows/Rtools/  
Installing package into 'c:/Users/mvlu/AppData/Local/R/win-library/4.5'  
(as 'lib' is unspecified)  
trying URL 'https://cran.rstudio.com/bin/windows/contrib/4.5/lubridate_1.9.4.zip'  
content type 'application/zip' length 996067 bytes (972 KB)  
downloaded 972 KB  
package 'lubridate' successfully unpacked and MD5 sums checked  
The downloaded binary packages are in  
c:/Users/mvlu/AppData/Local/Temp/RtmpGMDGUL/downloaded_packages  
> install.packages("lubridate")  
WARNING: Rtools is required to build R packages but is not currently installed. Please download and install the appropriate version of Rtools before proceeding:
```

Environment pane:

Object	Size	Modified
dates_df	4 obs. of 2 variables	
processed_data	4 obs. of 11 variables	
current_time	2025-12-08 12:29:29 IST	

Files pane:

Name	Size	Modified
RData	49 B	Dec 8, 2025
Rhistory	2.6 KB	Dec 8, 2025
Abd		
Analytics		
Custom Office Templates		
DATA ANALYSIS PRAC 6 5084.pdf	194.9 KB	Dec 1, 2025
GIS DataBase		
Global_Health (1) (1).csv	196 B	Dec 1, 2025
Global_Health (1).csv	547 B	Dec 1, 2025
Global_Health.csv	8.7 MB	Nov 29, 2025
Global_Health.xlsx	5.9 KB	Dec 1, 2025
IIExpress		
My Web Sites		
Power BI Desktop		
R		
Virtual Machines		
Visual Studio 2022		

15 Generating basic summaries using str() or summary() (R).

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The image displays two screenshots of the RStudio IDE, showing the execution of R code for data manipulation and summary statistics.

**Top Screenshot:**

```
> library(dplyr)

Attaching package: 'dplyr'

the following objects are masked from 'package:stats':
  filter, lag

the following objects are masked from 'package:base':
  intersect, setdiff, setequal, union

> library(kable)
> library(tidy)
> retail_df <- data.frame(
+   id = 1:6,
+   category = c("Electronics", "Home", "Electronics", "Clothing", "Home", "Clothing"),
+   price = c(500.50, 45.00, 980.00, NA, 300.00, 25.00),
+   in_stock = c(TRUE, TRUE, FALSE, FALSE, TRUE, TRUE),
+   rating = c(3.5, 3.8, 4.9, 4.2, 3.5, 4.2)
+ )

> print("Data Loaded ----")
[1] "Data Loaded ----"
> print("Output of str() ----")
[1] "Output of str() ----"
> str(retail_df)
'data.frame':   6 obs. of  5 variables:
 $ id      : int  1 2 3 4 5 6
 $ category: chr  "Electronics" "Home" "Electronics" "Clothing" ...
 $ price   : num  500.5 45 980 NA 300 25 ...
 $ in_stock: logi  TRUE TRUE FALSE TRUE FALSE TRUE
 $ rating  : num  3.5 3.8 4.9 4.2 3.5 4.2

> print("Output of summary() [Before Factor Conversion] ----")
[1] "Output of summary() [Before Factor Conversion] ----"
> summary(retail_df)
      id      category      price      in_stock      rating
int du.12.25 class :character int du.45.8  FALSE:F  int du.13.850
mean  :5.50   mode :character mean :180.5  TRUE :4   mean :16.130
max   :16.75  2nd qu.:1500.5  max  :200.8  2nd qu.:14.421  max  :16.900
```

**Bottom Screenshot:**

```
> retail_df$category <- as.factor(retail_df$category)
> print("Output of summary() [After Factor Conversion] ----")
[1] "Output of summary() [After Factor Conversion] ----"
> summary(retail_df)
      id      category      price      in_stock      rating
int du.12.25 class :factor    int du.45.8  FALSE:F  int du.13.850
mean  :5.50   mode :factor    mean :180.5  TRUE :4   mean :16.130
max   :16.75  2nd qu.:1500.5  max  :200.8  2nd qu.:14.421  max  :16.900
na's :1

> avg_rating <- mean(retail_df$rating)
> min_price <- min(retail_df$price, na.rm = TRUE)
> print(paste("Average Rating:", avg_rating))
[1] "Average Rating: 4.15"
> print(paste("Highest Price:", max_price))
[1] "Highest Price: 980"
```

The right-hand pane in both screenshots shows the 'Data' tab with a preview of the 'retail\_df' data frame, which has 6 observations and 5 variables: id, category, price, in\_stock, and rating.

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