

Untitled

Hannah

2023-10-20

```
search() #shows installed packages
```

```
## [1] ".GlobalEnv"      "package:stats"    "package:graphics"  
## [4] "package:grDevices" "package:utils"    "package:datasets"  
## [7] "package:methods" "Autoloads"        "package:base"
```

```
searchpaths() #shows location of packages
```

```
## [1] ".GlobalEnv"  
## [2] "C:/Program Files/R/R-4.3.1/library/stats"  
## [3] "C:/Program Files/R/R-4.3.1/library/graphics"  
## [4] "C:/Program Files/R/R-4.3.1/library/grDevices"  
## [5] "C:/Program Files/R/R-4.3.1/library/utils"  
## [6] "C:/Program Files/R/R-4.3.1/library/datasets"  
## [7] "C:/Program Files/R/R-4.3.1/library/methods"  
## [8] "Autoloads"  
## [9] "C:/PROGRA~1/R/R-43~1.1/library/base"
```

```
#install.packages("ggplot2") #installs packages. quotes are compulsory  
#library(ggplot2)  
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(dplyr)  
#install.packages("tidyverse")  
#install.packages("dplyr")
```

#Data transformation with dplyr

##why dplyr? -Great for data exploration and transformation -intuitive to write and easy to read -fast on data frames

##chaining and piping

```
#Syntax:
```

```
a=1:5
```

```
#example
```

```
sum(a)
```

```
## [1] 15
```

```
a %>% sum()
```

```
## [1] 15
```

```
#sqrt(sum(x1-x2)^2), where x1 and x2 are two vectors
```

```
x1=1:5; x2=2:6
```

```
sqrt(sum(x1-x2)^2)
```

```
## [1] 5
```

```
(x1-x2)^2 %>% sum() %>% sqrt()
```

```
## [1] 2.236068
```

```
#syntax()
```

```
#Find the rows where Sepal Length>5
```

```
filter(iris, Sepal.Length>5)
```

##	Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
## 1	5.1	3.5	1.4	0.2	setosa
## 2	5.4	3.9	1.7	0.4	setosa
## 3	5.4	3.7	1.5	0.2	setosa
## 4	5.8	4.0	1.2	0.2	setosa
## 5	5.7	4.4	1.5	0.4	setosa
## 6	5.4	3.9	1.3	0.4	setosa
## 7	5.1	3.5	1.4	0.3	setosa
## 8	5.7	3.8	1.7	0.3	setosa
## 9	5.1	3.8	1.5	0.3	setosa
## 10	5.4	3.4	1.7	0.2	setosa
## 11	5.1	3.7	1.5	0.4	setosa
## 12	5.1	3.3	1.7	0.5	setosa
## 13	5.2	3.5	1.5	0.2	setosa
## 14	5.2	3.4	1.4	0.2	setosa
## 15	5.4	3.4	1.5	0.4	setosa
## 16	5.2	4.1	1.5	0.1	setosa
## 17	5.5	4.2	1.4	0.2	setosa
## 18	5.5	3.5	1.3	0.2	setosa
## 19	5.1	3.4	1.5	0.2	setosa
## 20	5.1	3.8	1.9	0.4	setosa
## 21	5.1	3.8	1.6	0.2	setosa
## 22	5.3	3.7	1.5	0.2	setosa
## 23	7.0	3.2	4.7	1.4	versicolor
## 24	6.4	3.2	4.5	1.5	versicolor
## 25	6.9	3.1	4.9	1.5	versicolor
## 26	5.5	2.3	4.0	1.3	versicolor
## 27	6.5	2.8	4.6	1.5	versicolor
## 28	5.7	2.8	4.5	1.3	versicolor
## 29	6.3	3.3	4.7	1.6	versicolor
## 30	6.6	2.9	4.6	1.3	versicolor
## 31	5.2	2.7	3.9	1.4	versicolor
## 32	5.9	3.0	4.2	1.5	versicolor
## 33	6.0	2.2	4.0	1.0	versicolor
## 34	6.1	2.9	4.7	1.4	versicolor
## 35	5.6	2.9	3.6	1.3	versicolor
## 36	6.7	3.1	4.4	1.4	versicolor
## 37	5.6	3.0	4.5	1.5	versicolor
## 38	5.8	2.7	4.1	1.0	versicolor
## 39	6.2	2.2	4.5	1.5	versicolor
## 40	5.6	2.5	3.9	1.1	versicolor
## 41	5.9	3.2	4.8	1.8	versicolor
## 42	6.1	2.8	4.0	1.3	versicolor
## 43	6.3	2.5	4.9	1.5	versicolor
## 44	6.1	2.8	4.7	1.2	versicolor
## 45	6.4	2.9	4.3	1.3	versicolor
## 46	6.6	3.0	4.4	1.4	versicolor
## 47	6.8	2.8	4.8	1.4	versicolor
## 48	6.7	3.0	5.0	1.7	versicolor
## 49	6.0	2.9	4.5	1.5	versicolor
## 50	5.7	2.6	3.5	1.0	versicolor
## 51	5.5	2.4	3.8	1.1	versicolor
## 52	5.5	2.4	3.7	1.0	versicolor
## 53	5.8	2.7	3.9	1.2	versicolor
## 54	6.0	2.7	5.1	1.6	versicolor

## 55	5.4	3.0	4.5	1.5 versicolor
## 56	6.0	3.4	4.5	1.6 versicolor
## 57	6.7	3.1	4.7	1.5 versicolor
## 58	6.3	2.3	4.4	1.3 versicolor
## 59	5.6	3.0	4.1	1.3 versicolor
## 60	5.5	2.5	4.0	1.3 versicolor
## 61	5.5	2.6	4.4	1.2 versicolor
## 62	6.1	3.0	4.6	1.4 versicolor
## 63	5.8	2.6	4.0	1.2 versicolor
## 64	5.6	2.7	4.2	1.3 versicolor
## 65	5.7	3.0	4.2	1.2 versicolor
## 66	5.7	2.9	4.2	1.3 versicolor
## 67	6.2	2.9	4.3	1.3 versicolor
## 68	5.1	2.5	3.0	1.1 versicolor
## 69	5.7	2.8	4.1	1.3 versicolor
## 70	6.3	3.3	6.0	2.5 virginica
## 71	5.8	2.7	5.1	1.9 virginica
## 72	7.1	3.0	5.9	2.1 virginica
## 73	6.3	2.9	5.6	1.8 virginica
## 74	6.5	3.0	5.8	2.2 virginica
## 75	7.6	3.0	6.6	2.1 virginica
## 76	7.3	2.9	6.3	1.8 virginica
## 77	6.7	2.5	5.8	1.8 virginica
## 78	7.2	3.6	6.1	2.5 virginica
## 79	6.5	3.2	5.1	2.0 virginica
## 80	6.4	2.7	5.3	1.9 virginica
## 81	6.8	3.0	5.5	2.1 virginica
## 82	5.7	2.5	5.0	2.0 virginica
## 83	5.8	2.8	5.1	2.4 virginica
## 84	6.4	3.2	5.3	2.3 virginica
## 85	6.5	3.0	5.5	1.8 virginica
## 86	7.7	3.8	6.7	2.2 virginica
## 87	7.7	2.6	6.9	2.3 virginica
## 88	6.0	2.2	5.0	1.5 virginica
## 89	6.9	3.2	5.7	2.3 virginica
## 90	5.6	2.8	4.9	2.0 virginica
## 91	7.7	2.8	6.7	2.0 virginica
## 92	6.3	2.7	4.9	1.8 virginica
## 93	6.7	3.3	5.7	2.1 virginica
## 94	7.2	3.2	6.0	1.8 virginica
## 95	6.2	2.8	4.8	1.8 virginica
## 96	6.1	3.0	4.9	1.8 virginica
## 97	6.4	2.8	5.6	2.1 virginica
## 98	7.2	3.0	5.8	1.6 virginica
## 99	7.4	2.8	6.1	1.9 virginica
## 100	7.9	3.8	6.4	2.0 virginica
## 101	6.4	2.8	5.6	2.2 virginica
## 102	6.3	2.8	5.1	1.5 virginica
## 103	6.1	2.6	5.6	1.4 virginica
## 104	7.7	3.0	6.1	2.3 virginica
## 105	6.3	3.4	5.6	2.4 virginica
## 106	6.4	3.1	5.5	1.8 virginica
## 107	6.0	3.0	4.8	1.8 virginica
## 108	6.9	3.1	5.4	2.1 virginica
## 109	6.7	3.1	5.6	2.4 virginica
## 110	6.9	3.1	5.1	2.3 virginica

## 111	5.8	2.7	5.1	1.9	virginica
## 112	6.8	3.2	5.9	2.3	virginica
## 113	6.7	3.3	5.7	2.5	virginica
## 114	6.7	3.0	5.2	2.3	virginica
## 115	6.3	2.5	5.0	1.9	virginica
## 116	6.5	3.0	5.2	2.0	virginica
## 117	6.2	3.4	5.4	2.3	virginica
## 118	5.9	3.0	5.1	1.8	virginica

```
#Find the rows where Sepal.Width>4 and Species is Setosa  
filter(iris, Sepal.Width>4, Species=="setosa")
```

##	Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
## 1	5.7	4.4	1.5	0.4	setosa
## 2	5.2	4.1	1.5	0.1	setosa
## 3	5.5	4.2	1.4	0.2	setosa

```
#Find the rows where species is either setosa or versicolor  
filter(iris, Species=="setosa"|Species=="versicolor")
```

##	Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
## 1	5.1	3.5	1.4	0.2	setosa
## 2	4.9	3.0	1.4	0.2	setosa
## 3	4.7	3.2	1.3	0.2	setosa
## 4	4.6	3.1	1.5	0.2	setosa
## 5	5.0	3.6	1.4	0.2	setosa
## 6	5.4	3.9	1.7	0.4	setosa
## 7	4.6	3.4	1.4	0.3	setosa
## 8	5.0	3.4	1.5	0.2	setosa
## 9	4.4	2.9	1.4	0.2	setosa
## 10	4.9	3.1	1.5	0.1	setosa
## 11	5.4	3.7	1.5	0.2	setosa
## 12	4.8	3.4	1.6	0.2	setosa
## 13	4.8	3.0	1.4	0.1	setosa
## 14	4.3	3.0	1.1	0.1	setosa
## 15	5.8	4.0	1.2	0.2	setosa
## 16	5.7	4.4	1.5	0.4	setosa
## 17	5.4	3.9	1.3	0.4	setosa
## 18	5.1	3.5	1.4	0.3	setosa
## 19	5.7	3.8	1.7	0.3	setosa
## 20	5.1	3.8	1.5	0.3	setosa
## 21	5.4	3.4	1.7	0.2	setosa
## 22	5.1	3.7	1.5	0.4	setosa
## 23	4.6	3.6	1.0	0.2	setosa
## 24	5.1	3.3	1.7	0.5	setosa
## 25	4.8	3.4	1.9	0.2	setosa
## 26	5.0	3.0	1.6	0.2	setosa
## 27	5.0	3.4	1.6	0.4	setosa
## 28	5.2	3.5	1.5	0.2	setosa
## 29	5.2	3.4	1.4	0.2	setosa
## 30	4.7	3.2	1.6	0.2	setosa
## 31	4.8	3.1	1.6	0.2	setosa
## 32	5.4	3.4	1.5	0.4	setosa
## 33	5.2	4.1	1.5	0.1	setosa
## 34	5.5	4.2	1.4	0.2	setosa
## 35	4.9	3.1	1.5	0.2	setosa
## 36	5.0	3.2	1.2	0.2	setosa
## 37	5.5	3.5	1.3	0.2	setosa
## 38	4.9	3.6	1.4	0.1	setosa
## 39	4.4	3.0	1.3	0.2	setosa
## 40	5.1	3.4	1.5	0.2	setosa
## 41	5.0	3.5	1.3	0.3	setosa
## 42	4.5	2.3	1.3	0.3	setosa
## 43	4.4	3.2	1.3	0.2	setosa
## 44	5.0	3.5	1.6	0.6	setosa
## 45	5.1	3.8	1.9	0.4	setosa
## 46	4.8	3.0	1.4	0.3	setosa
## 47	5.1	3.8	1.6	0.2	setosa
## 48	4.6	3.2	1.4	0.2	setosa
## 49	5.3	3.7	1.5	0.2	setosa
## 50	5.0	3.3	1.4	0.2	setosa
## 51	7.0	3.2	4.7	1.4	versicolor
## 52	6.4	3.2	4.5	1.5	versicolor
## 53	6.9	3.1	4.9	1.5	versicolor
## 54	5.5	2.3	4.0	1.3	versicolor

## 55	6.5	2.8	4.6	1.5 versicolor
## 56	5.7	2.8	4.5	1.3 versicolor
## 57	6.3	3.3	4.7	1.6 versicolor
## 58	4.9	2.4	3.3	1.0 versicolor
## 59	6.6	2.9	4.6	1.3 versicolor
## 60	5.2	2.7	3.9	1.4 versicolor
## 61	5.0	2.0	3.5	1.0 versicolor
## 62	5.9	3.0	4.2	1.5 versicolor
## 63	6.0	2.2	4.0	1.0 versicolor
## 64	6.1	2.9	4.7	1.4 versicolor
## 65	5.6	2.9	3.6	1.3 versicolor
## 66	6.7	3.1	4.4	1.4 versicolor
## 67	5.6	3.0	4.5	1.5 versicolor
## 68	5.8	2.7	4.1	1.0 versicolor
## 69	6.2	2.2	4.5	1.5 versicolor
## 70	5.6	2.5	3.9	1.1 versicolor
## 71	5.9	3.2	4.8	1.8 versicolor
## 72	6.1	2.8	4.0	1.3 versicolor
## 73	6.3	2.5	4.9	1.5 versicolor
## 74	6.1	2.8	4.7	1.2 versicolor
## 75	6.4	2.9	4.3	1.3 versicolor
## 76	6.6	3.0	4.4	1.4 versicolor
## 77	6.8	2.8	4.8	1.4 versicolor
## 78	6.7	3.0	5.0	1.7 versicolor
## 79	6.0	2.9	4.5	1.5 versicolor
## 80	5.7	2.6	3.5	1.0 versicolor
## 81	5.5	2.4	3.8	1.1 versicolor
## 82	5.5	2.4	3.7	1.0 versicolor
## 83	5.8	2.7	3.9	1.2 versicolor
## 84	6.0	2.7	5.1	1.6 versicolor
## 85	5.4	3.0	4.5	1.5 versicolor
## 86	6.0	3.4	4.5	1.6 versicolor
## 87	6.7	3.1	4.7	1.5 versicolor
## 88	6.3	2.3	4.4	1.3 versicolor
## 89	5.6	3.0	4.1	1.3 versicolor
## 90	5.5	2.5	4.0	1.3 versicolor
## 91	5.5	2.6	4.4	1.2 versicolor
## 92	6.1	3.0	4.6	1.4 versicolor
## 93	5.8	2.6	4.0	1.2 versicolor
## 94	5.0	2.3	3.3	1.0 versicolor
## 95	5.6	2.7	4.2	1.3 versicolor
## 96	5.7	3.0	4.2	1.2 versicolor
## 97	5.7	2.9	4.2	1.3 versicolor
## 98	6.2	2.9	4.3	1.3 versicolor
## 99	5.1	2.5	3.0	1.1 versicolor
## 100	5.7	2.8	4.1	1.3 versicolor

```
#Find the rows where Sepal.Width>2 or species is setosa
filter(iris, Species=="setosa"|Sepal.Width>2)
```

##	Sepal.Length	Sepal.Width	Petal.Length	Petal.Width	Species
## 1	5.1	3.5	1.4	0.2	setosa
## 2	4.9	3.0	1.4	0.2	setosa
## 3	4.7	3.2	1.3	0.2	setosa
## 4	4.6	3.1	1.5	0.2	setosa
## 5	5.0	3.6	1.4	0.2	setosa
## 6	5.4	3.9	1.7	0.4	setosa
## 7	4.6	3.4	1.4	0.3	setosa
## 8	5.0	3.4	1.5	0.2	setosa
## 9	4.4	2.9	1.4	0.2	setosa
## 10	4.9	3.1	1.5	0.1	setosa
## 11	5.4	3.7	1.5	0.2	setosa
## 12	4.8	3.4	1.6	0.2	setosa
## 13	4.8	3.0	1.4	0.1	setosa
## 14	4.3	3.0	1.1	0.1	setosa
## 15	5.8	4.0	1.2	0.2	setosa
## 16	5.7	4.4	1.5	0.4	setosa
## 17	5.4	3.9	1.3	0.4	setosa
## 18	5.1	3.5	1.4	0.3	setosa
## 19	5.7	3.8	1.7	0.3	setosa
## 20	5.1	3.8	1.5	0.3	setosa
## 21	5.4	3.4	1.7	0.2	setosa
## 22	5.1	3.7	1.5	0.4	setosa
## 23	4.6	3.6	1.0	0.2	setosa
## 24	5.1	3.3	1.7	0.5	setosa
## 25	4.8	3.4	1.9	0.2	setosa
## 26	5.0	3.0	1.6	0.2	setosa
## 27	5.0	3.4	1.6	0.4	setosa
## 28	5.2	3.5	1.5	0.2	setosa
## 29	5.2	3.4	1.4	0.2	setosa
## 30	4.7	3.2	1.6	0.2	setosa
## 31	4.8	3.1	1.6	0.2	setosa
## 32	5.4	3.4	1.5	0.4	setosa
## 33	5.2	4.1	1.5	0.1	setosa
## 34	5.5	4.2	1.4	0.2	setosa
## 35	4.9	3.1	1.5	0.2	setosa
## 36	5.0	3.2	1.2	0.2	setosa
## 37	5.5	3.5	1.3	0.2	setosa
## 38	4.9	3.6	1.4	0.1	setosa
## 39	4.4	3.0	1.3	0.2	setosa
## 40	5.1	3.4	1.5	0.2	setosa
## 41	5.0	3.5	1.3	0.3	setosa
## 42	4.5	2.3	1.3	0.3	setosa
## 43	4.4	3.2	1.3	0.2	setosa
## 44	5.0	3.5	1.6	0.6	setosa
## 45	5.1	3.8	1.9	0.4	setosa
## 46	4.8	3.0	1.4	0.3	setosa
## 47	5.1	3.8	1.6	0.2	setosa
## 48	4.6	3.2	1.4	0.2	setosa
## 49	5.3	3.7	1.5	0.2	setosa
## 50	5.0	3.3	1.4	0.2	setosa
## 51	7.0	3.2	4.7	1.4	versicolor
## 52	6.4	3.2	4.5	1.5	versicolor
## 53	6.9	3.1	4.9	1.5	versicolor
## 54	5.5	2.3	4.0	1.3	versicolor

## 55	6.5	2.8	4.6	1.5 versicolor
## 56	5.7	2.8	4.5	1.3 versicolor
## 57	6.3	3.3	4.7	1.6 versicolor
## 58	4.9	2.4	3.3	1.0 versicolor
## 59	6.6	2.9	4.6	1.3 versicolor
## 60	5.2	2.7	3.9	1.4 versicolor
## 61	5.9	3.0	4.2	1.5 versicolor
## 62	6.0	2.2	4.0	1.0 versicolor
## 63	6.1	2.9	4.7	1.4 versicolor
## 64	5.6	2.9	3.6	1.3 versicolor
## 65	6.7	3.1	4.4	1.4 versicolor
## 66	5.6	3.0	4.5	1.5 versicolor
## 67	5.8	2.7	4.1	1.0 versicolor
## 68	6.2	2.2	4.5	1.5 versicolor
## 69	5.6	2.5	3.9	1.1 versicolor
## 70	5.9	3.2	4.8	1.8 versicolor
## 71	6.1	2.8	4.0	1.3 versicolor
## 72	6.3	2.5	4.9	1.5 versicolor
## 73	6.1	2.8	4.7	1.2 versicolor
## 74	6.4	2.9	4.3	1.3 versicolor
## 75	6.6	3.0	4.4	1.4 versicolor
## 76	6.8	2.8	4.8	1.4 versicolor
## 77	6.7	3.0	5.0	1.7 versicolor
## 78	6.0	2.9	4.5	1.5 versicolor
## 79	5.7	2.6	3.5	1.0 versicolor
## 80	5.5	2.4	3.8	1.1 versicolor
## 81	5.5	2.4	3.7	1.0 versicolor
## 82	5.8	2.7	3.9	1.2 versicolor
## 83	6.0	2.7	5.1	1.6 versicolor
## 84	5.4	3.0	4.5	1.5 versicolor
## 85	6.0	3.4	4.5	1.6 versicolor
## 86	6.7	3.1	4.7	1.5 versicolor
## 87	6.3	2.3	4.4	1.3 versicolor
## 88	5.6	3.0	4.1	1.3 versicolor
## 89	5.5	2.5	4.0	1.3 versicolor
## 90	5.5	2.6	4.4	1.2 versicolor
## 91	6.1	3.0	4.6	1.4 versicolor
## 92	5.8	2.6	4.0	1.2 versicolor
## 93	5.0	2.3	3.3	1.0 versicolor
## 94	5.6	2.7	4.2	1.3 versicolor
## 95	5.7	3.0	4.2	1.2 versicolor
## 96	5.7	2.9	4.2	1.3 versicolor
## 97	6.2	2.9	4.3	1.3 versicolor
## 98	5.1	2.5	3.0	1.1 versicolor
## 99	5.7	2.8	4.1	1.3 versicolor
## 100	6.3	3.3	6.0	2.5 virginica
## 101	5.8	2.7	5.1	1.9 virginica
## 102	7.1	3.0	5.9	2.1 virginica
## 103	6.3	2.9	5.6	1.8 virginica
## 104	6.5	3.0	5.8	2.2 virginica
## 105	7.6	3.0	6.6	2.1 virginica
## 106	4.9	2.5	4.5	1.7 virginica
## 107	7.3	2.9	6.3	1.8 virginica
## 108	6.7	2.5	5.8	1.8 virginica
## 109	7.2	3.6	6.1	2.5 virginica
## 110	6.5	3.2	5.1	2.0 virginica

## 111	6.4	2.7	5.3	1.9	virginica
## 112	6.8	3.0	5.5	2.1	virginica
## 113	5.7	2.5	5.0	2.0	virginica
## 114	5.8	2.8	5.1	2.4	virginica
## 115	6.4	3.2	5.3	2.3	virginica
## 116	6.5	3.0	5.5	1.8	virginica
## 117	7.7	3.8	6.7	2.2	virginica
## 118	7.7	2.6	6.9	2.3	virginica
## 119	6.0	2.2	5.0	1.5	virginica
## 120	6.9	3.2	5.7	2.3	virginica
## 121	5.6	2.8	4.9	2.0	virginica
## 122	7.7	2.8	6.7	2.0	virginica
## 123	6.3	2.7	4.9	1.8	virginica
## 124	6.7	3.3	5.7	2.1	virginica
## 125	7.2	3.2	6.0	1.8	virginica
## 126	6.2	2.8	4.8	1.8	virginica
## 127	6.1	3.0	4.9	1.8	virginica
## 128	6.4	2.8	5.6	2.1	virginica
## 129	7.2	3.0	5.8	1.6	virginica
## 130	7.4	2.8	6.1	1.9	virginica
## 131	7.9	3.8	6.4	2.0	virginica
## 132	6.4	2.8	5.6	2.2	virginica
## 133	6.3	2.8	5.1	1.5	virginica
## 134	6.1	2.6	5.6	1.4	virginica
## 135	7.7	3.0	6.1	2.3	virginica
## 136	6.3	3.4	5.6	2.4	virginica
## 137	6.4	3.1	5.5	1.8	virginica
## 138	6.0	3.0	4.8	1.8	virginica
## 139	6.9	3.1	5.4	2.1	virginica
## 140	6.7	3.1	5.6	2.4	virginica
## 141	6.9	3.1	5.1	2.3	virginica
## 142	5.8	2.7	5.1	1.9	virginica
## 143	6.8	3.2	5.9	2.3	virginica
## 144	6.7	3.3	5.7	2.5	virginica
## 145	6.7	3.0	5.2	2.3	virginica
## 146	6.3	2.5	5.0	1.9	virginica
## 147	6.5	3.0	5.2	2.0	virginica
## 148	6.2	3.4	5.4	2.3	virginica
## 149	5.9	3.0	5.1	1.8	virginica