Examine, Subset, and Filter Data

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Here, we'll be using everyone's favorite dataset, iris! It's built into R, so no need to download or read in anything. (Don't forget to run the set up chunks at the top of the document before getting started)

These topics aren't the flashiest or most interesting, but they're the most important. This is what you spend the majority of time doing.

Examine/Look at Your Data

The first thing you need to with data is look at it. If you don't know how it's structured, how can you do anything with it?

The simplest way is just to type the data table name and it will print.

```
iris
```

```
##     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
## 101         6.3         3.3          6.0         2.5  virginica
## 102         5.8         2.7          5.1         1.9  virginica
## 103         7.1         3.0          5.9         2.1  virginica
## 104         6.3         2.9          5.6         1.8  virginica
## 105         6.5         3.0          5.8         2.2  virginica
## 106         7.6         3.0          6.6         2.1  virginica
## 107         4.9         2.5          4.5         1.7  virginica
## 108         7.3         2.9          6.3         1.8  virginica
## 109         6.7         2.5          5.8         1.8  virginica
## 110         7.2         3.6          6.1         2.5  virginica
## 111         6.5         3.2          5.1         2.0  virginica
## 112         6.4         2.7          5.3         1.9  virginica
## 113         6.8         3.0          5.5         2.1  virginica
## 114         5.7         2.5          5.0         2.0  virginica
## 115         5.8         2.8          5.1         2.4  virginica
## 116         6.4         3.2          5.3         2.3  virginica
## 117         6.5         3.0          5.5         1.8  virginica
## 118         7.7         3.8          6.7         2.2  virginica
## 119         7.7         2.6          6.9         2.3  virginica
## 120         6.0         2.2          5.0         1.5  virginica
## 121         6.9         3.2          5.7         2.3  virginica
## 122         5.6         2.8          4.9         2.0  virginica
## 123         7.7         2.8          6.7         2.0  virginica
## 124         6.3         2.7          4.9         1.8  virginica
## 125         6.7         3.3          5.7         2.1  virginica
## 126         7.2         3.2          6.0         1.8  virginica
## 127         6.2         2.8          4.8         1.8  virginica
## 128         6.1         3.0          4.9         1.8  virginica
## 129         6.4         2.8          5.6         2.1  virginica
## 130         7.2         3.0          5.8         1.6  virginica
## 131         7.4         2.8          6.1         1.9  virginica
## 132         7.9         3.8          6.4         2.0  virginica
## 133         6.4         2.8          5.6         2.2  virginica
## 134         6.3         2.8          5.1         1.5  virginica
## 135         6.1         2.6          5.6         1.4  virginica
## 136         7.7         3.0          6.1         2.3  virginica
## 137         6.3         3.4          5.6         2.4  virginica
## 138         6.4         3.1          5.5         1.8  virginica
## 139         6.0         3.0          4.8         1.8  virginica
## 140         6.9         3.1          5.4         2.1  virginica
## 141         6.7         3.1          5.6         2.4  virginica
```

```
## 142          6.9         3.1          5.1         2.3  virginica
## 143          5.8         2.7          5.1         1.9  virginica
## 144          6.8         3.2          5.9         2.3  virginica
## 145          6.7         3.3          5.7         2.5  virginica
## 146          6.7         3.0          5.2         2.3  virginica
## 147          6.3         2.5          5.0         1.9  virginica
## 148          6.5         3.0          5.2         2.0  virginica
## 149          6.2         3.4          5.4         2.3  virginica
## 150          5.9         3.0          5.1         1.8  virginica
```

Be careful about doing this though! You can see that it printed out the entire table and some tables have thousands of rows! Use with caution. A much safer option is to use `head()` to print out the first 6 (by default) rows of the table.

```
head(iris)
```

```
##   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
```

You can also specify how many rows of the table you want `head()` to print out.

```
head(iris, 10)
```

```
##    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
```

You can use the opposite function of `head()`, `tail()` to look at the last 6 (by default) rows of the table

```
tail(iris)
```

```
##     Sepal.Length Sepal.Width Petal.Length Petal.Width   Species
## 145          6.7         3.3          5.7         2.5 virginica
## 146          6.7         3.0          5.2         2.3 virginica
## 147          6.3         2.5          5.0         1.9 virginica
## 148          6.5         3.0          5.2         2.0 virginica
## 149          6.2         3.4          5.4         2.3 virginica
## 150          5.9         3.0          5.1         1.8 virginica
```

Another helpful thing to know is the number of rows and columns in your table, which you can get with `dim()`. Dim always prints the number of rows first, then the number of columns.

```
dim(iris)
```

```
## [1] 150   5
```

You might also want to know the overall structure of your table, which you can see with `str()`

```
str(iris)
```

```
## 'data.frame':    150 obs. of  5 variables:
##  $ Sepal.Length: num  5.1 4.9 4.7 4.6 5 5.4 4.6 5 4.4 4.9 ...
##  $ Sepal.Width : num  3.5 3 3.2 3.1 3.6 3.9 3.4 3.4 2.9 3.1 ...
##  $ Petal.Length: num  1.4 1.4 1.3 1.5 1.4 1.7 1.4 1.5 1.4 1.5 ...
##  $ Petal.Width : num  0.2 0.2 0.2 0.2 0.2 0.4 0.3 0.2 0.2 0.1 ...
##  $ Species     : Factor w/ 3 levels "setosa","versicolor",..: 1 1 1 1 1 1 1 1 1 ...
```

First, starting from the top row, `str()` shows you the class, aka the type of table R has your data stored in. For example, a matrix can only hold numbers, but a dataframe like iris is can hold mixed types of information in this case numbers and written categorical descriptions. (We'll talk about this more at a later time.) It tells you what the dimensions of the table are; there are 150 obs, rows, of 5 variables, columns. All of the rows starting with a $ represent columns. Each tells you the column name, the type of data in the column, numbers, characters, etc, and shows the first ten entries in the column.

Quick Detour to Logicals

These operators are how you compare values to each other. Keep them in mind for subsetting and filtering going forward.

- equals `==`
- not equal to `!=`
- greater than `>`
- greater than or equal to `>=`
- less than `<`
- less than or equal to `<=`
- and `&`
- or `|`

Subsetting

Frequently, you will only want to work with part of a table or look at only part of a table. To reduce the size of the table, you have to subset it. The two most useful operators (symbols) you can use to subset in R are square brackets `[]`, and dollar signs '$'.

Basics

When you subset a table with square brackets, you have to put square brackets next to the name of the table.

```
iris[]
```

```
##     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
## 101         6.3         3.3          6.0         2.5  virginica
## 102         5.8         2.7          5.1         1.9  virginica
## 103         7.1         3.0          5.9         2.1  virginica
## 104         6.3         2.9          5.6         1.8  virginica
## 105         6.5         3.0          5.8         2.2  virginica
## 106         7.6         3.0          6.6         2.1  virginica
## 107         4.9         2.5          4.5         1.7  virginica
## 108         7.3         2.9          6.3         1.8  virginica
## 109         6.7         2.5          5.8         1.8  virginica
## 110         7.2         3.6          6.1         2.5  virginica
## 111         6.5         3.2          5.1         2.0  virginica
## 112         6.4         2.7          5.3         1.9  virginica
## 113         6.8         3.0          5.5         2.1  virginica
## 114         5.7         2.5          5.0         2.0  virginica
## 115         5.8         2.8          5.1         2.4  virginica
## 116         6.4         3.2          5.3         2.3  virginica
## 117         6.5         3.0          5.5         1.8  virginica
## 118         7.7         3.8          6.7         2.2  virginica
```

```
## 119          7.7         2.6          6.9         2.3  virginica
## 120          6.0         2.2          5.0         1.5  virginica
## 121          6.9         3.2          5.7         2.3  virginica
## 122          5.6         2.8          4.9         2.0  virginica
## 123          7.7         2.8          6.7         2.0  virginica
## 124          6.3         2.7          4.9         1.8  virginica
## 125          6.7         3.3          5.7         2.1  virginica
## 126          7.2         3.2          6.0         1.8  virginica
## 127          6.2         2.8          4.8         1.8  virginica
## 128          6.1         3.0          4.9         1.8  virginica
## 129          6.4         2.8          5.6         2.1  virginica
## 130          7.2         3.0          5.8         1.6  virginica
## 131          7.4         2.8          6.1         1.9  virginica
## 132          7.9         3.8          6.4         2.0  virginica
## 133          6.4         2.8          5.6         2.2  virginica
## 134          6.3         2.8          5.1         1.5  virginica
## 135          6.1         2.6          5.6         1.4  virginica
## 136          7.7         3.0          6.1         2.3  virginica
## 137          6.3         3.4          5.6         2.4  virginica
## 138          6.4         3.1          5.5         1.8  virginica
## 139          6.0         3.0          4.8         1.8  virginica
## 140          6.9         3.1          5.4         2.1  virginica
## 141          6.7         3.1          5.6         2.4  virginica
## 142          6.9         3.1          5.1         2.3  virginica
## 143          5.8         2.7          5.1         1.9  virginica
## 144          6.8         3.2          5.9         2.3  virginica
## 145          6.7         3.3          5.7         2.5  virginica
## 146          6.7         3.0          5.2         2.3  virginica
## 147          6.3         2.5          5.0         1.9  virginica
## 148          6.5         3.0          5.2         2.0  virginica
## 149          6.2         3.4          5.4         2.3  virginica
## 150          5.9         3.0          5.1         1.8  virginica
```

However, if you don't put anything inside the brackets, it returns the entire table, just like typing the name of the table. You have to supply numbers specifing the row number and column number, like in the chunk below.

```
# return row 3, column 5
iris[3,5]
```

```
## [1] setosa
## Levels: setosa versicolor virginica
```

This returns the value in row 3, column 5. But a single number isn't that helpful. You can get an entire row or column by supplying a number and leaving the other side of the comma blank, like below.

```
# return row 1 in all columns (no number after the comma selects all columns)
iris[1,]
```

```
##   Sepal.Length Sepal.Width Petal.Length Petal.Width Species
## 1          5.1         3.5          1.4         0.2  setosa
```

```
# return all rows in column 1 (no number before the comma selects all rows)
iris[,1]
```

```
##   [1] 5.1 4.9 4.7 4.6 5.0 5.4 4.6 5.0 4.4 4.9 5.4 4.8 4.8 4.3 5.8 5.7 5.4
##  [18] 5.1 5.7 5.1 5.4 5.1 4.6 5.1 4.8 5.0 5.0 5.2 5.2 4.7 4.8 5.4 5.2 5.5
```

```
##  [35] 4.9 5.0 5.5 4.9 4.4 5.1 5.0 4.5 4.4 5.0 5.1 4.8 5.1 4.6 5.3 5.0 7.0
##  [52] 6.4 6.9 5.5 6.5 5.7 6.3 4.9 6.6 5.2 5.0 5.9 6.0 6.1 5.6 6.7 5.6 5.8
##  [69] 6.2 5.6 5.9 6.1 6.3 6.1 6.4 6.6 6.8 6.7 6.0 5.7 5.5 5.5 5.8 6.0 5.4
##  [86] 6.0 6.7 6.3 5.6 5.5 5.5 6.1 5.8 5.0 5.6 5.7 5.7 6.2 5.1 5.7 6.3 5.8
## [103] 7.1 6.3 6.5 7.6 4.9 7.3 6.7 7.2 6.5 6.4 6.8 5.7 5.8 6.4 6.5 7.7 7.7
## [120] 6.0 6.9 5.6 7.7 6.3 6.7 7.2 6.2 6.1 6.4 7.2 7.4 7.9 6.4 6.3 6.1 7.7
## [137] 6.3 6.4 6.0 6.9 6.7 6.9 5.8 6.8 6.7 6.7 6.3 6.5 6.2 5.9
```

You can also get an entire column using the $ operator like below

```
iris$Petal.Width
```

```
##   [1] 0.2 0.2 0.2 0.2 0.2 0.4 0.3 0.2 0.2 0.1 0.2 0.2 0.1 0.1 0.2 0.4 0.4
##  [18] 0.3 0.3 0.3 0.2 0.4 0.2 0.5 0.2 0.2 0.4 0.2 0.2 0.2 0.2 0.4 0.1 0.2
##  [35] 0.2 0.2 0.2 0.1 0.2 0.2 0.3 0.3 0.2 0.6 0.4 0.3 0.2 0.2 0.2 0.2 1.4
##  [52] 1.5 1.5 1.3 1.5 1.3 1.6 1.0 1.3 1.4 1.0 1.5 1.0 1.4 1.3 1.4 1.5 1.0
##  [69] 1.5 1.1 1.8 1.3 1.5 1.2 1.3 1.4 1.4 1.7 1.5 1.0 1.1 1.0 1.2 1.6 1.5
##  [86] 1.6 1.5 1.3 1.3 1.3 1.2 1.4 1.2 1.0 1.3 1.2 1.3 1.3 1.1 1.3 2.5 1.9
## [103] 2.1 1.8 2.2 2.1 1.7 1.8 1.8 2.5 2.0 1.9 2.1 2.0 2.4 2.3 1.8 2.2 2.3
## [120] 1.5 2.3 2.0 2.0 1.8 2.1 1.8 1.8 1.8 2.1 1.6 1.9 2.0 2.2 1.5 1.4 2.3
## [137] 2.4 1.8 1.8 2.1 2.4 2.3 1.9 2.3 2.5 2.3 1.9 2.0 2.3 1.8
```

Other stuff you can put in square brackets

The majority of the time, you'll want more than a single row and/or column, so here are more complicated ways of subsetting.

You can use negative numbers to drop rows and/or columns.

```
# drop the first column
iris[,-1]
```

```
##     Sepal.Width Petal.Length Petal.Width    Species
## 1           3.5          1.4         0.2     setosa
## 2           3.0          1.4         0.2     setosa
## 3           3.2          1.3         0.2     setosa
## 4           3.1          1.5         0.2     setosa
## 5           3.6          1.4         0.2     setosa
## 6           3.9          1.7         0.4     setosa
## 7           3.4          1.4         0.3     setosa
## 8           3.4          1.5         0.2     setosa
## 9           2.9          1.4         0.2     setosa
## 10          3.1          1.5         0.1     setosa
## 11          3.7          1.5         0.2     setosa
## 12          3.4          1.6         0.2     setosa
## 13          3.0          1.4         0.1     setosa
## 14          3.0          1.1         0.1     setosa
## 15          4.0          1.2         0.2     setosa
## 16          4.4          1.5         0.4     setosa
## 17          3.9          1.3         0.4     setosa
## 18          3.5          1.4         0.3     setosa
## 19          3.8          1.7         0.3     setosa
## 20          3.8          1.5         0.3     setosa
## 21          3.4          1.7         0.2     setosa
## 22          3.7          1.5         0.4     setosa
## 23          3.6          1.0         0.2     setosa
```

```
## 24          3.3          1.7          0.5     setosa
## 25          3.4          1.9          0.2     setosa
## 26          3.0          1.6          0.2     setosa
## 27          3.4          1.6          0.4     setosa
## 28          3.5          1.5          0.2     setosa
## 29          3.4          1.4          0.2     setosa
## 30          3.2          1.6          0.2     setosa
## 31          3.1          1.6          0.2     setosa
## 32          3.4          1.5          0.4     setosa
## 33          4.1          1.5          0.1     setosa
## 34          4.2          1.4          0.2     setosa
## 35          3.1          1.5          0.2     setosa
## 36          3.2          1.2          0.2     setosa
## 37          3.5          1.3          0.2     setosa
## 38          3.6          1.4          0.1     setosa
## 39          3.0          1.3          0.2     setosa
## 40          3.4          1.5          0.2     setosa
## 41          3.5          1.3          0.3     setosa
## 42          2.3          1.3          0.3     setosa
## 43          3.2          1.3          0.2     setosa
## 44          3.5          1.6          0.6     setosa
## 45          3.8          1.9          0.4     setosa
## 46          3.0          1.4          0.3     setosa
## 47          3.8          1.6          0.2     setosa
## 48          3.2          1.4          0.2     setosa
## 49          3.7          1.5          0.2     setosa
## 50          3.3          1.4          0.2     setosa
## 51          3.2          4.7          1.4 versicolor
## 52          3.2          4.5          1.5 versicolor
## 53          3.1          4.9          1.5 versicolor
## 54          2.3          4.0          1.3 versicolor
## 55          2.8          4.6          1.5 versicolor
## 56          2.8          4.5          1.3 versicolor
## 57          3.3          4.7          1.6 versicolor
## 58          2.4          3.3          1.0 versicolor
## 59          2.9          4.6          1.3 versicolor
## 60          2.7          3.9          1.4 versicolor
## 61          2.0          3.5          1.0 versicolor
## 62          3.0          4.2          1.5 versicolor
## 63          2.2          4.0          1.0 versicolor
## 64          2.9          4.7          1.4 versicolor
## 65          2.9          3.6          1.3 versicolor
## 66          3.1          4.4          1.4 versicolor
## 67          3.0          4.5          1.5 versicolor
## 68          2.7          4.1          1.0 versicolor
## 69          2.2          4.5          1.5 versicolor
## 70          2.5          3.9          1.1 versicolor
## 71          3.2          4.8          1.8 versicolor
## 72          2.8          4.0          1.3 versicolor
## 73          2.5          4.9          1.5 versicolor
## 74          2.8          4.7          1.2 versicolor
## 75          2.9          4.3          1.3 versicolor
## 76          3.0          4.4          1.4 versicolor
## 77          2.8          4.8          1.4 versicolor
```

```
## 78          3.0          5.0          1.7 versicolor
## 79          2.9          4.5          1.5 versicolor
## 80          2.6          3.5          1.0 versicolor
## 81          2.4          3.8          1.1 versicolor
## 82          2.4          3.7          1.0 versicolor
## 83          2.7          3.9          1.2 versicolor
## 84          2.7          5.1          1.6 versicolor
## 85          3.0          4.5          1.5 versicolor
## 86          3.4          4.5          1.6 versicolor
## 87          3.1          4.7          1.5 versicolor
## 88          2.3          4.4          1.3 versicolor
## 89          3.0          4.1          1.3 versicolor
## 90          2.5          4.0          1.3 versicolor
## 91          2.6          4.4          1.2 versicolor
## 92          3.0          4.6          1.4 versicolor
## 93          2.6          4.0          1.2 versicolor
## 94          2.3          3.3          1.0 versicolor
## 95          2.7          4.2          1.3 versicolor
## 96          3.0          4.2          1.2 versicolor
## 97          2.9          4.2          1.3 versicolor
## 98          2.9          4.3          1.3 versicolor
## 99          2.5          3.0          1.1 versicolor
## 100         2.8          4.1          1.3 versicolor
## 101         3.3          6.0          2.5  virginica
## 102         2.7          5.1          1.9  virginica
## 103         3.0          5.9          2.1  virginica
## 104         2.9          5.6          1.8  virginica
## 105         3.0          5.8          2.2  virginica
## 106         3.0          6.6          2.1  virginica
## 107         2.5          4.5          1.7  virginica
## 108         2.9          6.3          1.8  virginica
## 109         2.5          5.8          1.8  virginica
## 110         3.6          6.1          2.5  virginica
## 111         3.2          5.1          2.0  virginica
## 112         2.7          5.3          1.9  virginica
## 113         3.0          5.5          2.1  virginica
## 114         2.5          5.0          2.0  virginica
## 115         2.8          5.1          2.4  virginica
## 116         3.2          5.3          2.3  virginica
## 117         3.0          5.5          1.8  virginica
## 118         3.8          6.7          2.2  virginica
## 119         2.6          6.9          2.3  virginica
## 120         2.2          5.0          1.5  virginica
## 121         3.2          5.7          2.3  virginica
## 122         2.8          4.9          2.0  virginica
## 123         2.8          6.7          2.0  virginica
## 124         2.7          4.9          1.8  virginica
## 125         3.3          5.7          2.1  virginica
## 126         3.2          6.0          1.8  virginica
## 127         2.8          4.8          1.8  virginica
## 128         3.0          4.9          1.8  virginica
## 129         2.8          5.6          2.1  virginica
## 130         3.0          5.8          1.6  virginica
## 131         2.8          6.1          1.9  virginica
```

```
## 132          3.8          6.4         2.0  virginica
## 133          2.8          5.6         2.2  virginica
## 134          2.8          5.1         1.5  virginica
## 135          2.6          5.6         1.4  virginica
## 136          3.0          6.1         2.3  virginica
## 137          3.4          5.6         2.4  virginica
## 138          3.1          5.5         1.8  virginica
## 139          3.0          4.8         1.8  virginica
## 140          3.1          5.4         2.1  virginica
## 141          3.1          5.6         2.4  virginica
## 142          3.1          5.1         2.3  virginica
## 143          2.7          5.1         1.9  virginica
## 144          3.2          5.9         2.3  virginica
## 145          3.3          5.7         2.5  virginica
## 146          3.0          5.2         2.3  virginica
## 147          2.5          5.0         1.9  virginica
## 148          3.0          5.2         2.0  virginica
## 149          3.4          5.4         2.3  virginica
## 150          3.0          5.1         1.8  virginica
```

You can separate numbers with a colon to select everything between them

```
# select rows 1 to 5 and columns 2 to 4
iris[1:5,2:4]
```

```
##   Sepal.Width Petal.Length Petal.Width
## 1         3.5          1.4         0.2
## 2         3.0          1.4         0.2
## 3         3.2          1.3         0.2
## 4         3.1          1.5         0.2
## 5         3.6          1.4         0.2
```

You can supply vectors (list values) to specify exactly which rows and columns you want

```
iris[c(37, 49, 132, 12, 77), c(1, 3)]
```

```
##     Sepal.Length Petal.Length
## 37           5.5          1.3
## 49           5.3          1.5
## 132          7.9          6.4
## 12           4.8          1.6
## 77           6.8          4.8
```

You can use logicals to select data only of a certain type.

```
# get all columns and all rows where sepal length is greater than or equal to 5
iris[iris$Sepal.Length >= 5,]
```

```
##     Sepal.Length Sepal.Width Petal.Length Petal.Width    Species
## 1            5.1         3.5          1.4         0.2     setosa
## 5            5.0         3.6          1.4         0.2     setosa
## 6            5.4         3.9          1.7         0.4     setosa
## 8            5.0         3.4          1.5         0.2     setosa
## 11           5.4         3.7          1.5         0.2     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
## 24          5.1         3.3          1.7         0.5     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
## 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
## 36          5.0         3.2          1.2         0.2     setosa
## 37          5.5         3.5          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
## 44          5.0         3.5          1.6         0.6     setosa
## 45          5.1         3.8          1.9         0.4     setosa
## 47          5.1         3.8          1.6         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
## 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
## 101         6.3         3.3          6.0         2.5  virginica
## 102         5.8         2.7          5.1         1.9  virginica
## 103         7.1         3.0          5.9         2.1  virginica
## 104         6.3         2.9          5.6         1.8  virginica
## 105         6.5         3.0          5.8         2.2  virginica
## 106         7.6         3.0          6.6         2.1  virginica
## 108         7.3         2.9          6.3         1.8  virginica
## 109         6.7         2.5          5.8         1.8  virginica
## 110         7.2         3.6          6.1         2.5  virginica
## 111         6.5         3.2          5.1         2.0  virginica
## 112         6.4         2.7          5.3         1.9  virginica
## 113         6.8         3.0          5.5         2.1  virginica
## 114         5.7         2.5          5.0         2.0  virginica
## 115         5.8         2.8          5.1         2.4  virginica
## 116         6.4         3.2          5.3         2.3  virginica
## 117         6.5         3.0          5.5         1.8  virginica
## 118         7.7         3.8          6.7         2.2  virginica
## 119         7.7         2.6          6.9         2.3  virginica
## 120         6.0         2.2          5.0         1.5  virginica
## 121         6.9         3.2          5.7         2.3  virginica
## 122         5.6         2.8          4.9         2.0  virginica
## 123         7.7         2.8          6.7         2.0  virginica
## 124         6.3         2.7          4.9         1.8  virginica
## 125         6.7         3.3          5.7         2.1  virginica
## 126         7.2         3.2          6.0         1.8  virginica
## 127         6.2         2.8          4.8         1.8  virginica
## 128         6.1         3.0          4.9         1.8  virginica
## 129         6.4         2.8          5.6         2.1  virginica
## 130         7.2         3.0          5.8         1.6  virginica
## 131         7.4         2.8          6.1         1.9  virginica
## 132         7.9         3.8          6.4         2.0  virginica
## 133         6.4         2.8          5.6         2.2  virginica
## 134         6.3         2.8          5.1         1.5  virginica
## 135         6.1         2.6          5.6         1.4  virginica
## 136         7.7         3.0          6.1         2.3  virginica
## 137         6.3         3.4          5.6         2.4  virginica
## 138         6.4         3.1          5.5         1.8  virginica
## 139         6.0         3.0          4.8         1.8  virginica
```

```
## 140          6.9         3.1          5.4         2.1  virginica
## 141          6.7         3.1          5.6         2.4  virginica
## 142          6.9         3.1          5.1         2.3  virginica
## 143          5.8         2.7          5.1         1.9  virginica
## 144          6.8         3.2          5.9         2.3  virginica
## 145          6.7         3.3          5.7         2.5  virginica
## 146          6.7         3.0          5.2         2.3  virginica
## 147          6.3         2.5          5.0         1.9  virginica
## 148          6.5         3.0          5.2         2.0  virginica
## 149          6.2         3.4          5.4         2.3  virginica
## 150          5.9         3.0          5.1         1.8  virginica
```

```
# get all columns and all rows species is NOT viriginica
iris[iris$Species != 'virginica',]
```

```
##     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
```

Filtering And Selecting

Everything we've been doing so far today is included in R by default. `filter()` and `select()` are in the dplyr package, part of the tidyverse. Before you can use them you have to load either dplyr or the whole tidyverse.

```
# load just the dplyr package
library(dplyr)

### OR

# load the tidyverse
library(tidyverse)
```

`filter()`

`filter()` selects rows based on the criteria you give it. You specify what column you want to filter on and by what values.

```
filter(iris, Petal.Length <= 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
```

You can filter on as many columns as you want.

```
filter(iris, Petal.Length >= 2, Sepal.Length <= 5)
```

```
##   Sepal.Length Sepal.Width Petal.Length Petal.Width    Species
## 1          4.9         2.4          3.3         1.0 versicolor
## 2          5.0         2.0          3.5         1.0 versicolor
## 3          5.0         2.3          3.3         1.0 versicolor
## 4          4.9         2.5          4.5         1.7  virginica
```

select()

`select()` selects columns

```
select(iris, Species)
```

```
##        Species
## 1       setosa
## 2       setosa
## 3       setosa
## 4       setosa
## 5       setosa
## 6       setosa
## 7       setosa
## 8       setosa
## 9       setosa
## 10      setosa
```

```
## 11      setosa
## 12      setosa
## 13      setosa
## 14      setosa
## 15      setosa
## 16      setosa
## 17      setosa
## 18      setosa
## 19      setosa
## 20      setosa
## 21      setosa
## 22      setosa
## 23      setosa
## 24      setosa
## 25      setosa
## 26      setosa
## 27      setosa
## 28      setosa
## 29      setosa
## 30      setosa
## 31      setosa
## 32      setosa
## 33      setosa
## 34      setosa
## 35      setosa
## 36      setosa
## 37      setosa
## 38      setosa
## 39      setosa
## 40      setosa
## 41      setosa
## 42      setosa
## 43      setosa
## 44      setosa
## 45      setosa
## 46      setosa
## 47      setosa
## 48      setosa
## 49      setosa
## 50      setosa
## 51  versicolor
## 52  versicolor
## 53  versicolor
## 54  versicolor
## 55  versicolor
## 56  versicolor
## 57  versicolor
## 58  versicolor
## 59  versicolor
## 60  versicolor
## 61  versicolor
## 62  versicolor
## 63  versicolor
## 64  versicolor
```

```
## 65  versicolor
## 66  versicolor
## 67  versicolor
## 68  versicolor
## 69  versicolor
## 70  versicolor
## 71  versicolor
## 72  versicolor
## 73  versicolor
## 74  versicolor
## 75  versicolor
## 76  versicolor
## 77  versicolor
## 78  versicolor
## 79  versicolor
## 80  versicolor
## 81  versicolor
## 82  versicolor
## 83  versicolor
## 84  versicolor
## 85  versicolor
## 86  versicolor
## 87  versicolor
## 88  versicolor
## 89  versicolor
## 90  versicolor
## 91  versicolor
## 92  versicolor
## 93  versicolor
## 94  versicolor
## 95  versicolor
## 96  versicolor
## 97  versicolor
## 98  versicolor
## 99  versicolor
## 100 versicolor
## 101  virginica
## 102  virginica
## 103  virginica
## 104  virginica
## 105  virginica
## 106  virginica
## 107  virginica
## 108  virginica
## 109  virginica
## 110  virginica
## 111  virginica
## 112  virginica
## 113  virginica
## 114  virginica
## 115  virginica
## 116  virginica
## 117  virginica
## 118  virginica
```

```
## 119  virginica
## 120  virginica
## 121  virginica
## 122  virginica
## 123  virginica
## 124  virginica
## 125  virginica
## 126  virginica
## 127  virginica
## 128  virginica
## 129  virginica
## 130  virginica
## 131  virginica
## 132  virginica
## 133  virginica
## 134  virginica
## 135  virginica
## 136  virginica
## 137  virginica
## 138  virginica
## 139  virginica
## 140  virginica
## 141  virginica
## 142  virginica
## 143  virginica
## 144  virginica
## 145  virginica
## 146  virginica
## 147  virginica
## 148  virginica
## 149  virginica
## 150  virginica
```

You can select multiple columns

```
select(iris, Sepal.Width, Petal.Width, Species)
```

```
##     Sepal.Width Petal.Width    Species
## 1           3.5         0.2     setosa
## 2           3.0         0.2     setosa
## 3           3.2         0.2     setosa
## 4           3.1         0.2     setosa
## 5           3.6         0.2     setosa
## 6           3.9         0.4     setosa
## 7           3.4         0.3     setosa
## 8           3.4         0.2     setosa
## 9           2.9         0.2     setosa
## 10          3.1         0.1     setosa
## 11          3.7         0.2     setosa
## 12          3.4         0.2     setosa
## 13          3.0         0.1     setosa
## 14          3.0         0.1     setosa
## 15          4.0         0.2     setosa
## 16          4.4         0.4     setosa
## 17          3.9         0.4     setosa
```

```
## 18          3.5         0.3     setosa
## 19          3.8         0.3     setosa
## 20          3.8         0.3     setosa
## 21          3.4         0.2     setosa
## 22          3.7         0.4     setosa
## 23          3.6         0.2     setosa
## 24          3.3         0.5     setosa
## 25          3.4         0.2     setosa
## 26          3.0         0.2     setosa
## 27          3.4         0.4     setosa
## 28          3.5         0.2     setosa
## 29          3.4         0.2     setosa
## 30          3.2         0.2     setosa
## 31          3.1         0.2     setosa
## 32          3.4         0.4     setosa
## 33          4.1         0.1     setosa
## 34          4.2         0.2     setosa
## 35          3.1         0.2     setosa
## 36          3.2         0.2     setosa
## 37          3.5         0.2     setosa
## 38          3.6         0.1     setosa
## 39          3.0         0.2     setosa
## 40          3.4         0.2     setosa
## 41          3.5         0.3     setosa
## 42          2.3         0.3     setosa
## 43          3.2         0.2     setosa
## 44          3.5         0.6     setosa
## 45          3.8         0.4     setosa
## 46          3.0         0.3     setosa
## 47          3.8         0.2     setosa
## 48          3.2         0.2     setosa
## 49          3.7         0.2     setosa
## 50          3.3         0.2     setosa
## 51          3.2         1.4 versicolor
## 52          3.2         1.5 versicolor
## 53          3.1         1.5 versicolor
## 54          2.3         1.3 versicolor
## 55          2.8         1.5 versicolor
## 56          2.8         1.3 versicolor
## 57          3.3         1.6 versicolor
## 58          2.4         1.0 versicolor
## 59          2.9         1.3 versicolor
## 60          2.7         1.4 versicolor
## 61          2.0         1.0 versicolor
## 62          3.0         1.5 versicolor
## 63          2.2         1.0 versicolor
## 64          2.9         1.4 versicolor
## 65          2.9         1.3 versicolor
## 66          3.1         1.4 versicolor
## 67          3.0         1.5 versicolor
## 68          2.7         1.0 versicolor
## 69          2.2         1.5 versicolor
## 70          2.5         1.1 versicolor
## 71          3.2         1.8 versicolor
```

```
## 72          2.8         1.3 versicolor
## 73          2.5         1.5 versicolor
## 74          2.8         1.2 versicolor
## 75          2.9         1.3 versicolor
## 76          3.0         1.4 versicolor
## 77          2.8         1.4 versicolor
## 78          3.0         1.7 versicolor
## 79          2.9         1.5 versicolor
## 80          2.6         1.0 versicolor
## 81          2.4         1.1 versicolor
## 82          2.4         1.0 versicolor
## 83          2.7         1.2 versicolor
## 84          2.7         1.6 versicolor
## 85          3.0         1.5 versicolor
## 86          3.4         1.6 versicolor
## 87          3.1         1.5 versicolor
## 88          2.3         1.3 versicolor
## 89          3.0         1.3 versicolor
## 90          2.5         1.3 versicolor
## 91          2.6         1.2 versicolor
## 92          3.0         1.4 versicolor
## 93          2.6         1.2 versicolor
## 94          2.3         1.0 versicolor
## 95          2.7         1.3 versicolor
## 96          3.0         1.2 versicolor
## 97          2.9         1.3 versicolor
## 98          2.9         1.3 versicolor
## 99          2.5         1.1 versicolor
## 100         2.8         1.3 versicolor
## 101         3.3         2.5  virginica
## 102         2.7         1.9  virginica
## 103         3.0         2.1  virginica
## 104         2.9         1.8  virginica
## 105         3.0         2.2  virginica
## 106         3.0         2.1  virginica
## 107         2.5         1.7  virginica
## 108         2.9         1.8  virginica
## 109         2.5         1.8  virginica
## 110         3.6         2.5  virginica
## 111         3.2         2.0  virginica
## 112         2.7         1.9  virginica
## 113         3.0         2.1  virginica
## 114         2.5         2.0  virginica
## 115         2.8         2.4  virginica
## 116         3.2         2.3  virginica
## 117         3.0         1.8  virginica
## 118         3.8         2.2  virginica
## 119         2.6         2.3  virginica
## 120         2.2         1.5  virginica
## 121         3.2         2.3  virginica
## 122         2.8         2.0  virginica
## 123         2.8         2.0  virginica
## 124         2.7         1.8  virginica
## 125         3.3         2.1  virginica
```

```
## 126         3.2         1.8  virginica
## 127         2.8         1.8  virginica
## 128         3.0         1.8  virginica
## 129         2.8         2.1  virginica
## 130         3.0         1.6  virginica
## 131         2.8         1.9  virginica
## 132         3.8         2.0  virginica
## 133         2.8         2.2  virginica
## 134         2.8         1.5  virginica
## 135         2.6         1.4  virginica
## 136         3.0         2.3  virginica
## 137         3.4         2.4  virginica
## 138         3.1         1.8  virginica
## 139         3.0         1.8  virginica
## 140         3.1         2.1  virginica
## 141         3.1         2.4  virginica
## 142         3.1         2.3  virginica
## 143         2.7         1.9  virginica
## 144         3.2         2.3  virginica
## 145         3.3         2.5  virginica
## 146         3.0         2.3  virginica
## 147         2.5         1.9  virginica
## 148         3.0         2.0  virginica
## 149         3.4         2.3  virginica
## 150         3.0         1.8  virginica
```

You can also drop columns by putting a minus sign, -, in front of them

```
select(iris, -Species)
```

```
##     Sepal.Length Sepal.Width Petal.Length Petal.Width
## 1            5.1         3.5          1.4         0.2
## 2            4.9         3.0          1.4         0.2
## 3            4.7         3.2          1.3         0.2
## 4            4.6         3.1          1.5         0.2
## 5            5.0         3.6          1.4         0.2
## 6            5.4         3.9          1.7         0.4
## 7            4.6         3.4          1.4         0.3
## 8            5.0         3.4          1.5         0.2
## 9            4.4         2.9          1.4         0.2
## 10           4.9         3.1          1.5         0.1
## 11           5.4         3.7          1.5         0.2
## 12           4.8         3.4          1.6         0.2
## 13           4.8         3.0          1.4         0.1
## 14           4.3         3.0          1.1         0.1
## 15           5.8         4.0          1.2         0.2
## 16           5.7         4.4          1.5         0.4
## 17           5.4         3.9          1.3         0.4
## 18           5.1         3.5          1.4         0.3
## 19           5.7         3.8          1.7         0.3
## 20           5.1         3.8          1.5         0.3
## 21           5.4         3.4          1.7         0.2
## 22           5.1         3.7          1.5         0.4
## 23           4.6         3.6          1.0         0.2
## 24           5.1         3.3          1.7         0.5
```

```
## 25          4.8         3.4         1.9         0.2
## 26          5.0         3.0         1.6         0.2
## 27          5.0         3.4         1.6         0.4
## 28          5.2         3.5         1.5         0.2
## 29          5.2         3.4         1.4         0.2
## 30          4.7         3.2         1.6         0.2
## 31          4.8         3.1         1.6         0.2
## 32          5.4         3.4         1.5         0.4
## 33          5.2         4.1         1.5         0.1
## 34          5.5         4.2         1.4         0.2
## 35          4.9         3.1         1.5         0.2
## 36          5.0         3.2         1.2         0.2
## 37          5.5         3.5         1.3         0.2
## 38          4.9         3.6         1.4         0.1
## 39          4.4         3.0         1.3         0.2
## 40          5.1         3.4         1.5         0.2
## 41          5.0         3.5         1.3         0.3
## 42          4.5         2.3         1.3         0.3
## 43          4.4         3.2         1.3         0.2
## 44          5.0         3.5         1.6         0.6
## 45          5.1         3.8         1.9         0.4
## 46          4.8         3.0         1.4         0.3
## 47          5.1         3.8         1.6         0.2
## 48          4.6         3.2         1.4         0.2
## 49          5.3         3.7         1.5         0.2
## 50          5.0         3.3         1.4         0.2
## 51          7.0         3.2         4.7         1.4
## 52          6.4         3.2         4.5         1.5
## 53          6.9         3.1         4.9         1.5
## 54          5.5         2.3         4.0         1.3
## 55          6.5         2.8         4.6         1.5
## 56          5.7         2.8         4.5         1.3
## 57          6.3         3.3         4.7         1.6
## 58          4.9         2.4         3.3         1.0
## 59          6.6         2.9         4.6         1.3
## 60          5.2         2.7         3.9         1.4
## 61          5.0         2.0         3.5         1.0
## 62          5.9         3.0         4.2         1.5
## 63          6.0         2.2         4.0         1.0
## 64          6.1         2.9         4.7         1.4
## 65          5.6         2.9         3.6         1.3
## 66          6.7         3.1         4.4         1.4
## 67          5.6         3.0         4.5         1.5
## 68          5.8         2.7         4.1         1.0
## 69          6.2         2.2         4.5         1.5
## 70          5.6         2.5         3.9         1.1
## 71          5.9         3.2         4.8         1.8
## 72          6.1         2.8         4.0         1.3
## 73          6.3         2.5         4.9         1.5
## 74          6.1         2.8         4.7         1.2
## 75          6.4         2.9         4.3         1.3
## 76          6.6         3.0         4.4         1.4
## 77          6.8         2.8         4.8         1.4
## 78          6.7         3.0         5.0         1.7
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## 79          6.0         2.9         4.5         1.5
## 80          5.7         2.6         3.5         1.0
## 81          5.5         2.4         3.8         1.1
## 82          5.5         2.4         3.7         1.0
## 83          5.8         2.7         3.9         1.2
## 84          6.0         2.7         5.1         1.6
## 85          5.4         3.0         4.5         1.5
## 86          6.0         3.4         4.5         1.6
## 87          6.7         3.1         4.7         1.5
## 88          6.3         2.3         4.4         1.3
## 89          5.6         3.0         4.1         1.3
## 90          5.5         2.5         4.0         1.3
## 91          5.5         2.6         4.4         1.2
## 92          6.1         3.0         4.6         1.4
## 93          5.8         2.6         4.0         1.2
## 94          5.0         2.3         3.3         1.0
## 95          5.6         2.7         4.2         1.3
## 96          5.7         3.0         4.2         1.2
## 97          5.7         2.9         4.2         1.3
## 98          6.2         2.9         4.3         1.3
## 99          5.1         2.5         3.0         1.1
## 100         5.7         2.8         4.1         1.3
## 101         6.3         3.3         6.0         2.5
## 102         5.8         2.7         5.1         1.9
## 103         7.1         3.0         5.9         2.1
## 104         6.3         2.9         5.6         1.8
## 105         6.5         3.0         5.8         2.2
## 106         7.6         3.0         6.6         2.1
## 107         4.9         2.5         4.5         1.7
## 108         7.3         2.9         6.3         1.8
## 109         6.7         2.5         5.8         1.8
## 110         7.2         3.6         6.1         2.5
## 111         6.5         3.2         5.1         2.0
## 112         6.4         2.7         5.3         1.9
## 113         6.8         3.0         5.5         2.1
## 114         5.7         2.5         5.0         2.0
## 115         5.8         2.8         5.1         2.4
## 116         6.4         3.2         5.3         2.3
## 117         6.5         3.0         5.5         1.8
## 118         7.7         3.8         6.7         2.2
## 119         7.7         2.6         6.9         2.3
## 120         6.0         2.2         5.0         1.5
## 121         6.9         3.2         5.7         2.3
## 122         5.6         2.8         4.9         2.0
## 123         7.7         2.8         6.7         2.0
## 124         6.3         2.7         4.9         1.8
## 125         6.7         3.3         5.7         2.1
## 126         7.2         3.2         6.0         1.8
## 127         6.2         2.8         4.8         1.8
## 128         6.1         3.0         4.9         1.8
## 129         6.4         2.8         5.6         2.1
## 130         7.2         3.0         5.8         1.6
## 131         7.4         2.8         6.1         1.9
## 132         7.9         3.8         6.4         2.0
```

```
## 133         6.4         2.8         5.6         2.2
## 134         6.3         2.8         5.1         1.5
## 135         6.1         2.6         5.6         1.4
## 136         7.7         3.0         6.1         2.3
## 137         6.3         3.4         5.6         2.4
## 138         6.4         3.1         5.5         1.8
## 139         6.0         3.0         4.8         1.8
## 140         6.9         3.1         5.4         2.1
## 141         6.7         3.1         5.6         2.4
## 142         6.9         3.1         5.1         2.3
## 143         5.8         2.7         5.1         1.9
## 144         6.8         3.2         5.9         2.3
## 145         6.7         3.3         5.7         2.5
## 146         6.7         3.0         5.2         2.3
## 147         6.3         2.5         5.0         1.9
## 148         6.5         3.0         5.2         2.0
## 149         6.2         3.4         5.4         2.3
## 150         5.9         3.0         5.1         1.8
```