

# Data Wrangling with dplyr and tidyr

## Cheat Sheet



### Syntax - Helpful conventions for wrangling

#### dplyr::tbl\_df(iris)

Converts data to tbl class. tbl's are easier to examine than data frames. R displays only the data that fits onscreen:

```
Source: local data frame [150 x 5]
  Sepal.Length Sepal.Width Petal.Length
1           5.1           3.5           1.4
2           4.9           3.0           1.4
3           4.7           3.2           1.3
4           4.6           3.1           1.5
5           5.0           3.6           1.4
..           ...           ...           ..
Variables not shown: Petal.Width (dbl),
Species (fctr)
```

#### dplyr::glimpse(iris)

Information dense summary of tbl data.

#### utils::View(iris)

View data set in spreadsheet-like display (note capital V).

	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

#### dplyr::%>%

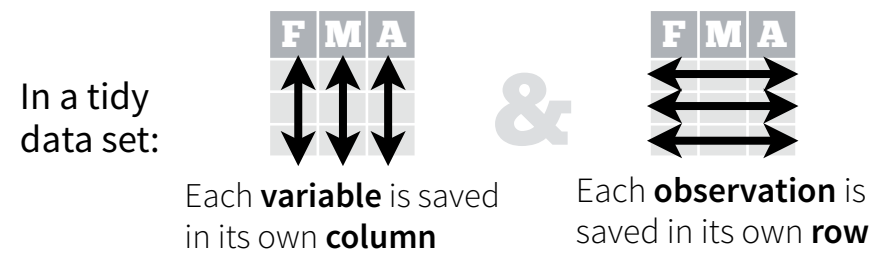
Passes object on left hand side as first argument (or . argument) of function on righthand side.

$x \%>\% f(y)$  is the same as  $f(x, y)$   
 $y \%>\% f(x, ., z)$  is the same as  $f(x, y, z)$

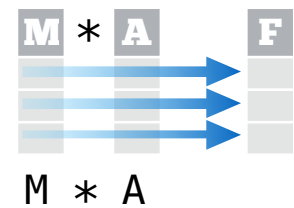
"Piping" with %>% makes code more readable, e.g.

```
iris %>%
  group_by(Species) %>%
  summarise(avg = mean(Sepal.Width)) %>%
  arrange(avg)
```

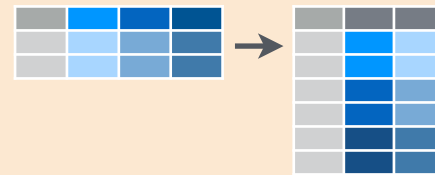
## Tidy Data - A foundation for wrangling in R



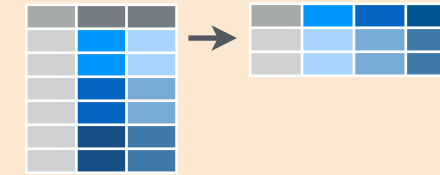
Tidy data complements R's **vectorized operations**. R will automatically preserve observations as you manipulate variables. No other format works as intuitively with R.



### Reshaping Data - Change the layout of a data set



**tidyr::gather(cases, "year", "n", 2:4)**  
Gather columns into rows.



**tidyr::spread(pollution, size, amount)**  
Spread rows into columns.



**tidyr::separate(storms, date, c("y", "m", "d"))**  
Separate one column into several.



**tidyr::unite(data, col, ..., sep)**  
Unite several columns into one.

**dplyr::data\_frame(a = 1:3, b = 4:6)**  
Combine vectors into data frame (optimized).

**dplyr::arrange(mtcars, mpg)**  
Order rows by values of a column (low to high).

**dplyr::arrange(.mtcars, desc(mpg))**  
Order rows by values of a column (high to low).

**dplyr::rename(tb, y = year)**  
Rename the columns of a data frame.

### Subset Observations (Rows)



**dplyr::filter(iris, Sepal.Length > 7)**  
Extract rows that meet logical criteria.

**dplyr::distinct(iris)**  
Remove duplicate rows.

**dplyr::sample\_frac(iris, 0.5, replace = TRUE)**  
Randomly select fraction of rows.

**dplyr::sample\_n(iris, 10, replace = TRUE)**  
Randomly select n rows.

**dplyr::slice(iris, 10:15)**  
Select rows by position.

**dplyr::top\_n(storms, 2, date)**  
Select and order top n entries (by group if grouped data).

### Subset Variables (Columns)



**dplyr::select(iris, Sepal.Width, Petal.Length, Species)**  
Select columns by name or helper function.

#### Helper functions for select - ?select

- select(iris, contains("."))**  
Select columns whose name contains a character string.
- select(iris, ends\_with("Length"))**  
Select columns whose name ends with a character string.
- select(iris, everything())**  
Select every column.
- select(iris, matches(".t."))**  
Select columns whose name matches a regular expression.
- select(iris, num\_range("x", 1:5))**  
Select columns named x1, x2, x3, x4, x5.
- select(iris, one\_of(c("Species", "Genus")))**  
Select columns whose names are in a group of names.
- select(iris, starts\_with("Sepal"))**  
Select columns whose name starts with a character string.
- select(iris, Sepal.Length:Petal.Width)**  
Select all columns between Sepal.Length and Petal.Width (inclusive).
- select(iris, -Species)**  
Select all columns except Species.

#### Logic in R - ?Comparison, ?base::Logic

<	Less than	!=	Not equal to
>	Greater than	%in%	Group membership
==	Equal to	is.na	Is NA
<=	Less than or equal to	!is.na	Is not NA
>=	Greater than or equal to	&,  , !, xor, any, all	Boolean operators

## Summarise Data



`dplyr::summarise(iris, avg = mean(Sepal.Length))`

Summarise data into single row of values.

`dplyr::summarise_each(iris, funs(mean))`

Apply summary function to each column.

`dplyr::count(iris, Species, wt = Sepal.Length)`

Count number of rows with each unique value of variable (with or without weights).



Summarise uses **summary functions**, functions that take a vector of values and return a single value, such as:

`dplyr::first`

First value of a vector.

`dplyr::last`

Last value of a vector.

`dplyr::nth`

Nth value of a vector.

`dplyr::n`

# of values in a vector.

`dplyr::n_distinct`

# of distinct values in a vector.

**IQR**

IQR of a vector.

**min**

Minimum value in a vector.

**max**

Maximum value in a vector.

**mean**

Mean value of a vector.

**median**

Median value of a vector.

**var**

Variance of a vector.

**sd**

Standard deviation of a vector.

## Group Data

`dplyr::group_by(iris, Species)`

Group data into rows with the same value of Species.

`dplyr::ungroup(iris)`

Remove grouping information from data frame.

`iris %>% group_by(Species) %>% summarise(...)`

Compute separate summary row for each group.



## Make New Variables



`dplyr::mutate(iris, sepal = Sepal.Length + Sepal.Width)`

Compute and append one or more new columns.

`dplyr::mutate_each(iris, funs(min_rank))`

Apply window function to each column.

`dplyr::transmute(iris, sepal = Sepal.Length + Sepal.Width)`

Compute one or more new columns. Drop original columns.



Mutate uses **window functions**, functions that take a vector of values and return another vector of values, such as:

`dplyr::lead`

Copy with values shifted by 1.

`dplyr::lag`

Copy with values lagged by 1.

`dplyr::dense_rank`

Ranks with no gaps.

`dplyr::min_rank`

Ranks. Ties get min rank.

`dplyr::percent_rank`

Ranks rescaled to [0, 1].

`dplyr::row_number`

Ranks. Ties got to first value.

`dplyr::ntile`

Bin vector into n buckets.

`dplyr::between`

Are values between a and b?

`dplyr::cume_dist`

Cumulative distribution.

`dplyr::cumall`

Cumulative **all**

`dplyr::cumany`

Cumulative **any**

`dplyr::cummean`

Cumulative **mean**

**cumsum**

Cumulative **sum**

**cummax**

Cumulative **max**

**cummin**

Cumulative **min**

**cumprod**

Cumulative **prod**

**pmax**

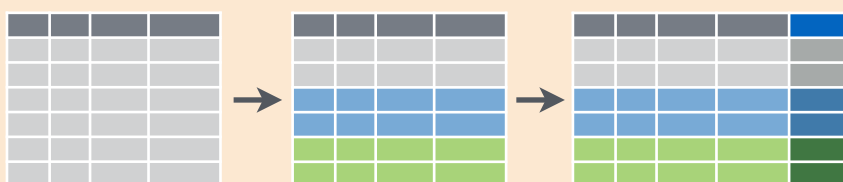
Element-wise **max**

**pmin**

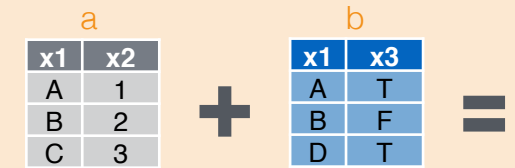
Element-wise **min**

`iris %>% group_by(Species) %>% mutate(...)`

Compute new variables by group.



## Combine Data Sets



Mutating Joins

x1	x2	x3
A	1	T
B	2	F
C	3	NA

x1	x3	x2
A	T	1
B	F	2
D	T	NA

x1	x2	x3
A	1	T
B	2	F

x1	x2	x3
A	1	T
B	2	F
C	3	NA
D	NA	T

`dplyr::left_join(a, b, by = "x1")`

Join matching rows from b to a.

`dplyr::right_join(a, b, by = "x1")`

Join matching rows from a to b.

`dplyr::inner_join(a, b, by = "x1")`

Join data. Retain only rows in both sets.

`dplyr::outer_join(a, b, by = "x1")`

Join data. Retain all values, all rows.

Filtering Joins

x1	x2
A	1
B	2

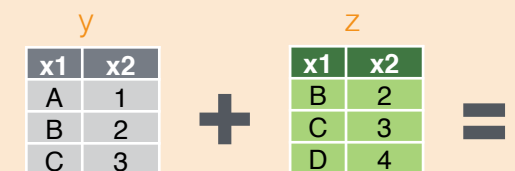
x1	x2
C	3

`dplyr::semi_join(a, b, by = "x1")`

All rows in a that have a match in b.

`dplyr::anti_join(a, b, by = "x1")`

All rows in a that do not have a match in b.



Set Operations

x1	x2
B	2
C	3

x1	x2
A	1
B	2
C	3
D	4

x1	x2
A	1
D	4

`dplyr::intersect(y, z)`

Rows that appear in both y and z.

`dplyr::union(y, z)`

Rows that appear in either or both y and z.

`dplyr::setdiff(y, z)`

Rows that appear in only one of y and z.

Binding

x1	x2
A	1
B	2
C	3

x1	x2	x1	x2
A	1	B	2
B	2	C	3
C	3	D	4

`dplyr::bind_rows(y, z)`

Append z to y as new rows.

`dplyr::bind_cols(y, z)`

Append z to y as new columns.

Caution: matches rows by position.