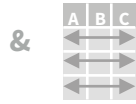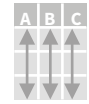# Data Transformation with dplyr : : **CHEAT SHEET**

dplyr functions work with pipes and expect **tidy data**. In tidy data:

Each **variable** is in its own **column**

&

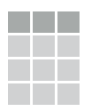Each **observation**, or **case**, is in its own **row**

pipes
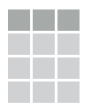
x %>% f(y) becomes f(x, y)

Summarise Cases

These apply **summary functions** to columns to create a new table. Summary functions take vectors as input and return one value (see back).

summary function

summarise(.data, …)
Compute table of summaries. Also **summarise_()**.
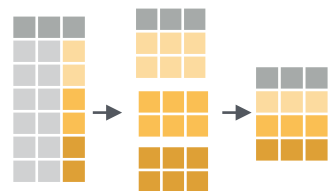*summarise(mtcars, avg = mean(mpg))*

count(x, …, wt = NULL, sort = FALSE)
Count number of rows in each group defined by the variables in … Also **tally()**.
count(iris, Species)

VARIATIONS

summarise_all() - Apply funs to every column.
summarise_at() - Apply funs to specific columns.
summarise_if() - Apply funs to all cols of one type.

Group Cases

Use **group_by()** to created a "grouped" copy of a table. dplyr functions will manipulate each "group" separately and then combine the results.
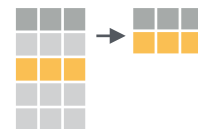
mtcars %>%
group_by(cyl) %>%
summarise(avg = mean(mpg))

group_by(.data, …, add = FALSE)
Returns copy of table grouped by …
g_iris <- group_by(iris, Species)

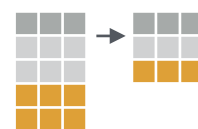**ungroup**(x, …)
Returns ungrouped copy of table.
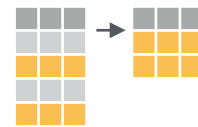*ungroup(g_iris)*

Manipulate Cases

EXTRACT CASES

Row functions return a subset of rows as a new table. Use a variant that ends in _ for non-standard evaluation friendly code.

**filter**(.data, …) Extract rows that meet logical criteria. Also **filter_()**. *filter(iris, Sepal.Length > 7)*

distinct(.data, …, .keep_all = FALSE) Remove rows with duplicate values. Also **distinct_()**. *distinct(iris, Species)*

sample_frac(tbl, size = 1, replace = FALSE, weight = NULL, .env = parent.frame()) Randomly select fraction of rows. *sample_frac(iris, 0.5, replace = TRUE)*

sample_n(tbl, size, replace = FALSE, weight = NULL, .env = parent.frame()) Randomly select size rows. *sample_n(iris, 10, replace = TRUE)*
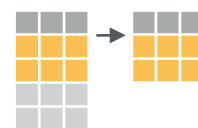
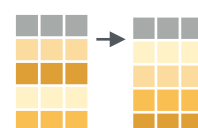**slice**(.data, …) Select rows by position. Also **slice_()**. *slice(iris, 10:15)*

top_n(x, n, wt) Select and order top n entries (by group if grouped data). *top_n(iris, 5, Sepal.Width)*

Logical and boolean operators to use with filter()

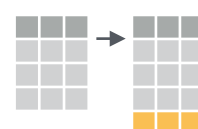| <	<=	is.na()	%in%	|	xor()
>	>=	!is.na()	!	&	

See **?base::logic** and **?Comparison** for help.

ARRANGE CASES

arrange(.data, …)
Order rows by values of a column (low to high), use with **desc()** to order from high to low.
arrange(mtcars, mpg)
arrange(mtcars, desc(mpg))

ADD CASES

add_row(.data, …, .before = NULL, .after = NULL)
Add one or more rows to a table.
add_row(faithful, eruptions = 1, waiting = 1)

Column functions return a set of columns as a new table. Use a variant that ends in _ for non-standard evaluation friendly code.

select(.data, …)
Extract columns by name. Also **select_if()**
*select(iris, Sepal.Length, Species)*

Use these helpers with select (),
e.g. select(iris, starts_with("Sepal"))

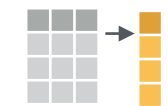| **contains**(match) | **num_range**(prefix, range) | **:**, e.g. mpg:cyl |
| **ends_with**(match) | **one_of**(…) | **-**, e.g, -Species |
| **matches**(match) | **starts_with**(match) | |

MAKE NEW VARIABLES

These apply **vectorized functions** to columns. Vectorized funs take vectors as input and return vectors of the same length as output (see back).
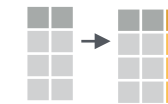
vectorized function
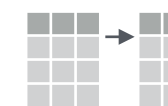
mutate(.data, …)
Compute new column(s).
mutate(mtcars, gpm = 1/mpg)

transmute(.data, …)
Compute new column(s), drop others.
transmute(mtcars, gpm = 1/mpg)

mutate_all(.tbl, .funs, …) Apply funs to every column. Use with **funs()**.
mutate_all(faithful, funs(log(.), log2(.)))

mutate_at(.tbl, .cols, .funs, …) Apply funs to specific columns. Use with **funs()**, **vars()** and the helper functions for select().
mutate_at(iris, vars(-Species), funs(log(.)))

mutate_if(.tbl, .predicate, .funs, …)
Apply funs to all columns of one type. Use with **funs()**.
mutate_if(iris, is.numeric, funs(log(.)))

add_column(.data, …, .before = NULL, .after = NULL) Add new column(s).
add_column(mtcars, new = 1:32)

rename(.data, …) Rename columns.
rename(iris, Length = Sepal.Length)

Vectorized Functions

TO USE WITH MUTATE ()

mutate() and **transmute()** apply vectorized functions to columns to create new columns. Vectorized functions take vectors as input and return vectors of the same length as output.

vectorized function →

OFFSETS
dplyr::**lag()** - Offset elements by 1
dplyr::**lead()** - Offset elements by -1

CUMULATIVE AGGREGATES
dplyr::**cumall()** - Cumulative all()
dplyr::**cumany()** - Cumulative any()
    cummax() - Cumulative max()
dplyr::**cummean()** - Cumulative mean()
    cummin() - Cumulative min()
    cumprod() - Cumulative prod()
    cumsum() - Cumulative sum()

RANKINGS
dplyr::**cume_dist()** - Proportion of all values <=
dplyr::**dense_rank()** - rank with ties = min, no gaps
dplyr::**min_rank()** - rank with ties = min
dplyr::**ntile()** - bins into n bins
dplyr::**percent_rank()** - min_rank scaled to [0,1]
dplyr::**row_number()** - rank with ties = "first"

MATH
    +, -, *, /, ^, %/%, %% - arithmetic ops
    log(), log2(), log10() - logs
    <, <=, >, >=, !=, == - logical comparisons

MISC
dplyr::**between()** - x >= left & x <= right
dplyr::**case_when()** - multi-case if_else()
dplyr::**coalesce()** - first non-NA values by element across a set of vectors
dplyr::**if_else()** - element-wise if() + else()
dplyr::**na_if()** - replace specific values with NA
    pmax() - element-wise max()
    pmin() - element-wise min()
dplyr::**recode()** - Vectorized switch()
dplyr::**recode_factor()** - Vectorized switch() for factors

Summary Functions

TO USE WITH SUMMARISE ()

summarise() applies summary functions to columns to create a new table. Summary functions take vectors as input and return single values as output.

summary function →

COUNTS
dplyr::**n()** - number of values/rows
dplyr::**n_distinct()** - # of uniques
    sum(!is.na()) - # of non-NA's

LOCATION
    mean() - mean, also **mean(!is.na())**
    median() - median

LOGICALS
    mean() - Proportion of TRUE's
    sum() - # of TRUE's

POSITION/ORDER
dplyr::**first()** - first value
dplyr::last() - last value
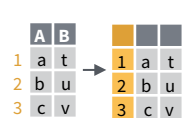dplyr::nth() - value in nth location of vector

RANK
    quantile() - nth quantile
    min() - minimum value
    max() - maximum value

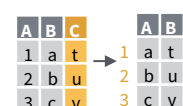### SPREAD
    IQR() - Inter-Quartile Range
    mad() - mean absolute deviation
    sd() - standard deviation
    var() - variance

Row Names

Tidy data does not use rownames, which store a variable outside of the columns. To work with the rownames, first move them into a column.
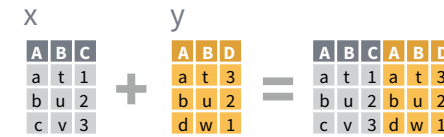
rownames_to_column()
Move row names into col.
a <- rownames_to_column(iris, var = "C")

column_to_rownames()
Move col in row names.
column_to_rownames(a, var = "C")

Also has **rownames()**, **remove_rownames()**

Combine Tables

COMBINE VARIABLES

x   y
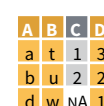

Use **bind_cols()** to paste tables beside each other as they are.

bind_cols(...) Returns tables placed side by side as a single table.
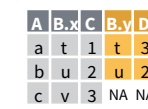BE SURE THAT ROWS ALIGN.

Use a "**Mutating Join**" to join one table to columns from another, matching values with the rows that they correspond to. Each join retains a different combination of values from the tables.

left_join(x, y, by = NULL, copy=FALSE, suffix=c(".x",".y"),...)
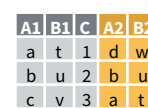Join matching values from y to x.

right_join(x, y, by = NULL, copy = FALSE, suffix=c(".x",".y"),...)
Join matching values from x to y.

inner_join(x, y, by = NULL, copy = FALSE, suffix=c(".x",".y"),...)
Join data. Retain only rows with matches.

full_join(x, y, by = NULL, copy=FALSE, suffix=c(".x",".y"),...)
Join data. Retain all values, all rows.

Use **by = c("col1", "col2")** to specify the column(s) to match on. *left_join(x, y, by = "A")*

Use a named vector, **by = c("col1" = "col2")**, to match on columns with different names in each data set. *left_join(x, y, by = c("C" = "D"))*

Use **suffix** to specify suffix to give to duplicate column names. *left_join(x, y, by = c("C" = "D"), suffix = c("1", "2"))*

COMBINE CASES

x

+ y
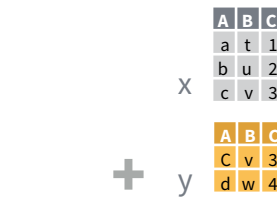
Use **bind_rows()** to paste tables below each other as they are.

bind_rows(..., .id = NULL**)**
Returns tables one on top of the other as a single table. Set .id to a column name to add a column of the original table names (as pictured)
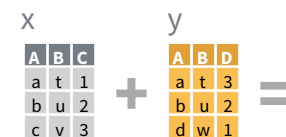
intersect(x, y, ...)
Rows that appear in both x and z.

setdiff(x, y, ...)
Rows that appear in x but not z.

union(x, y, ...)
Rows that appear in x or z. (Duplicates removed). union_all() retains duplicates.

Use **setequal()** to test whether two data sets contain the exact same rows (in any order).

EXTRACT ROWS

x   y

=

Use a "**Filtering Join**" to filter one table against the rows of another.

semi_join(x, y, by = NULL, ...)
Return rows of x that have a match in y. USEFUL TO SEE WHAT WILL BE JOINED.

anti_join(x, y, by = NULL, ...)
Return rows of x that do not have a match in y. USEFUL TO SEE WHAT WILL NOT BE JOINED.