R Programming For Natural Resource Professionals

Lecture 5
Data Wrangling II:
Joining and advanced dplyr

Polishing R markdowns

Updated criteria for R markdown documents

1) Display resulting tibbles/tables using kableExtra

```
tib %>% kbl() %>% kable_styling()
```

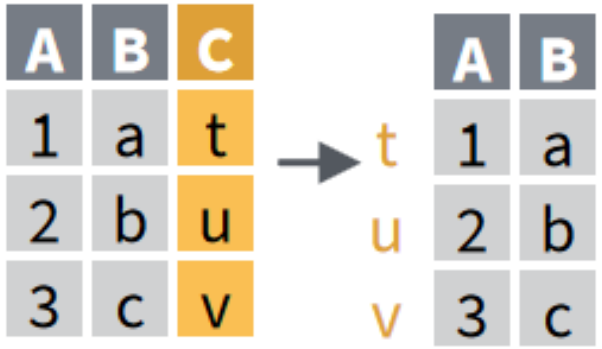
Consult excellent kableExtra vignette for options

2) Final document emphasizes code and result. No messages, errors, etc.

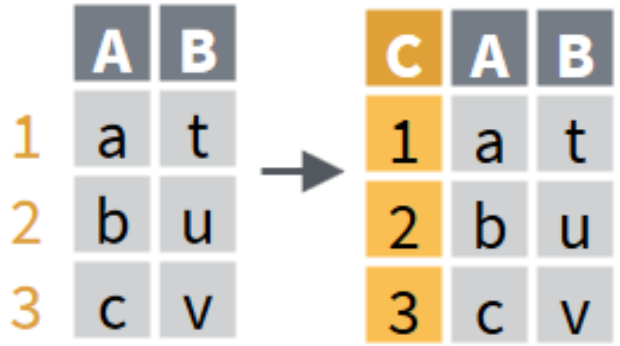
3) Goal is to generate publication quality documents

4) Get creative and have fun with it.

Working with row names



`tibble::column_to_rownames()`



`tibble::rownames_to_column()`

Adding new data

`dplyr::mutate`

Add a new variable or change an existing variable

`mutate(newVar = [calculation])`

Adding new data

`dplyr::transmute`

Compute a new variable while dropping the others

`transmute(newVar = [calculation])`

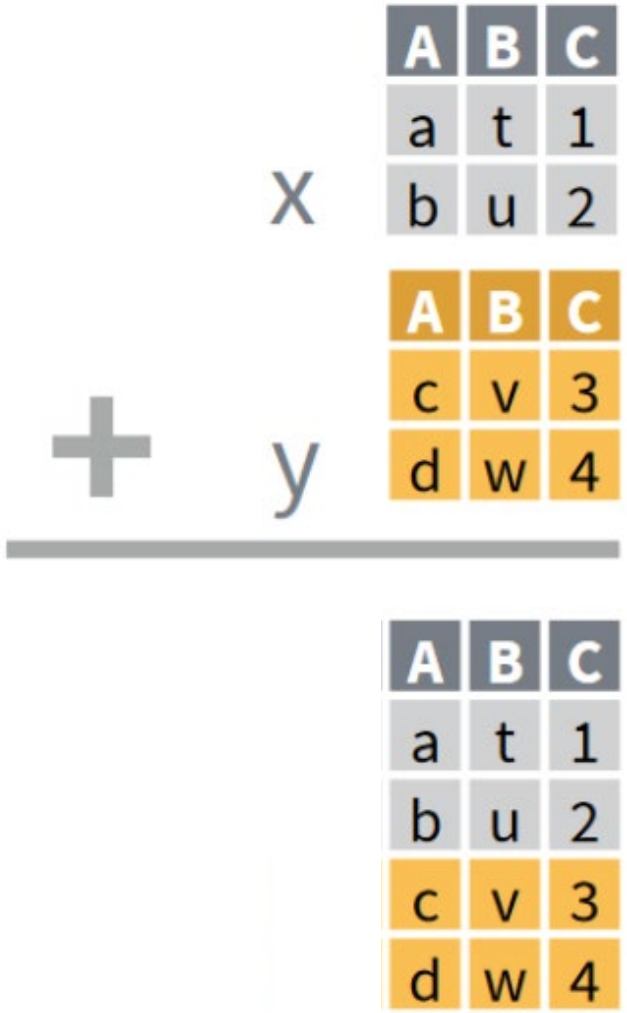
Rename variables

`dplyr::rename`

Change the name of a variable

```
rename(newName = oldName)
```

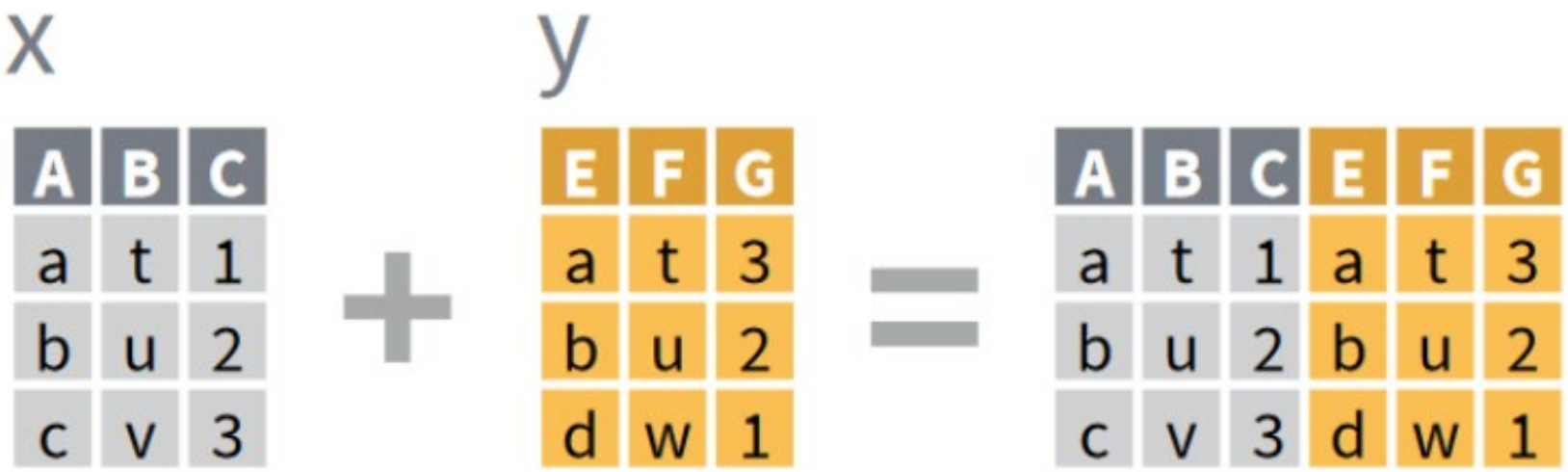
Combining data sets



`bind_rows()`

Returns one tibble pasted above the other

Combining data sets



`bind_cols()`

Returns one tibble pasted next to the other.

Important: Not for combining tibbles with the same variables!

Joining data sets

- Merge data based on given criteria
  - “Relational merging”

Tree	Height
Maple	80
Spruce	57
Oak	121
Oak	109
Maple	92

+

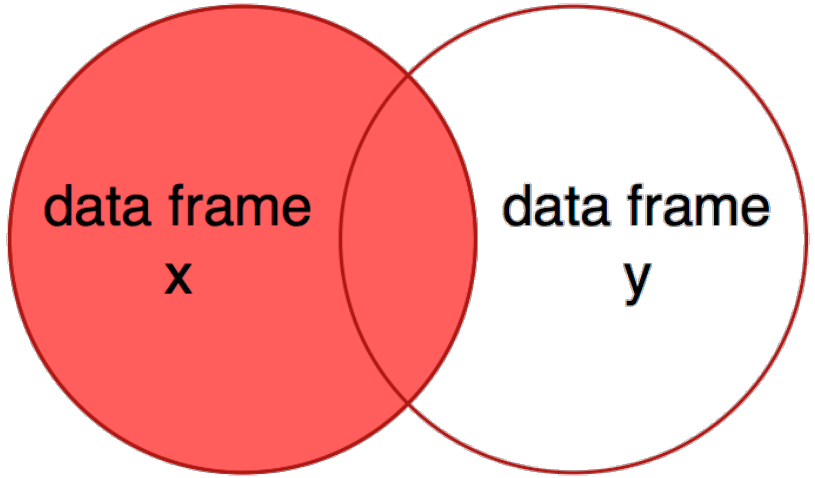
Tree	SciName
Maple	*Acer rubrum*
Spruce	*Picea pungens*
Oak	*Quercus alba*

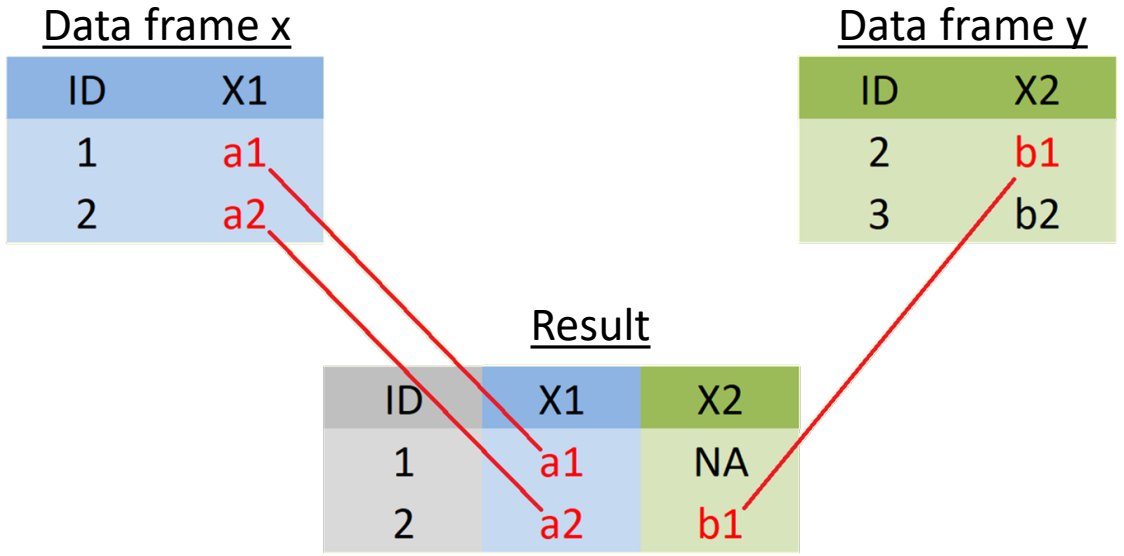
=

Tree	Height	SciName
Maple	80	*Acer rubrum*
Spruce	57	*Picea pungens*
Oak	121	*Quercus alba*
Oak	109	*Quercus alba*
Maple	92	*Acer rubrum*

Combining data sets

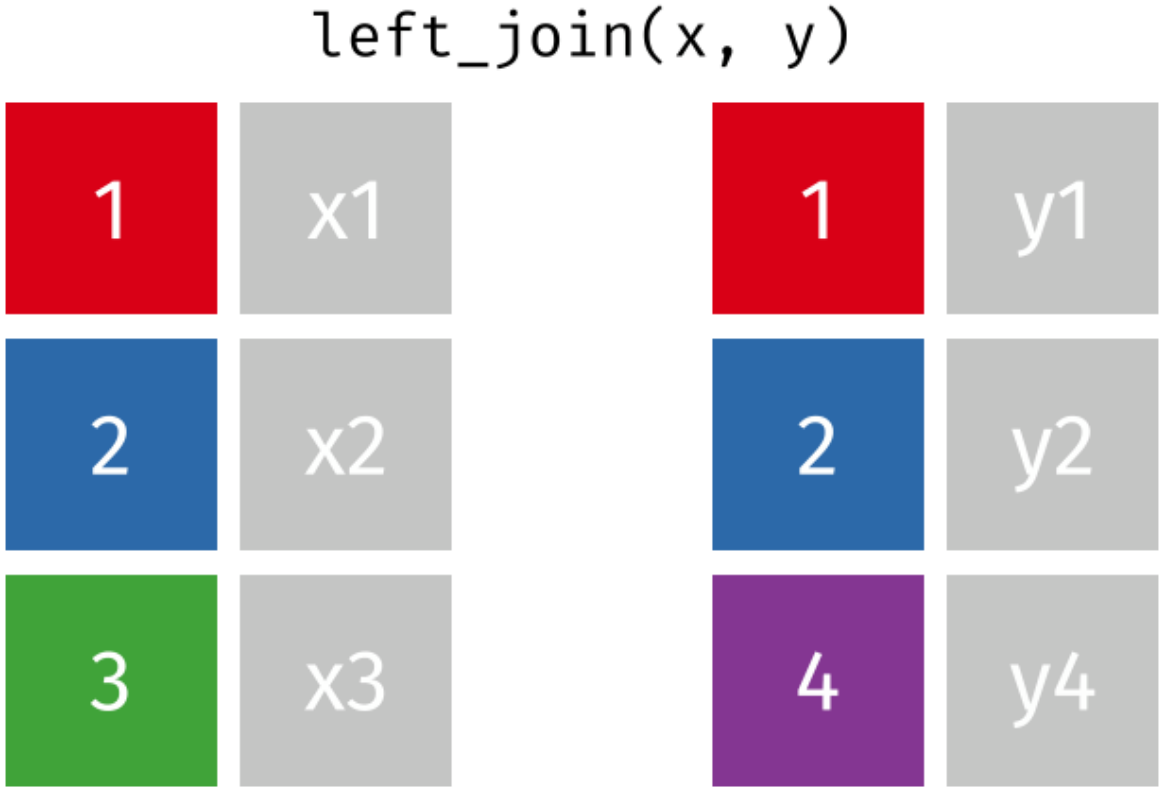
`left_join()`





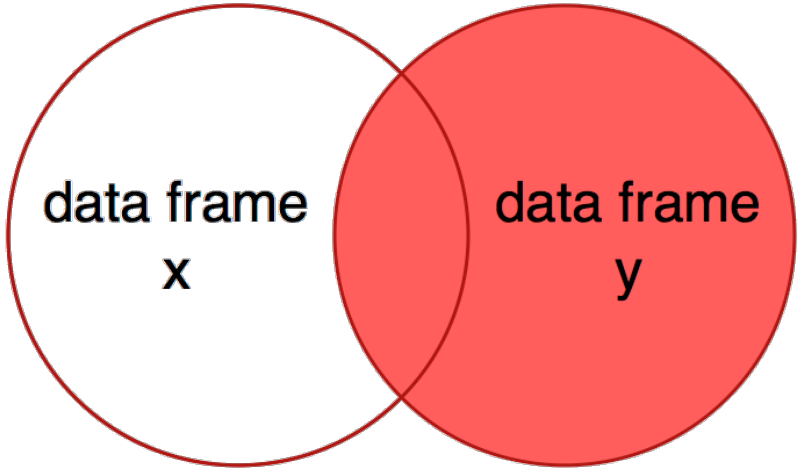
- Key variable in example is “ID”
- Returns all observations from x and all variables from x and y.
- Observations in x with no match in y will be populated with NAs

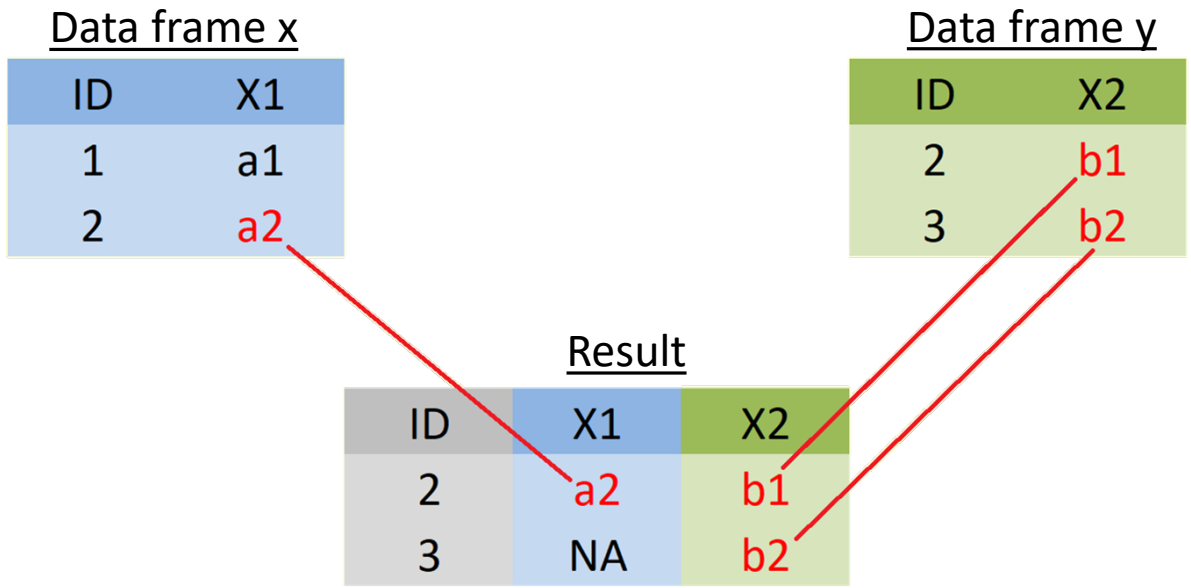
Combining data sets



Combining data sets

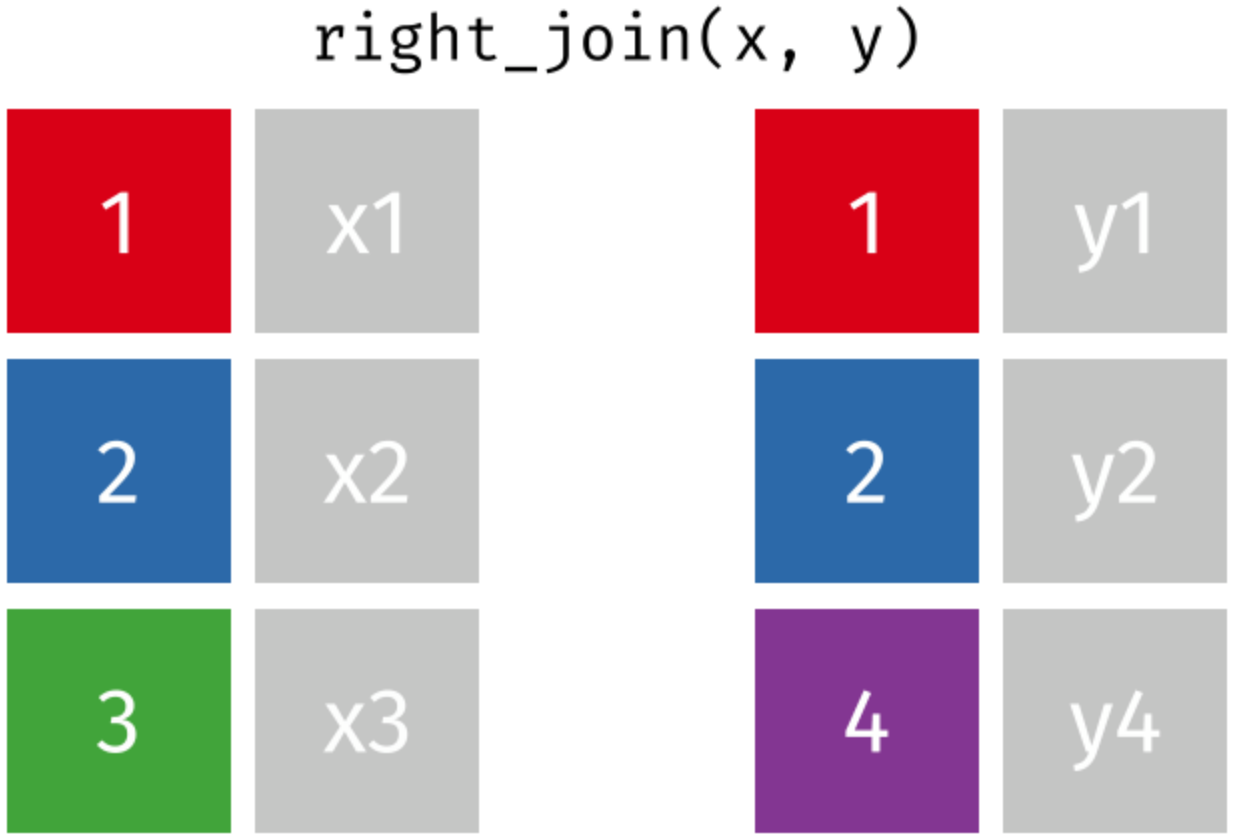
`right_join()`





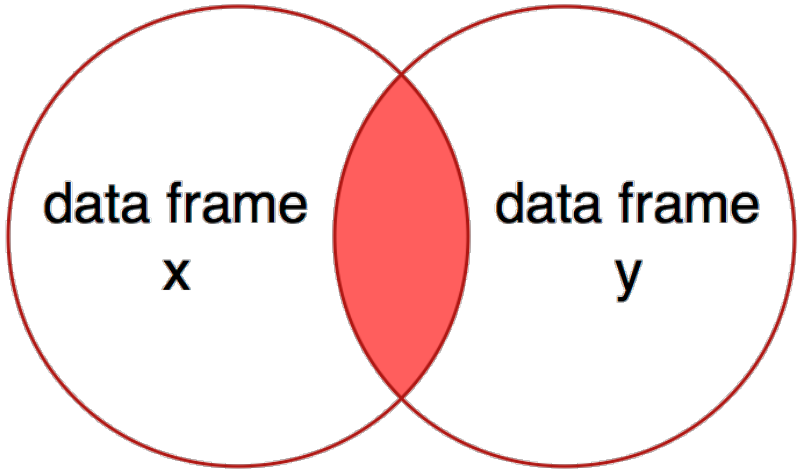
- Key variable in example is “ID”
- Returns all observations from y and all variables from x and y.
- Observations in y with no match in x will be populated with NAs

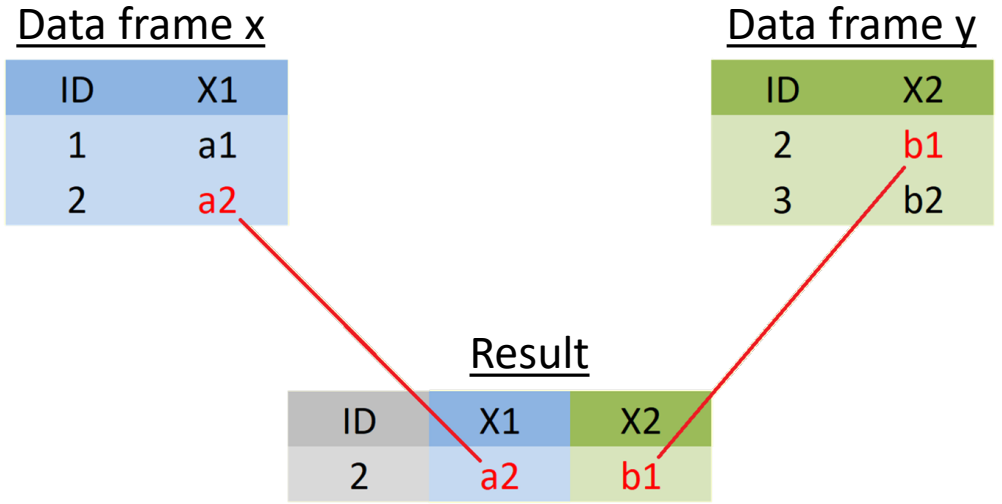
Combining data sets



Combining data sets

`inner_join()`





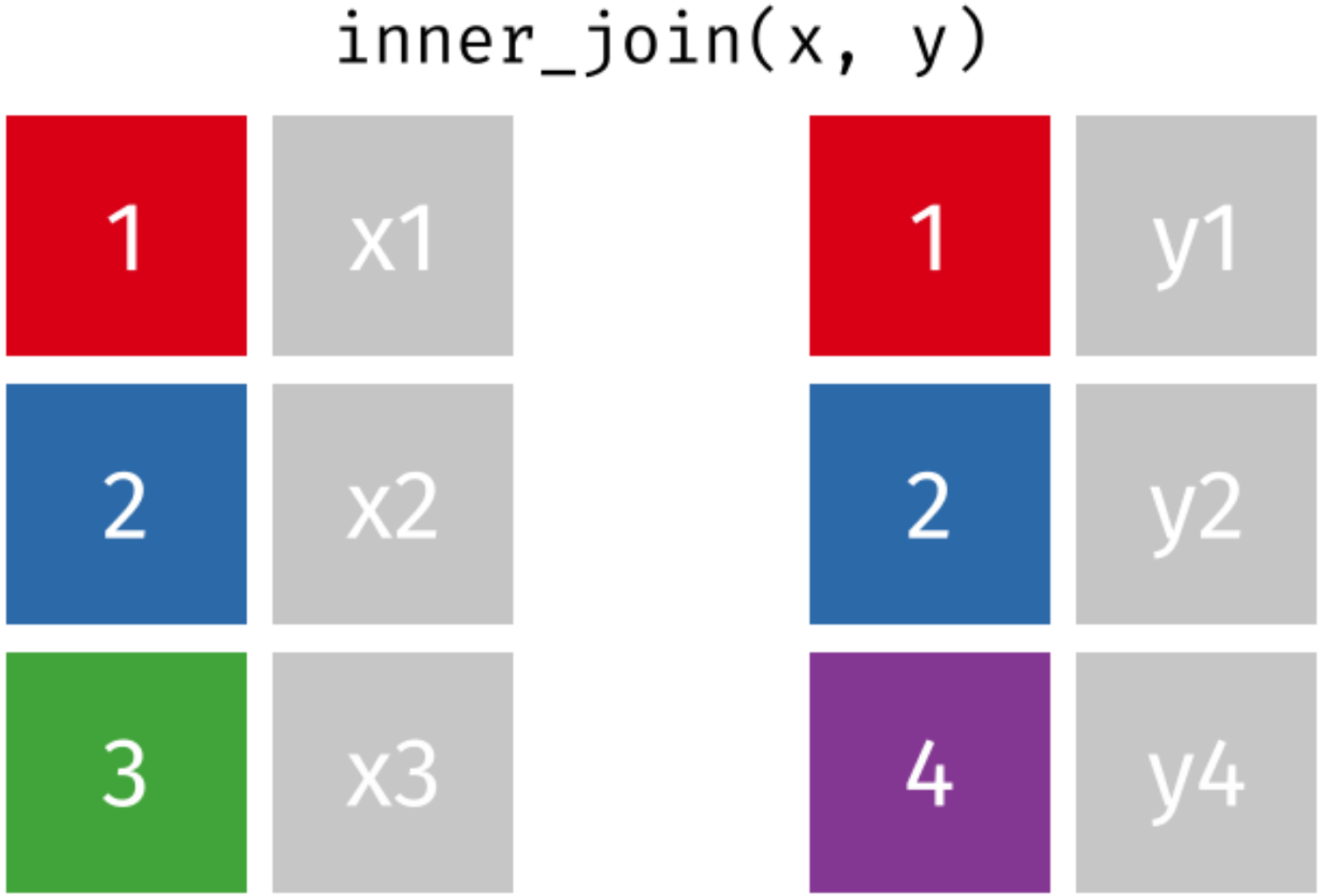
Key variable in example is “ID”

Returns all observations from x with matching observations in y

Returns all columns of x and y

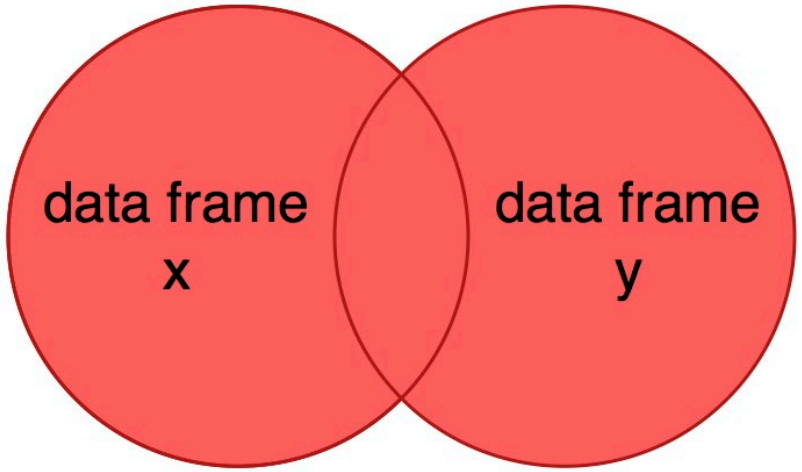
If there are multiple matches between x and y, all combinations are returned

Combining data sets



Combining data sets

`full_join()`



Data frame x

ID	X1
1	a1
2	a2

Data frame y

ID	X2
2	b1
3	b2

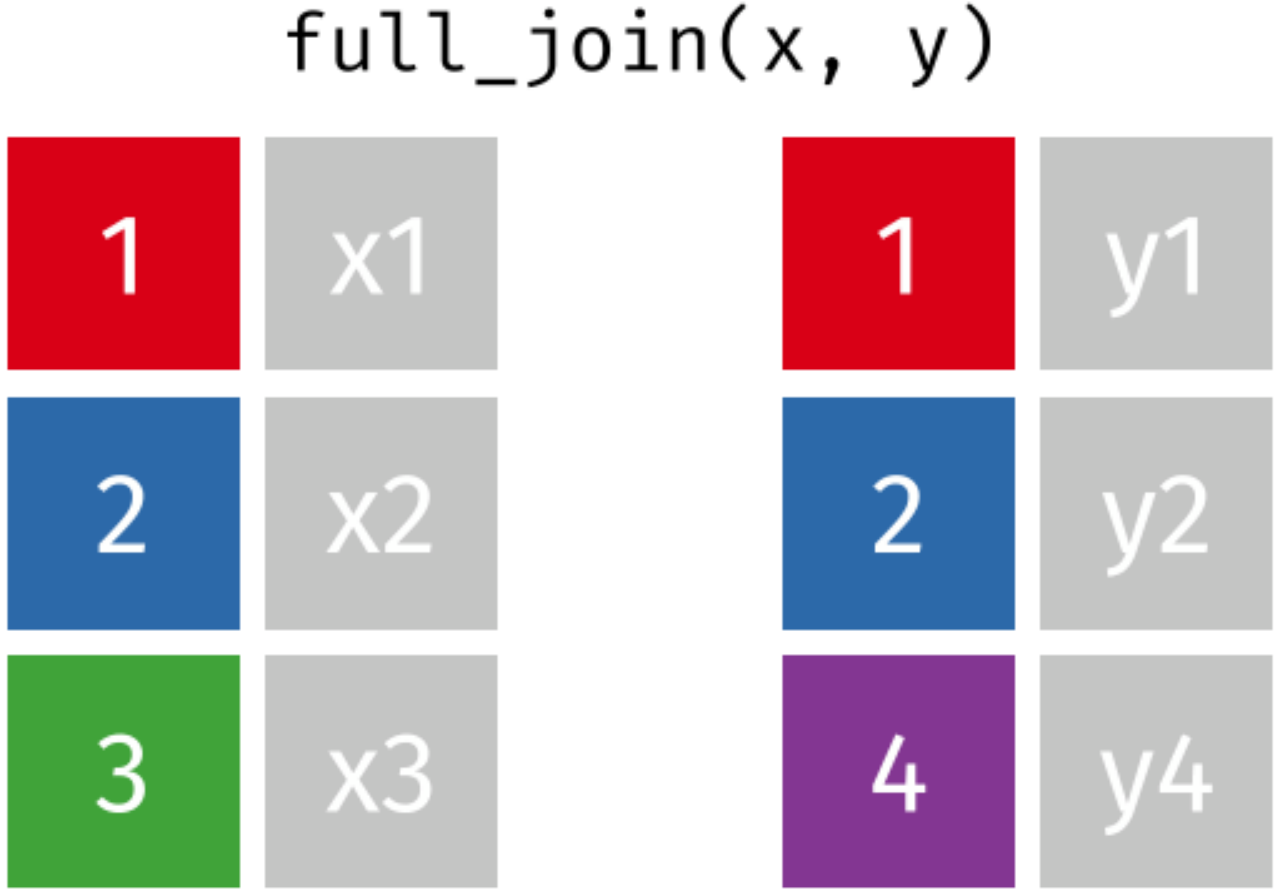
Result

ID	X1	X2
1	a1	NA
2	a2	b1
3	NA	b2

Returns all observations and variables of both x and y

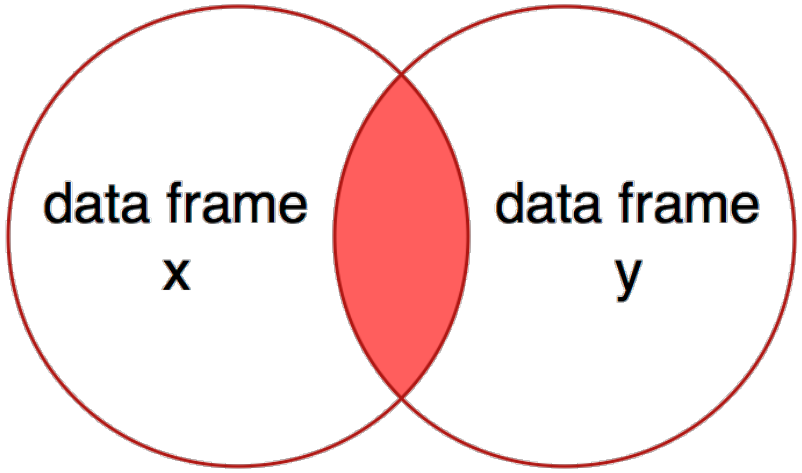
When not matching, returns NA

Combining data sets



Combining data sets

`semi_join()`



Data frame x

ID	X1
1	a1
2	a2

Data frame y

ID	X2
2	b1
3	b2

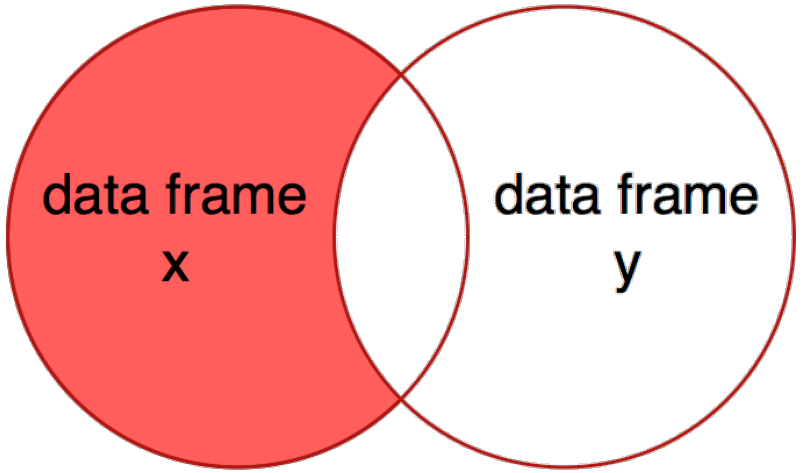
Result

ID	X1
2	a2

- A type of “filtering join”
- Returns observations from x that **do** also occur in y.
- Differs from inner_join() because it doesn’t retain variables in y

Combining data sets

anti_join()



Data frame x

ID	X1
1	a1
2	a2

Data frame y

ID	X2
2	b1
3	b2

Result

ID	X1
1	a1

- A type of “filtering join”
- Returns observations from x that **do not** also occur in y.

Combine Data Sets

a

x1	x2
A	1
B	2
C	3

+

b

x1	x3
A	T
B	F
D	T

=

Combining data sets

- What if the key variable isn't the same in x and y?

```
tib1 %>%
   left_join(tib2, by = c("fish" = "species"))
```

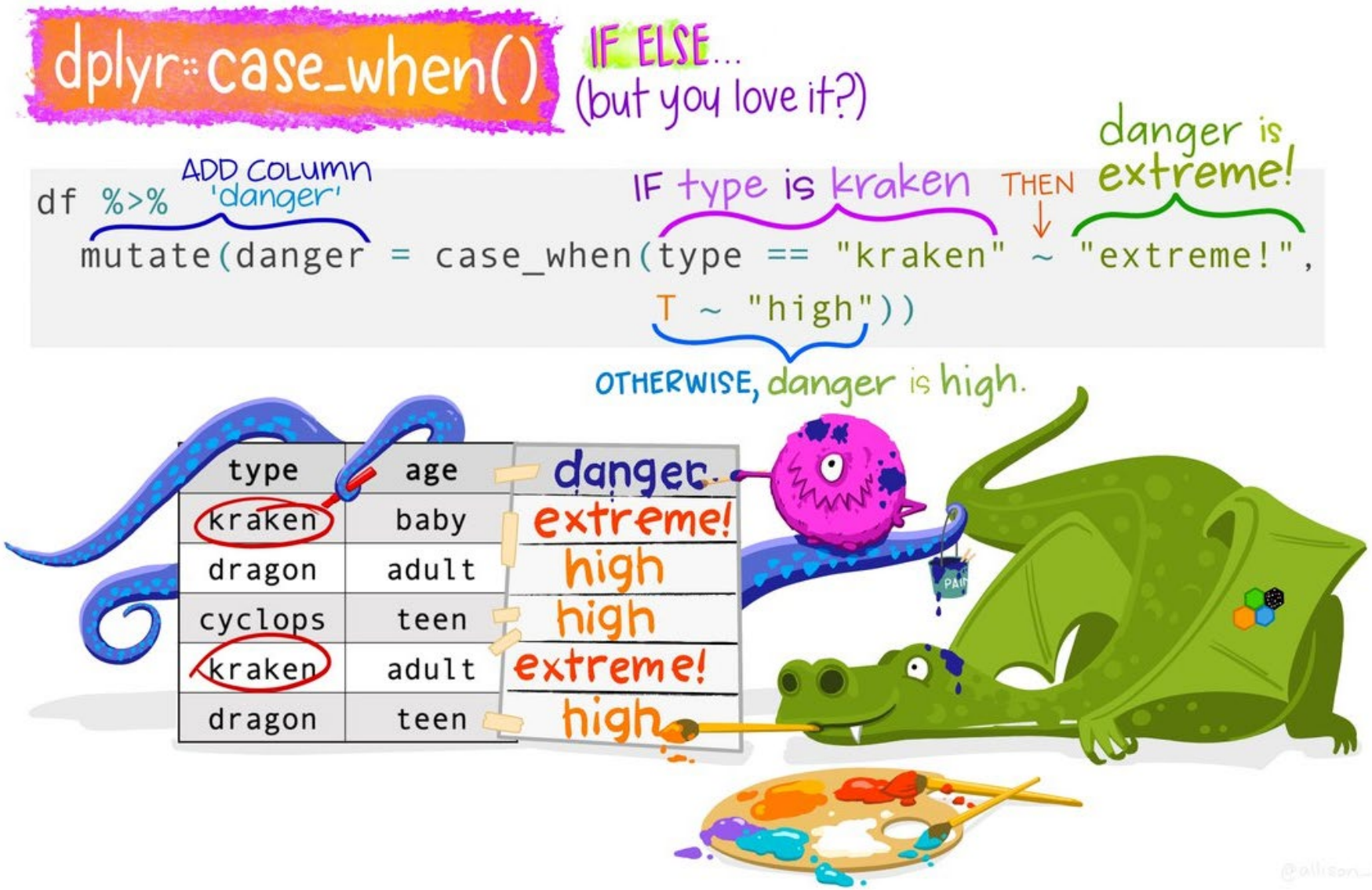
Tib1

fish	length
Brook trout	12
Walleye	15
Walleye	16

Tib2

species	genus_species
Brook trout	*Salvelinus fontinalis*
Walleye	*Sander vitreus*

Create new variables using conditional statements



Paired programming

Exercise 1

Step 1: Use a join operation to generate a tibble containing all the survey data, completed with the data in the species tibble.

Step 2: Combine the genus and species column into a single column separated by an underscore. Retain the original columns.

Step 3: Subset your data to include only observation of *Dipodomys merriami.*

Step 4: Calculate the mean and standard deviation of the hindfoot length of this species for each year of the data.

Step 5: Within the pipeline, filter the data set to just the maximum mean hindfoot length

Paired programming

Exercise 2

Not all survey observations have a corresponding value in the species table. Use a filtering join to determine which do. Then determine how many different values of species_id occur.