Reading data files

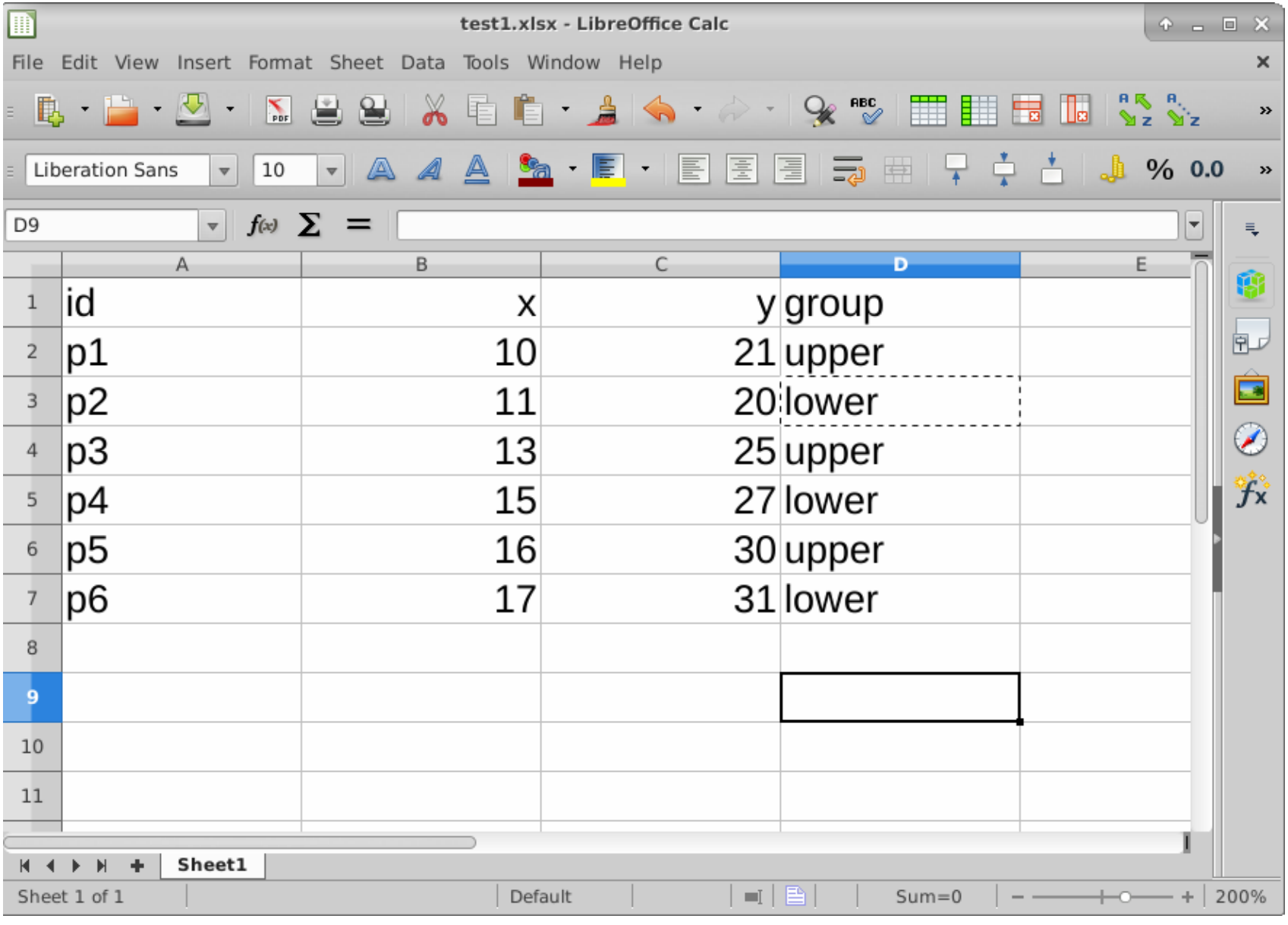
Introduction

- First thing we need to do is to read in data, so that we can use our software to analyze.
- Consider these:
  - Spreadsheet data saved as `.csv` file.
  - "Delimited" data such as values separated by spaces.
  - Actual Excel spreadsheets.

Packages for this section

```
library(tidyverse)
```

A spreadsheet



	A	B	C	D	E
1	id	x	y	group	
2	p1	10	21	upper	
3	p2	11	20	lower	
4	p3	13	25	upper	
5	p4	15	27	lower	
6	p5	16	30	upper	
7	p6	17	31	lower	
8					
9					
10					
11					

Save as `.csv`

- `.csv` or "comma-separated values" is a way of turning spreadsheet values into plain text.
- Easy to read into R
- but does not preserve formulas. (This is a reason for doing all your calculations in your statistical software, and only having data in your spreadsheet.)
- File, Save As Text CSV (or similar).
- used name `test1.csv`.

The .csv file

```
id,x,y,group
p1,10,21,upper
p2,11,20,lower
p3,13,25,upper
p4,15,27,lower
p5,16,30,upper
p6,17,31,lower
```

To read this in:

- Fire up R Studio at `r.datatools.utoronto.ca`
- Upload this .csv file. (Bottom right, next to New Folder, Upload.) Click Choose File, find the file, click Open. Click OK. See the file appear bottom right.

Make a new Quarto document

- File, New File, Quarto Document
- ...and get rid of the template document (leaving the first four lines).
- Make a code chunk and in it put this. Run it.

```
library(tidyverse)
```

Reading in the file

- Use `read_csv` with the name of the file, in quotes. Save the read-in file in something, here called `mydata`. Make a new code chunk for this:

```
mydata <- read_csv("test1.csv")
mydata
```

```
# A tibble: 6 x 4
  id        x     y group
  <chr> <dbl> <dbl> <chr>
1 p1       10    21 upper
2 p2       11    20 lower
3 p3       13    25 upper
4 p4       15    27 lower
5 p5       16    30 upper
6 p6       17    31 lower
```

More on the above

- read_csv guesses what kind of thing is in each column. Here it correctly guesses that:
  - id and group are text (categorical variables). id is actually "identifier variable": identifies individuals.
  - x and y are "double": numbers that might have a decimal point in them.

R Studio on your own computer

- Put the .csv file in the same folder as your project. Then read it in as above like `read_csv("test1.csv")`.
- Or, use

```
# f <- file.choose()
f
```

which brings up a file selector (as if you were going to find a file to load or save it). Find your `.csv` file, the address of which will be saved in `f`, and then:

```
mydata <- read_csv(f)
```

- When you have selected the file, comment out the `file.choose` line by putting a # on the front of it. That will save you having to find the file again by mistake. (Keyboard shortcut: go to the line, type control-shift-C or Mac equivalent with Cmd.)

Looking at what we read in

- Again, type the name of the thing to display it:

```
mydata
```

```
# A tibble: 6 x 4
  id        x     y group
  <chr> <dbl> <dbl> <chr>
1 p1       10    21 upper
2 p2       11    20 lower
3 p3       13    25 upper
4 p4       15    27 lower
5 p5       16    30 upper
6 p6       17    31 lower
```

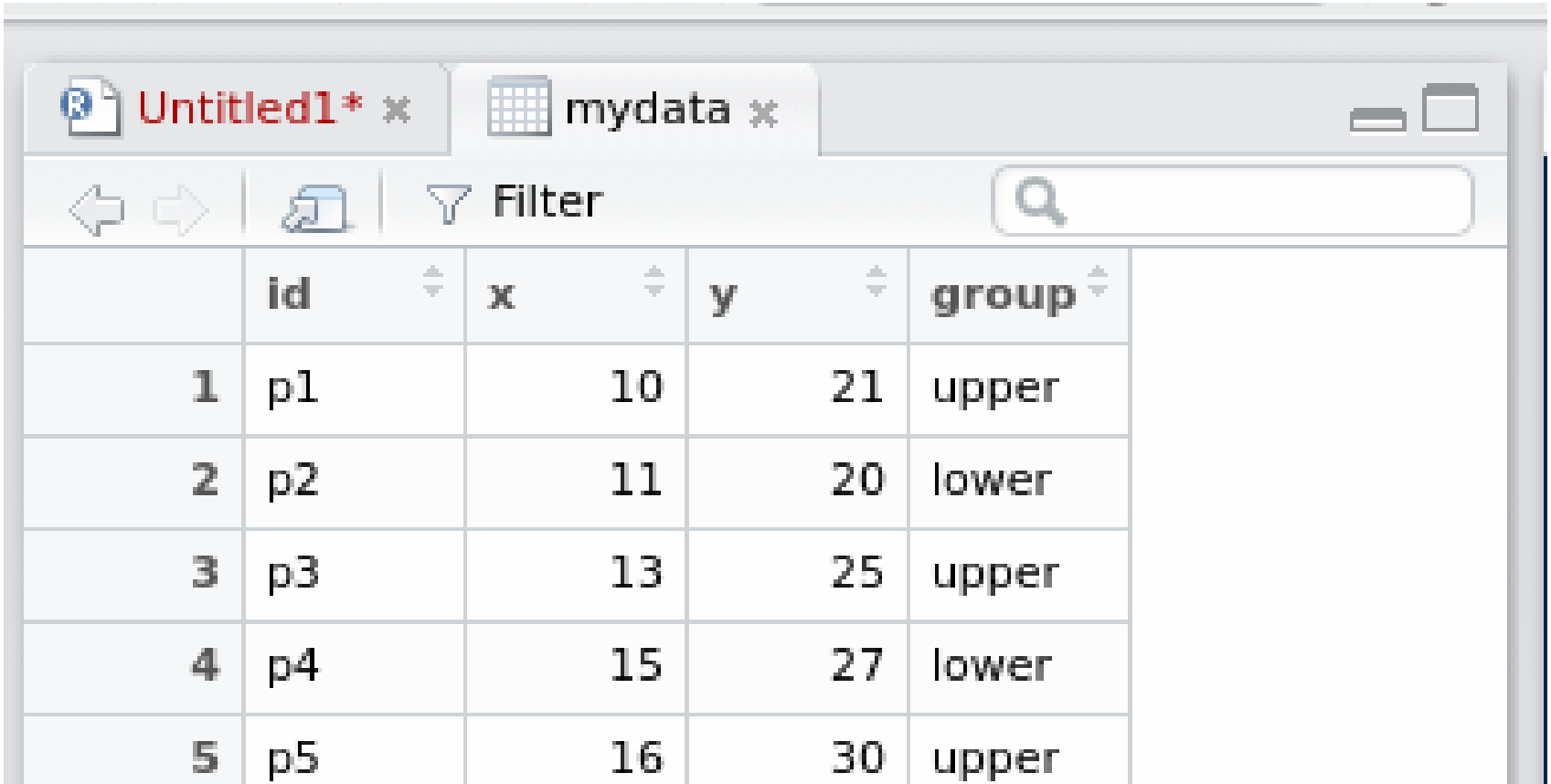
- This is a "tibble" or data frame, the standard way of storing a data set in R.
- Tibbles print as much as will display on the screen. If there are more rows or columns, it will say so.
- You will see navigation keys to display more rows or columns (if there are more).

View-ing your data frame

- Another way to examine your data frame is to View it, like this:

```
View(mydata)
```

...or find your data frame in the Global Environment top right and click it. - This pops up a "data frame viewer" top left:



	id	x	y	group
1	p1	10	21	upper
2	p2	11	20	lower
3	p3	13	25	upper
4	p4	15	27	lower
5	p5	16	30	upper

This View

- Read-only: cannot edit data
- Can display data satisfying conditions: click on Filter, then:
  - for a categorical variable, type name of category you want
  - for a quantitative variable, use slider to describe values you want.
- Can sort a column into ascending or descending order (click little arrows next to column name).
- Clicking the symbol with arrow on it left of Filter "pops out" View into separate (bigger) window.

Summarizing what we read in

- It is always a good idea to look at your data after you have read it in, to make sure you have believable numbers (and the right number of individuals and variables).
- Quick check for errors: these often show up as values too high or too low, so the min and/or max will be unreasonable.
- Five-number summary:

```
summary(mydata)
```

```
      id                   x                    y              grou
 Length:6           Min.   :10.00   Min.   :20.00   Length:
 Class :character   1st Qu.:11.50   1st Qu.:22.00   Class :
 Mode  :character   Median :14.00   Median :26.00   Mode  :
                    Mean   :13.67   Mean   :25.67
                    3rd Qu.:15.75   3rd Qu.:29.25
                    Max.   :17.00   Max.   :31.00
```

- Quantitative, five-number summary plus mean.
- Categorical, how many rows.

Reading from a URL

- Any data file on the Web can be read directly.
- Example data link:
- Use URL instead of filename.
- I like to save the URL in a variable first (because URLs tend to be long), and then put that variable in the `read_` function:

```
my_url <- "http://ritsokiguess.site/datafiles/global.csv"
my_url
```

```
[1] "http://ritsokiguess.site/datafiles/global.csv"
```

```
global <- read_csv(my_url)
```

The data

```
global
```

```
# A tibble: 10 x 3
   warehouse  size  cost
   <chr>     <dbl> <dbl>
 1 A           225 12.0
 2 B           350 14.1
 3 A           150  8.93
 4 A           200 11.0
 5 A           175 10.0
 6 A           180 10.1
 7 B           325 13.8
 8 B           290 13.3
 9 B           400 15
10 A           125  7.97
```

Space-delimited files

- Another common format for data is a text file with the values separated by spaces. Top of some other data:

```
cup tempdiff
Starbucks 13
Starbucks 7
Starbucks 7
Starbucks 17.5
Starbucks 10
Starbucks 15.5
Starbucks 6
Starbucks 6
SIGG 12
SIGG 16
SIGG 9
SIGG 23
SIGG 11
SIGG 20.5
SIGG 12.5
```

Reading the coffee data

- This file was on my computer so I uploaded it to `r.datatools.utoronto.ca` first.
- This time, `read_delim`, and we also have to say what the thing is separating the values:

```
coffee <- read_delim("coffee.txt", " ")
coffee
```

```
# A tibble: 32 x 2
   cup       tempdiff
   <chr>        <dbl>
 1 Starbucks     13
 2 Starbucks      7
 3 Starbucks      7
 4 Starbucks     17.5
 5 Starbucks     10
 6 Starbucks     15.5
 7 Starbucks      6
 8 Starbucks      6
```

Looking at the values (some)

```
coffee
```

```
# A tibble: 32 x 2
   cup       tempdiff
   <chr>        <dbl>
 1 Starbucks     13
 2 Starbucks      7
 3 Starbucks      7
 4 Starbucks     17.5
 5 Starbucks     10
 6 Starbucks     15.5
 7 Starbucks      6
 8 Starbucks      6
 9 SIGG          12
10 SIGG          16
# i 22 more rows
```

These were four brands of travel mug (in cup), and for each, how much the temperature of the coffee in the mug decreased over 30

Reading from the Web; the soap data

- Use the URL in place of the filename.
- Save the URL in a variable first:

```
url <- "http://ritsokiguess.site/datafiles/soap.txt"
soap <- read_delim(url, " ")
```

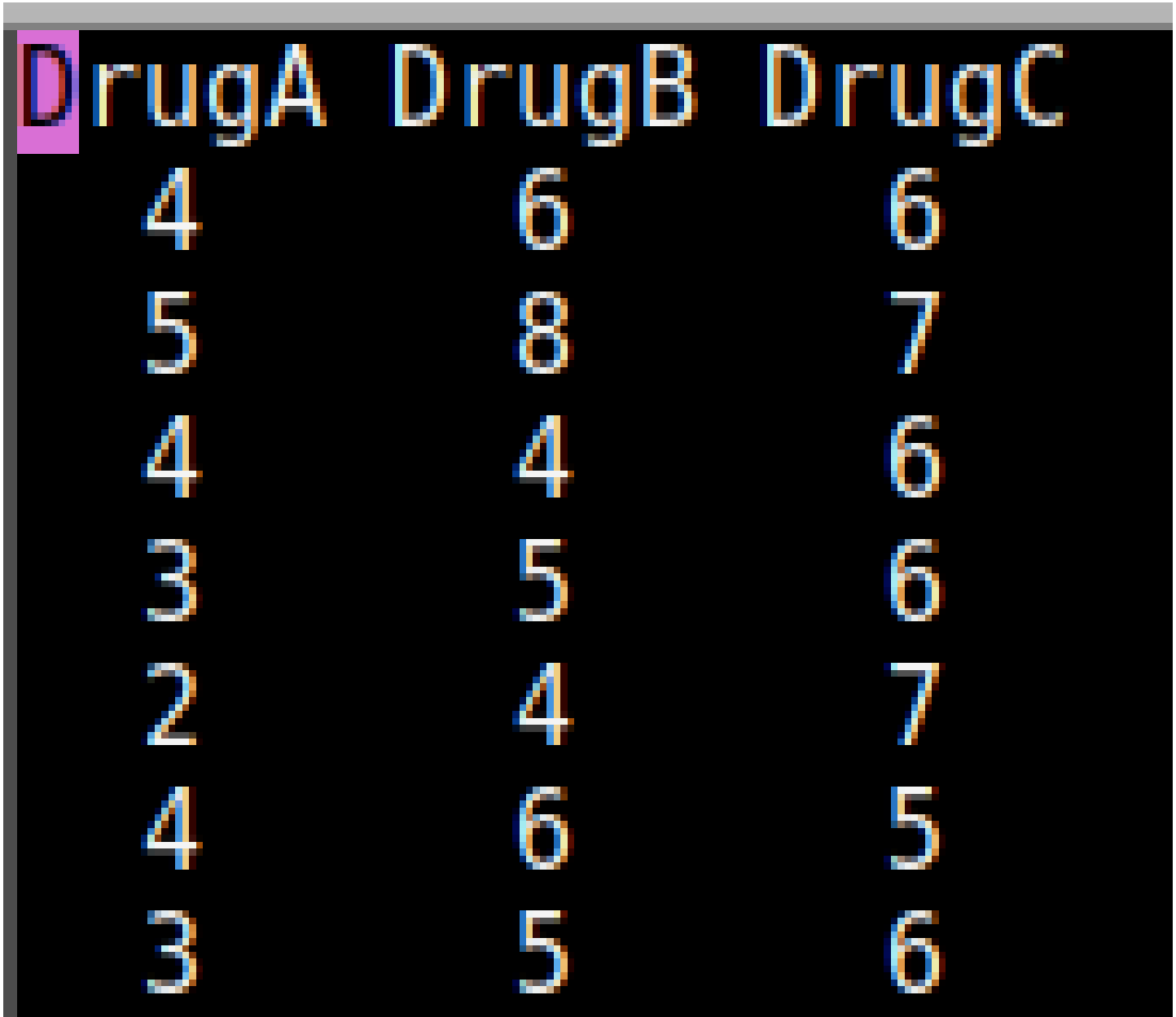
The soap data (some)

```
soap
```

```
# A tibble: 27 x 4
    case scrap speed line
   <dbl> <dbl> <dbl> <chr>
 1     1   218   100 a
 2     2   248   125 a
 3     3   360   220 a
 4     4   351   205 a
 5     5   470   300 a
 6     6   394   255 a
 7     7   332   225 a
 8     8   321   175 a
 9     9   410   270 a
10    10   260   170 a
# i 17 more rows
```

Data aligned in columns

- Sometimes you see data aligned in columns, thus:



DrugA	DrugB	DrugC
4	6	6
5	8	7
4	4	6
3	5	6
2	4	7
4	6	5
3	5	6

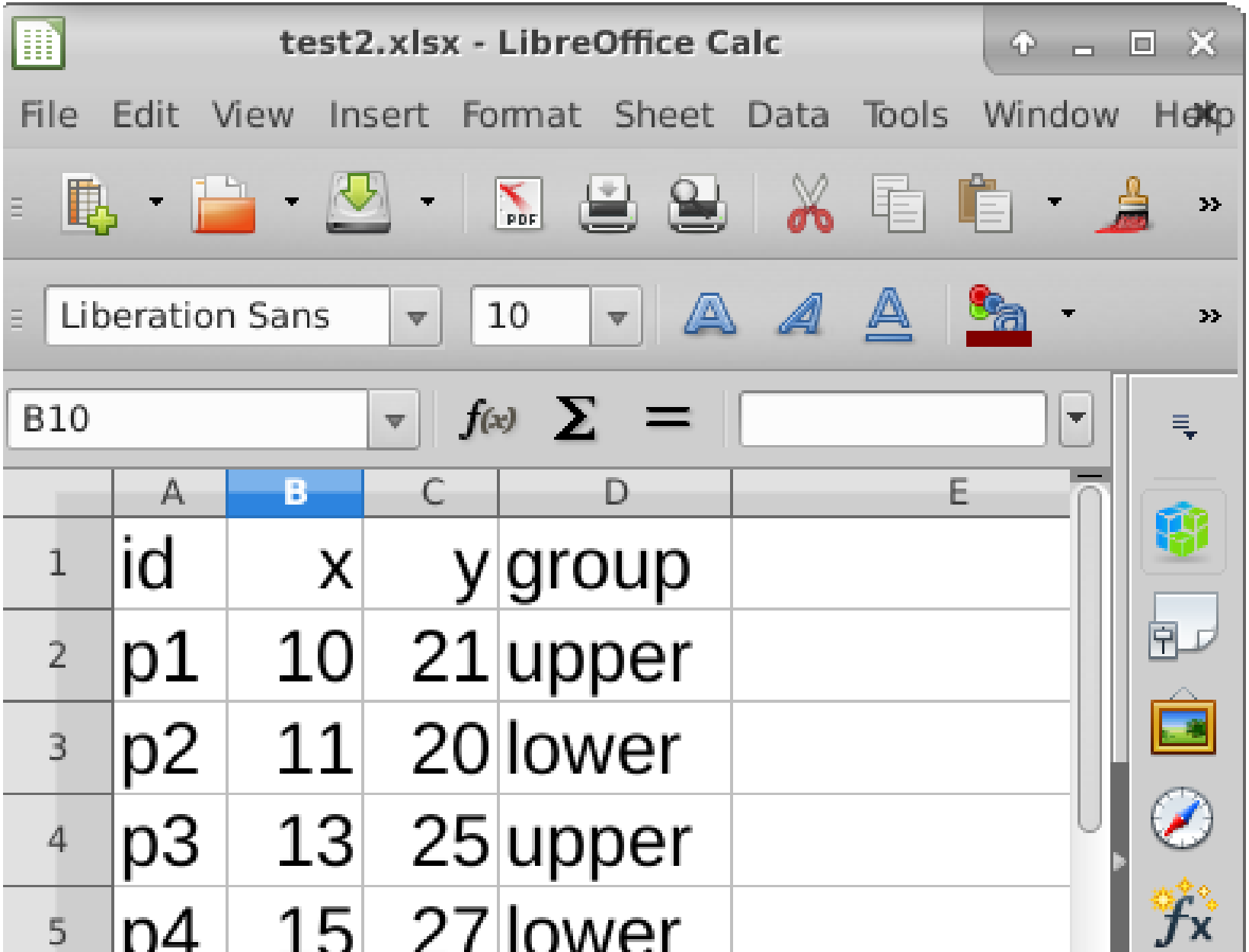
Reading in column-aligned data

```
drugs <- read_table("migraine.txt")
drugs
```

```
# A tibble: 9 x 3
  DrugA DrugB DrugC
  <dbl> <dbl> <dbl>
1     4     6     6
2     5     8     7
3     4     4     6
4     3     5     6
5     2     4     7
6     4     6     5
7     3     5     6
8     4    10     5
9     4     6     5
```

Reading an Excel sheet directly

- Here is my spreadsheet from before, but tarted up a bit:



	A	B	C	D	E
1	id	x	y	group	
2	p1	10	21	upper	
3	p2	11	20	lower	
4	p3	13	25	upper	
5	p4	15	27	lower	

Reading it in

- Read into R, saying that we only want the sheet "data". Upload spreadsheet first.
- Excel spreadsheets must be "local": cannot read one in from a URL.

```
# install.packages("readxl")
library(readxl)
mydata2 <- read_excel("test2.xlsx", sheet = "data")
mydata2
```

```
# A tibble: 6 x 4
  id        x     y group
  <chr> <dbl> <dbl> <chr>
1 p1       10    21 upper
2 p2       11    20 lower
3 p3       13    25 upper
4 p4       15    27 lower
5 p5       16    30 upper
6 p6       17    31 lower
```