

# YData: An Introduction to Data Science

## Lecture 05: Building Tables

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Credit: [data8.org](https://data8.org)



# Announcements

## Review: Arrays

An array contains a sequence of values

- All elements of an array should have the same type
- Arithmetic is applied to each element individually
- When two arrays are added, they must have the same size; corresponding elements are added in the result
- A column of a table is an array

# Ranges

# Ranges

A range is an array of consecutive numbers

- `np.arange(end):`  
An array of increasing integers from 0 up to end
- `np.arange(start, end):`  
An array of increasing integers from start up to end
- `np.arange(start, end, step):`  
A range with step between consecutive values

The range always includes start but excludes end

(DEMO)

# Tables

# Ways to create a table

- `Table.read_table(filename)` - reads a table from a spreadsheet
- `Table()` - an empty table
- and... `select`, `where`, `sort` and so on all create new tables

(DEMO)

Example



# Charles Joseph Minard, 1781-1870



[Image link](#)

- French civil engineer who created one of the greatest graphs of all time
- Visualized Napoleon's 1812 invasion of Russia, including
  - the number of soldiers
  - the direction of the march
  - the latitude and longitude of each city
  - the temperature on the return journey
  - Dates in November and December

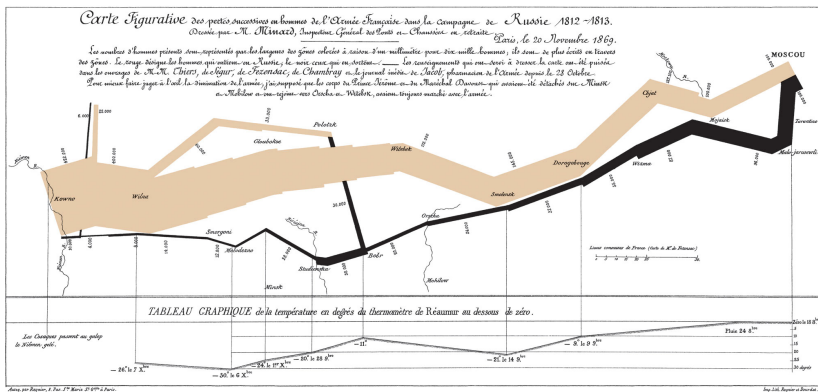


Image link

## Some of Minard's Data

Longitude	Latitude	City	Direction	Survivors
32	54.8	Smolensk	Advance	145000
33.2	54.9	Dorogobouge	Advance	140000
34.4	55.5	Chjat	Advance	127100
37.6	55.8	Moscou	Advance	100000
34.3	55.2	Wixma	Retreat	55000
32	54.6	Smolensk	Retreat	24000
30.4	54.4	Orscha	Retreat	20000
26.8	54.3	Moiodexno	Retreat	12000

(DEMO)

Image: [data8.org](http://data8.org)

# Table Methods

- Creating and extending tables:
  - `Table().with_column` and `Table.read_table`
- Finding the size: `num_rows` and `num_columns`
- Referring to columns: labels, relabeling, and indices
  - `labels` and `reabeled`; column indices start at 0
- Accessing data in a column
  - `column` takes a label or index and returns an array
- Using array methods to work with data in columns
  - `item`, `sum`, `min`, `max`, and so on
- Creating new tables containing some of the original columns:
  - `select`, `drop`

(DEMO)

# Manipulating Rows

- `t.sort(column)` sorts the rows in increasing order
- `t.take(row_numbers)` keeps the numbered rows
  - Each row has an index, starting at 0
- `t.where(column, are.condition)` keeps all rows for which a column's value satisfies a condition
- `t.where(column, value)` keeps all rows containing a certain value in a column