

Today

- Terminal and shell
- Counter controlled repetition
- Combining conditions and counters
- Data generating process

Working in the terminal

- Shell (e.g. bash, or zsh on Mac)
 - command line interface (CLI) to the operating system (OS)
 - **interpreter** program
- Terminal
 - application where the shell runs
- Console in VSCode and RStudio
 - like a terminal but only for R or Python
 - doesn't interact with the OS

Which do I have?
echo \$SHELL

bash

- Bourne Again Shell
 - open source implementation of Bourne's sh (unix 1970s)
 - commands to do stuff in the operating system (file management etc)
 - demo, incl git

while repetition structure

- Counter controlled repetition

```
i = 0
while i < n
    expression_1
    expression_2
    ...
    i = i + 1
```

The diagram illustrates a counter-controlled while loop. It consists of the following parts:

- Initialization:** `i = 0`. The variable `i` is highlighted in red. A blue arrow points from the label "counter" to `i`.
- Condition:** `while i < n`. The variable `n` is highlighted in red. A blue arrow points from the label "number of repetitions" to `n`.
- Loop Body:** Indented lines representing statements:
 - `expression_1`
 - `expression_2`
 - `...`
 - `i = i + 1`. The `+` and `1` are highlighted in red. A blue arrow points from the label "increment the counter" to the `1`.

Exercise: **while**, **counter** control

```
i = 0
```

counter

```
while i < n
```

n repetitions

```
    ... expressions
```

```
    i = i + 1
```

increment counter

Exercise: counter controlled repetition

A population starts with 2 individuals. Each generation, it doubles in size.

What is the population size after 20 generations?

Use the `while` structure. The algorithm should finish by printing the answer. You can't use an exponentiation operator.

Pseudocode first, then flowchart ... then Python.

Both counters & conditions

- How many generations does it take to exceed 10,000?

Both counters & conditions

- Stop if population size $> 1e9$ (1 billion)
- or
- generation > 100