Eric Pitman Summer Workshop in Computational Science

4. Writing Functions

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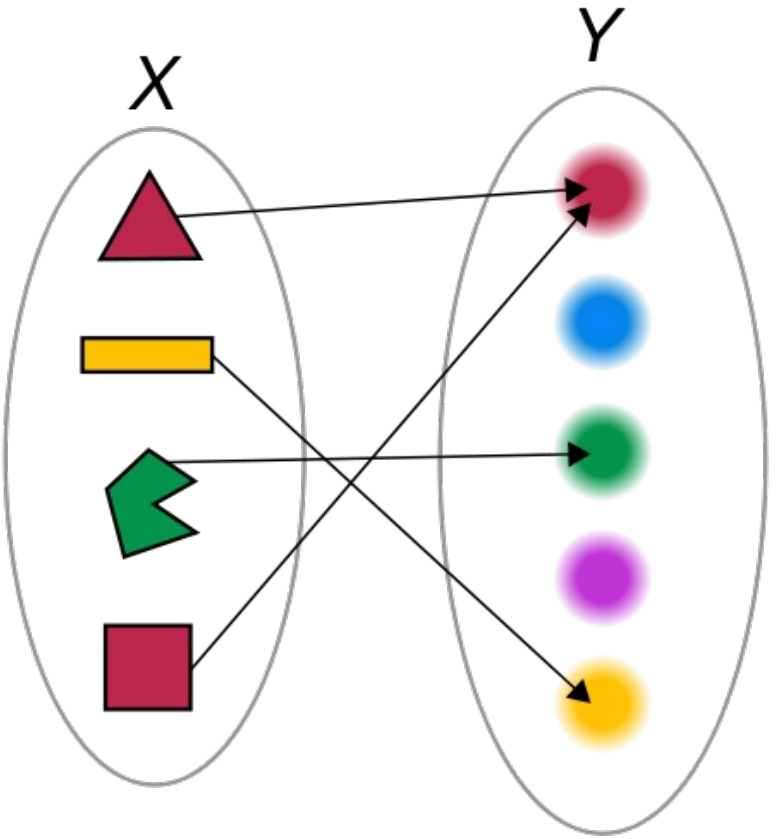
Functions

A function generates an output (Y), given an input (X).



Control Structures: if/else

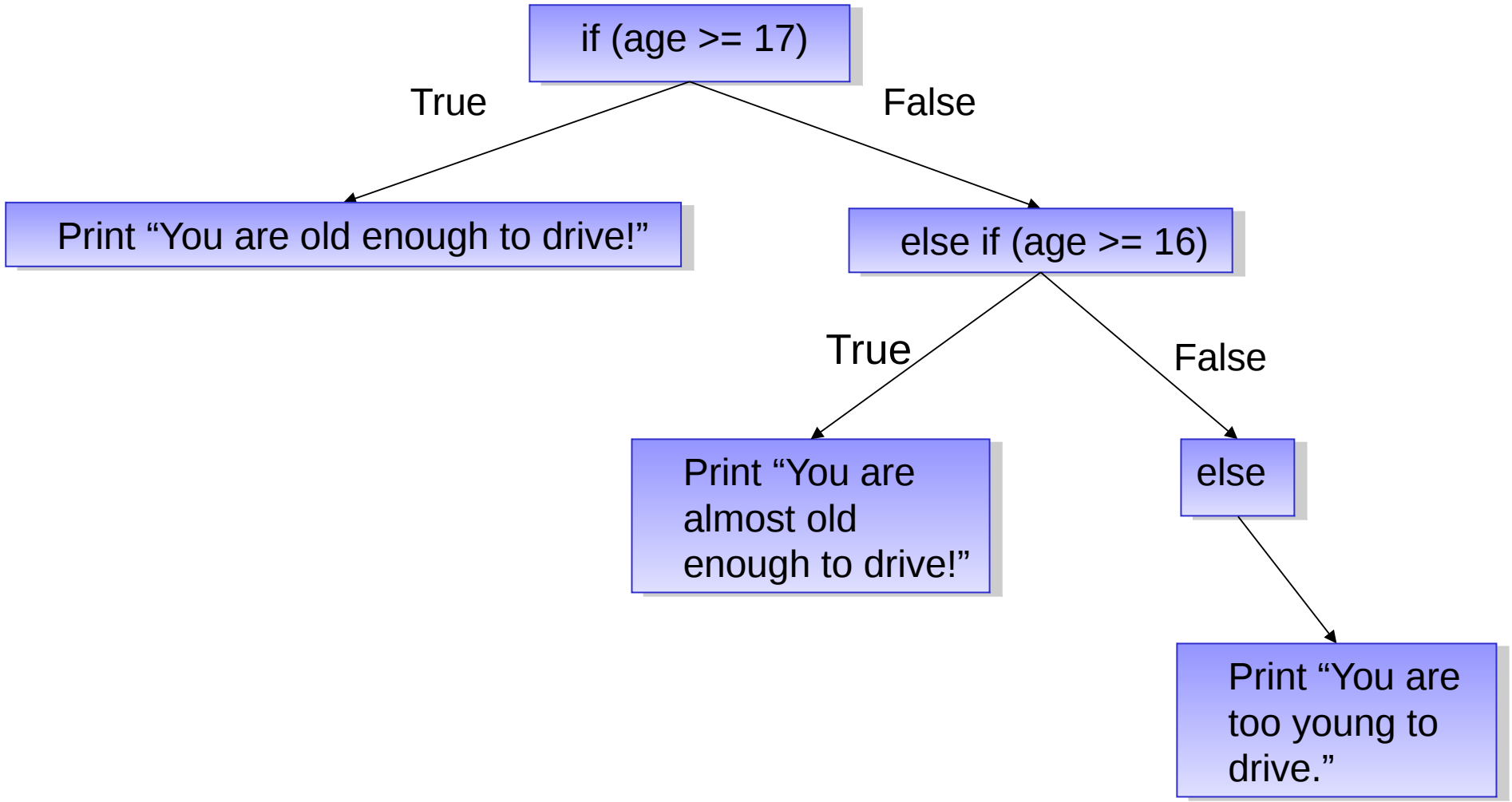
- Make a logical test
- Perform operations based on the outcome

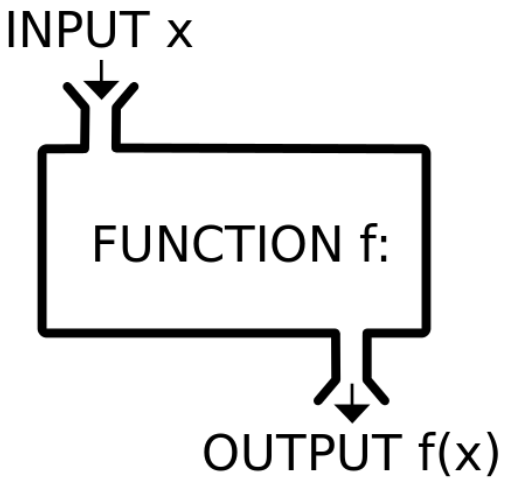
```
if (condition is true)
{
    # do something
}
```

Control Structures: if/else

```
age = 21;

if (age >= 17) {

      print(“You can drive!”);

} else if (age >= 16) {

      print(“You are almost old enough to drive!”);

} else {

      print(“You are not old enough to drive.”);
}
```

if/else Flowchart

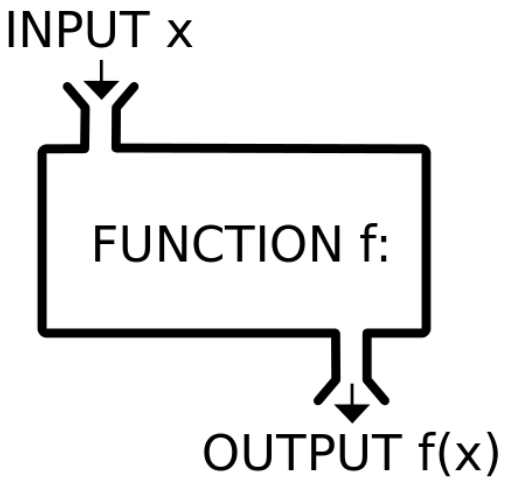




Functions

- A function f takes an input, x, and returns an output $f(x)$.

- It's like a machine that converts an input into an output.



Functions

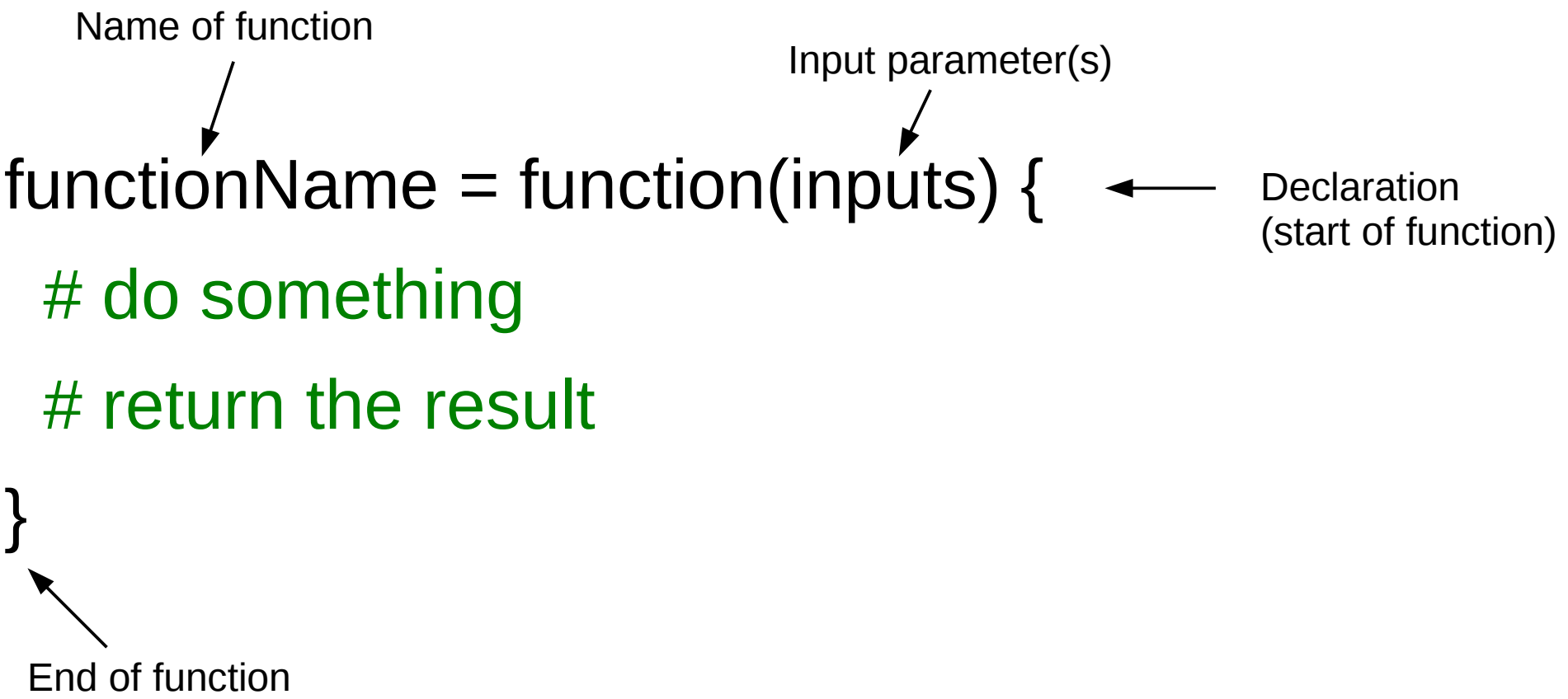
Function: a piece of code that can be called again and again

To call it, specify:

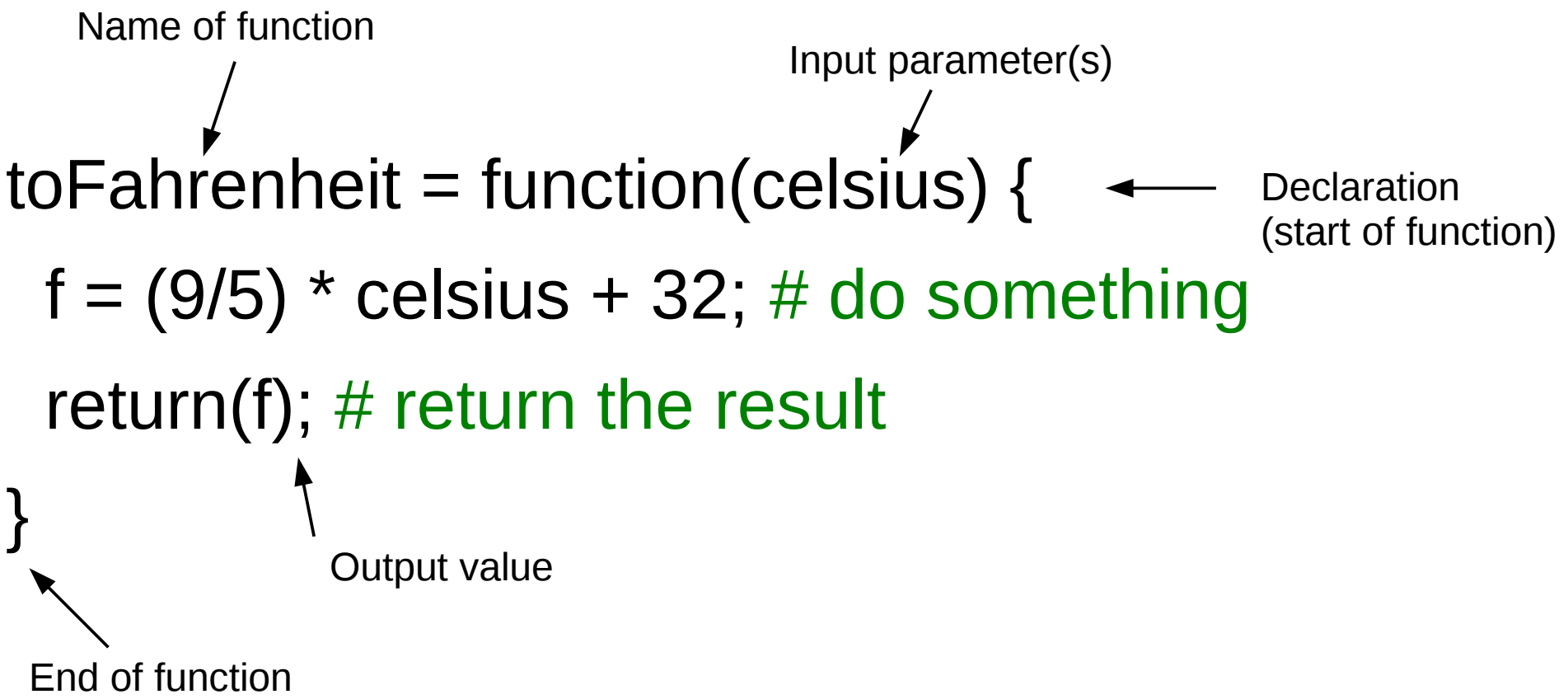
- Function name
- Input values

It may return an output value

Functions in R



Functions in R



Functions in R

```
toFahrenheit = function(celsius) {
  f = (9/5) * celsius + 32; # do something
  return(f); # return the result
}
```

Functions in R

```
celsius = c(20:25); # define input temperatures

toFahrenheit = function(celsius) {
  f = (9/5) * celsius + 32;  # perform the conversion
  return(f);
}

# call the function to convert temperatures to Fahrenheit:
toFahrenheit(celsius);
[1] 68.0  69.8  71.6  73.4  75.2  77.0
```

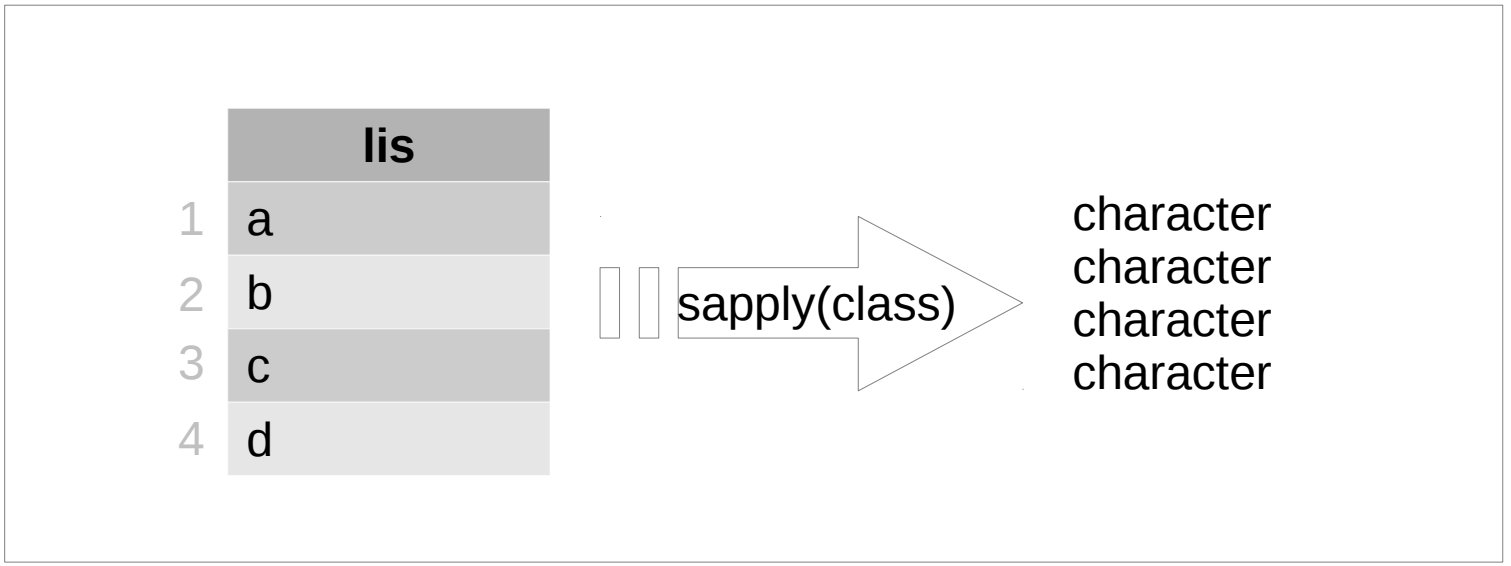
Control Structures: apply() Family

- What if we want to call a function over and over?
- We can do this with a single line of R code!
- Use it on native R functions, or functions you wrote yourself.

sapply(*vector*, *function*)

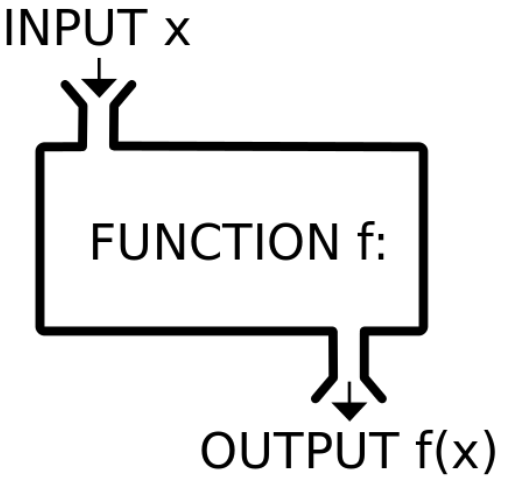
Control Structures: sapply()

```
> lis = c("a", "b", "c", "d")
> sapply(lis, class)
        a         b         c         d
"character" "character" "character" "character"
```



Tips: Writing Functions

- Use an editor window (not the command line) to compose functions
- Try out one line at a time, and test!
- Comment your function to indicate:
  - input
  - output
  - purpose



Student Dataset Example

Remember our own dataset:

`firstInitial, lastInitial, school, height, htUnit, age, handed, gender`

Let's write functions that:

- Convert heights to a uniform unit
- List initials of students that are old enough to drive

Interlude

Complete function exercises.

Open in the RStudio source editor:

<workshop>/exercises/exercises-functions.R