Programming: Intro to Conditionals

Stat 133 with Gaston Sanchez

Introduction to `if-else`

Conditionals

If-else or **if-then-else**

Use to decide what to do based on a logical condition

Motivation example

Generate a random Normal number

```
x <- rnorm(1)
```

$\boxed{?}$

Is it positive or negative?

If `x > 0` ↓ *positive*

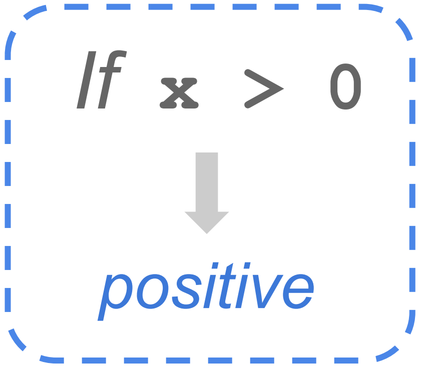
If `x < 0` ↓ *negative*

Generate a random Normal number

```
x <- rnorm(1)
```

$\boxed{?}$

Is it positive or negative?



```
x <- rnorm(1)

if (x > 0) {
   print("positive")
}
```

Generate a random Normal number

```
x <- rnorm(1)
```

$\boxed{?}$

Is it positive or negative?

If `x > 0`

$\downarrow$

positive

```
x <- rnorm(1)

if (x > 0) {
   print("positive")
} else {
   print("negative")
}
```

If `x < 0`

$\downarrow$

negative

Another option

Generate a random Normal number

```
x <- rnorm(1)
```

$\boxed{?}$

Is it positive or negative?

If `x < 0` $\downarrow$ *negative*

```
x <- rnorm(1)

if (x < 0) {
   print("negative")
}
```

Generate a random Normal number

```
x <- rnorm(1)
```

?

Is it positive or negative?

If `x < 0` ⬇ *negative*

```
x <- rnorm(1)

if (x < 0) {
   print("negative")
} else {
   print("positive")
}
```

If `x > 0` ⬇ *positive*

Anatomy of an `if-then-else` statement

```r
x <- rnorm(1)

if (x > 0) {
  print("positive")
} else {
  print("negative")
}
```

```
x <- rnorm(1)
```

if-else statement

```
if (x > 0) {
  print("positive")
} else {
  print("negative")
}
```

```r
x <- rnorm(1)
```

Logical condition → single TRUE / single FALSE

```r
if (x > 0) {
  print("positive")
} else {
  print("negative")
}
```

```r
x <- rnorm(1)

if (x > 0) {
  print("positive")
} else {
  print("negative")
}
```

What to do if condition is TRUE

```r
x <- rnorm(1)

if (x > 0) {
  print("positive")
} else {
  print("negative")
}
```

What to do if condition is FALSE

When you don’t care about the condition being FALSE

```r
x <- rnorm(1)

if (x > 0) {
  print("positive")
} else {
  print("negative")
}
```

What if you don't care about this?

```
x <- rnorm(1)

if (x > 0) {
  print("positive")
}
```

If you don't care about the ***else*** *clause, then don't use it*

```r
x <- rnorm(1)

if (x > 0) {
  print("positive")
} else NULL
```

*Equivalent: when you don't care about the **else** clause*

Multiple chained if’s

Generate a random Normal number

Is it positive? Is it negative? Or is it zero?

```
x <- rnorm(1)

if (x > 0) {
   print("positive")
} else if (x < 0) {
   print("negative")
} else if (x == 0) {
   print("zero")
}
```

Generate a random Normal number

Is it positive? Is it negative? Or is it zero?

```
x <- rnorm(1)

if (x > 0) {
  print("positive")
} else if (x < 0) {
  print("negative")
} else if (x == 0) {
  print("zero")
}
```

Generate a random Normal number

Is it positive? Is it negative? Or is it zero?

```
x <- rnorm(1)

if (x > 0) {
   print("positive")
} else if (x < 0) {
   print("negative")
} else if (x == 0) {
   print("zero")
}
```

Generate a random Normal number

Is it positive? Is it negative? Or is it zero?

```
x <- rnorm(1)

if (x > 0) {
   print("positive")
} else if (x < 0) {
   print("negative")
} else if (x == 0) {
   print("zero")
}
```

Generate a random Normal number

Is it positive? Is it negative? Or is it zero?

```
x <- rnorm(1)

if (x > 0) {
   print("positive")
} else if (x < 0) {
   print("negative")
} else {
   print("zero")
}
```

Errors and Warnings

Error and Warning messages

There are 2 main functions for generating errors and warnings:

`stop()`

`warning()`

*There's also the function `stopifnot()`

Error and Warning messages

Use **`stop()`** to stop the execution of a function, raising an error message.

Use **`warning()`** to show a warning message, without stopping execution.

A warning is useful when we don’t want to stop execution, but we still want to show potential issues/errors.

Example

Future Value (in its simplest version)

$$\mathbf{FV = p\,(1 + r)^n}$$

where:

p = principal

r = interest rate (annual)

n = time (years)

```r
# future value function
future_value <- function(p=1, r=0.01, n=1) {
   fv = p * (1 + r)^n
   fv
}

# how much would you get in 5 years if you
# invest 1000 at a 4% annual rate of return?
future_value(p=1000, r=0.04, n=5)
```

```
# negative returns?
future_value(p=1000, r=-0.04, n=5)

# negative principal (e.g. paying debt)?
future_value(p=-1000, r=0.04, n=5)

# negative time?
future_value(p=1000, r=0.04, n=-5)
```

Negative time doesn't make much sense

Error Messages

```
# future value function
future_value <- function(p=1, r=0.01, n=1) {
  if (n < 0) {
    stop('n cannot be positive')
  } else {
    fv = p * (1 + r)^n
    return(fv)
  }
}
```

`stop()` will stop execution with an error message

```
# future value function
future_value <- function(p=1, r=0.01, n=1) {
   if (n < 0) {
      stop('n cannot be positive')
   } ~~else {~~
   fv = p * (1 + r)^n
   return(fv)
   ~~}~~
}
```

`stop()` will stop execution with an error message

```
# future value function
future_value <- function(p=1, r=0.01, n=1) {
  if (n < 0) {
    stop('n cannot be positive')
  }
  fv = p * (1 + r)^n
  fv
}
```

`stop()` will stop execution with an error message

Warning Messages

```
# future value function
future_value <- function(p=1, r=0.01, n=1) {
  if (n < 0) {
    warning('n cannot be positive')
    n = -n
  } else {
    fv = p * (1 + r)^n
    return(fv)
  }
}
```

`warning()` does not stop execution but gives a warning message

```
# future value function
future_value <- function(p=1, r=0.01, n=1) {
  if (n < 0) {
    warning('n cannot be positive')
    n = -n
  } ~~else {~~
  fv = p * (1 + r)^n
  return(fv)
  ~~}~~
}
```

`warning()` does not stop execution but gives a warning message

```r
# future value function
future_value <- function(p=1, r=0.01, n=1) {
  if (n < 0) {
    warning('n cannot be positive')
    n = -n
  }
  fv = p * (1 + r)^n
  fv
}
```

`warning()` does not stop execution but gives a warning message