Lab 6: functions

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All functions in R have:

- a name
- input arguments
- the body (what to do to the arguments)

name <- function(arg1, arg2, etc.){ what to do(arg1, arg2) }

writing a simple function

a function to add numbers named `add()`

```
# what we want `add()` to do
x <- 10
y <- 10
x + y
```

```
[1] 20
```

```
add <- function(x){
  y <- 10
  x + y
```

```
} # this function will take a value x and add 10 to it
```

remember to run the code before using the function

```
add(1)
```

```
[1] 11
```

now to make the function more flexible

```
add <- function(x, y){
  x + y
}
```

```
add(1, 10)
```

```
[1] 11
```

but now we need to input two numbers for the function to work. To change this we can add a default to one of the arguments

```
add <- function(x, y = 1){
  x + y
}
```

```
add(5)
```

```
[1] 6
```

for the lab worksheet

write a function grade() to determine an overall grade from a vector of student homework

assignment scores dropping the lowest single score. If a student misses a homework (i.e. has an NA value) this can be used as a score to be potentially dropped.

```r
# Example input vectors to start with
student1 <- c(100, 100, 100, 100, 100, 100, 100, 90)
student2 <- c(100, NA, 90, 90, 90, 90, 97, 80)
student3 <- c(90, NA, NA, NA, NA, NA, NA, NA)
```

```r
# what we want the `grade()` function to do
which.min(student2) # get the lowest number
```

```
[1] 8
```

```r
student1[-which.min(student2)]# remove the lowest number
```

```
[1] 100 100 100 100 100 100 100
```

```r
mean(student1) # average the values but doesn't work with NA values
```

```
[1] 98.75
```

```r
mean(student2, na.rm = TRUE) # now can remove all NAs
```

```
[1] 91
```

```r
student3[is.na(student3)] <- 0 # this can replace all NAs with 0
```

```r
grade <- function(x){
  x[is.na(x)] <- 0 # replace NAs with 0
  mean(x[-which.min(x)]) # drops lower score and find mean
}
```

```r
grade(student1)
```

```
[1] 100
```

```r
grade(student2)
```

```
[1] 91
```

```
grade(student3)
```

```
[1] 12.85714
```

yay it works!

use the function on the gradebook

```
url <- "https://tinyurl.com/gradeinput"
gradebook <- read.csv(url, row.names = 1)
View(gradebook)
```

```
grades <- apply(gradebook, 1, grade)
```

who is the top scoring student?

```
which.max(grades)
```

```
student-18
        18
```

```
max(grades)
```

```
[1] 94.5
```

which homework was toughest on students?

```
which.min(colMeans(gradebook, na.rm = TRUE))
```

```
hw3
  3
```

```
min(colMeans(gradebook, na.rm = TRUE))
```

```
[1] 80.8
```

which homework was most predictive of overall score?

```r
gradebook2 <- gradebook
gradebook2[is.na(gradebook2)] <- 0
```

```r
which.max(apply(gradebook2, 2, cor, y = grades))
```

```
hw5
  5
```