Class 6: R Functions

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Today we will explore R functions.

We will start with calculating a grade for these example students.

```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)
```

Use mean() to calculate an average.

```r
mean(student1, na.rm = TRUE)
```

```
## [1] 98.75
```

Try is.na() on student 2.

```r
student2
```

```
## [1] 100  NA  90  90  90  90  97  80
```

```r
is.na(student2)
```

```
## [1] FALSE  TRUE FALSE FALSE FALSE FALSE FALSE FALSE
```

Use result to get NA values (i.e. the TRUE positions).

```r
student2[is.na(student2)]
```

```
## [1] NA
```

Put mean() and is.na() together.

```r
student3[is.na(student3)] <- 0
mean(student3)
```

```
## [1] 11.25
```

Determine the lowest score.

```
which.min(student1)
```

[1] 8

Remove the lowest score.

```
student1[-which.min(student1)]
```

[1] 100 100 100 100 100 100 100

Calculate grade with the lowest score dropped.

```
x <- student2
# Set NA values to zero
x[is.na(x)] <- 0
# Remove lowest score and calculate average
x <- x[-which.min(x)]
mean(x)
```

[1] 91

R Function All R functions have 3 things: -name (grade) -input arguments (student scores) -body (does the work)

```
grade <- function(x) {
  x[is.na(x)] <- 0
  mean(x[-which.min(x)])
}
```

Q1.

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

```
##           hw1 hw2 hw3 hw4 hw5
## student-1 100  73 100  88  79
## student-2  85  64  78  89  78
## student-3  83  69  77 100  77
## student-4  88  NA  73 100  76
## student-5  88 100  75  86  79
## student-6  89  78 100  89  77
```

Use the `apply()` function to grade the whole class.

Q2.

```
scores <- apply(gradebook, 1, grade)
which.max(scores)
```
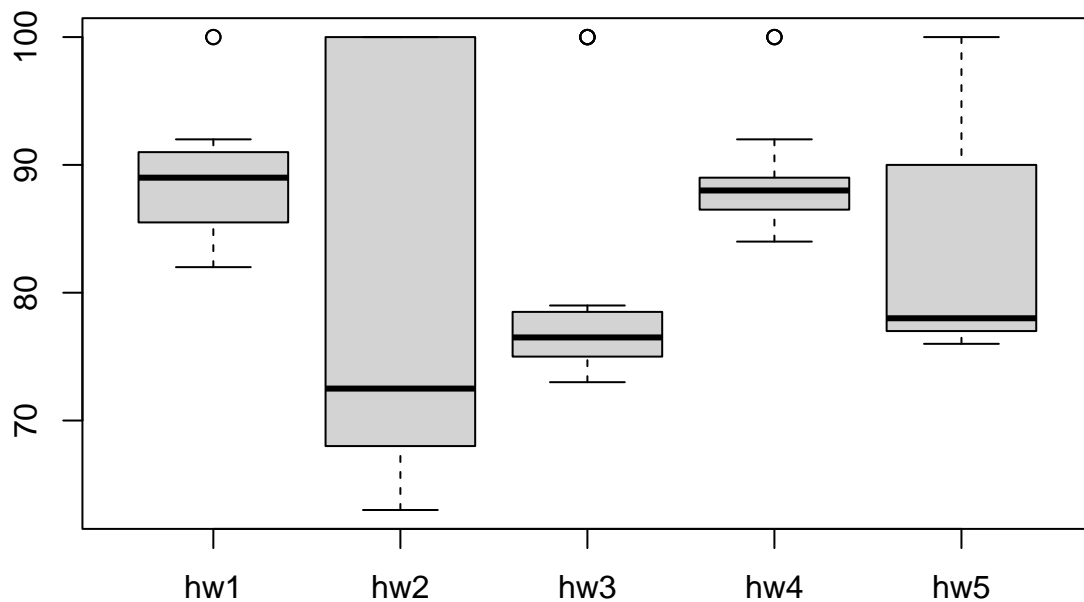
```
## student-18
##        18
```

Q3.

```
hardHw <- apply(gradebook, 2, median, na.rm = TRUE)
which.min(hardHw)
```

```
## hw2
##   2
```

```
boxplot(gradebook)
```


Q4.

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

```
##             hw1 hw2 hw3 hw4 hw5
## student-1   100  73 100  88  79
## student-2    85  64  78  89  78
## student-3    83  69  77 100  77
```

```
## student-4    88    0   73 100   76
## student-5    88  100   75  86   79
## student-6    89   78  100  89   77
## student-7    89  100   74  87  100
## student-8    89  100   76  86  100
## student-9    86  100   77  88   77
## student-10   89   72   79   0   76
## student-11   82   66   78  84  100
## student-12  100   70   75  92  100
## student-13   89  100   76 100   80
## student-14   85  100   77  89   76
## student-15   85   65   76  89    0
## student-16   92  100   74  89   77
## student-17   88   63  100  86   78
## student-18   91    0  100  87  100
## student-19   91   68   75  86   79
## student-20   91   68   76  88   76
```

```
apply(mask, 2, cor, scores)
```

```
##       hw1       hw2       hw3       hw4       hw5
## 0.4250204 0.1767780 0.3042561 0.3810884 0.6325982
```

Q5. Knit