

Class06Hw

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)
```

Average grade for student 1.

```
mean(student1)
```

```
[1] 98.75
```

Average grade for student 2. `is.na()` function is used to convert all *NA* inputs of student 2 grades into 0

```
student2[is.na(student2)] <- 0
student2
```

```
[1] 100    0  90  90  90  90  97  80
```

```
mean(student2)
```

```
[1] 79.625
```

Average grade for student 3 `is.na()` function is used to convert all *NA* inputs of student 2 grades into 0

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

```
[1] 90 0 0 0 0 0 0 0
```

```
mean(student3)
```

```
[1] 11.25
```

Q1. Average grade with lowest score dropped for student 1. I can use the minus sign together with `which.min()` to exclude the lowest value:

```
student1
```

```
[1] 100 100 100 100 100 100 100 90
```

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

```
[1] 8
```

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

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

Now I need to put this all back together to make our working snippet:

```
#Map/Replace NA values to zero
student3 [ is.na(student3) ] <- 0
#Exclude the lowest score
student3 [ -which.min(student3)]
```

```
[1] 90 0 0 0 0 0 0
```

```
# Calculate the mean
mean(student3[ -which.min(student3)] )
```

```
[1] 12.85714
```

This is my working snippet that I can turn into a function called `grade()`

All function in R have at least 3 things: - **Name**, in our case “grade” - Input **arguments**, student 1 etc. - **Body**, this is our working snippet above.

```

grade <- function(y) {
  #Map/Replace NA values to zero
  y [ is.na(y) ] <- 0
  #Exclude the lowest score
  y [ -which.min(y)]
  # Calculate the mean
  mean(y[ -which.min(y)] )
}

```

Using the function to get student 1 grade:

```

grade(student1)

```

```

[1] 100

```

Read a gradebook from online

```

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

```

	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
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	NA	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	NA
student-16	92	100	74	89	77
student-17	88	63	100	86	78
student-18	91	NA	100	87	100
student-19	91	68	75	86	79
student-20	91	68	76	88	76

Q1. Write a function `grade()` to determine an overall grade from a vector of student homework assignment scores dropping the lowest single score.

The `apply` functions allows us to run any function over the rows or columns of `data.frame`.

```
ans <- apply(hw, 1, grade)
ans
```

```
student-1 student-2 student-3 student-4 student-5 student-6 student-7
      91.75      82.50      84.25      84.25      88.25      89.00      94.00
student-8 student-9 student-10 student-11 student-12 student-13 student-14
      93.75      87.75      79.00      86.00      91.75      92.25      87.75
student-15 student-16 student-17 student-18 student-19 student-20
      78.75      89.50      88.00      94.50      82.75      82.75
```

Q2. Using your `grade()` function and the supplied gradebook, who is the top scoring student overall in the gradebook?

```
ans [ which.max(ans) ]
```

```
student-18
      94.5
```

Q3. From your analysis of the gradebook, which homework was toughest on students?

```
which.min( apply (hw, 2, sum, na.rm=TRUE) )
```

```
hw2
      2
```

Hw 2 seems to have been the toughest for students.

Q4. Optional Extension: From your analysis of the gradebook, which homework was most predictive of overall score (i.e. highest correlation with average grade score)?

```
hw$hw1
```

```
[1] 100  85  83  88  88  89  89  89  86  89  82 100  89  85  85  92  88  91  91
[20]  91
```

```
ans
```

student-1	student-2	student-3	student-4	student-5	student-6	student-7
91.75	82.50	84.25	84.25	88.25	89.00	94.00
student-8	student-9	student-10	student-11	student-12	student-13	student-14
93.75	87.75	79.00	86.00	91.75	92.25	87.75
student-15	student-16	student-17	student-18	student-19	student-20	
78.75	89.50	88.00	94.50	82.75	82.75	

```
cor(hw$hw1, ans)
```

```
[1] 0.4250204
```

```
cor(hw$hw3, ans)
```

```
[1] 0.3042561
```

Changing NA values in homework assignments to 0.

```
mask <- hw
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

```

```
cor(mask$hw5, ans)
```

```
[1] 0.6325982
```

```
apply(mask, 2, cor, y=ans)
```

```

      hw1      hw2      hw3      hw4      hw5
0.4250204 0.1767780 0.3042561 0.3810884 0.6325982

```