

Homework Assignment #1

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1. Calculate the monthly payment required for a loan of \$200,000, at a monthly interest rate of 0.003, based on monthly payments, starting in one month's time.

$$R = p \frac{i}{1 - (1 + i)^{-n}}$$

```
i <- 0.003
p <- 200000
n <- 300
p*(i/((1+i)^-n))

## [1] 1473.775
```

2. a.) Compute the roots of the quadratic equation.

$$3x^2 + 2x - 1 = 0$$

Quadratic Equation:

$$x = \frac{-b + \sqrt{b^2 - 4ac}}{2a}$$

```
a <- 3
b <- 2
c <- -1
(-b+sqrt(b^2-4*a*c))/2*a

## [1] 3

(-b-sqrt(b^2-4*a*c))/2*a

## [1] -9
```

2. b.) What happens when you try to compute the roots of

$$x^2 + x + 1 = 0$$

```
a <- 1
b <- 1
c <- 1
(-b+sqrt(b^2-4*a*c))/2*a
```

```
## Warning in sqrt(b^2 - 4 * a * c): NaNs produced
## [1] NaN

(-b-sqrt(b^2-4*a*c))/2*a

## Warning in sqrt(b^2 - 4 * a * c): NaNs produced
## [1] NaN
```

Why?

When calculating the roots for the above formula you get a Not a Number as a result. This means that the result is imaginary.

3. a.) Calculate the remainder after dividing 31,079 into 170,166,719.

```
170166719 %% 31079

## [1] 9194
```

3. b.) How many times does 31,079 go into 170,166,719 (i.e what's the "integer divide" value.)?

```
170166719 %/% 31079

## [1] 5475
```

4. a.) How can you use %% to compute the units digit of an integer x? For example, given the number 123, the units digit is 3 and the other digits are 12.

```
123 %% 120

## [1] 3
```

4. b.) How can you use %/% to return all but the units digit of x?

```
123 %/% 10

## [1] 12
```

5. Create the following objects.

```
jj1 <- jj2 <- jj3 <- aDf <- 8
```

5. a.) Write a command that lists all the objects in your Workspace.

```
ls()

## [1] "a" "aDf" "b" "c" "i" "jj1" "jj2" "jj3" "n" "p"
```

-
5. b.) Write a command that removes jj3 from the Workspace.

```
rm(jj3)
```

5. c.) Write a command that removes all objects from your Workspace.

```
rm(list = ls())
```

6. Try the commands pi, round (pi), round(pi, digits = 4) and trunc(pi), ceiling(pi), floor(pi). What are the results?

```
pi
## [1] 3.141593

round(pi)
## [1] 3

round(pi, digits = 4)
## [1] 3.1416

trunc(pi)
## [1] 3

ceiling(pi)
## [1] 4

floor(pi)
## [1] 3
```

These commands will all show the value in a different position of a number.

7. a.) Look at the help file for the function signif() by typing.

```
?signif
## starting httpd help server ...
## done
```

7. b.) How many arguments does signif() have?

Signif has two arguments. One for a vector and the second for the number of digits.

7. c.) Do any of its arguments have default values? If so, which one, and what is its default value?.

None of the arguments have default values.

7. d.) Write commands that print the value $77/21,943$ to 4, 5 and 6 significant digits.

```
signif(7^7/21943, digits = 4)

## [1] 37.53

signif(7^7/21943, digits = 5)

## [1] 37.531

signif(7^7/21943, digits = 6)

## [1] 37.531
```

8. Refer to Problem 1. Write a function `pmt()` that has three arguments, `P`, a loan amount (in dollars), `i`, a monthly interest rate, and `n`, the number of months over which the loan is to be paid back (beginning one month from now), and returns the monthly payment amount `R`.

```
pmt <- function(p, i, n) {
  r <- p*(i/((1+i)^-n))
  r
}

pmt(200000, 0.003, 300)

## [1] 1473.775
```