

# The University of British Columbia

Irving K. Barber Faculty of Science

DATA 101

Practice Set 1

In each question below, write out (or type) the required lines of R code, together with the answer to the question.

1. Perform the following calculations.

- (a) Find the remainder of  $11^2$  after division by 7 and compare with the remainder of  $4^2$  after division by 7.
- (b) Find the remainder of  $11^3$  after division by 7 and compare with the remainder of  $4^3$  after division by 7.
- (c) Find the remainder of  $11^4$  after division by 7 and compare with the remainder of  $4^4$  after division by 7.
- (d) Find the remainder of  $11^5$  after division by 7 and compare with the remainder of  $4^5$  after division by 7.
- (e) Based on the pattern you see in calculations above, what would you predict to be the remainder after division of  $11^{16}$  by 7?
- (f) Using `options(digits=16)`, attempt to perform the calculation in the previous part in R. Who is right - you or R?

2. The `sum()` function can be used to obtain the sum of the elements of any numeric vector. For example, if a numeric vector `x` contains the elements 3, 7 and 9, we can find the sum of the elements by executing

```
x <- c(3, 7, 9)
sum(x)
```

- (a) Assign the first 20 integers to the vector `first20` and find the sum of these numbers.
- (b) Calculate the total of all of the North American river lengths in the `rivers` vector.

3. Find the sums of the following sequences.

- (a)  $\{1, 1/2, 1/3, 1/4, \dots, 1/20\}$ .
- (b)  $\{1, 1/2^2, 1/3^2, 1/4^2, \dots, 1/20^2\}$ .
- (c)  $\{1, 1/2^3, 1/3^3, 1/4^3, \dots, 1/20^3\}$ .
- (d)  $\{\log(1), \log(2), \dots, \log(20)\}$ . (This is the so-called natural logarithm and is evaluated in R using `log()`.)

4. The populations of Australia's five largest cities are 4.6 million, 4.2 million, 2.2 million, 1.9 million, and 1.2 million, respectively. Create a bar plot to display these data.