Homework 2 fo Porgramming

Due Date: November 18, 18:00

1. Rolling two fair dices, evaluate the total number that all possible outcomes occur at least once. The events are as follows, and each row has two outcomes of dices.

```
two.dice <- matrix( c(3, 5, 5, 4, 4, 3, 4, 5, 5, 2, 3, 2, 6, 6, 6,
                      3, 6, 2, 1, 2, 5, 6, 1, 5, 6, 1, 3, 6, 6, 3,
                      5, 3, 3, 5, 3, 3, 4, 2, 1, 4, 3, 1, 5, 1, 6,
                      4, 5, 5, 3, 5, 2, 2, 1, 2, 2, 6, 1, 3, 4, 5,
                      6, 4, 3, 3, 6, 1, 2, 1, 4, 5, 1, 1, 2, 3, 6,
                      5, 6, 5, 3, 1, 4, 1, 5, 2, 2, 6, 3, 2, 3, 1,
                      5, 1, 2, 5, 1, 1, 1, 3, 1, 3, 4, 1, 6, 5, 1,
                      5, 6, 6, 5, 5, 2, 4, 1, 3, 5, 2, 1, 1, 1, 1), ncol = 2)
```

2. Let $U_1, \ldots, U_k$ be from a uniform(0,1). Define

$$N = \max\left\{ n : \prod_{i=1}^{n} U_i > 10^{-8} \right\}.$$

What is the value of N if you use the following sequence?

```
U <- c(0.89, 0.03, 0.52, 0.41, 0.09, 0.37, 0.71, 0.29, 0.01, 0.92,
       0.53, 0.14, 0.64, 0.94, 0.89, 0.19, 0.33, 0.31, 0.24, 0.15)
```

You should use at least one of **for( )**, **while( )**, and **if( )**.

3. Collect students' scores of math and English as follows:

```
Math <- c(79, 61, 76, 40, 51, 98, 48, 34, 54, 51, 45, 61, 75, 42, 32,
          61, 56, 82, 22, 33, 19, 60, 91, 49, 44)
English <- c(87, 54, 96, 63, 58, 75, 60, 74, 46, 94, 57, 69, 69, 55, 79,
             94, 72, 86, 85, 56, 62, 77, 78, 62, 56)
```

(a) Construct a matrix with two columns to collect these scores. The first column is for math and the second column is for English. Assign the names for the columns as "Math" and "English", respectively, and assign the ID numbers for the rows from 1 to the total number of the students. Assign the name to the matrix as "scores".

(b) Classify the students by the scores. Define the student passes the class if the score is greater or equal to 60, and the student gets a fail if the score is less than 60. Summarize the number of each of the following event:

A: Math $\geq$ 60 and English $\geq$ 60;

B: Math $\geq$ 60 and English $<$ 60;

C: Math $<$ 60 and English $\geq$ 60;

D: Math $<$ 60 and English $<$ 60.

(c) Provide the students' ID numbers in each category (A, B, C, D).

4. When you enter a vector including $\{5, 10, 11, 1, 0, 3, 8, 10, 4, 0, 1, 6, 7, 10, 7, 0\}$, treat 0 as a missing value. Delete all missing values and evaluate the following questions:

(1) Sum of the values in the vector;

(2) The length of the input vector;

(3) The average of the values in the vector;

(4) The number of odd values in the vector;

(5) The number of 10 in the vector;

(6) The maximum of the values in the vector.

Using **paste( )** and **cat( )** (or **print( )**), prepare the code for the following output:

```
## (1) Sum: 83
## (2) length: 13
## (3) Average: 6.384615
## (4) # of odd: 7
## (5) # of 10: 3
## (6) Max: 11
```

Note that: Do not type the exact values, {83, 13, 6.384615, 7, 3, 11}, by yourself, but use the evaluations and paste them (paste(...)) to show the output.

Apply the code to the vector $\{7, 5, 0, 1, 2, 7, 1, 10, 5, 0, 3, 7, 2, 3, 3\}$ and print the results from (1) to (6).