

Statistical Computing (140.776) Homework 2

Due Thursday, Sept 29

For this homework, email the following materials to TA:

A document (.doc or .pdf) summarizing all results + R codes

1. Answer the following questions

(1) $2^2 + 4^2 + 6^2 + \dots + 100^2 =$ _____ .

(2) $x_1 = 1, x_2 = 5, x_3 = 2$. For $n > 3$, $x_n = \log_2(x_{n-1}) + x_{n-2} + \sqrt{x_{n-3}}$.

$x_{100} =$ _____ .

2. Monte Carlo

Suppose x_1, x_2, \dots, x_{50} are 50 random numbers drawn independently from a normal distribution with mean = 2 and standard deviation = 3. Let $x_{(10)}$ be the 10th smallest number among them. Clearly, $x_{(10)}$ is also a random number since it depends on x_1, x_2, \dots, x_{50} . Provide estimates of the mean and variance of $x_{(10)}$.

Mean = _____ ; Variance = _____ .

3. Read the R code below.

George says: “based on the code, f(3) should be equal to 13”. Michael says, “No, it should be 12”. Julie disagrees, “you are both wrong! It should be 11”.

```
#####  
##  
x<-1  
y<-5  
z<-2  
  
f<-function(x) {  
  y<-2*x  
  
  g<-function(z) {  
    z+2*y
```

```

    }

    g(x)+h(x)
}

h<-function(x) {
    x-y
}
#####
##

```

- (1) Who is correct?
- (2) Explain why.

4. Tree traversal

(1) Download tree.rda from the course website. Implement the tree-traversal algorithm to systematically visit all nodes in the tree. Assemble the keys of the nodes in the order of “left child -> current node -> right child”. Report the assembled key.

(2) Write a program to build the following tree using recursive functions. You can use your program in (1) to check whether you have correctly built the tree. The assembled key should read as “most biostatistician agree that the preferred approach to analyzing clinical-trial results is to pick a”.

