

1.

(a) What is the class of the object defined by `vec <- c(5, TRUE)` ?

• **Numeric Answer**

- Integer
- Matrix
- Logical

(b) Suppose I have vectors `x <- 1:4` and `y <- 1:2`. What is the result of the expression `x + y`?

- A numeric vector with the values 1, 2, 5, 7
- A numeric vector with the values 2, 4, 2, 4
- **An integer vector with the values 2, 4, 4, 6 Answer**
- An error

(c) Suppose I define the following function in R:

```
fsin <- function(x) sin(pi*x)
```

What will be returned by `fsin(1)` ?

- **The number 0 is returned**
- The number 1 is returned
- A warning is given with no value returned
- An error is returned because 'pi' is not specified in the call to 'fsin'

(d) What is returned by the R command `c(1,2) %*% t(c(1,2))` ?

- The number 5
- A one by two matrix
- **A two by two matrix Answer**
- An error is returned because the dimensions mismatch

(e) Suppose I define the following function in R:

```
f <- function(x) {  
  g <- function(y) {  
    y + z  
  }  
  z <- 4  
  x + g(x)  
}
```

If I then run in R the following statements

```
z <- 15
```

```
f(3)
```

What value is returned?

- 16
- 7
- **10 Answer**
- 4

2.

Use R to calculate $\sum_{x=1}^{1000} x^2 = 1^2 + 2^2 + \dots + 1000^2$.

Please hand in your R commands and the results you produce by running those commands.

Rscript:

```
x<-(1:1000)^2
> y<-0
> for (i in (1:length(x)))
+ {y<-y+x[i]}
> y
[1] 333833500
```

Answer: 333833500

3.

Write an R script that does all of the following:

- a) Create a vector X of length 20, with the kth element in $X = 2k$, for $k=1\dots 20$. Print out the values of X.

a.

Rscript:

```
X<-1:20
> for (k in 1:length(X)){X[k]<-2*k}
> X
[1] 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40
```

Answer- 2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40

- b) Create a vector Y of length 20, with all elements in Y equal to 0. Print out the values of Y.

b.

Rscript:

```
Y<-rep(0,20)
> Y
[1] 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0
```

Answer- 0

c) Using a for loop, reassigns the value of the k-th element in Y, for k = 1...20. When $k < 12$, the kth element of Y is reassigned as the cosine of k. When the $k \geq 12$, the kth element of Y is reassigned as the value of integral $\int_0^k \sqrt{t} dt$.

c. Rscript

```
Y<-(1:20)
for (k in 1:length(Y))
{
  if(k<12)
  {
    Y[k]<-cos(k)
  } else{
    integrand<-function(t) sqrt(t)
    Y[k]= integrate(integrand,lower=0, upper=k)
  }
}
Y
```

Answer:

[[1]]

[1] 0.5403023

[[2]]

[1] -0.4161468

[[3]]

[1] -0.9899925

[[4]]

[1] -0.6536436

[[5]]

[1] 0.2836622

[[6]]

[1] 0.9601703

[[7]]

[1] 0.7539023

[[8]]

[1] -0.1455

[[9]]
[1] -0.9111303

[[10]]
[1] -0.8390715

[[11]]
[1] 0.004425698

[[12]]
[1] 27.71282

[[13]]
[1] 31.24811

[[14]]
[1] 34.92214

[[15]]
[1] 38.72984

[[16]]
[1] 42.66667

[[17]]
[1] 46.72854

[[18]]
[1] 50.91169

[[19]]
[1] 55.21273

[[20]]
[1] 59.62849