

MOOC Course - Introduction to R Software

July 2021

Assignment 2

1. Which one of the following is the correct specification to compute $y = \sqrt{\ln(x) + x^{1/3}}$ and what is its value for $x = 7590$?

- a. `y<-(x){sqrt(log(x) +x^(1/3))}`, `y = 53.46673`
- b. `y<-f(x)[sqrt(log(x) +x^(1/3))]`, `y = 534.6673`
- c. `y<-function(x){sqrt(log(x)) +x^(1/3)}`, `y = 0.5346673`
- d. `y<- function(x){sqrt(log(x)+x^(1/3))}`, `y = 5.346673`

Solution:

```
R Console
> y<- function(x){sqrt(log(x)+x^(1/3))}
> y(7590)
[1] 5.346673
> y<-(x){sqrt(log(x) +x^(1/3))}
Error: unexpected '{' in "y<-(x){"
> y<-f(x)[sqrt(log(x) +x^(1/3))]
```

Error in f(x) : could not find function "f"

```
> y<-function(x){sqrt(log(x)) +x^(1/3)}
Error: unexpected '{' in "y<-function{"
> |
```

2. Which one of the following is the correct outcome of `z(12,14)` of the function specified as `z=function(x,y){sqrt(x^2+y^2)+exp(-(x^-2+y^-2))-(x^2+y^2)^(2/4)}` ?

- a. `-29.28675`
- b. `0.9880258`
- c. `37.8662`
- d. None of these

Solution:

```
R Console
> z=function(x,y){sqrt(x^2+y^2)+exp(-(x^-2+y^-2))-(x^2+y^2)^(2/4)}
> z(12,14)
[1] 0.9880258
> |
```

3. Which one of the following is the correct command to obtain the following matrix?

$$x = \begin{pmatrix} 1 & 4 & 7 \\ 2 & 5 & 8 \\ 3 & 6 & 9 \end{pmatrix}$$

- a. `x=matrix(1:9,3,3,byrow=T)`
- b. `x=mat(1:9,3,3, byrow=T)`
- c. `x=matrix(1:9,3,3,byrow=F)`
- d. `x=mat(1:9,3,3,byrow=F)`

Solution:

```
R Console
> x=matrix(1:9,3,3,byrow=F)
> x
      [,1] [,2] [,3]
[1,]    1    4    7
[2,]    2    5    8
[3,]    3    6    9
> x=matrix(1:9,3,3,byrow=T)
> x
      [,1] [,2] [,3]
[1,]    1    2    3
[2,]    4    5    6
[3,]    7    8    9
> x=mat(1:9,3,3, byrow=T)
Error in mat(1:9, 3, 3, byrow = T) : could not find function "mat"
> x=mat(1:9,3,3,byrow=F)
Error in mat(1:9, 3, 3, byrow = F) : could not find function "mat"
> |
```

4. Which one of the following is the correct command to obtain the following matrix?

$$z = \begin{pmatrix} 5 & 6 & 7 \\ 8 & 9 & 10 \end{pmatrix}$$

- a. `z <- matrix(nrow=2,ncol=3,data=c(5,6,7,8,9,10),byrow=T)`
- b. `z <- matrix(nrow=3,ncol=2,data=c(5,8,6,9,7,10),byrow=T)`
- c. `z <- matrix(nrow=2,ncol=3,data=(5,6,7,8,9,10),byrow=T)`
- d. `z <- matrix(nrow=3,ncol=2,data=(5,6,7,8,9,10),byrow=T)`

Solution:

```
R Console
> z <- matrix(nrow=2, ncol=3, data=c(5,6,7,8,9,10), byrow=T)
> z
      [,1] [,2] [,3]
[1,]    5    6    7
[2,]    8    9   10
> z <- matrix(nrow=3, ncol=2, data=c(5,8,6,9,7,10) , byrow=T)
> z
      [,1] [,2]
[1,]    5    8
[2,]    6    9
[3,]    7   10
> z <- matrix(nrow=2, ncol=3, data=(5,6,7,8,9,10) , byrow=T)
Error: unexpected ',' in "z <- matrix(nrow=2, ncol=3, data=(5,"
> z <- matrix(nrow=3, ncol=2, data=(5,6,7,8,9,10) , byrow=T)
Error: unexpected ',' in "z <- matrix(nrow=3, ncol=2, data=(5,"
> |
```

5. Which one of the following is the correct command to obtain the second column and third row of the following matrix?

$$x = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$$

- a. `x(2,)` and `x(,3)` respectively.
- b. `x(2,)` and `x(3,)` respectively.
- c. `x[,2]` and `x[3,]` respectively.
- d. `x[,2]` and `x[,3]` respectively.

Solution:

```
R Console
> x=matrix(1:9,3,3,byrow=T)
> x
      [,1] [,2] [,3]
[1,]    1    2    3
[2,]    4    5    6
[3,]    7    8    9
> x[, 2]
[1] 2 5 8
> x[3, ]
[1] 7 8 9
> |
```

6. Which one of the following is the correct outcome of the command `X[3,2]` for the matrix constituted by the command `X<-matrix(1:9,3,3,byrow=F)`?

- a. 3
- b. 6
- c. 7
- d. 8

Solution:

```
R Console
> X<-matrix(1:9,3,3,byrow=F)
> X[3,2]
[1] 6
> |
```

7. Which one of the following is the correct outcome of the commands `dim(x)` and `dim(y)` for the matrices obtained by `x<-matrix(1:100,50,2,byrow=T)` and `y<-matrix(1:100,50,2,byrow=F)`?

- a. 50 2 and 2 50 respectively.
- b. 2 50 and 50 2 respectively.
- c. 2 50 and 2 50 respectively.
- d. 50 2 and 50 2 respectively.

Solution:

```
R Console
> x<-matrix(1:100,50,2,byrow=T)
> y<-matrix(1:100,50,2,byrow=F)
> dim(x)
[1] 50 2
> dim(y)
[1] 50 2
> |
```

8. Which one of the following matrix is the correct outcome of the command

`x <- diag(3, nrow=2, ncol=2) ?`

a. $x = \begin{pmatrix} 3 & 3 & 3 \\ 3 & 3 & 3 \end{pmatrix}$

b. $x = \begin{pmatrix} 3 & 0 & 0 \\ 0 & 3 & 3 \end{pmatrix}$

c. $x = \begin{pmatrix} 0 & 3 & 0 \\ 0 & 0 & 3 \end{pmatrix}$

d. $x = \begin{pmatrix} 3 & 0 \\ 0 & 3 \end{pmatrix}$

Answer: d

Solution:

```
R Console
> x <- diag(3, nrow=2, ncol=2)
> x
      [,1] [,2]
[1,]    3    0
[2,]    0    3
> |
```

9. Which one of the following is the correct outcome of the command `t(x)` for

`x<-matrix(nrow=3, ncol=2, data=6:11, byrow=T)` ?

a.

```
      [,1] [,2] [,3]
[1,]    6    8   10
[2,]    7    9   11
```

b.

```
      [,1] [,2]
[1,]    6    9
[2,]    7   10
[3,]    8   11
```

c.

```
      [,1] [,2] [,3]
[1,]    6    7    8
[2,]    9   10   11
```

d. None of these

Solution:

```
R Console
> x<-matrix(nrow=3, ncol=2, data=6:11, byrow=T)
> t(x)
      [,1] [,2] [,3]
[1,]    6    8   10
[2,]    7    9   11
```

10. Which one of the following is the correct command to obtain the multiplication of two matrices **x** and **y** of the same order?

a. **x*y**

b. **%x*y**

c. **x**y**

d. **x***y**

Answer: c

11. Which one of the following is the correct command to obtain the multiplication of

two matrices $x = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and $y = \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix}$ along with its correct answer?

a. **x*y**

and its correct answer is

	[,1]	[,2]
[1,]	19	22
[2,]	43	50

b. **x**y**

and its correct answer is

	[,1]	[,2]
[1,]	19	43
[2,]	22	50

c. `x%*%y`

and its correct answer is

```
      [,1] [,2]
[1,]    19    22
[2,]    43    50
```

d. `x%*%*%y`

and its correct answer is

```
      [,1] [,2]
[1,]    50    43
[2,]    22    19
```

Solution:

```
R Console
> x<- matrix(1:4,2,2,byrow=T)
> y<- matrix(5:8,2,2,byrow=T)
> x
      [,1] [,2]
[1,]     1     2
[2,]     3     4
> y
      [,1] [,2]
[1,]     5     6
[2,]     7     8
> x%*%y
      [,1] [,2]
[1,]    19    22
[2,]    43    50
> |
```


12. Let `x<- matrix(nrow=2, ncol=2, data=1:4, byrow=T)` then which one of the following is the correct outcome of `2*x` ?

a.

```
      [,1] [,2]  
[1,]     2     4  
[2,]     6     8
```

b.

```
      [,1] [,2]  
[1,]     2     6  
[2,]     4     8
```

c.

```
      [,1] [,2]  
[1,]     2     4  
[2,]     8     6
```

d. None of these

Solution:

```
R Console  
  
> x<- matrix(nrow=2, ncol=2, data=1:4, byrow=T)  
> 2*x  
      [,1] [,2]  
[1,]     2     4  
[2,]     6     8  
> |
```

13. Which one of the following is the correct command for the addition of two

matrices $x = \begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$ and $y = \begin{pmatrix} 5 & 6 \\ 7 & 8 \end{pmatrix}$ along with its correct answer?

a.

`x + y`

and its correct answer is

`[,1] [,2]`

`[1,] 6 8`

`[2,] 10 12`

b.

`x %+% y`

and its correct answer is

`[,1] [,2]`

`[1,] 6 8`

`[2,] 12 10`

c.

`x %%+% y`

and its correct answer is

`[,1] [,2]`

`[1,] 10 12`

`[2,] 6 8`

d.

`x %+%+ y`

and its correct answer is

`[,1] [,2]`

`[1,] 6 8`

`[2,] 10 12`

Solution:

```
R Console
> x<- matrix(1:4,2,2,byrow=T)
> y<- matrix(5:8,2,2,byrow=T)
> x
      [,1] [,2]
[1,]     1     2
[2,]     3     4
> y
      [,1] [,2]
[1,]     5     6
[2,]     7     8
> x+y
      [,1] [,2]
[1,]     6     8
[2,]    10    12
> |
```

14. Let `x<- matrix(nrow=2, ncol=2, data=1:4, byrow=T)` then which one of the following is the correct outcome of `2%*%x` ?

a.

```
      [,1] [,2]
[1,]     2     4
[2,]     6     8
```

b.

```
      [,1] [,2]
[1,]     2     6
[2,]     4     8
```

c. Error...

d. None of these

Solution:

```
R Console
> x<- matrix(nrow=2, ncol=2, data=1:4, byrow=T)
> 2%*%x
Error in 2 %*% x : non-conformable arguments
> |
```

15. Which one of the following is the correct outcome of `x[,2]` for the matrix specified by

```
X<-matrix(nrow=3, ncol=3, data=c(10,20,30,40,50,60,70,80,90),
          byrow=F) ?
```

- a. `[1] 40 50 60`
- b. `[1] 20 50 80`
- c. `[1] 10 50 90`
- d. None of these

Solution:

```
R Console
> X<-matrix(nrow=3, ncol=3, data=c(10,20,30,40,50,60,70,80,90), byrow=F)
> X[,2]
[1] 40 50 60
> |
```

16. Which one of the following is the correct outcome of `x[2:3,2:3]` for the matrix specified by

```
X<-matrix(nrow=3, ncol=3, data=c(10,20,30,40,50,60,70,80,90),
          byrow=F) ?
```

a.

```
      [,1] [,2]
[1,]    50    60
[2,]    80    90
```

b.

```
      [,1] [,2]
[1,]    50    80
[2,]    60    90
```

c.

```

      [,1] [,2]
[1,]    20    80
[2,]    30    90

```

d. None of these

Solution:

```

R Console
> X<-matrix(nrow=3, ncol=3, data=c(10,20,30,40,50,60,70,80,90), byrow=F)
> X[2:3,2:3]
      [,1] [,2]
[1,]    50    80
[2,]    60    90
> |

```

17. Which one of the following is the correct command to get the matrix $\begin{pmatrix} 40 & 70 \\ 50 & 80 \end{pmatrix}$ from the matrix specified by

`X<-matrix(nrow=3, ncol=3, data=c(10,20,30,40,50,60,70,80,90), byrow=F)` ?

- a. `X[1:2, 1:2]`
- b. `X[1:2, 2:3]`
- c. `X[1:1, 2:2, 3:3, 4:4]`
- d. None of these

Solution:

```

R Console
> X<-matrix(nrow=3, ncol=3, data=c(10,20,30,40,50,60,70,80,90), byrow=F)
> X[1:2, 2:3]
      [,1] [,2]
[1,]    40    70
[2,]    50    80
> X[1:2, 1:2]
      [,1] [,2]
[1,]    10    40
[2,]    20    50
> X[1:1, 2:2, 3:3, 4:4]
Error in X[1:1, 2:2, 3:3, 4:4] : incorrect number of dimensions
> |

```

$$x = \begin{pmatrix} 12 & 18 & 10 \\ 23 & 34 & 56 \\ 12 & 64 & 22 \end{pmatrix}$$

18. If then which one of the following is the correct command and its outcome for obtaining the inverse of the matrix **x**?

a.

```
solve(x) =
      [,1]      [,2]      [,3]
[1,]  0.13899235 -0.01195844 -0.03273868
[2,] -0.00813566 -0.00705744  0.02166242
[3,] -0.05214664  0.02705352  0.00029406
```

b.

```
inv(x) =
      [,1]      [,2]      [,3]
[1,]  0.13899235 -0.01195844 -0.03273868
[2,] -0.00813566 -0.00705744  0.02166242
[3,] -0.05214664  0.02705352  0.00029406
```

c.

```
inv(x) =
      [,1]      [,2]      [,3]
[1,]  0.13899235 -0.01195844 -0.03273868
[2,] -0.05214664  0.02705352  0.00029406
[3,] -0.00813566 -0.00705744  0.02166242
```

d.

```
solve(x) =
      [,1]      [,2]      [,3]
[1,]  0.13899235 -0.01195844 -0.03273868
[2,] -0.05214664  0.02705352  0.00029406
[3,] -0.00813566 -0.00705744  0.02166242
```

Solution:

```
R Console
> x=matrix(c(12,18,10,23,34,56,12,64,22), 3, 3, byrow=T)
> x
      [,1] [,2] [,3]
[1,]  12   18   10
[2,]  23   34   56
[3,]  12   64   22
> solve(x)
      [,1]      [,2]      [,3]
[1,] 0.13899235 -0.01195844 -0.03273868
[2,] -0.00813566 -0.00705744  0.02166242
[3,] -0.05214664  0.02705352  0.00029406
> |
```

19. Suppose **x** is any vector as **x=c(100,200, 300, 1:100, NA)** then which one of the following is the correct outcome of the command **mean(x)** ?

a. **54.85437**

b. **140.2**

c. **Error...**

d. **NA**

Solution:

```
R Console
> x=c(100,200, 300, 1:100, NA)
> mean(x)
[1] NA
> |
```

20. Which one of the following is the correct outcome of the command

(x < 5) && (x > 2) & (x < 5) || (x > 2) || (x == 7)

when **x = 3** and when **x = -3** ?

a. **FALSE** and **FALSE** respectively.

b. **TRUE** and **FALSE** respectively.

c. **FALSE** and **TRUE** respectively.

d. **TRUE** and **TRUE** respectively.

Solution:

```
R Console
> x=3
> (x < 5) && (x > 2) & (x < 5) || (x > 2) || (x == 7)
[1] TRUE
> x=-3
> (x < 5) && (x > 2) & (x < 5) || (x > 2) || (x == 7)
[1] FALSE
> |
```

21. Suppose $x = 3:7$ then which one of the following is the correct outcome of the command $(x > 3) \&(x < 5)$?

- a. FALSE TRUE FALSE FALSE FALSE
- b. TRUE FALSE TRUE TRUE TRUE
- c. TRUE TRUE TRUE FALSE FALSE
- d. FALSE FALSE FALSE TRUE TRUE

Solution:

```
R Console
> x = 3:7
> (x > 3) & (x < 5)
[1] FALSE TRUE FALSE FALSE FALSE
> |
```


22. Suppose `x = 33:53` then which one of the following correctly specifies the outcomes of the following statements: `x[(x > 28) & (x < 59)]` and `x[(x > 28) || (x < 59)]`?

a. are different for both as

`33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53`

and

`23 24 25 26 27 28 29 30 41 42 43 44 45 46 47 48 49 50 51 52 53`

respectively.

b. are the same for both as

`33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53`

c. are different for both as

`23 24 25 26 27 28 29 30 41 42 43 44 45 46 47 48 49 50 51 52 53`

and

`33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53`

respectively.

d. None of these

Solution:

```
R Console
> x = 33:53
> x[(x > 28) & (x < 59)]
[1] 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53
> x[(x > 28) || (x < 59)]
[1] 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53
> |
```

23. Suppose $x = 30:70$ then which one of the following is the correct command to know that which of the values in x are more than 20 and less than 50?

- a. `x[(x > 20) & (x < 50)]`
- b. `(x > 20) & (x < 50)`
- c. `x[(x >= 20) & (x >= 50)]`
- d. None of these

Solution:

```
R Console
> x = 30:70
> x[(x > 20) & (x < 50)]
[1] 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49
> |
```

24. Suppose $x = 53:97$ then which one of the following is the correct outcome of `(x > 92) && (x < 85)` and `(x > 92) || (x < 85)`?

- a. `TRUE` and `FALSE` respectively.
- b. `FALSE` and `FALSE` respectively.
- c. `TRUE` and `TRUE` respectively.
- d. `FALSE` and `TRUE` respectively.

Solution:

```
R Console
> x = 53:97
> (x > 92) && (x < 85)
[1] FALSE
> (x > 92) || (x < 85)
[1] TRUE
> |
```

25. Suppose $x = 3:7$ then which one of the following is the correct outcome of

$x[(x > 2) \mid\mid (x < 5)]$?

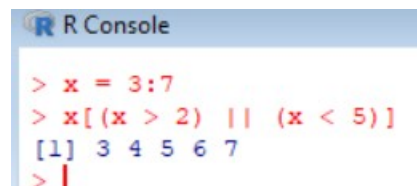
a. TRUE

b. FALSE

c. 3 4 5 6 7

d. None of these

Solution:



```
R Console
> x = 3:7
> x[(x > 2) || (x < 5)]
[1] 3 4 5 6 7
> |
```

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Answers of Assignment 2

1. d
2. b
3. c
4. a

5. c
6. b
7. d
8. d
9. a
10. c
11. c
12. a
13. a
14. c
15. a
16. b
17. b
18. a
19. d
20. b
21. a
22. b
23. a
24. d
25. c