

Introduction to R Software

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Lecture 11

Matrix Operations

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Slides can be downloaded from
<http://home.iitk.ac.in/~shalab/sp>

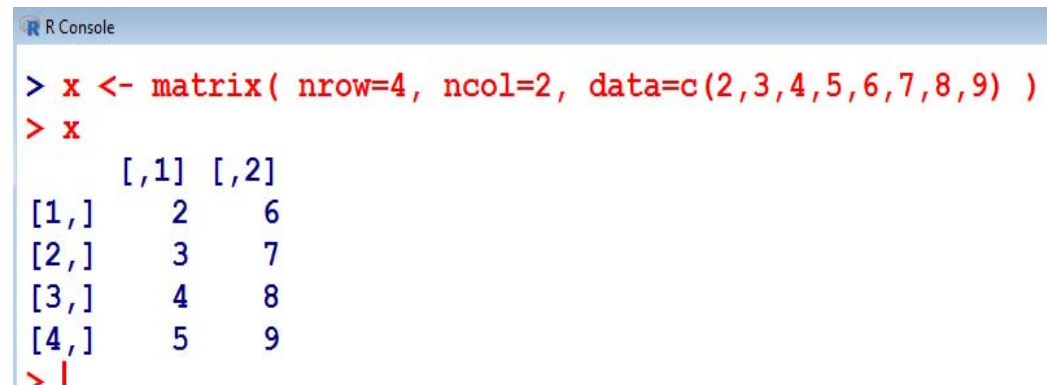


Matrix

In R, a 4×2 -matrix X can be created with a following command:

```
> x <- matrix( nrow=4, ncol=2,  
               data=c(2,3,4,5,6,7,8,9) )
```

```
> x  
      [,1] [,2]  
[1,]    2    6  
[2,]    3    7  
[3,]    4    8  
[4,]    5    9
```



```
R Console  
> x <- matrix( nrow=4, ncol=2, data=c(2,3,4,5,6,7,8,9) )  
> x  
      [,1] [,2]  
[1,]    2    6  
[2,]    3    7  
[3,]    4    8  
[4,]    5    9  
> |
```

One can access a single element of a matrix with $x[i,j]$:

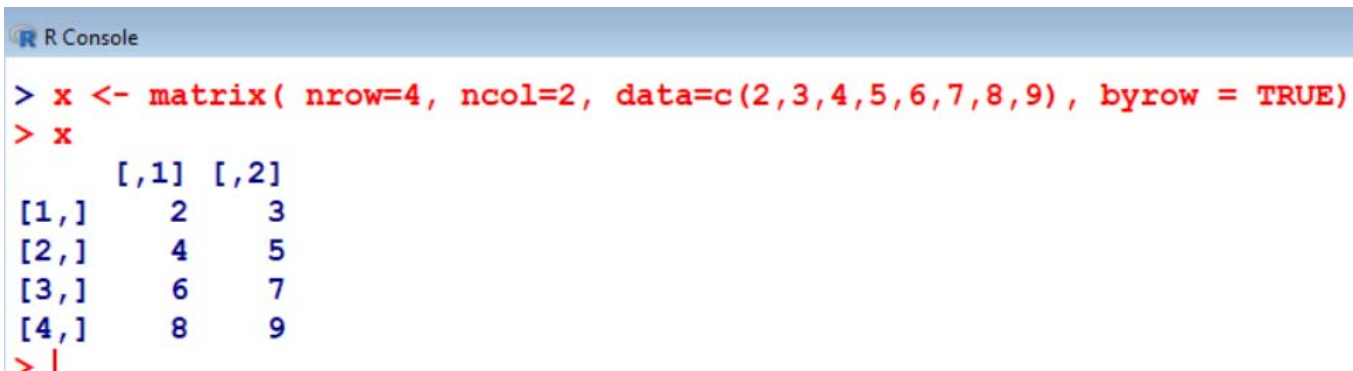
```
> x[4,2]  
[1] 9
```

Matrix

In case, the data has to be entered row wise, then a 4×2 -matrix X can be created with

```
> x <- matrix( nrow=4, ncol=2,  
               data=c(2,3,4,5,6,7,8,9), byrow = TRUE)
```

```
> x  
      [,1] [,2]  
[1,]    2    3  
[2,]    4    5  
[3,]    6    7  
[4,]    8    9
```



```
R Console  
> x <- matrix( nrow=4, ncol=2, data=c(2,3,4,5,6,7,8,9), byrow = TRUE)  
> x  
      [,1] [,2]  
[1,]    2    3  
[2,]    4    5  
[3,]    6    7  
[4,]    8    9  
> |
```

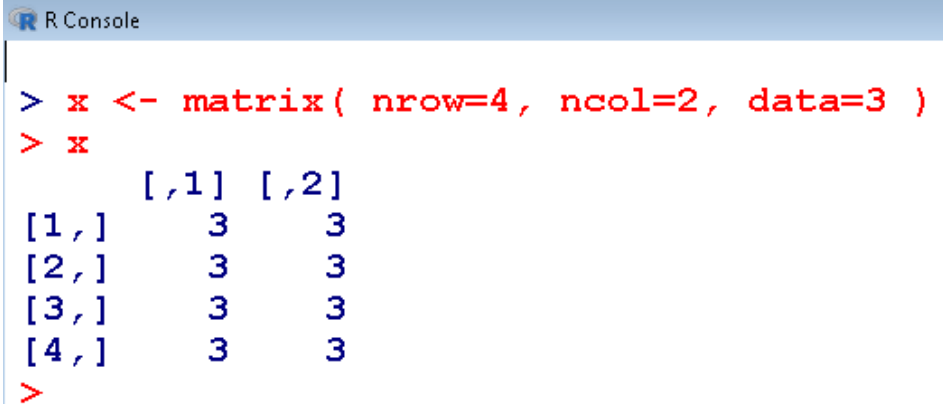
Matrix Operations

Assigning a specified number to all matrix elements:

```
> x <- matrix( nrow=4, ncol=2, data=3 )
```

```
> x
```

```
      [,1] [,2]  
[1,]    3    3  
[2,]    3    3  
[3,]    3    3  
[4,]    3    3
```



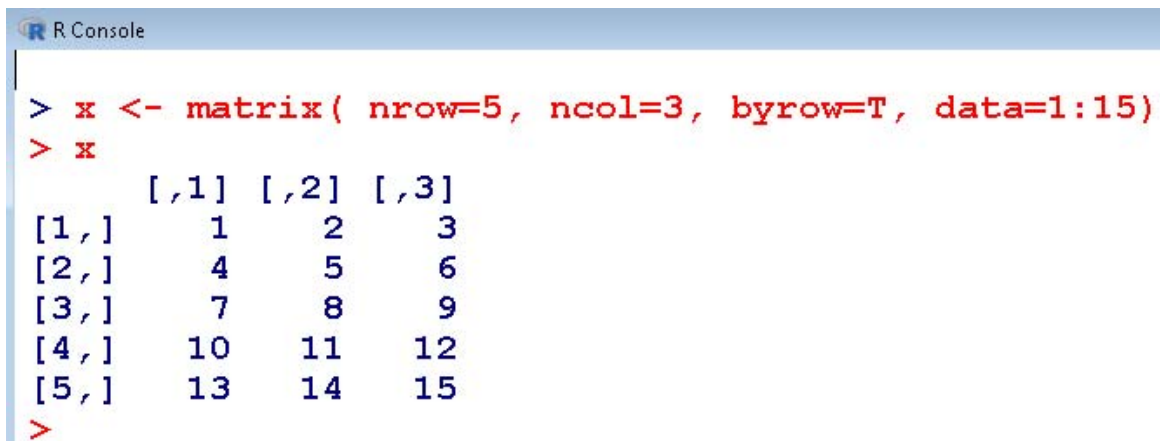
```
R Console  
> x <- matrix( nrow=4, ncol=2, data=3 )  
> x  
      [,1] [,2]  
[1,]    3    3  
[2,]    3    3  
[3,]    3    3  
[4,]    3    3  
>
```

Access to rows, columns or submatrices

```
> x <- matrix( nrow=5, ncol=3, byrow=T, data=1:15)
```

```
> x
```

```
      [,1] [,2] [,3]
[1,]    1    2    3
[2,]    4    5    6
[3,]    7    8    9
[4,]   10   11   12
[5,]   13   14   15
```



```
R Console
> x <- matrix( nrow=5, ncol=3, byrow=T, data=1:15)
> x
      [,1] [,2] [,3]
[1,]    1    2    3
[2,]    4    5    6
[3,]    7    8    9
[4,]   10   11   12
[5,]   13   14   15
>
```

Access to rows and columns

```
> x[4,]  
[1] 10 11 12
```

```
> x[,3]  
[1] 3 6 9 12 15
```

```
R Console  
  
> x  
      [,1] [,2] [,3]  
[1,]    1    2    3  
[2,]    4    5    6  
[3,]    7    8    9  
[4,]   10   11   12  
[5,]   13   14   15
```

```
R Console  
  
> x[4,]  
[1] 10 11 12  
>  
> x[,3]  
[1] 3 6 9 12 15  
>
```

Access to submatrices

```
> x[4:2, 3:2]
      [,1] [,2]
[1,]   12  11
[2,]    9   8
[3,]    6   5
```

```
R Console
> x
      [,1] [,2] [,3]
[1,]    1    2    3
[2,]    4    5    6
[3,]    7    8    9
[4,]   10   11   12
[5,]   13   14   15
```

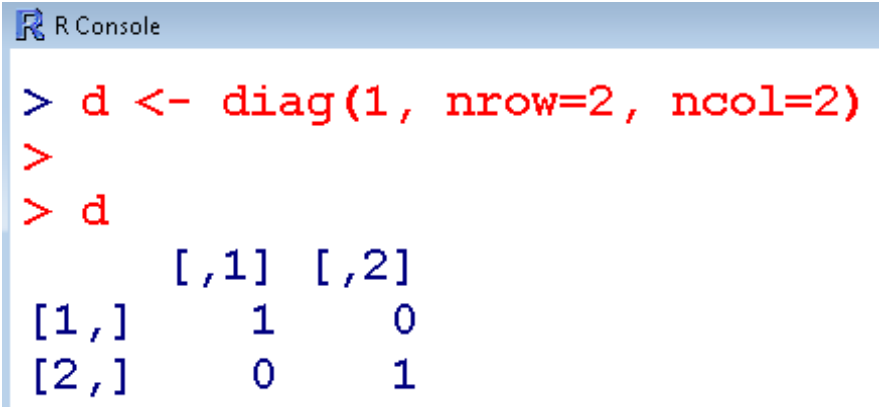
```
R Console
> x[4:2, 3:2]
      [,1] [,2]
[1,]   12  11
[2,]    9   8
[3,]    6   5
>
```

Matrix Operations

Construction of a diagonal matrix, here the identity matrix of a dimension 2:

```
> d <- diag(1, nrow=2, ncol=2)
```

```
> d  
      [,1] [,2]  
[1,]  1   0  
[2,]  0   1
```



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