Array Operations in R

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Create array using Direct method

```
my_array <- array(1:24,dim = c(3,4,2))

print(my_array)
```

```
## , , 1
##
##      [,1] [,2] [,3] [,4]
## [1,]    1    4    7   10
## [2,]    2    5    8   11
## [3,]    3    6    9   12
##
## , , 2
##
##      [,1] [,2] [,3] [,4]
## [1,]   13   16   19   22
## [2,]   14   17   20   23
## [3,]   15   18   21   24
```

```
# Another way to create array

  #Creating two vectors of different lengths
  v1 <-c(1,3,7)
  v2 <-c(11:16)

#Taking these vectors as input to the array
my_array2 <- array(c(v1,v2),dim=c(3,3,2))
print(my_array2)
```

```
## , , 1
##
##      [,1] [,2] [,3]
## [1,]    1   11   14
## [2,]    3   12   15
## [3,]    7   13   16
##
## , , 2
##
##      [,1] [,2] [,3]
## [1,]    1   11   14
## [2,]    3   12   15
## [3,]    7   13   16
```

If no. of elements and dimensions are mismatched.

```
# 45 elements and 27 (3*3*3) places...
Q <- array(c(1:45), dim = c(3,3,3))
print(Q)
```

```
## , , 1
##
##      [,1] [,2] [,3]
## [1,]    1    4    7
## [2,]    2    5    8
## [3,]    3    6    9
##
## , , 2
##
##      [,1] [,2] [,3]
## [1,]   10   13   16
## [2,]   11   14   17
## [3,]   12   15   18
##
## , , 3
##
##      [,1] [,2] [,3]
## [1,]   19   22   25
## [2,]   20   23   26
## [3,]   21   24   27
```

```
# 45 elements and 64 (4*4*4) places...
R <- array(c(1:45), dim = c(4,4,4))
print(R)
```

```
## , , 1
##
##      [,1] [,2] [,3] [,4]
## [1,]    1    5    9   13
## [2,]    2    6   10   14
## [3,]    3    7   11   15
## [4,]    4    8   12   16
##
## , , 2
##
##      [,1] [,2] [,3] [,4]
## [1,]   17   21   25   29
## [2,]   18   22   26   30
## [3,]   19   23   27   31
## [4,]   20   24   28   32
##
## , , 3
##
##      [,1] [,2] [,3] [,4]
## [1,]   33   37   41   45
## [2,]   34   38   42    1
```

```
## [3,]   35   39   43    2
## [4,]   36   40   44    3
##
## , , 4
##
##      [,1] [,2] [,3] [,4]
## [1,]    4    8   12   16
## [2,]    5    9   13   17
## [3,]    6   10   14   18
## [4,]    7   11   15   19
```

Adding Row,Column and Matrix Name to Array using dimnames attribute

```
# Define the column and row names.
rownames = c("row1", "row2", "row3", "row4")
colnames = paste("col",1:3,sep="")
matrixnames = c("m1", "m2")

S <- array(c(1:24), dim = c(4,3,2), dimnames = list(rownames, colnames, matrixnames))
print(S)
```

```
## , , m1
##
##      col1 col2 col3
## row1    1    5    9
## row2    2    6   10
## row3    3    7   11
## row4    4    8   12
##
## , , m2
##
##      col1 col2 col3
## row1   13   17   21
## row2   14   18   22
## row3   15   19   23
## row4   16   20   24
```

To get Structure of Array

Use of **dim()**,**nrow()**,**ncol()** and **length()** methods

```
# Create Array

my_array <- array(1:24,dim = c(3,4,2))
print(my_array)
```

```
## , , 1
##
##      [,1] [,2] [,3] [,4]
## [1,]    1    4    7   10
## [2,]    2    5    8   11
```

```
## [3,]    3    6    9   12
##
## , , 2
##
##      [,1] [,2] [,3] [,4]
## [1,]   13   16   19   22
## [2,]   14   17   20   23
## [3,]   15   18   21   24
```

```
# dim()
print(dim(my_array))
```

```
## [1] 3 4 2
```

```
# nrow()
print(nrow(my_array))
```

```
## [1] 3
```

```
# ncol()
print(ncol(my_array))
```

```
## [1] 4
```

```
# length()
print(length(my_array))
```

```
## [1] 24
```

Access Elements

```
# Create Array

my_array <- array(1:24,dim = c(3,4,3), dimnames = list(c("r1","r2","r3"), c("c1","c2","c3","c4"), c("m1
print(my_array)
```

```
## , , m1
##
##    c1 c2 c3 c4
## r1  1  4  7 10
## r2  2  5  8 11
## r3  3  6  9 12
##
## , , m2
##
##    c1 c2 c3 c4
## r1 13 16 19 22
## r2 14 17 20 23
## r3 15 18 21 24
```

```
##
## , , m3
##
##    c1 c2 c3 c4
## r1  1  4  7 10
## r2  2  5  8 11
## r3  3  6  9 12
```

```
# Access the 2nd row, 1st column and 3rd matrix of my_array.
print(my_array[2,1,3])
```

```
## [1] 2
```

```
# Remove 2nd row, 3rd column and 1st matrix of my_array.
print(my_array[-2,-3,-1])
```

```
## , , m2
##
##    c1 c2 c4
## r1 13 16 22
## r3 15 18 24
##
## , , m3
##
##    c1 c2 c4
## r1  1  4 10
## r3  3  6 12
```

```
# Using Logical Vectors to access 1st and 3rd row, 2nd and 3rd column of 1st and 2nd matrix of my_array
print(my_array[c(T,F,T),c(F,T,T),c(T,T,F)])
```

```
## , , m1
##
##    c2 c3
## r1  4  7
## r3  6  9
##
## , , m2
##
##    c2 c3
## r1 16 19
## r3 18 21
```

```
# Using character vectors 1st and 3rd row, 2nd and 3rd column of 1st and 2nd matrix of my_array.
my_array[c("r1","r3"),c("c2","c3"),c("m1","m2")]
```

```
## , , m1
##
##    c2 c3
## r1  4  7
## r3  6  9
```

```
##
## , , m2
##
##    c2 c3
## r1 16 19
## r3 18 21
```

```
# Access all rows, 1st column and all matrix.
print(my_array[,1,])
```

```
##    m1 m2 m3
## r1  1 13  1
## r2  2 14  2
## r3  3 15  3
```

```
# Access 1st row, all columns and 2nd matrix.
print(my_array[1,,2])
```

```
## c1 c2 c3 c4
## 13 16 19 22
```

Modifying Array

```
# Create Array

my_array <- array(1:24,dim = c(3,4,2))
print(my_array)
```

```
## , , 1
##
##      [,1] [,2] [,3] [,4]
## [1,]    1    4    7   10
## [2,]    2    5    8   11
## [3,]    3    6    9   12
##
## , , 2
##
##      [,1] [,2] [,3] [,4]
## [1,]   13   16   19   22
## [2,]   14   17   20   23
## [3,]   15   18   21   24
```

```
# Re-assignment to change values

my_array[3,,1] <- c(7,7,7,7)
print(my_array)
```

```
## , , 1
##
```

```
##      [,1] [,2] [,3] [,4]
## [1,]    1    4    7   10
## [2,]    2    5    8   11
## [3,]    7    7    7    7
##
## , , 2
##
##      [,1] [,2] [,3] [,4]
## [1,]   13   16   19   22
## [2,]   14   17   20   23
## [3,]   15   18   21   24
```

```
# Re-assignment to change dimension
dim(my_array) <- c(2,3,4)
print(my_array)
```

```
## , , 1
##
##      [,1] [,2] [,3]
## [1,]    1    7    5
## [2,]    2    4    7
##
## , , 2
##
##      [,1] [,2] [,3]
## [1,]    7    7   11
## [2,]    8   10    7
##
## , , 3
##
##      [,1] [,2] [,3]
## [1,]   13   15   17
## [2,]   14   16   18
##
## , , 4
##
##      [,1] [,2] [,3]
## [1,]   19   21   23
## [2,]   20   22   24
```

```
print(22%in%my_array)
```

```
## [1] TRUE
```

Convert Array into Matrix

```
# Create Array

my_array <- array(1:18,dim = c(3,3,2))
print(my_array)
```

```
## , , 1
##
##      [,1] [,2] [,3]
## [1,]    1    4    7
## [2,]    2    5    8
## [3,]    3    6    9
##
## , , 2
##
##      [,1] [,2] [,3]
## [1,]   10   13   16
## [2,]   11   14   17
## [3,]   12   15   18
```

```
# Creating matrices from these arrays
m1 <- my_array[,,1]
m2 <- my_array[,,2]
m3 <- my_array[,,2]

class(my_array)
```

```
## [1] "array"
```

```
class(m1)
```

```
## [1] "matrix" "array"
```

```
mat_add <- m1 + m2
print(mat_add)
```

```
##      [,1] [,2] [,3]
## [1,]   11   17   23
## [2,]   13   19   25
## [3,]   15   21   27
```

```
mat_mul <- m1 %*% m2
print(mat_mul)
```

```
##      [,1] [,2] [,3]
## [1,]  138  174  210
## [2,]  171  216  261
## [3,]  204  258  312
```

```
cat("m1 and m2 are identical:",identical(m1,m2))
```

```
## m1 and m2 are identical: FALSE
```

```
cat("m2 and m3 are identical:",identical(m2,m3))
```

```
## m2 and m3 are identical: TRUE
```