

MATRICES

```
X = matrix(c(1, 4, 6, 2, 4, 7, 3,7,9), 3, 3)
```

```
X
```

```
X1 = matrix(1:9, 3)
```

```
X2 = matrix(1:9, 3, byrow=T)
```

```
Y1 = matrix(c(1:19, 23), 4)
```

Adding a value to all elements of Y1

```
Y1 + 1
```

Multiplying all elements by a value

```
2 * Y1
```

See particular element(s) of Y1

```
Y1[2,3]
```

Replace particular element of Y1 by 17

```
Y1[2,3] = 17
```

See the 2nd column of Y1

```
Y1[,2]
```

Replace 2nd row of Y1 by 13

```
Y1[2,] = 13
```

Replace first 3 elements of 3rd column by
(13, 19, 31)

```
Y1[1:3, 3] = c(13, 19, 31)
```

10×5 matrix of ones

```
matrix(1,10,5)
```

10×5 matrix of zeros

```
matrix(0,10,5)
```

10×10 Identity Matrix

```
diag(10)
```

Diagonal matrix

```
diag(1:5)
```

```
diag(c(2, 5, 8, 9))
```

Empty matrices

```
A = matrix(,5,4)
```

```
A[2,3] = 7
```

```
A
```

```
A[4,4] = 9
```

```
A
```

Matrix operations

```
U = matrix(c(1:3, 13, 19, 29), 2)
```

```
V = matrix(c(4:6, 26, 138, 158), 2)
```

```
U + V    # Element-wise addition
```

```
U - V    # Element-wise subtraction
```

```
U * V    # Element-wise multiplication
```

```
U / V    # Element-wise division
```

U^2 # Element-wise square

t(U) # Transpose of U

matrix multiplication (Y1)'(Y1)

W = t(Y1) %*% Y1

solve(W) # Inverse of (Y1)'(Y1)

LOGICAL MATRICES

For all [i,j], is Y1[i,j] > 5?

W1 = (Y1 > 5)

The output is a matrix of size same as Y1
with elements 0 (false) and/or 1 (true)

Is Y1[i,j] > 10 AND Y1[i,j] <= 15?

W2 = (Y1 > 10) & (Y1 <= 15)

Is Y1[i,j] < 10 OR Y1[i,j] = 17?

W3 = (Y1 < 10) | (Y1 == 17)

W4 = (Y1 != 10)

Replace the values of Y1 less than 5 or more than 17 by zero

```
Y1[Y1 < 5 | Y1 > 17] = 0
```

CONCATENATION

```
A1 = matrix(1:20, 5, 4)
```

```
A2 = matrix(1, 5, 3)
```

```
B = matrix(0,6, 7)
```

Horizontally join A1 and A2

```
A = cbind(A1, A2)
```

```
AB = rbind(A, B) # Vertically join A and B.
```

```
dim(A) # See no. of rows and columns of A
```