

```
'Output':
array([[2290, 2478, 2240],
       [1784, 2072, 1792],
       [3040, 3448, 2360]])
```

Element-Wise Operations

Element-wise matrix operations involve matrices operating on themselves in an element-wise fashion. The action can be an addition, subtraction, division, or multiplication (which is commonly called the Hadamard product). The matrices must be of the same shape. **Please note** that while a matrix is of shape $n \times n$, a vector is of shape $n \times 1$. These concepts easily apply to vectors as well. See Figure 10-2.

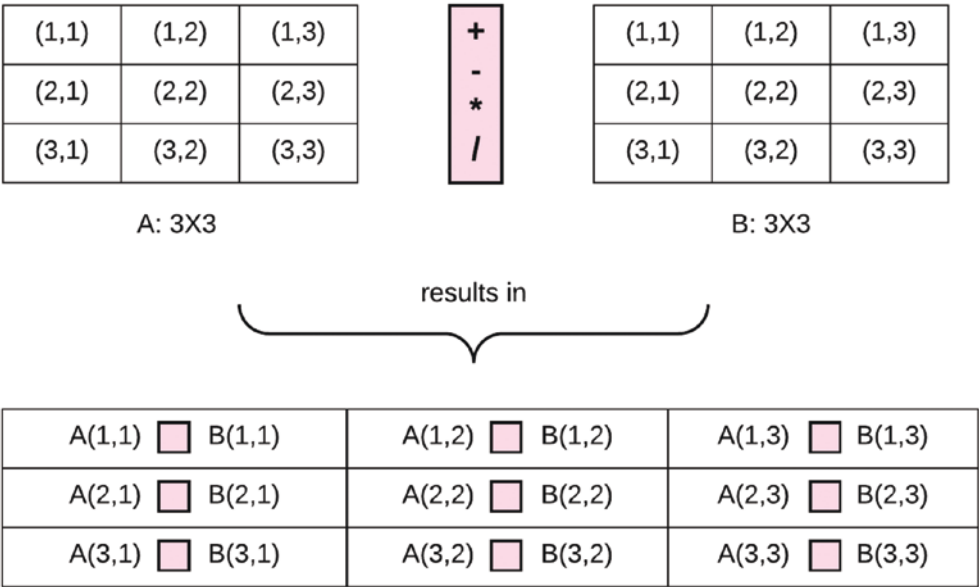


Figure 10-2. *Element-wise matrix operations*

```
Let's have some examples.

# Hadamard multiplication of A and B
A * B
'Output':
array([[ 570,  928,  528],
       [ 160,  690, 1196],
       [ 990,  658, 1056]])
```

```

# add A and B
A + B
'Output':
array([[53, 61, 46],
       [37, 53, 72],
       [63, 61, 68]])
# subtract A from B
B - A
'Output':
array([[ 23,   3, -2],
       [ 27,   7, 20],
       [  3,  33, -20]])
# divide A with B
A / B
'Output':
array([[ 0.39473684,  0.90625   ,  1.09090909],
       [ 0.15625   ,  0.76666667,  0.56521739],
       [ 0.90909091,  0.29787234,  1.83333333]])

```

Scalar Operation

A matrix can be acted upon by a scalar (i.e., a single numeric entity) in the same way element-wise fashion. This time the scalar operates upon each element of the matrix or vector. See Figure [10-3](#).