

exercise 1-190397E

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2 Index Number: 190397E

1)

```
[ ]: for i in range(1,6):  
      print(i,":",i**2)
```

```
1 : 1  
2 : 4  
3 : 9  
4 : 16  
5 : 25
```

2)

```
[ ]: import sympy as sy  
      for i in range(1,6):  
          if not (sy.isprime(i)):  
              print(i,":",i**2)
```

```
1 : 1  
4 : 16
```

3)

```
[ ]: sqrs = [i**2 for i in range(1,6)]  
      for i in range(len(sqrs)):  
          print(i+1,":",sqrs[i])
```

```
1 : 1  
2 : 4  
3 : 9  
4 : 16  
5 : 25
```

4)

```
[ ]: prime_sqrs = [(i,i**2) for i in range(1,6) if not sy.isprime(i)]  
      for i in prime_sqrs:
```

```
print(i[0],":",i[1])
```

```
1 : 1  
4 : 16
```

5) a)

```
[ ]: import numpy as np  
A = np.array([[1,2],[3,4],[5,6]])  
B = np.array([[7,8,9,1],[1,2,3,4]])  
C = np.matmul(A,B)  
print(C)
```

```
[[ 9 12 15  9]  
 [25 32 39 19]  
 [41 52 63 29]]
```

5) b)

```
[ ]: A = np.array([[1,2],[3,4],[5,6]])  
B = np.array([[3,2],[5,4],[3,1]])  
D = np.multiply(A,B)  
print(D)
```

```
[[ 3  4]  
 [15 16]  
 [15  6]]
```

6)

```
[ ]: nums= np.random.randint(0,11,size=(5,7))  
print(nums)
```

```
[[10  4 10  0  4  8  5]  
 [ 8  8  5  5  5  2  8]  
 [ 4  5  1  7  1  2  8]  
 [10  3  7  3  8  8  5]  
 [10  2  3  5  6  8  9]]
```

```
[ ]: sub_arr = nums[1:4,:2]  
print(sub_arr)  
print("Shape of the array:",sub_arr.shape)
```

```
[[ 8  8]  
 [ 4  5]  
 [10  3]]
```

Shape of the array: (3, 2)

7)

Broadcast examples

```
[ ]: arr = np.array([2,3,4,5,6,6])
      b = 4
      print(arr*4)
```

```
[ 8 12 16 20 24 24]
```

```
[ ]: arr = np.array([[1,2,3],[4,5,6],[7,8,9]])
      b = np.array([1,2,4])
      print(arr+b)
```

```
[[ 2  4  7]
 [ 5  7 10]
 [ 8 10 13]]
```

```
[ ]: arr = np.array([[1],[2],[3],[4],[5]])
      b = np.array([1,2,3])
      print(arr+b)
```

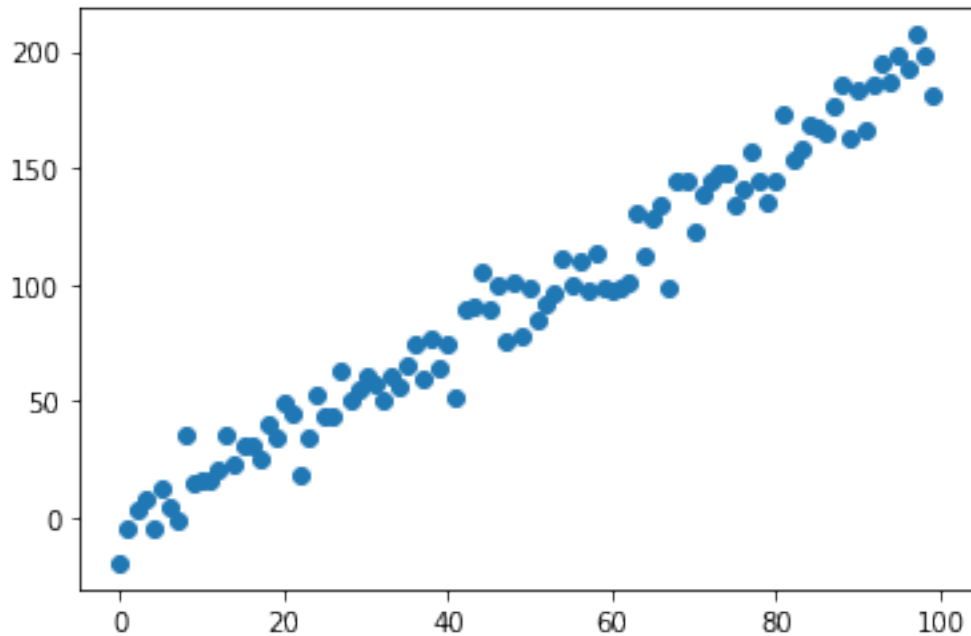
```
[[2 3 4]
 [3 4 5]
 [4 5 6]
 [5 6 7]
 [6 7 8]]
```

8)

```
[ ]: import matplotlib.pyplot as plt
      from numpy import linalg
      m, c = 2 , -4
      N = 100
      x = np.linspace(0 , N-1, N).reshape(N, 1)
      sigma = 10
      y = m*x + c + np.random.normal(0 , sigma , (N, 1 ) )
      plt.scatter(x,y)

      X = np.append(np.ones((N,1)),x,axis = 1)
      result = linalg.inv(X.T @ X) @ X.T @ y
      result
```

```
[ ]: array([[ -4.61620424],
            [ 1.99638058]])
```



9)

```
[ ]: def hyper_sqrt(N):
    n = 0
    a = N
    while(N>=100):
        N = N/100
        n += 1
        a = N

    s = (10**n)*(10 + (-190)/(a + 20))
    return s

def newton_sqrt(N):
    ans = 1
    while not (abs(ans**2 - N)<(10**(-5))):
        ans = 0.5*(ans+N/ans)
    return ans

N_list = [64,75,100,1600]
for N in N_list:
    print("Number = ",N)
    print(" >> Hyperbolic method answer = ",hyper_sqrt(N))
    print(" >> Newton's method answer = ",newton_sqrt(N))
```

```
Number = 64
>> Hyperbolic method answer = 7.738095238095238
```

```

>> Newton's method answer = 8.000000000000017
Number = 75
>> Hyperbolic method answer = 8.0
>> Newton's method answer = 8.66025403784659
Number = 100
>> Hyperbolic method answer = 9.523809523809526
>> Newton's method answer = 10.000000000139897
Number = 1600
>> Hyperbolic method answer = 47.22222222222222
>> Newton's method answer = 40.000000000606505

```

10)

```

[ ]: import cv2 as cv

im = cv.imread(r'.\gal_gaussian.png')
blured_im = cv.GaussianBlur(im,(5,5),0)

cv.namedWindow('Image',cv.WINDOW_AUTOSIZE)
cv.imshow('Image',im)
cv.waitKey(0)
cv.imshow('Image',blured_im)
cv.waitKey(0)
cv.destroyAllWindows()

```

11)

```

[ ]: im2 = cv.imread(r'.\gal_sandp.png')
filtered_im2 = cv.medianBlur(im2,5)

cv.namedWindow('Image',cv.WINDOW_AUTOSIZE)
cv.imshow('Image',im2)
cv.waitKey(0)
cv.imshow('Image',filtered_im2)
cv.waitKey(0)
cv.destroyAllWindows()

```

12)

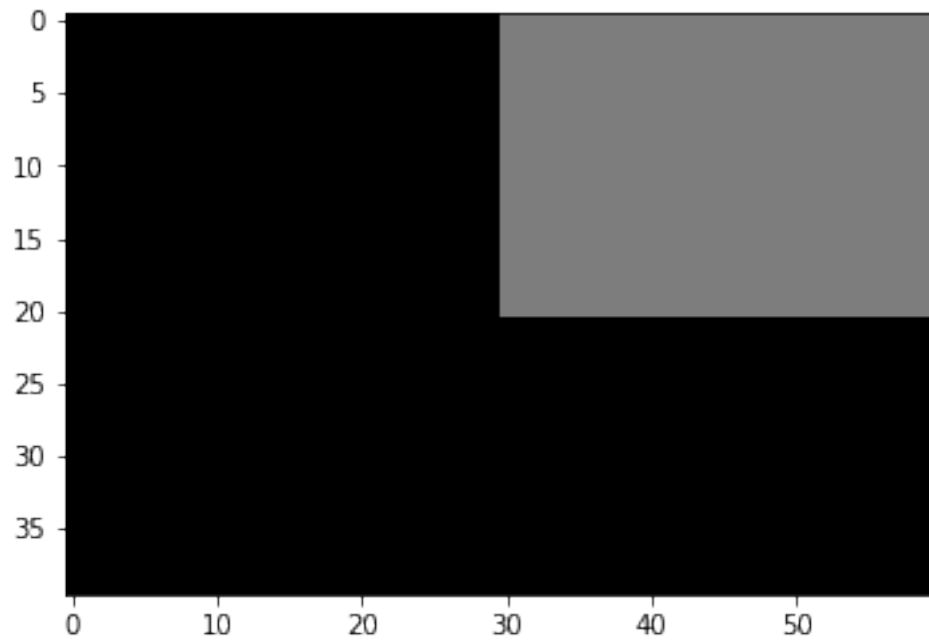
```

[ ]: import numpy as np
import matplotlib.pyplot as plt

im3 = np.zeros((40,60),dtype=np.uint8)
im3[:21,30:] = 125
fig,ax = plt.subplots()
ax.imshow(im3, cmap = 'gray', vmin = 0, vmax = 255)

plt.show()

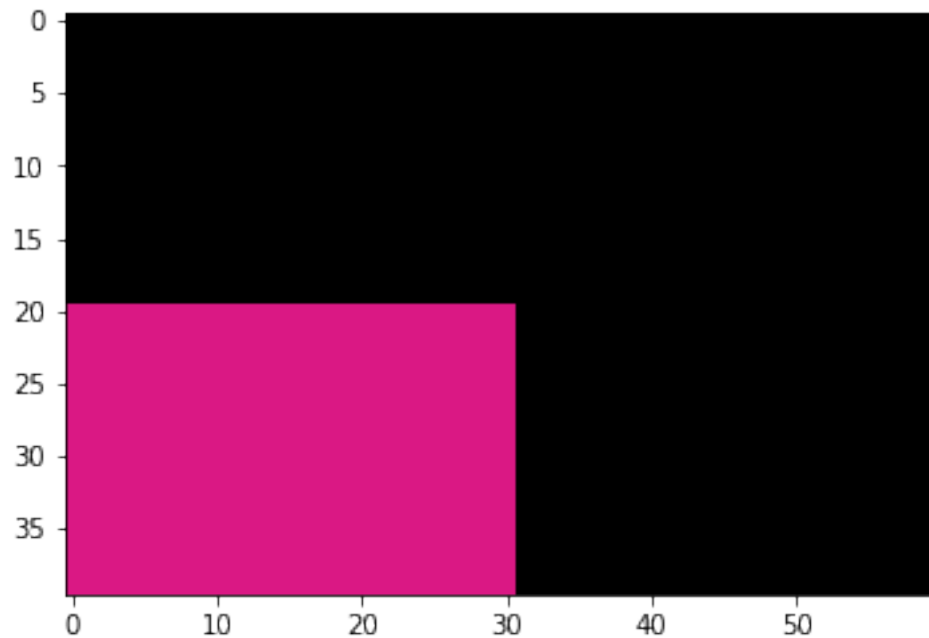
```



13)

```
[ ]: im4 = np.zeros([40,60,3],dtype=np.uint8)
      im4[20:,:31] = [218,24,132] #RGB values for Barbie pink
      fig,ax = plt.subplots()
      ax.imshow(im4)

      plt.show()
```



14)

```
[ ]: im5 = cv.imread('tom_dark.jpg')
hsv = cv.cvtColor(im5, cv.COLOR_BGR2HSV)

increase = 50
hsv[:, :, 2] += increase
bright_im5 = cv.cvtColor(hsv, cv.COLOR_HSV2BGR)

cv.namedWindow('Image', cv.WINDOW_AUTOSIZE)
cv.imshow('Image', im5)
cv.waitKey(0)
cv.imshow('Image', bright_im5)
cv.waitKey(0)
cv.destroyAllWindows()
```