190622R-excercise-01

February 2, 2022

1 Name : Tharindu O.K.D

2 Index No. : 190622R

3 Question 01

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

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

4 Question 02

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

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

5 Question 03

[ ]:
```
squares = [i**2 for i in range(1,6)]
for i, s in enumerate(squares):
    print(i+1, ': ',s)
```

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

6 Question 04

[ ]:
```
squares = [i**2 for i in range(1,6) if not sympy.isprime(i)]
for i, s in enumerate(squares):
    print(i+1, ': ', s)
```

```
1 :  1
2 :  16
```

7 Question 05

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

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

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

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

8 Question 06

[ ]:
```
M = np.random.randint(11, size=(5, 7))
sub = M[1:3,0:2]
print(sub)
print("Size of sub-matrix = ",sub.shape)
```

```
[[ 4  0]
 [10  7]]
Size of sub-matrix =  (2, 2)
```

9 Question 07

[ ]:
```
x = np.array([[1, 2], [3, 4],[5, 6]])
y = x * 2
print('x = ',x)
print('y = ',y)
```

```
x =  [[1 2]
 [3 4]
 [5 6]]
y =  [[ 2  4]
 [ 6  8]
 [10 12]]
```

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

```
[[ 9 10 11  3]
 [ 6  7  8  9]]
```

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

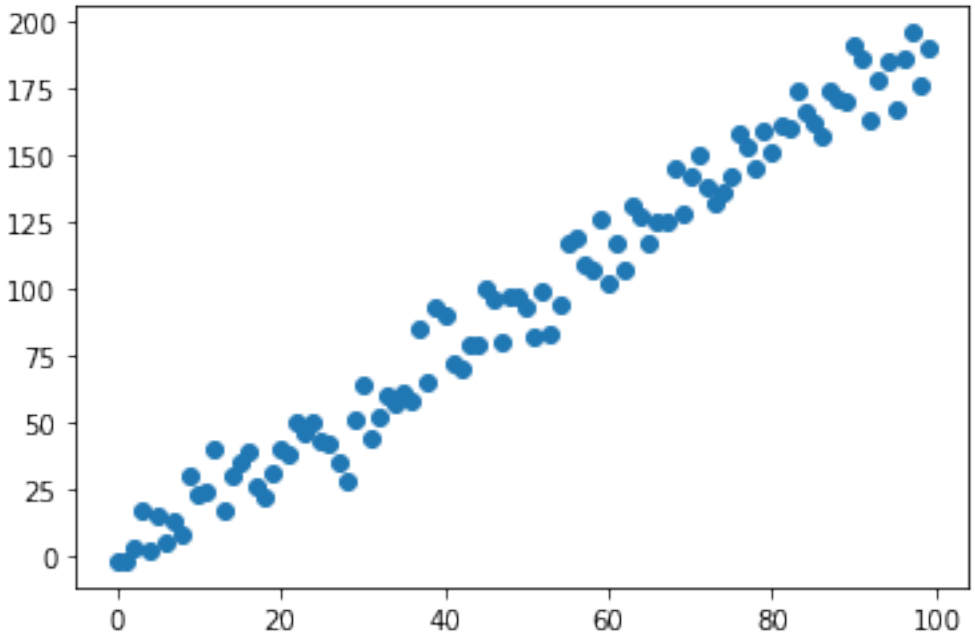
```
[[ 9 10 11  3 10]
 [12 13 14  6 13]
 [14 15 16  8 15]
 [10 11 12  4 11]
 [ 8  9 10  2  9]]
```

10 Question 08

[ ]:
```
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)

#append column of ones
X = np.concatenate((x,np.ones((N,1))),axis=1)
#print(X)
w = linalg.inv(X.T @ X) @ X.T @ y
w
```

[ ]:
```
array([[ 1.95453602],
       [-1.95149318]])
```



11 Question 09

[ ]:
```
def hyperbolid_estimate(s):
    n = 0
    a = s
    while a >= 100:
        n+=1
        a = a / (100)
    return ((-190/(a + 20))+10)*10**n
```

15.178571428571423

[ ]:
```
def newton_raphson(s, precision):
    s0 = hyperbolid_estimate(s)
    while True:
        sqrt = 0.5 * (s0 + (s / s0))
        if (abs(sqrt - s0)<precision):
            break
        s0 = sqrt
    return sqrt
```

[ ]: 8.000000000000094

[ ]:
```
precision = 10**(-5)
print(newton_raphson(64,precision))
```

```
print(newton_raphson(75,precision))
print(newton_raphson(100,precision))
print(newton_raphson(1600,precision))
```

```
8.000000000000094
8.660254037844386
10.000000000002505
40.0
```

12 Question 10

[ ]:
```
import cv2 as cv
im = cv.imread(r'gal.png')

blur = cv.GaussianBlur(im,(5,5),0)

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

13 Question 11

[ ]:
```
im = cv.imread(r'gal_sandp.png')

median = cv.medianBlur(im,5)

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

14 Question 12

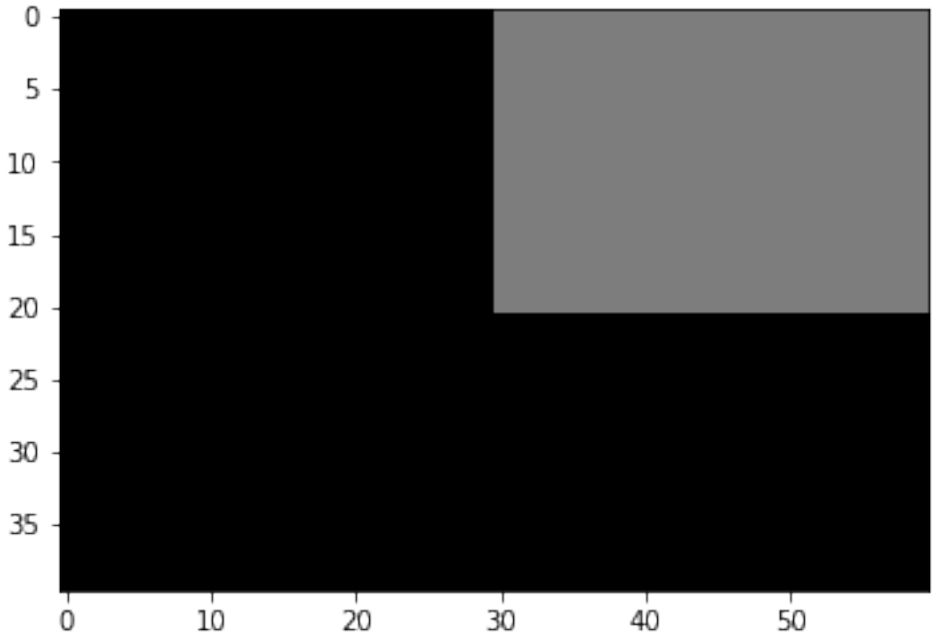
[ ]:
```
im = np.zeros((40,60),dtype=np.uint8)
im[0:21,30:61] = 125

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

[ ]:
```
im = np.zeros((40,60),dtype=np.uint8)
im[0:21,30:61] = 125

fig, ax = plt.subplots()

ax.imshow(im, cmap='gray', vmin=0, vmax=255)
plt.show()
```



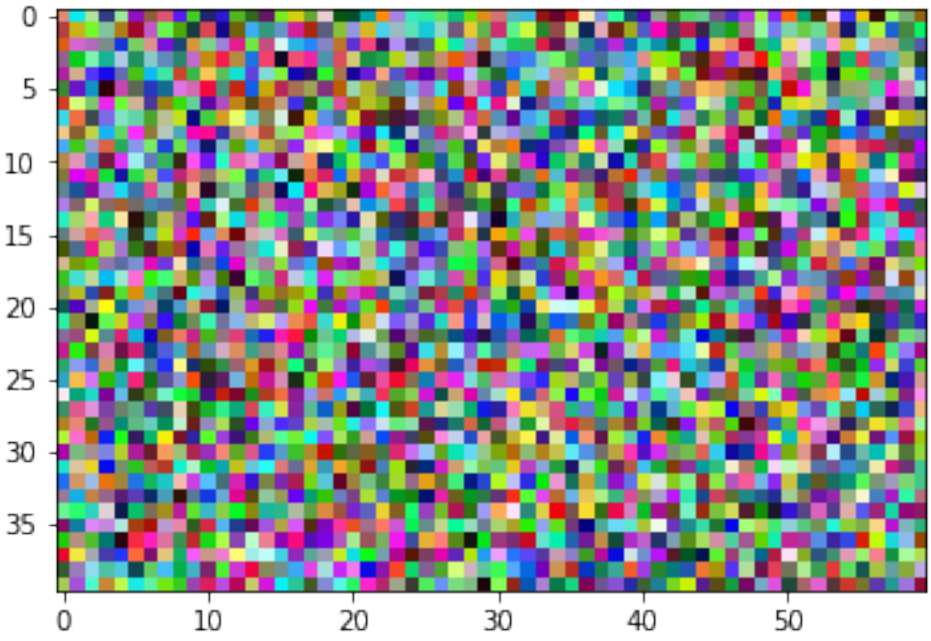
15 Question 13

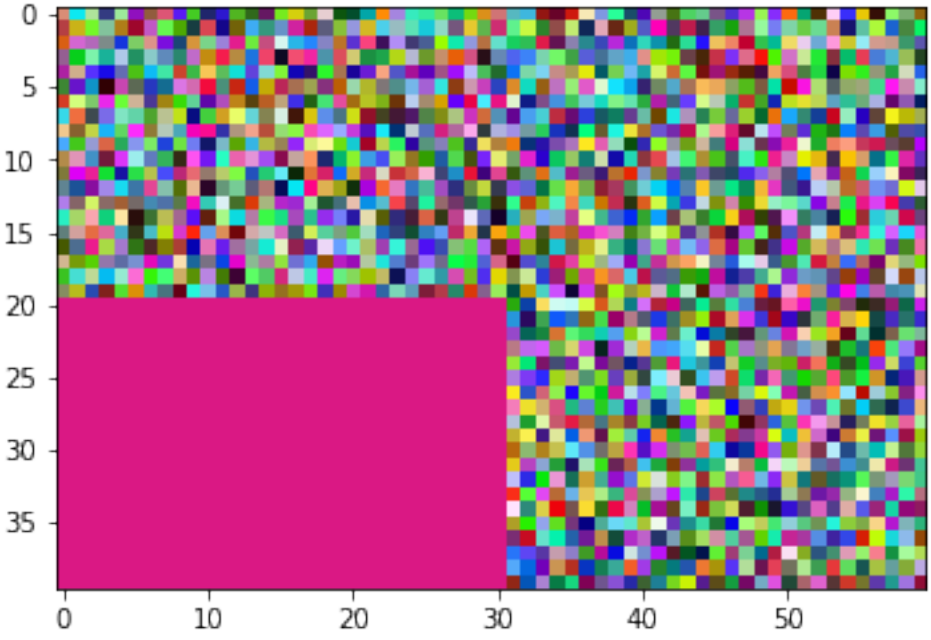
[ ]:
```
#create rondom color image
im = np.random.randint(256,size=(40,60,3),dtype=np.uint8)
fig, ax = plt.subplots()

ax.imshow(im, cmap='gray', vmin=0, vmax=255)
plt.show()
im[20:41,0:31] = np.array([218, 24, 132])

fig, ax = plt.subplots()

ax.imshow(im, vmin=0, vmax=255)
plt.show()
```


0
5
10
15
20
25
30
35
0
10
20
30
40
50


0
5
10
15
20
25
30
35
0
10
20
30
40
50

16 Question 14

[ ]:
```
im = cv.imread(r'tom_dark.jpg')
fig, ax = plt.subplots()

ax.imshow(im, cmap='gray', vmin=0, vmax=255)
plt.show()
value = 120

im = im + ((255 - im) > value) * value + ((255 - im) <= value) * 255

fig, ax = plt.subplots()

ax.imshow(im, cmap='gray', vmin=0, vmax=255)
plt.show()
```


0
100
200
300
400
0
100
200
300
400
500
600
700