Name - Gajaanan S. Index Number - 190185D

Question 1

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

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

Question 2

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

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

Question 3

In [3]:
```
squares = [i**2 for i in range(1,6)]
for i,i2 in enumerate(squares):
  print(i,':',i2)
```

```
0 : 1
1 : 4
2 : 9
3 : 16
4 : 25
```

Question 4

In [4]:
```
import sympy
squares = [i**2 for i in range(1,6) if not(sympy.isprime(i))]
for i,i2 in enumerate(squares):
  print(i,':',i2)
```

```
0 : 1
1 : 16
```

Question 5 (a)

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

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

Question 5 (b)

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

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

Question 6

In [7]:
```
R = np.random.randint(10, size=(5, 7))
print(R)
print(R[2:5,:3])
np.size(R[2:5,:3])
```

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

Out[7]: 9

Question 7

Examples of broadcasting

1 . Combined operation of an array and scaler value

In [8]:
```
p = np.array([5, 7, 10])
q = 4
p * q
```

Out[8]: array([20, 28, 40])

2 . Addition of 1D and 2D arrays

In [9]:
```
a = np.array([[ 1,  2,  3],
              [11, 12, 13],
              [21, 22, 23],
              [31, 32, 33]])
b = np.array([1, 2, 3])
a + b
```

Out[9]:
```
array([[ 2,  4,  6],
       [12, 14, 16],
       [22, 24, 26],
       [32, 34, 36]])
```

3 . Add k to each row of l using broadcasting

In [10]:
```
import numpy as np
l = np.array([[10,20,30], [14,15,16], [27,28,29], [10, 11, 12]])
k = np.array([2, 1, 2])
```

```
g = l + k
print(g)
```

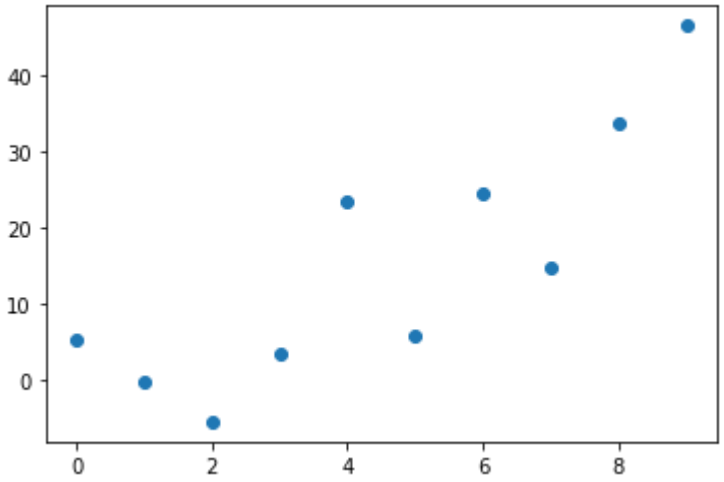
```
[[12 21 32]
 [16 16 18]
 [29 29 31]
 [12 12 14]]
```

Question 8

In [8]:

```
import numpy as np
import matplotlib.pyplot as plt
m, c = 2 , 4
N = 10
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)
```

Out[8]: <matplotlib.collections.PathCollection at 0x1dd93dbad00>



In [9]:

```
X = np.append(np.ones((N,1)),x, axis=1)
X
```

Out[9]:

```
array([[1., 0.],
       [1., 1.],
       [1., 2.],
       [1., 3.],
       [1., 4.],
       [1., 5.],
       [1., 6.],
       [1., 7.],
       [1., 8.],
       [1., 9.]])
```

In [10]:

```
w=X.T@X
```

In [11]:

```
import numpy as np
from numpy import linalg
W=np.linalg.inv(w)@X.T@y
print(W)
```

```
[[-5.39419983]
 [ 4.56295027]]
```

Question 9

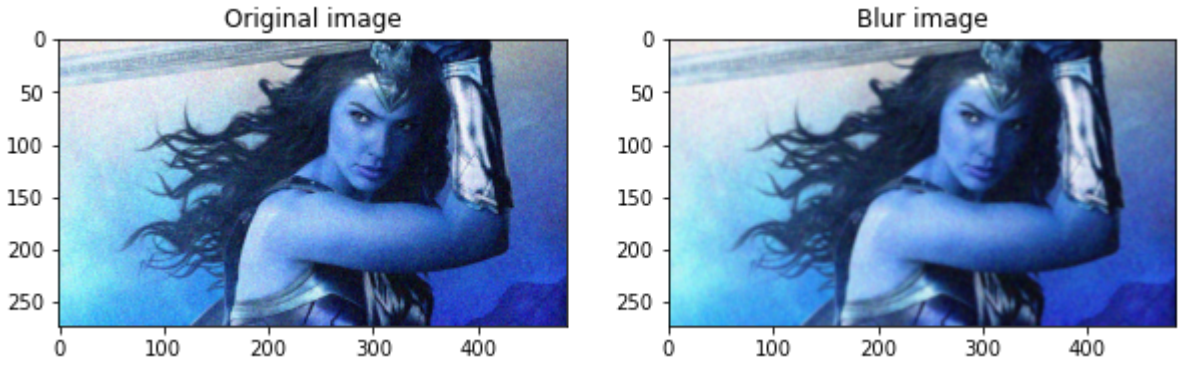
In [ ]:

```
```

Question 10

In [15]:

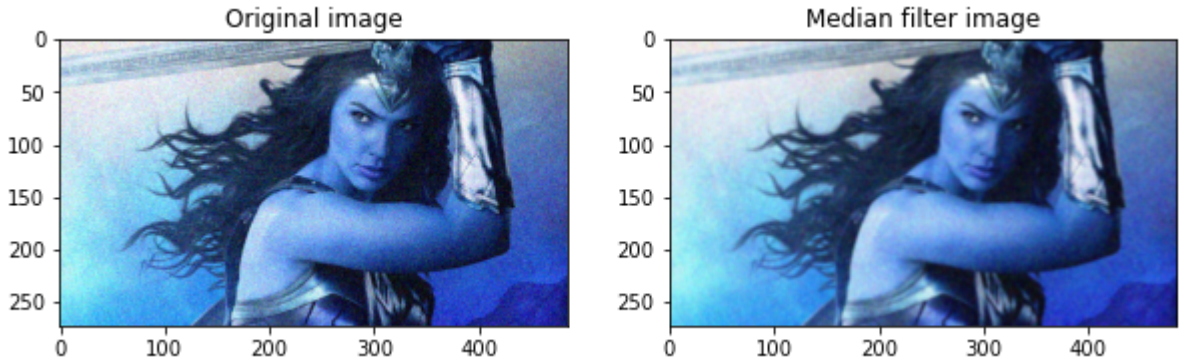
```
import cv2 as cv
im = cv.imread(r'gal_gaussian.png')
blur = cv.GaussianBlur(im,(5,5),0)
cv.namedWindow('image',cv.WINDOW_AUTOSIZE)
cv.imshow('image',im)
cv.waitKey(0)
cv.imshow('image',blur)
cv.waitKey(0)
cv.destroyAllWindows()
import numpy as np
import matplotlib.pyplot as plt
fig, ax = plt.subplots(1, 2,  figsize=(10, 10))
ax[0].imshow(im)
ax[0].title.set_text('Original image')
ax[1].imshow(blur)
ax[1].title.set_text('Blur image')
plt.show()
```



Question 11

In [16]:

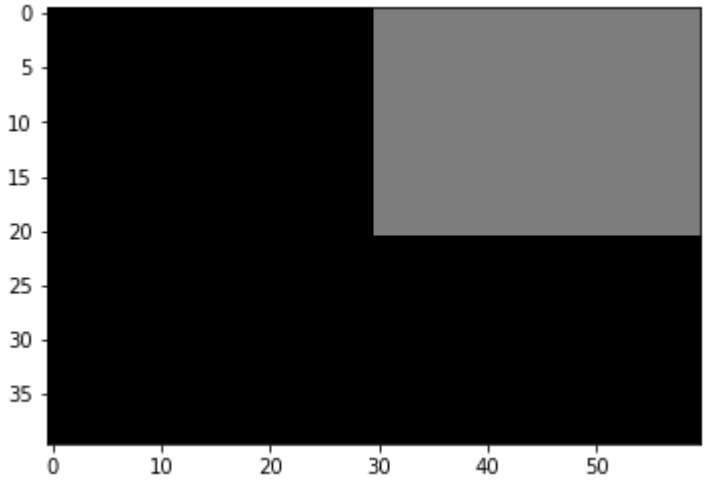
```
import cv2 as cv
import numpy as np
img = cv.imread(r'gal_sandp.png')
median = cv.medianBlur(img, 5)
cv.imshow('image', median)
cv.waitKey(0)
cv.destroyAllWindows()
import numpy as np
import matplotlib.pyplot as plt
fig, ax = plt.subplots(1, 2,  figsize=(10, 10))
ax[0].imshow(im)
ax[0].title.set_text('Original image')
ax[1].imshow(blur)
ax[1].title.set_text('Median filter image')
plt.show()
```



Question 12

In [17]:

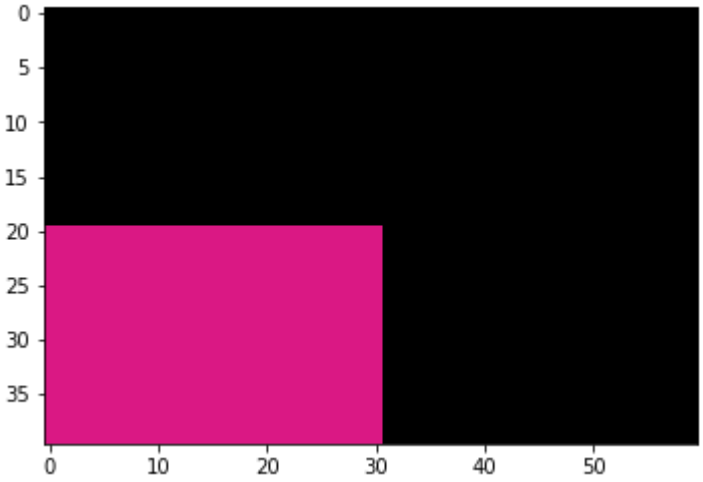
```
import numpy as np
import cv2 as cv
import matplotlib.pyplot as plt
im = np.zeros((40,60),dtype=np.uint8)
im[0:21 , 30:61] = 125
fig, ax = plt.subplots()
ax.imshow(im, cmap='gray',vmin=0,vmax=255)
plt.show()
```



Question 13

In [27]:

```
import numpy as np
import cv2 as cv
import matplotlib.pyplot as plt
im = np.zeros((40,60,3),dtype=np.uint8)
im[20:41 , 0:31] = [218,24,132]
fig, ax = plt.subplots()
ax.imshow(im,vmin=0,vmax=255)
plt.show()
```



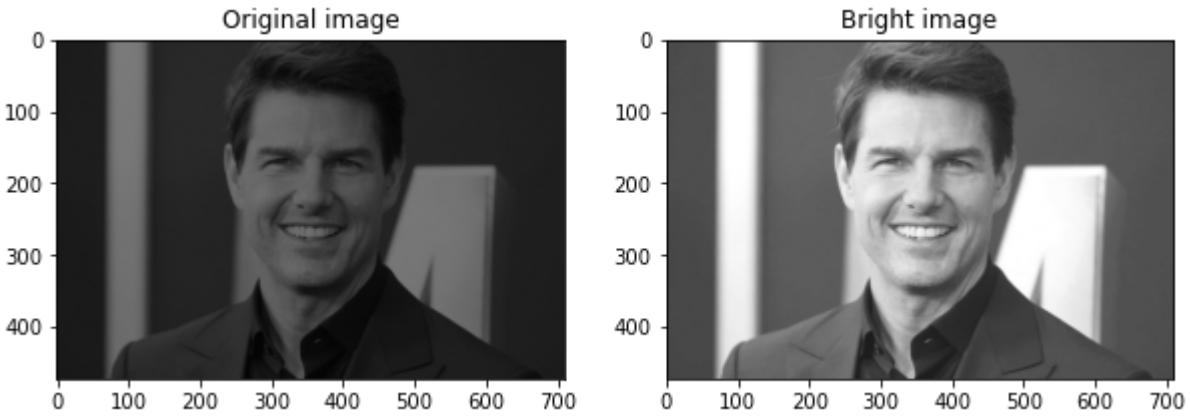
Question 14

In [14]:

```
import cv2
image = cv2.imread(r'tom_dark.jpg')
a = 2
b = 20

br_img = cv2.convertScaleAbs(image, alpha=a, beta=b)

cv2.imshow('dark image', image)
cv2.imshow('bright image', br_img)
cv2.waitKey(0)
cv.destroyAllWindows()
import numpy as np
import matplotlib.pyplot as plt
fig, ax = plt.subplots(1, 2,  figsize=(10, 10))
ax[0].imshow(image)
ax[0].title.set_text('Original image')
ax[1].imshow(br_img)
ax[1].title.set_text('Bright image')
plt.show()
```



In [ ]: