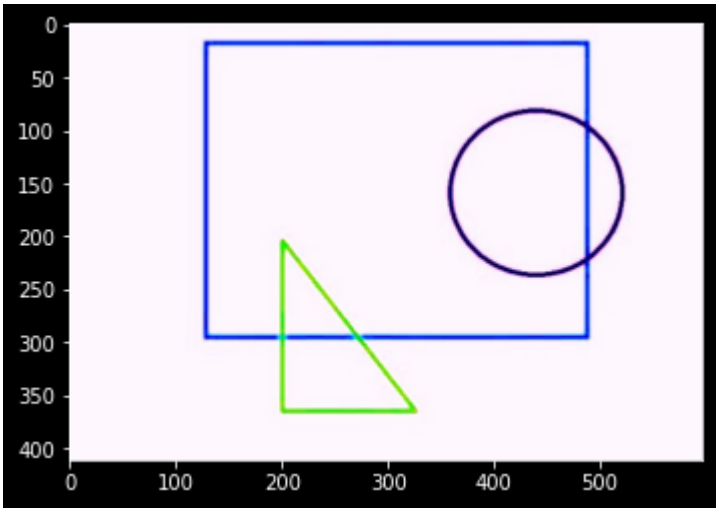
In [ ]:
```python
import cv2
import numpy as np

def find_maximum_intersection_area(image):
  _, threshold = cv2.threshold(image, 127, 255, cv2.THRESH_BINARY)

  contours, _ = cv2.findContours(threshold, cv2.RETR_EXTERNAL, cv2.CHAIN_APPROX_SIMPLE


  print(f'No of countours: {len(contours)}')

  # Initialize the maximum intersection area to 0.
  max_intersection_area = 0
  max_intersection_mask = None

  i=0
  # Iterate over the contours and find the maximum intersection area.
  for contour in contours:

    if i == 0:
      i = 1
      continue

    # Create a mask for the contour.
    mask = np.zeros_like(image, dtype=np.uint8)
    cv2.drawContours(mask, [contour], -1, (255, 255, 255), -1)

    # Find the intersection of the mask and the image.
    intersection_mask = mask & image

    # Calculate the intersection area.
    intersection_area = np.sum(intersection_mask)

    # If the intersection area is greater than the maximum intersection area, update t
    if intersection_area > max_intersection_area:
      max_intersection_area = intersection_area
      max_intersection_mask = intersection_mask

  # Highlight the maximum intersection area in black.
  image[max_intersection_mask > 0] = 0

  return image
```

In [ ]:
```python
import matplotlib.pyplot as plt
```

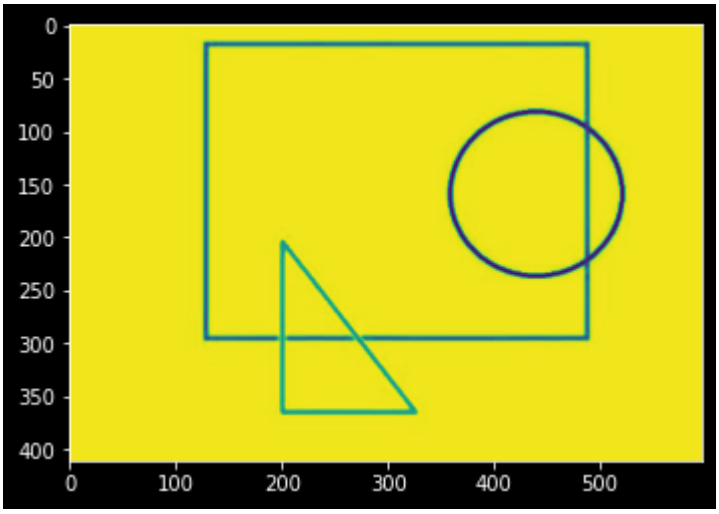
In [ ]:
```python
image = cv2.imread("Input-1.jpg")
plt.imshow(image)
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x1eb88b8e1f0>
```



In [ ]:
```
image_gray = cv2.cvtColor(image, cv2.COLOR_BGR2GRAY)
plt.imshow(image_gray)
```

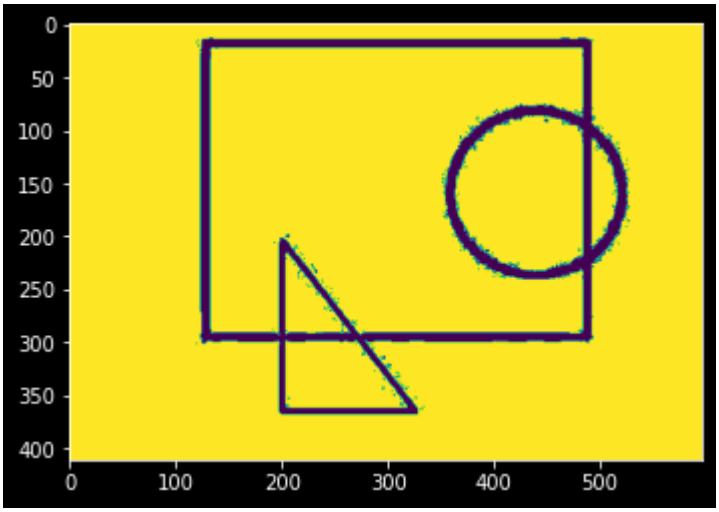
Out[ ]:
```
<matplotlib.image.AxesImage at 0x1eb88bf4580>
```



In [ ]:
```
# image = find_maximum_intersection_area(image_gray)
# image= cv2.cvtColor(image, cv2.COLOR_BGR2RGB)
# plt.imshow(image)
```

In [ ]:
```
_, threshold = cv2.threshold(image_gray, 127, 255, cv2.THRESH_TRIANGLE)

plt.imshow(threshold)
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x1eb88c3f2e0>
```



In [ ]:
```
# using a findContours() function
contours, _ = cv2.findContours(
        threshold, cv2.RETR_TREE, cv2.CHAIN_APPROX_SIMPLE)
```

In [ ]:
```
print(f'no of countours is: {len(contours)}')
```

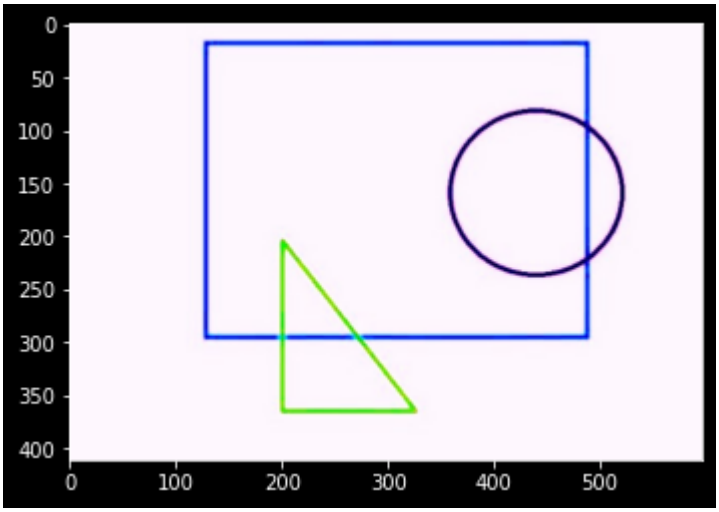
```
no of countours is: 267
```

In [ ]:
```
new_image= image.copy()
```

In [ ]:
```
max_intersection_area = 0
max_intersection_mask = None
i=0
# Iterate over the contours and find the maximum intersection area.
for contour in contours:
  if i == 0:
    i = 1
    continue
  # Create a mask for the contour.
  mask = np.zeros_like(image, dtype=np.uint8)
  cv2.drawContours(mask, [contour], -1, (255, 255, 255), -1)
  # Find the intersection of the mask and the image.
  intersection_mask = mask & image
  # Calculate the intersection area.
  intersection_area = np.sum(intersection_mask)
  # If the intersection area is greater than the maximum intersection area, update the
  if intersection_area > max_intersection_area:
    max_intersection_area = intersection_area
    max_intersection_mask = intersection_mask
# Highlight the maximum intersection area in black.
image[max_intersection_mask > 0] = 0
```

In [ ]:
```
plt.imshow(image)
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x1293df64100>
```

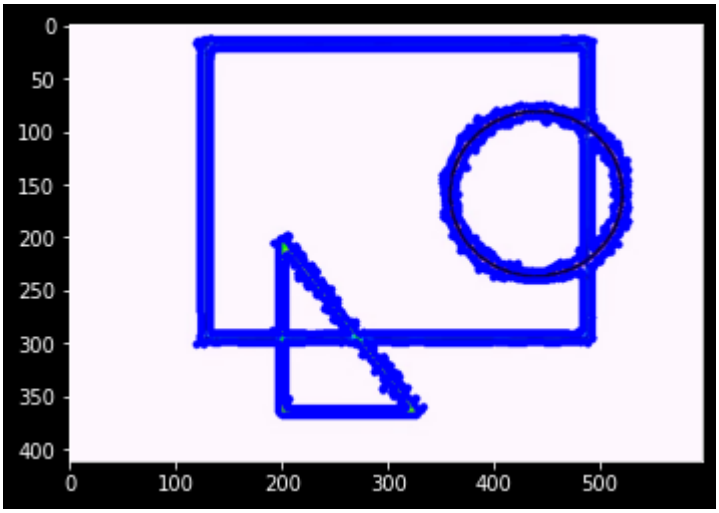


In [ ]:

```
# reading image
img = cv2.imread('Input-1.jpg')

# converting image into grayscale image
gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)

# setting threshold of gray image
_, threshold = cv2.threshold(gray, 127, 255, cv2.THRESH_TRIANGLE)

# using a findContours() function
# contours, _ = cv2.findContours(
        # threshold, cv2.RETR_EXTERNAL, cv2.CHAIN_APPROX_SIMPLE)
contours, _ = cv2.findContours(
        threshold, cv2.RETR_TREE, cv2.CHAIN_APPROX_SIMPLE)

i = 0
shape= img.shape
img_copy= np.zeros(shape=shape)

# list for storing names of shapes
for contour in contours:

        # here we are ignoring first counter because
        # findcontour function detects whole image as shape
        if i == 0:
                i = 1
                continue

        # cv2.approxPloyDP() function to approximate the shape
        approx = cv2.approxPolyDP(
                contour, 0.01 * cv2.arcLength(contour, True), True)



        # using drawContours() function
        cv2.drawContours(img, [contour], 0, (0, 0, 255), 5)
        cv2.drawContours(img_copy, [contour], 0, (0, 0, 255), 5)
```

In [ ]:
```
plt.imshow(img)
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x12942931d30>
```

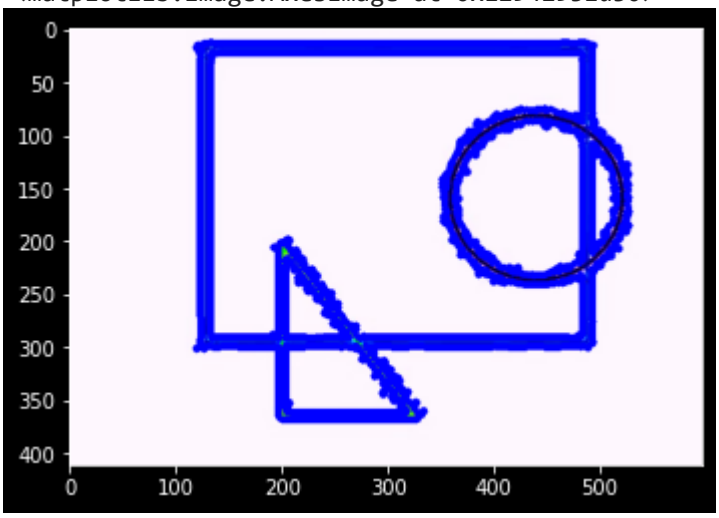


In [ ]:
```
img.shape
```

Out[ ]:
```
(411, 597, 3)
```

In [ ]:
```
plt.imshow(img)
```

```
<matplotlib.image.AxesImage at 0x12942931d30>
```

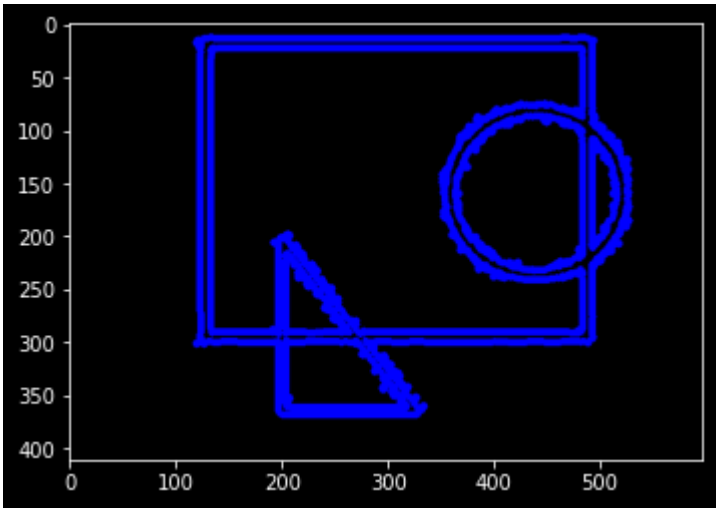


In [ ]:
```

```

In [ ]:
```
plt.imshow(img_copy)
```

```
Clipping input data to the valid range for imshow with RGB data ([0..1] for floats or [0..255] for integers).
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x12942a898e0>
```



In [ ]:

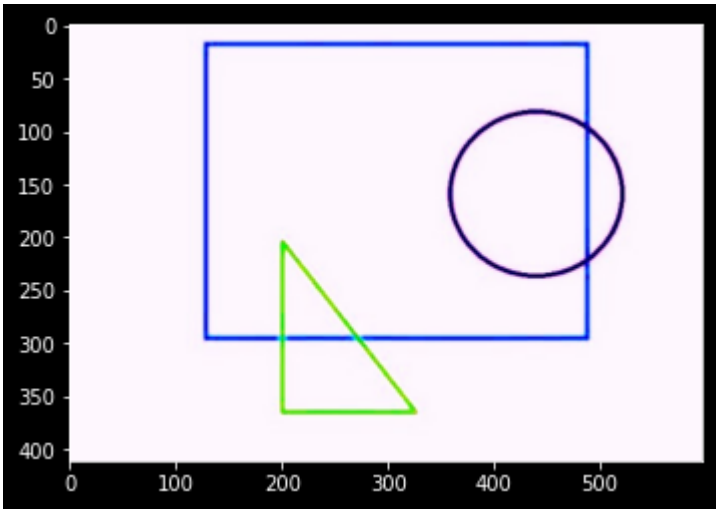
In [ ]:

In [ ]:

In [ ]:
```
foog = cv2.createBackgroundSubtractorMOG2(
    detectShadows=False, varThreshold= 100, history=100)
```

In [ ]:
```
frame= cv2.imread('Input-1.jpg')
plt.imshow(frame)
```

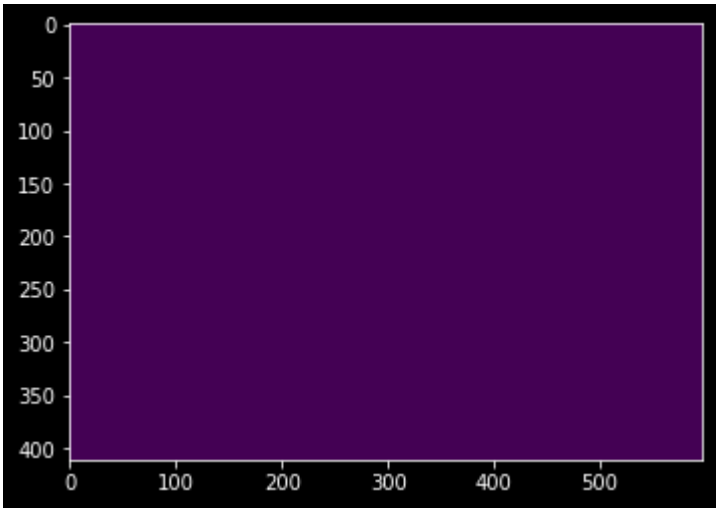
Out[ ]:
```
<matplotlib.image.AxesImage at 0x1293f53f310>
```



In [ ]:
```
fgmask = foog.apply(frame)

# ret, fgmask = cv2.threshold(fgmask, 250, 255, cv2.THRESH_BINARY)
```

In [ ]:
```
plt.imshow(fgmask)
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x1293f5a7730>
```



In [ ]:

In [ ]:

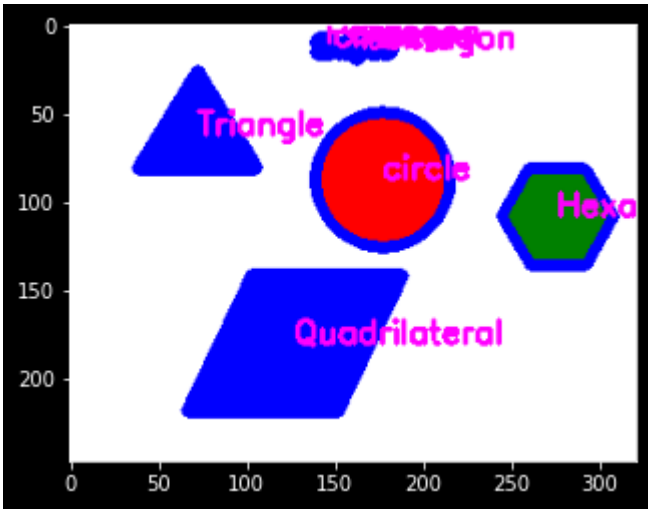
In [ ]:

GFG

In [ ]:
```
import cv2
import numpy as np
from matplotlib import pyplot as plt

# reading image
img = cv2.imread('shapes.png')

# converting image into grayscale image
gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)

# setting threshold of gray image
_, threshold = cv2.threshold(gray, 127, 255, cv2.THRESH_BINARY)

# using a findContours() function
contours, _ = cv2.findContours(
        threshold, cv2.RETR_TREE, cv2.CHAIN_APPROX_SIMPLE)

i = 0

# list for storing names of shapes
for contour in contours:

        # here we are ignoring first counter because
        # findcontour function detects whole image as shape
        if i == 0:
                i = 1
                continue

        # cv2.approxPloyDP() function to approximate the shape
        approx = cv2.approxPolyDP(
                contour, 0.01 * cv2.arcLength(contour, True), True)
```

```
        # using drawContours() function
        cv2.drawContours(img, [contour], 0, (0, 0, 255), 5)

        # finding center point of shape
        M = cv2.moments(contour)
        if M['m00'] != 0.0:
                x = int(M['m10']/M['m00'])
                y = int(M['m01']/M['m00'])

        # putting shape name at center of each shape
        if len(approx) == 3:
                cv2.putText(img, 'Triangle', (x, y),
                                        cv2.FONT_HERSHEY_SIMPLEX, 0.6, (255, 0, 255),

        elif len(approx) == 4:
                cv2.putText(img, 'Quadrilateral', (x, y),
                                        cv2.FONT_HERSHEY_SIMPLEX, 0.6, (255, 0, 255),

        elif len(approx) == 5:
                cv2.putText(img, 'Pentagon', (x, y),
                                        cv2.FONT_HERSHEY_SIMPLEX, 0.6, (255, 0, 255),

        elif len(approx) == 6:
                cv2.putText(img, 'Hexagon', (x, y),
                                        cv2.FONT_HERSHEY_SIMPLEX, 0.6, (255, 0, 255),

        else:
                cv2.putText(img, 'circle', (x, y),
                                        cv2.FONT_HERSHEY_SIMPLEX, 0.6, (255, 0, 255),

# displaying the image after drawing contours
plt.imshow(img)
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x1eb85c017c0>
```



In [ ]:
```
import cv2
import numpy as np
from matplotlib import pyplot as plt

# reading image
img = cv2.imread('Input.jpg')

# converting image into grayscale image
gray = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)
```

```
ret,thresh = cv2.threshold(gray,127,255,1)

contours,h = cv2.findContours(thresh,1,2)

for cnt in contours:
    approx = cv2.approxPolyDP(cnt,0.01*cv2.arcLength(cnt,True),True)
    print (len(approx))
    if len(approx)==5:
        print ("pentagon")
        cv2.drawContours(img,[cnt],0,255,-1)
    elif len(approx)==3:
        print ("triangle")
        cv2.drawContours(img,[cnt],0,(0,255,0),-1)
    elif len(approx)==4:
        print ("square")
        cv2.drawContours(img,[cnt],0,(0,0,255),-1)
    elif len(approx) == 9:
        mask = np.zeros_like(img, dtype=np.uint8)
        cv2.drawContours(mask, [cnt], -1, (255, 255, 255), -1)
        # Find the intersection of the mask and the image.
        intersection_mask = mask & img
        print ("half-circle")
        cv2.drawContours(img,[cnt],0,(255,255,0),-1)
        intersection_area = np.sum(intersection_mask)

    elif len(approx) > 15:
        print ("circle")
        cv2.drawContours(img,[cnt],0,(0,255,255),-1)

# displaying the image after drawing contours
plt.imshow(img)
```

4
square
4
square
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square
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square
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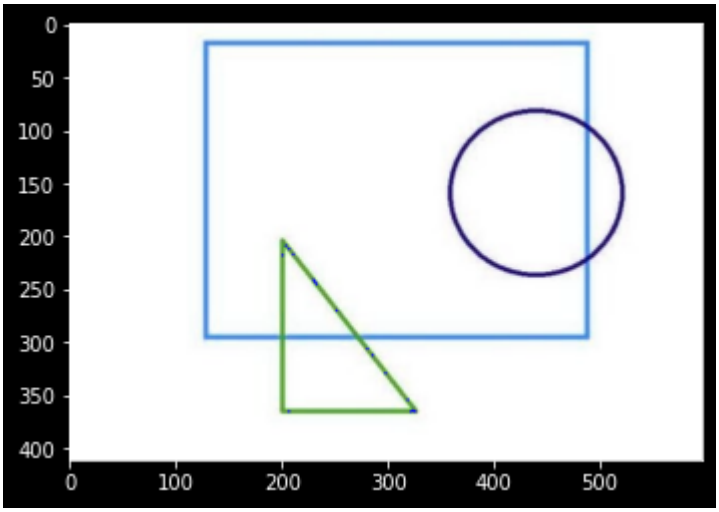
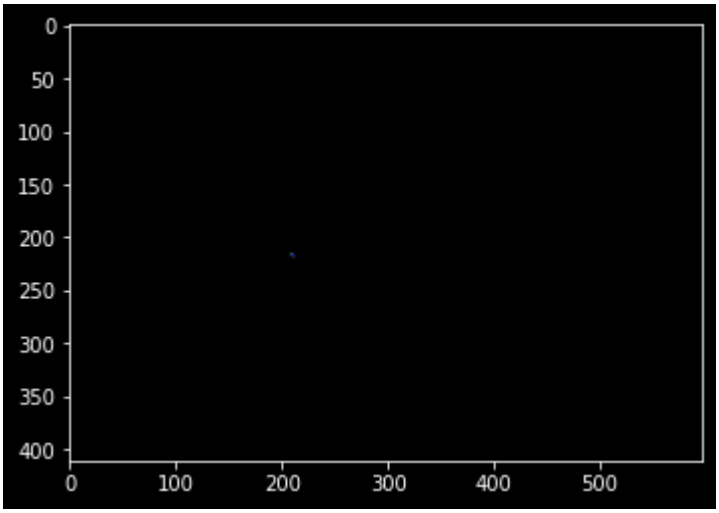
square
4
square
4
square
4
square
4
square
4
square
9
half-circle
6
4
square
4
square
6
15
14



In [ ]:
```
img[intersection_mask < 0] = 0

plt.imshow(intersection_mask)
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x1eb88e3ad30>
```



In [ ]:

In [ ]:

In [ ]:

In [ ]:

In [ ]:
```
import numpy as np
import cv2
```

In [ ]:
```
img = cv2.imread('Input.jpg')
imgGry = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)

_, thrash = cv2.threshold(imgGry, 240 , 255, cv2.CHAIN_APPROX_NONE)
contours , _ = cv2.findContours(thrash, cv2.RETR_TREE, cv2.CHAIN_APPROX_NONE)
```

In [ ]:
```
print(f'No of countours: {len(contours)}')
# Initialize the maximum intersection area to 0.
max_intersection_area = 0
max_intersection_mask = None

i=0
```

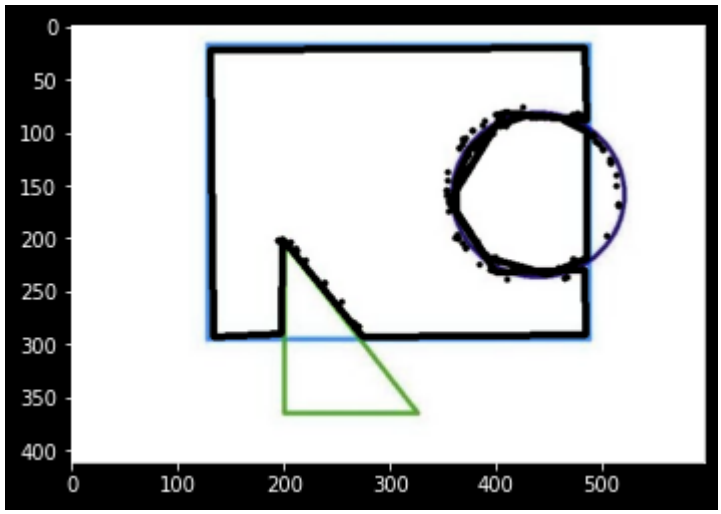
```
No of countours: 124
```

In [ ]:
```
for contour in contours:

    if i <50:
        i+=1
        continue
    approx = cv2.approxPolyDP(contour, 0.01* cv2.arcLength(contour, True), True)
    cv2.drawContours(img, [approx], 0, (0, 0, 0), 5)
    x = approx.ravel()[0]
    y = approx.ravel()[1] - 5



    mask = np.zeros_like(img, dtype=np.uint8)
    cv2.drawContours(mask, [contour], -1, (255, 255, 255), -1)


    intersection_mask = mask & img

    # Calculate the intersection area.
    intersection_area = np.sum(intersection_mask)

    # If the intersection area is greater than the maximum intersection area, update t
    if intersection_area > max_intersection_area:
      max_intersection_area = intersection_area
      max_intersection_mask = intersection_mask


    if len(approx) == 3:
        pass
        # cv2.putText( img, "Triangle", (x, y), cv2.FONT_HERSHEY_COMPLEX, 0.5, (0, 0,
    elif len(approx) == 4 :
        # pass
        x, y , w, h = cv2.boundingRect(approx)
        # aspectRatio = float(w)/h
        # print(aspectRatio)
        # if aspectRatio >= 0.95 and aspectRatio < 1.05:
            # cv2.putText(img, "square", (x, y), cv2.FONT_HERSHEY_COMPLEX, 0.5, (0, 0,

        # else:
            # cv2.putText(img, "rectangle", (x, y), cv2.FONT_HERSHEY_COMPLEX, 0.5, (0,

    elif len(approx) == 5 :
        pass
        # cv2.putText(img, "pentagon", (x, y), cv2.FONT_HERSHEY_COMPLEX, 0.5, (0, 0, 0
    elif len(approx) == 10 :
        pass
```

```
        # cv2.putText(img, "star", (x, y), cv2.FONT_HERSHEY_COMPLEX, 0.5, (0, 0, 0))
    # else:
    #     cv2.putText(img, "circle", (x, y), cv2.FONT_HERSHEY_COMPLEX, 0.5, (0, 0, 0))
```

In [ ]:
```
plt.imshow(img)
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x1eb8fa88ee0>
```

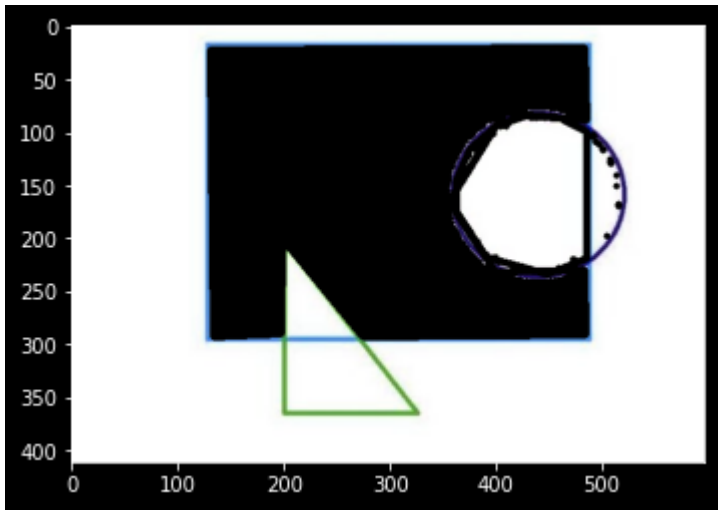


In [ ]:
```
img[max_intersection_mask > 0] = 0

max_intersection_mask2= max_intersection_mask
```

In [ ]:
```

```

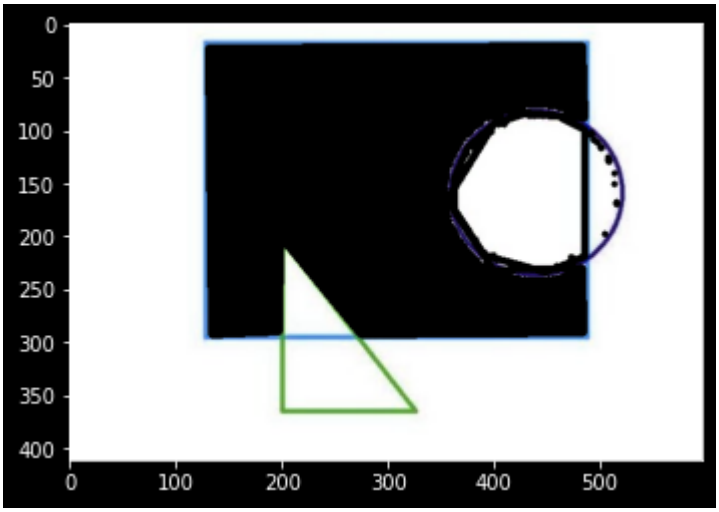
In [ ]:
```
plt.imshow(img)
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x1eb8faf3e50>
```



In [ ]:
```
rectangle_intersection= img.copy()
plt.imshow(rectangle_intersection)
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x1eb8fb5cf10>
```



In [ ]:

In [ ]:

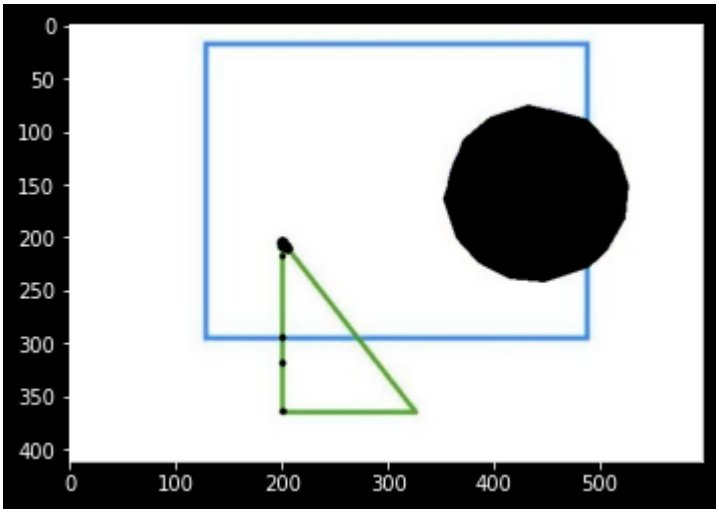
In [ ]:
```
img = cv2.imread('Input.jpg')
imgGry = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)

# _, thrash = cv2.threshold(imgGry, 240 , 255, cv2.CHAIN_APPROX_NONE)
_, thrash = cv2.threshold(imgGry, 127 , 255, cv2.THRESH_BINARY)
contours , _ = cv2.findContours(thrash, cv2.RETR_TREE, cv2.CHAIN_APPROX_NONE)


print(f'No of countours: {len(contours)}')
# Initialize the maximum intersection area to 0.
max_intersection_area = 0
max_intersection_mask = None

i=0



for contour in contours:

    if i <24:
        i+=1
        continue
    approx = cv2.approxPolyDP(contour, 0.01* cv2.arcLength(contour, True), True)
    cv2.drawContours(img, [approx], 0, (0, 0, 0), 5)
    x = approx.ravel()[0]
    y = approx.ravel()[1] - 5



    mask = np.zeros_like(img, dtype=np.uint8)
    cv2.drawContours(mask, [contour], -1, (255, 255, 255), -1)


    intersection_mask = mask & img

    # Calculate the intersection area.
    intersection_area = np.sum(intersection_mask)
```

```
    # If the intersection area is greater than the maximum intersection area, update t
    if intersection_area > max_intersection_area:
      max_intersection_area = intersection_area
      max_intersection_mask = intersection_mask


    if len(approx) == 3:
        pass
        # cv2.putText( img, "Triangle", (x, y), cv2.FONT_HERSHEY_COMPLEX, 0.5, (0, 0,
    elif len(approx) == 4 :
        # pass
        x, y , w, h = cv2.boundingRect(approx)
        # aspectRatio = float(w)/h
        # print(aspectRatio)
        # if aspectRatio >= 0.95 and aspectRatio < 1.05:
            # cv2.putText(img, "square", (x, y), cv2.FONT_HERSHEY_COMPLEX, 0.5, (0, 0,

        # else:
            # cv2.putText(img, "rectangle", (x, y), cv2.FONT_HERSHEY_COMPLEX, 0.5, (0,

    elif len(approx) == 5 :
        pass
        # cv2.putText(img, "pentagon", (x, y), cv2.FONT_HERSHEY_COMPLEX, 0.5, (0, 0, 0
    elif len(approx) == 10 :
        pass
        # cv2.putText(img, "star", (x, y), cv2.FONT_HERSHEY_COMPLEX, 0.5, (0, 0, 0))
    # else:
    #     cv2.putText(img, "circle", (x, y), cv2.FONT_HERSHEY_COMPLEX, 0.5, (0, 0, 0))


max_intersection_mask1= max_intersection_mask
img[max_intersection_mask > 0] = 0
```

```
No of countours: 32
```

In [ ]:
```
full_intersection= img.copy()
plt.imshow(img)
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x1eb9220ee80>
```



In [ ]:
```
img = cv2.imread('Input.jpg')
imgGry = cv2.cvtColor(img, cv2.COLOR_BGR2GRAY)

_, thrash = cv2.threshold(imgGry, 240 , 255, cv2.CHAIN_APPROX_NONE)
```

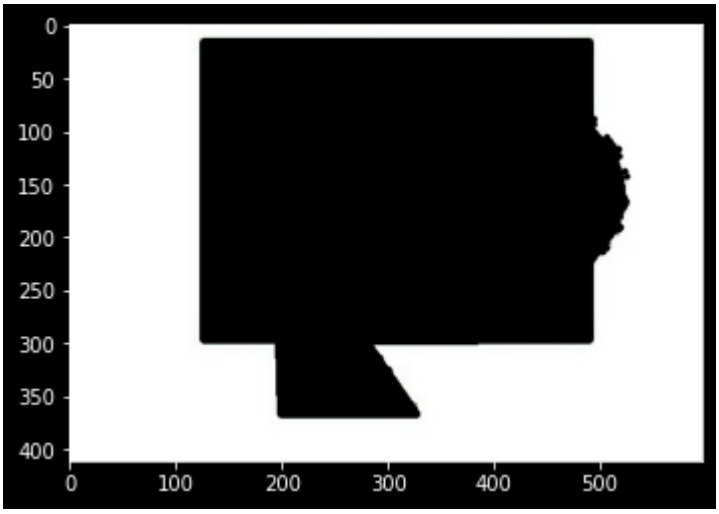
```
# _, thrash = cv2.threshold(imgGry, 127 , 255, cv2.THRESH_BINARY)
contours , _ = cv2.findContours(thrash, cv2.RETR_TREE, cv2.CHAIN_APPROX_NONE)


print(f'No of countours: {len(contours)}')
# Initialize the maximum intersection area to 0.
max_intersection_area = 0
max_intersection_mask = None

i=0



for contour in contours:

    if i <12:
        i+=1
        continue
    approx = cv2.approxPolyDP(contour, 0.01* cv2.arcLength(contour, True), True)
    cv2.drawContours(img, [approx], 0, (0, 0, 0), 5)
    x = approx.ravel()[0]
    y = approx.ravel()[1] - 5



    mask = np.zeros_like(img, dtype=np.uint8)
    cv2.drawContours(mask, [contour], -1, (255, 255, 255), -1)


    intersection_mask = mask & img

    # Calculate the intersection area.
    intersection_area = np.sum(intersection_mask)

    # If the intersection area is greater than the maximum intersection area, update t
    if intersection_area > max_intersection_area:
      max_intersection_area = intersection_area
      max_intersection_mask = intersection_mask


    if len(approx) == 3:
        pass
        # cv2.putText( img, "Triangle", (x, y), cv2.FONT_HERSHEY_COMPLEX, 0.5, (0, 0,
    elif len(approx) == 4 :
        # pass
        x, y , w, h = cv2.boundingRect(approx)
        # aspectRatio = float(w)/h
        # print(aspectRatio)
        # if aspectRatio >= 0.95 and aspectRatio < 1.05:
            # cv2.putText(img, "square", (x, y), cv2.FONT_HERSHEY_COMPLEX, 0.5, (0, 0,

        # else:
            # cv2.putText(img, "rectangle", (x, y), cv2.FONT_HERSHEY_COMPLEX, 0.5, (0,

    elif len(approx) == 5 :
        pass
        # cv2.putText(img, "pentagon", (x, y), cv2.FONT_HERSHEY_COMPLEX, 0.5, (0, 0, 0
    elif len(approx) == 10 :
        pass
        # cv2.putText(img, "star", (x, y), cv2.FONT_HERSHEY_COMPLEX, 0.5, (0, 0, 0))
```

```
    # else:
    #     cv2.putText(img, "circle", (x, y), cv2.FONT_HERSHEY_COMPLEX, 0.5, (0, 0, 0))


max_intersection_mask2= max_intersection_mask
img[max_intersection_mask > 0] = 0
```

```
No of countours: 124
```

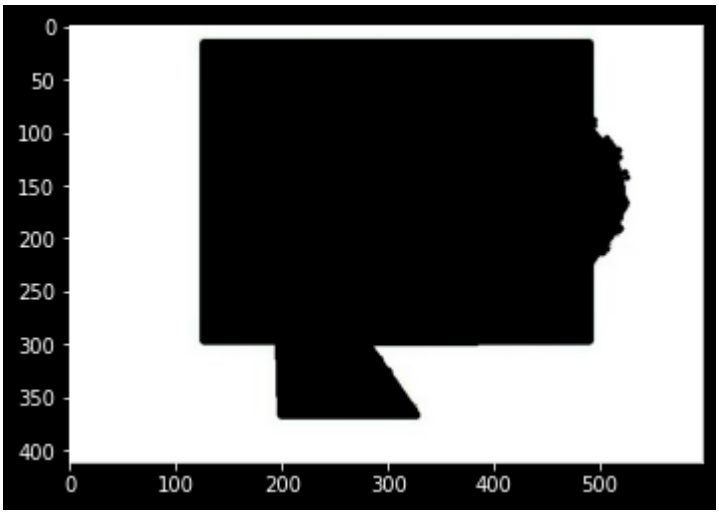
In [ ]:
```
full_intersection= img.copy()
plt.imshow(full_intersection)
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x1eb90f1e640>
```



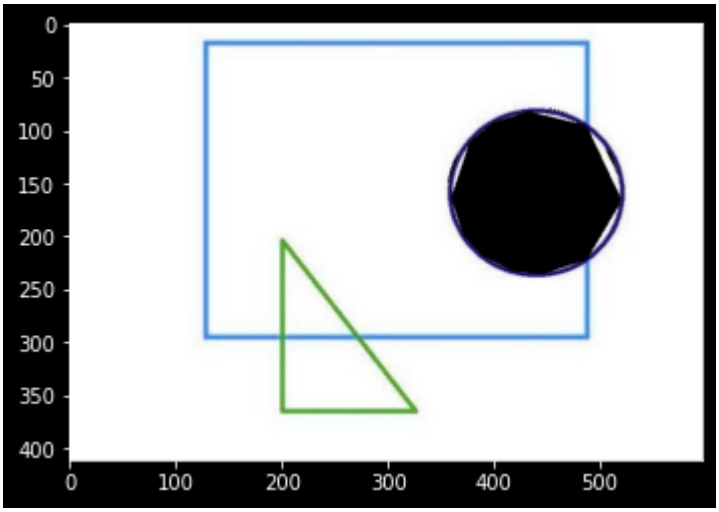
In [ ]:
```
desiredimage= rectangle_intersection & full_intersection
plt.imshow(desiredimage)
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x1eb90f7e340>
```



In [ ]:
```
img = cv2.imread('Input.jpg')

final_mask= max_intersection_mask1&max_intersection_mask2

img[final_mask>0]=0
plt.imshow(img)
```

Out[ ]:
```
<matplotlib.image.AxesImage at 0x1eb90fe56d0>
```



In [ ]: