def collage():  #main function
    #original picture, from public domain
    pic = makePicture(getMediaPath("silhouette.jpg"))
cropPic = crop(pic,345,1120,370,1060)    #crops picture
    width = getWidth(cropPic)
    height = getHeight(cropPic)
collage = makeEmptyPicture(width,height)    #creates blank canvas
    scalePic = scale(cropPic,.25)    #creates scaled version of cropped image
    sketch = edgeDetect(cropPic,black,white)
    #creates image used multiple times throughout function
    scaledSketch = scale(sketch,.25)
    centerPic = scale(sketch,.5)
copy(centerPic,collage,int(width/4),int(height/4))
    pic1 = edgeDetect(scalePic,white,black)
copy(pic1,collage,3*int(width/4),int(height/4))
    pic2 = negative(grayScale(rainbow(scaledSketch,.8,.2,red)))
copy(pic2,collage,3*int(width/4),2*int(height/4))
copy(scalePic,collage,3*int(width/4),3*int(height/4))
    pic3 = rainbow(scaledSketch,.8,.2,red)
copy(pic3,collage,0,3*int(height/4))
    redColor = makeColor(255,85,0)
    grayColor = makeColor(57,57,57)
copy(pic4,collage,int(width/4),3*int(height/4))
    orangeColor = makeColor(255,155,0)
copy(pic5,collage,2*int(width/4),3*int(height/4))
    blueColor = makeColor(0,0,205)
    grayColor2 = makeColor(28,28,28)
copy(pic7,collage,0,int(height/4))
    blueColor2 = makeColor(0,100,255)
copy(pic8,collage,0,2*int(height/4))
pic9 = rainbow(scaledSketch,.3,.7,green)
copy(pic9,collage,3*int(width/4),0)
greenColor = makeColor(50,155,0)
pic10 = edgeDetect(scalePic,greenColor,grayColor2)
copy(pic10,collage,2*int(width/4),0)
greenColor2 = makeColor(0,100,0)
pic11 = edgeDetect(scalePic,greenColor2,black)
copy(pic11,collage,int(width/4),0)
signature(collage,580,655)
explore(collage)

def grayScale(pic):  #creates the grayscale effect
    width = getWidth(pic)
    height = getHeight(pic)
    newPic = makeEmptyPicture(width,height)
    for x in range(width):
        for y in range(height):
            pixel = getPixel(pic,x,y)
            newPixel = getPixel(newPic,x,y)
            lum = luminance(pixel)
            color = makeColor(lum,lum,lum)
            setColor(newPixel,color)
    return newPic

def luminance(pixel):  #returns the luminance of a pixel, used in other functions
    luminance = (getRed(pixel)+getGreen(pixel)+getBlue(pixel))/3
    return luminance

def negative(pic):   #creates the negative of the input picture
    width = getWidth(pic)
    height = getHeight(pic)
    newPic = makeEmptyPicture(width,height)
    for x in range(width):
        for y in range(height):
            pixel = getPixel(pic,x,y)
            newRed = 255-getRed(pixel)
            newGreen = 255-getGreen(pixel)
            newBlue = 255-getBlue(pixel)
            color = makeColor(newRed,newGreen,newBlue)
            newPixel = getPixel(newPic,x,y)
            setColor(newPixel,color)
    return newPic

def copy(pic,canvas,startX,startY):   #copies an image onto another image
    begX = startX
    for x in range(getWidth(pic)):
        begY = startY
        for y in range(getHeight(pic)):
            sourcePx = getPixel(pic,x,y)
            color = getColor(sourcePx)
            targetPx = getPixel(canvas,begX,begY)
            setColor(targetPx,color)
            begY = begY + 1
        begX = begX + 1

def scale(pic,factor):  #scales an image by a specified factor
    newPic = makeEmptyPicture(int(factor*getWidth(pic)),int(factor*getHeight(pic)))
sourceX = 0
for x in range(getWidth(newPic)):
    sourceY = 0
    for y in range(getHeight(newPic)):
        sourcePx = getPixel(pic,int(sourceX),int(sourceY))
        targetPx = getPixel(newPic,x,y)
        color = getColor(sourcePx)
        setColor(targetPx,color)
        sourceY = sourceY + 1/factor
        sourceX = sourceX + 1/factor
    return newPic

def crop(pic,startX,endX,startY,endY):  #crops a picture
    newPic = makeEmptyPicture(endX-startX,endY-startY)
    sourceX = startX
    for x in range(getWidth(newPic)):
        sourceY = startY
        for y in range(getHeight(newPic)):
            sourcePx = getPixel(pic,sourceX,sourceY)
            color = getColor(sourcePx)
            targetPx = getPixel(newPic,x,y)
            setColor(targetPx,color)
            sourceY = sourceY + 1
            sourceX = sourceX + 1
        return newPic

#changes the color gradually across the picture, creating a sort of rainbow
def rainbow(pic,w1,w2,color1):
    width = getWidth(pic)
    height = getHeight(pic)
    inc = width/256
    if inc < float(width)/256:
        inc = inc + 1
    newPic = makeEmptyPicture(width,height)
    counter = 0
    for x in range(width):
        for y in range(height):
            pixel = getPixel(pic,x,y)
            if color1 == red:
                color = makeColor(getRed(pixel),int(w1*counter),int(w2*counter))
            elif color1 == green:
                color = makeColor(int(w1*counter),getGreen(pixel),int(w2*counter))
            elif color1 == blue:
                color = makeColor(int(w1*counter),int(w2*counter),getBlue(pixel))
            targetPixel = getPixel(newPic,x,y)
            setColor(targetPixel,color)
            if (x+1) % inc == 0:
                counter = counter + 1
        return newPic

#creates a sketch of a picture with two specified colors
def edgeDetect(pic,color1,color2):
    width = getWidth(pic)
    height = getHeight(pic)
    newPic = makeEmptyPicture(width,height)
    for x in range(width-1):
        for y in range(height-1):
pixel = getPixel(pic,x,y)
botrt = getPixel(pic,x+1,y+1)
lum1 = luminance(pixel)
lum2 = luminance(botrt)
newPixel = getPixel(newPic,x,y)
if abs(lum1-lum2) > 2:
    setColor(newPixel,color1)
elif abs(lum1-lum2) <= 2:
    setColor(newPixel,color2)
return newPic

def signature(canvas,startX,startY):  #draws the signature on a picture
    pic = scale(crop(makePicture(getMediaPath("signature.jpg")),
                     956,3368,1052,1508),.075)
targetX = startX
for x in range(getWidth(pic)):
    targetY = startY
    for y in range(getHeight(pic)):
        pixel = getPixel(pic,x,y)
        targetPixel = getPixel(canvas,targetX,targetY)
        picColor = getColor(pixel)
        if distance(picColor,white) > 250:
            setColor(targetPixel,white)
        targetY = targetY + 1
    targetX = targetX + 1

# means the line is continued on the next line.