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// Author -------------- Cecilia Y. Sui
// Course -------------- Computer Graphics
// Instructor ---------- Dr. Crawley
// Date of Submission -- September 20, 2019
// Assignment ---------- Use Java Graphics2D to draw a house with
// -------------------- roof, door, windows, trees or shrub, sun or
// -------------------- moon.
//-------------------------------------------------------------------

//-------------------------------------------------------------------
// Import
//-------------------------------------------------------------------
import java.awt.*;
import java.awt.geom.*;
import javax.swing.*;
import java.awt.image.BufferedImage;
import java.io.File;
import javax.imageio.ImageIO;
import java.io.IOException;


//-------------------------------------------------------------------
// House Class extends JPanel
//-------------------------------------------------------------------
public class House extends JPanel{
    public static void main (String[] args) throws IOException{
        JFrame window;
        window = new JFrame("The Happy House");
        window.setContentPane(new House());
        window.setDefaultCloseOperation(JFrame.EXIT_ON_CLOSE);
        window.pack();
        window.setResizable(false);
        Dimension screen = Toolkit.getDefaultToolkit().getScreenSize(
);
        window.setLocation(
            (screen.width - window.getWidth())/2,
            (screen.height - window.getHeight())/2);
```

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        window.setVisible(true);
    }

    private float pixelSize;

    //-----------------------------------------------------------------
    // Constructor
    //-----------------------------------------------------------------
    public House(){
        setPreferredSize( new Dimension(1200,700));
    }

    //-----------------------------------------------------------------
    // paintComponent Function
    //-----------------------------------------------------------------
    protected void paintComponent(Graphics g) {

        Graphics2D g2 = (Graphics2D)g.create();
        g2.setRenderingHint(RenderingHints.KEY_ANTIALIASING, Renderin
gHints.VALUE_ANTIALIAS_ON);
        g2.setPaint(Color.WHITE);
        g2.fillRect(0,0,getWidth(),getHeight());
        applyapplyWindowToViewportTransformation(g2, -100, 100, -100,
 100, true);

        //-----------------------------------------------------------
        // Draw the chimney
        //-----------------------------------------------------------
        Rectangle2D chim = new Rectangle2D.Double(-120,25,12,30);
        g2.setPaint(new Color(128,64,0,255));
        g2.fill(chim);
        g2.setStroke(new BasicStroke(4*pixelSize));
        g2.setPaint(new Color(190,188,193));
        g2.draw(chim);

        //-----------------------------------------------------------
        // Draw the smoke from chimney
        //-----------------------------------------------------------
```

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AffineTransform savedChim = g2.getTransform();
Ellipse2D smoke = new Ellipse2D.Double(-120,58,10,8);
g2.setPaint(new Color(190,188,193));
g2.fill(smoke);
g2.scale(1.1,1.1);
g2.translate(-1,1);
g2.fill(smoke);
g2.setTransform(savedChim);
g2.scale(1.5,1.5);
g2.translate(19,-9);
g2.fill(smoke);
g2.setTransform(savedChim);

//-----------------------------------------------------------
// Draw Triangle House Roof
//-----------------------------------------------------------
Path2D p = new Path2D.Double();
p.moveTo(-150,0);
p.lineTo(-60,80);
p.lineTo(30,0);
p.closePath();
g2.setPaint(new Color(190,188,193));
g2.fill(p);

//-----------------------------------------------------------
// Print the image "Happy" on house roof
//-----------------------------------------------------------
BufferedImage img = null;
try {
    img = ImageIO.read(new File("Happy.png"));
}
catch (IOException e) {
}
g2.drawImage(img, -80,10,48,44,null);

//-----------------------------------------------------------
// Draw the House body rectangle
//-----------------------------------------------------------
```

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g2.setPaint(new Color(172,229,238));
g2.fill( new Rectangle2D.Double(-150,-80,180,80) );

//-------------------------------------------------------------
// Draw the door in the middle
//-------------------------------------------------------------
g2.setPaint(new Color(33,46,83,200));
g2.fill(new Rectangle2D.Double(-80,-80,40,35));
// Door knobs
g2.setPaint(Color.pink);
g2.fill(new Ellipse2D.Double(-58,-65,2,2));
g2.fill(new Ellipse2D.Double(-64,-65,2,2));
// Door Line
g2.setStroke(new BasicStroke(2*pixelSize));
g2.draw(new Line2D.Double(-60,-80,-60,-45));
// Filled arc on top
Path2D p2 = new Path2D.Double();
p2.moveTo(-80,-45);
p2.quadTo(-60,-20,-40,-45);
p2.closePath();
g2.setPaint(Color.pink);
g2.fill(p2);

//-------------------------------------------------------------
// Draw the concrete floor
//-------------------------------------------------------------
g2.setPaint(new Color(190,188,193));
g2.setStroke(new BasicStroke(20*pixelSize));
g2.draw(new Line2D.Double(-155,-82,35,-82));

//-------------------------------------------------------------
// Draw the windows
//-------------------------------------------------------------
Rectangle2D wind = new Rectangle2D.Double(-135,-45,30,30);
g2.setPaint(new Color(33,46,83,200));
g2.fill(wind);
AffineTransform savedWind = g2.getTransform();
g2.translate(120,0);
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```
g2.fill(wind);
g2.setTransform(savedWind);
g2.setPaint(Color.pink);
g2.setStroke(new BasicStroke(4*pixelSize));
g2.draw(new Line2D.Double(-120,-45,-120,-15));
g2.draw(new Line2D.Double(-135,-30,-105,-30));
g2.draw(new Line2D.Double(0,-45,0,-15));
g2.draw(new Line2D.Double(-15,-30,15,-30));
g2.setStroke(new BasicStroke(10*pixelSize));
g2.draw(new Line2D.Double(-135,-45,-105,-45));
g2.draw(new Line2D.Double(-15,-45,15,-45));

//-------------------------------------------------------------
// Draw the sun
//-------------------------------------------------------------
Ellipse2D sun = new Ellipse2D.Double(100,40,32,32);
g2.setPaint(new Color(255,247,0,220));
g2.fill(sun);
Rectangle2D light = new Rectangle2D.Double(116,56,11,3.5);
g2.setStroke( new BasicStroke(2*pixelSize) );
for (int i = 0; i < 10; i++) {
    AffineTransform savedTransform = g2.getTransform();
    double angle = (2*Math.PI/10) * i;
    g2.rotate(angle, 116,56);
    g2.translate(20,0);
    g2.setPaint( new Color(255,255,51) );
    g2.fill(light);
    g2.setPaint(Color.yellow);
    g2.draw(light);
    g2.setTransform(savedTransform);
}

//-------------------------------------------------------------
// Draw the Trees
//-------------------------------------------------------------
Rectangle2D trunk = new Rectangle2D.Double(57,-80,6,68);
g2.setPaint(new Color(101,67,33));
g2.fill(trunk);
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```
        Ellipse2D tree = new Ellipse2D.Double(40,-20,20,15);
        g2.setPaint(new Color(144,151,0));
        for (int i = 0; i < 8; i++){
            AffineTransform savedTree = g2.getTransform();
            double angle2 = (2*Math.PI/8) * i;
            g2.rotate(angle2, 60,-15);
            g2.fill(tree);
            g2.setTransform(savedTree);
        }
        Rectangle2D trunk2 = new Rectangle2D.Double(103,-80,4,51);
        g2.setPaint(new Color(101,67,33));
        g2.fill(trunk2);
        Ellipse2D tree2 = new Ellipse2D.Double(90,-40,15,10.5);
        g2.setPaint(new Color(68,75,9));
        for (int i = 0; i < 8; i++){
            AffineTransform savedTree = g2.getTransform();
            double angle2 = (2*Math.PI/8) * i;
            g2.rotate(angle2, 105,-35);
            g2.translate(0,0);
            g2.fill(tree2);
            g2.setTransform(savedTree);
        }

        //-----------------------------------------------------------
        // Print Welcome Note
        //-----------------------------------------------------------
        g.setColor(new Color(140,190,214));
        g.setFont(new Font("Courier", Font.PLAIN, 25));
        g.drawString("Welcome to The Happy House!", 195, 50);

    }

    //-----------------------------------------------------------------
    // applyapplyWindowToViewportTransformation
    //-----------------------------------------------------------------
    private void applyapplyWindowToViewportTransformation(Graphics2D
g2,
            double left, double right, double bottom, double top,
```

```
            boolean preserveAspect) {
        int width = getWidth();
        int height = getHeight();
        if (preserveAspect) {
            double displayAspect = Math.abs((double)height / width);
            double requestedAspect = Math.abs(( bottom-
top ) / ( right-left ));
            if (displayAspect > requestedAspect) {
                double excess = (bottom-top) * (displayAspect/
requestedAspect - 1);
                bottom += excess/2;
                top -= excess/2;
            }
            else if (displayAspect < requestedAspect) {
                double excess = (right-left) * (requestedAspect/
displayAspect - 1);
                right += excess/2;
                left -= excess/2;
            }
        }
        g2.scale( width / (right-left), height / (bottom-top) );
        g2.translate( -left, -top );
        double pixelWidth = Math.abs(( right - left ) / width);
        double pixelHeight = Math.abs(( bottom - top ) / height);
        pixelSize = (float)Math.max(pixelWidth,pixelHeight);
    }
}
```