Learning to Code with SVG

Lesson Plan: Coding a Yin Yang Symbol in SVG on a 600 by 600 grid

Objective: Hands-on learning of SVG by drawing a Yin Yang Symbol. Learning the path element Arc command to draw semicircles.

Lab Time: Approximately 1/2 hour, not including Lecture time. Students should test each path command before adding each additional command.

Age range: 4-8th grades, or any age student unfamiliar with SVG

Requirements: Familiar with a simple text editor
Ability to save file with a .svg extension.
Understanding of concept of radius in both x and y directions.
Familiar with the radius of ellipse & circle elements in SVG

Resources: http://steamcoded.org/lessons/grid600x600.svg
http://www.w3schools.com/svg/default.asp
https://www.w3.org/TR/SVG11/
Free eBook for iBooks: *STEAM Coded String Art*, by Jay Nick

Lecture: This lesson will draw 1 path element and 3 circle elements on a 600x600 grid. The path element will create 3 semicircles using the Arc Command 'A'. The resulting shape formed from the 3 semicircles will create the Yin of the Yin Yang symbol.

The Arc command is followed by 7 parameters: x-radius, y-radius, angle to rotate, large arc flag, sweep flag, ending x-coordinate, and ending y-coordinate. For a arc on a semicircle, the starting and ending points will determine the radius to use.
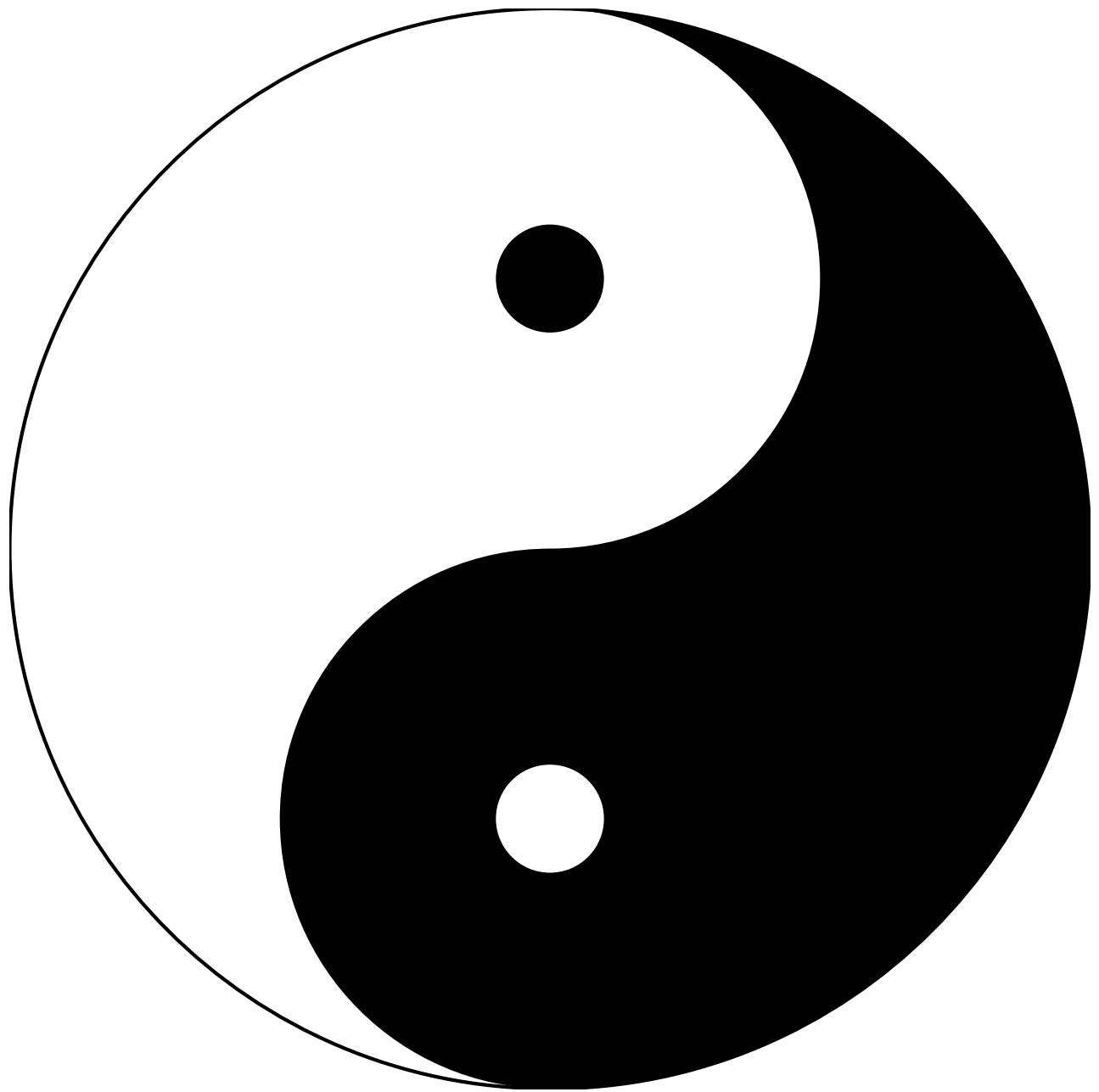
Procedure: Have students get an SVG template with 600x600 grid from:
http://steamcoded.org/lessons/grid600x600.svg.txt
Copy the code and paste it into a text editor.
Save the file as yinyang.svg then open in a browser. Keep the text editor and browser windows open.

Add SVG elements where indicated using the instructions on page 3 (see below). **Important:** Students should save the file and refresh the browser after adding a few SVG element to their file to make sure they don't have errors.

When complete, change the style attribute of the first <g> element from "display:initial" to "display:none" which hides the grid Then change the style attribute of the second <g> element from "opacity:0.5" to "opacity:1"

Take Away: Students should gain an understanding of the Arc command of the SVG path element.

Additional Activity   Students can change the x-radius of the arc commands to change the shape of the Yin Yang symbol.

Coding a Yin Yang in SVG on a 600 by 600 grid

To get started copy the code of this image into your editor:
http://steamcoded.org/lessons/grid600x600.svg.txt and save the file as yinyang.svg and open the file in a browser.

In the editor, add the SVG elements (per instructions below) where indicated in the SVG code, i.e. on the blank line below the comment line <!-- insert SVG elements here -->. **Important:** Save the file and refresh the browser after each step.

1:     Create a <path> element with the following commands:
       Moveto 300,0
       Arc with x and y radius:150, rotate:0, large arc flag:0, sweep flag:1, ending at (300,300)
       hint: M300,0A150,150,0,0,1,300,300

       Add a style attribute with value: "fill:none;stroke:black;"

2:     Append an Arc command to the end of the path command. Note: the arc will start at the ending coordinates of the arc command in step 1, i.e. (300,300)
       Arc with x and y radius:150, rotate:0, large arc flag:0, sweep flag:0, ending at (300,600)
       hint: A150,150,0,0,0,300,600

3:     Append another Arc command to the end of the path command. Note: the arc will start at the ending coordinates of the arc command in step 2, i.e. (300,600)
       Arc with x and y radius:300, rotate:0, large arc flag:0, sweep flag:0, ending at (300,0)
       hint: A300,300,0,0,0,300,0

4:     Change the style attribute from "fill:none;stroke:black;" to "fill:black;stroke:none;"

5:     Before the path element, add a circle element centered at (300,300) with a radius of 300 and style="fill:white; stroke:black;stroke-width:2px;"

6:     After the path element, add a circle element centered at (300,150) with a radius of 30 and style="fill:black;"

7:     After the path element, add a circle element centered at (300,450) with a radius of 30 and style="fill:white;"

       When complete, change the style attribute of the first element from "display:initial" to "display:none" which hides the grid. Then change the style attribute of the second element from "opacity:0.5" to "opacity:1"

Coding a Yin Yang symbol in SVG on a 600 by 600 grid
Answer Sheet

Common mistakes are missing double quote marks around attribute values, missing space between attributes, missing the start < and ending /> tags, using a semicolon where a colon is required and vice-versa, and not putting elements in the correct order.

1:
```
<path d="M300,0A150,150,0,0,1,300,300"
      style="fill:none;stroke:black;" />
```

2:
```
<path d="M300,0A150,150,0,0,1,300,300A150,150,0,0,0,300,600"
      style="fill:none;stroke:black;" />
```

3:
```
<path d="M300,0A150,150,0,0,1,300,300A150,150,0,0,0,300,600A300,300,0,0,0,300,0"
      style="fill:none;stroke:black;">
```

4:
```
<path d="M300,0A150,150,0,0,1,300,300A150,150,0,0,0,300,600A300,300,0,0,0,300,0"
      style="fill:black;stroke:none;">
```

5:
```
<circle cx="300" cy="300" r="300" style="fill:white;stroke:black;stroke-width:2px;" />
<path d="M300,0A150,150,0,0,1,300,300A150,150,0,0,0,300,600A300,300,0,0,0,300,0"
      style="fill:black;stroke:none;">
```

6:
```
<circle cx="300" cy="300" r="300" style="fill:white;stroke:black;stroke-width:2px;" />
<path d="M300,0A150,150,0,0,1,300,300A150,150,0,0,0,300,600A300,300,0,0,0,300,0"
      style="fill:black;stroke:none;">
<circle cx="300" cy="150" r="30" style="fill:black;" />
```

7:
```
<circle cx="300" cy="300" r="300" style="fill:white;stroke:black;stroke-width:2px;" />
<path d="M300,0A150,150,0,0,1,300,300A150,150,0,0,0,300,600A300,300,0,0,0,300,0"
      style="fill:black;stroke:none;">
<circle cx="300" cy="150" r="30" style="fill:black;" />
<circle cx="300" cy="450" r="30" style="fill:white;" />
```