

- 1 Write the following code fragment as a **for** loop. (3)

```
int i = 0;
while (i < 10) {
    ellipse(i, i, i, i);
    i++;
}
```

- 2 Write the following code fragment as a **while** loop. (3)

```
for (int i = 0; i < width; i = i + 5)
    line(i, 0, i, height);
```

- 3 A common error beginning programmers face with the **for**-loop is illustrated in the code segment below: (5)

```
for (int i = 0; i < 100; i = i + 5);
    line(i, 0, i, height);
```

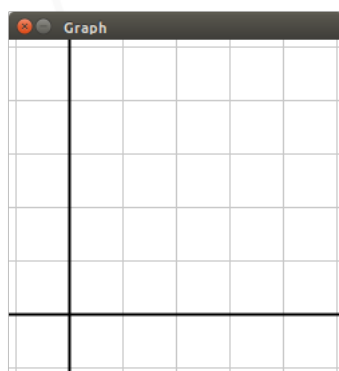
- Identify the error in the code above.
- This type of error is actually a *semantic* error. That is, Processing accepts the code as valid; however, it will not do what appears to be intended by the programmer. What happens when the above code fragment is run and why?

- 4 Use nested loops to create a grid of Processing Bees based on your work on the Processing Bee program from Assignment #3. (5)

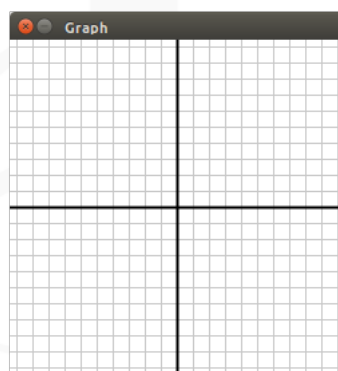
Note: Your program should include as many bees as possible based on the **width** and **height** of the drawing canvas. You may include some padding between consecutive bees for aesthetic reasons if you wish.

- 5 Redesign your **Dartboard** program from Assignment #3 to use loops wherever possible in order to drastically reduce the number of individual lines of code. (10)

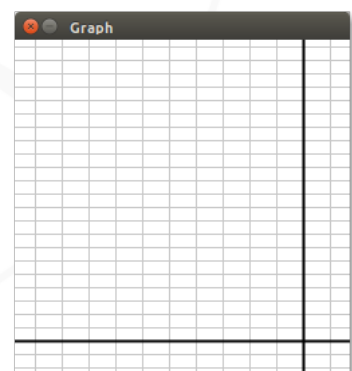
- 6 Although the Processing drawing canvas has a pixel coordinate statement wherein the top-left coordinate is always (0, 0) and the bottom-right coordinate is always (**width**, **height**), it is often important to offer different "views" of data, requiring a transformation of the coordinate system. Implement a program that will store values for **xMin**, **xMax**, **xStep**, **yMin**, **yMax**, and **yStep** and produces a coordinate grid, including coordinate axis. This will allow us to produce a "window" system similar to many popular graphing calculators. See below for a number of examples. (20)



xMin	-5	yMin	-5
xMax	25	yMax	25
xStep	5	yStep	5



xMin	-10	yMin	-10
xMax	10	yMax	10
xStep	1	yStep	1



xMin	-100	yMin	0
xMax	10	yMax	100
xStep	10	yStep	5