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CS 106A

Section #2
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Section Handout #2—Simple Java

Portions of this handout by Eric Roberts and Julia Daniel

1. Mystery Calculation

The following is code for an interactive console program that performs a type of calculation that is probably familiar. Examine the code. What is the role of the **`SENTINEL`** value? How do each of the four variables – **`a`**, **`b`**, **`x`**, and **`y`** – change over time? Overall, what common task does this program do?

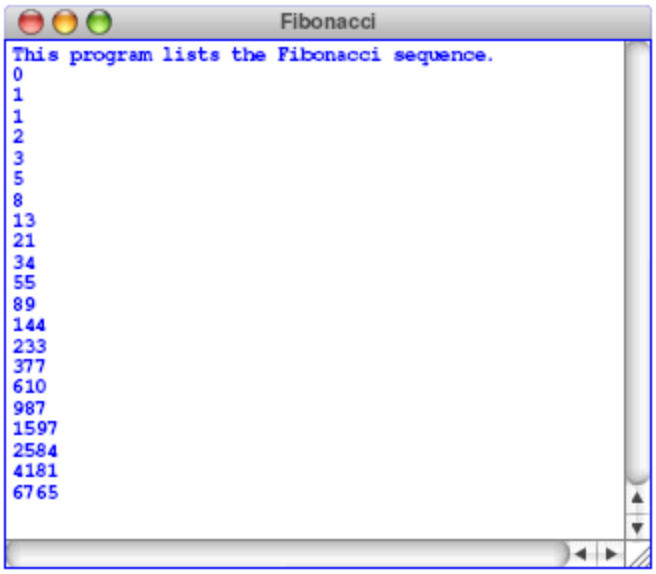
```
/*
 * File: MysteryCalculation.java
 * -----------------------------
 * It's your job to figure out what this program does!
 */

import acm.program.*;

public class MysteryCalculation extends ConsoleProgram {

    /* What does this constant do? */
    private static final int SENTINEL = -1;

    public void run() {
        int a = readInt("Enter a value for a: ");
        int b = readInt("Enter a value for b: ");
        int x = readInt("Enter a value for x: ");
        while (x != SENTINEL) {
            int y = a * x + b;
            println("Result for x = " + x + " is " + y);
            x = readInt("Enter a value for x: ");
        }
    }
}
```

2. The Fibonacci sequence

In the 13th century, the Italian mathematician Leonardo Fibonacci—as a way to explain the geometric growth of a population of rabbits—devised a mathematical sequence that now bears his name. The first two terms in this sequence, **`Fib`**(0) and **`Fib`**(1), are 0 and 1, and every subsequent term is the sum of the preceding two. Thus, the first several terms in the Fibonacci sequence look like this:

`Fib`(0)	=	0	
`Fib`(1)	=	1	
`Fib`(2)	=	1	(0 + 1)
`Fib`(3)	=	2	(1 + 1)
`Fib`(4)	=	3	(1 + 2)
`Fib`(5)	=	5	(2 + 3)

Write a program that displays the terms in the Fibonacci sequence, starting with **`Fib`**(0) and continuing as long as the terms are less than or equal to 10,000. Thus, your program should produce the following sample run:



This program should continue as long as the value of the term is less than or equal to the maximum value. To do this, you should use a **`while`** loop, presumably with a header line that looks like this:

```
while (term <= MAX_TERM_VALUE)
```

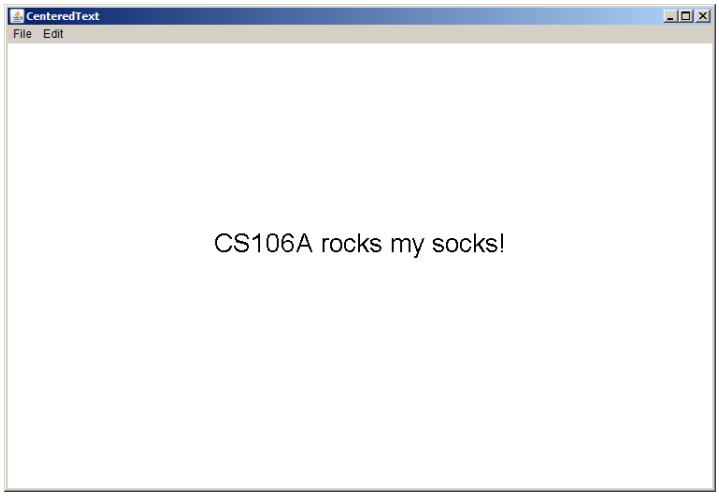
Note that the maximum term value is specified using a named constant. Your program should work properly regardless of the value of **`MAX_TERM_VALUE`**.

3. Drawing Centered Text

Your job is to write a **`GraphicsProgram`** that displays the text message (i.e., **`GLabel`**):

CS106A rocks my socks!

The text should be displayed in SansSerif 28-point font, and centered horizontally and vertically in the middle of the graphics window, looking something like this:

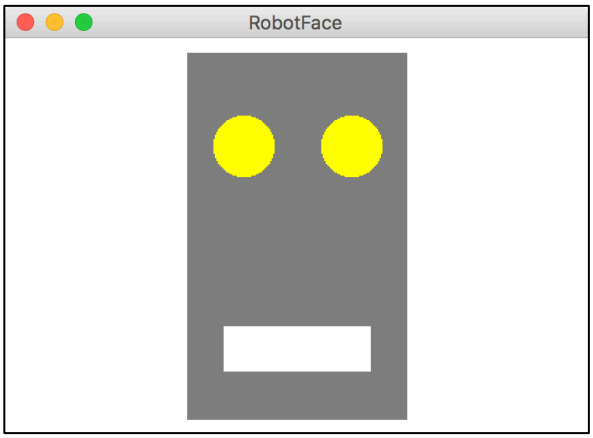


You can find the width of a label by calling **`label.getWidth()`** and the height it extends above the baseline by calling **`label.getAscent()`**. If you want to center a label, you need to shift its origin by half of these distances in each direction.

Bonus: If you wanted to add 10 labels to the window, all with the same font, size, and horizontal centering but with different y-coordinates, how might you organize your code?

4. Drawing a face

Your job is to draw a robot-looking face like the one shown in the following sample run:



This simple face consists of four parts—a head, two eyes, and a mouth—which are arranged as follows:

- *The head*. The head is a big rectangle whose dimensions are given by the named constants **HEAD_WIDTH** and **HEAD_HEIGHT**. The head is gray.
- *The eyes*. The eyes should be circles whose radius in pixels is given by the named constant **EYE_RADIUS**. The centers of the eyes should be set horizontally a quarter of the width of the head in from either edge, and one quarter of the distance down from the top of the head. The eyes are yellow.
- *The mouth*. The mouth should be centered with respect to the head in the *x*-dimension and one quarter of the distance up from the bottom of the head in the *y*-dimension. The dimensions of the mouth are given by the named constants **MOUTH_WIDTH** and **MOUTH_HEIGHT**. The mouth is white.

Finally, the robot face should be centered in the graphics window.