Section Handout #2

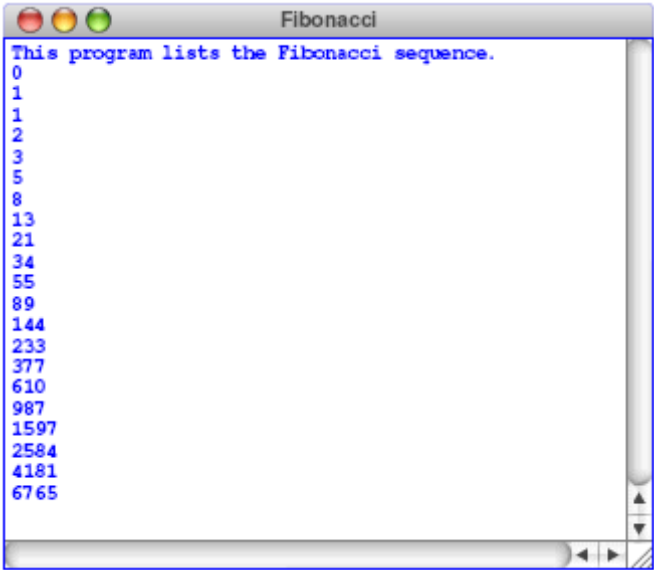
Based on a handout by Eric Roberts and Mehran Sahami

Problem One: The Fibonacci sequence

In the 13th century, the Italian mathematician Leonardo Fibonacci—as a way to explain the geometic 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 10,000. Thus, your program should produce the following sample run:



This program continues as long as the value of the term is less than the maximum value, so that the loop construct you need is a **`while`**, 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.

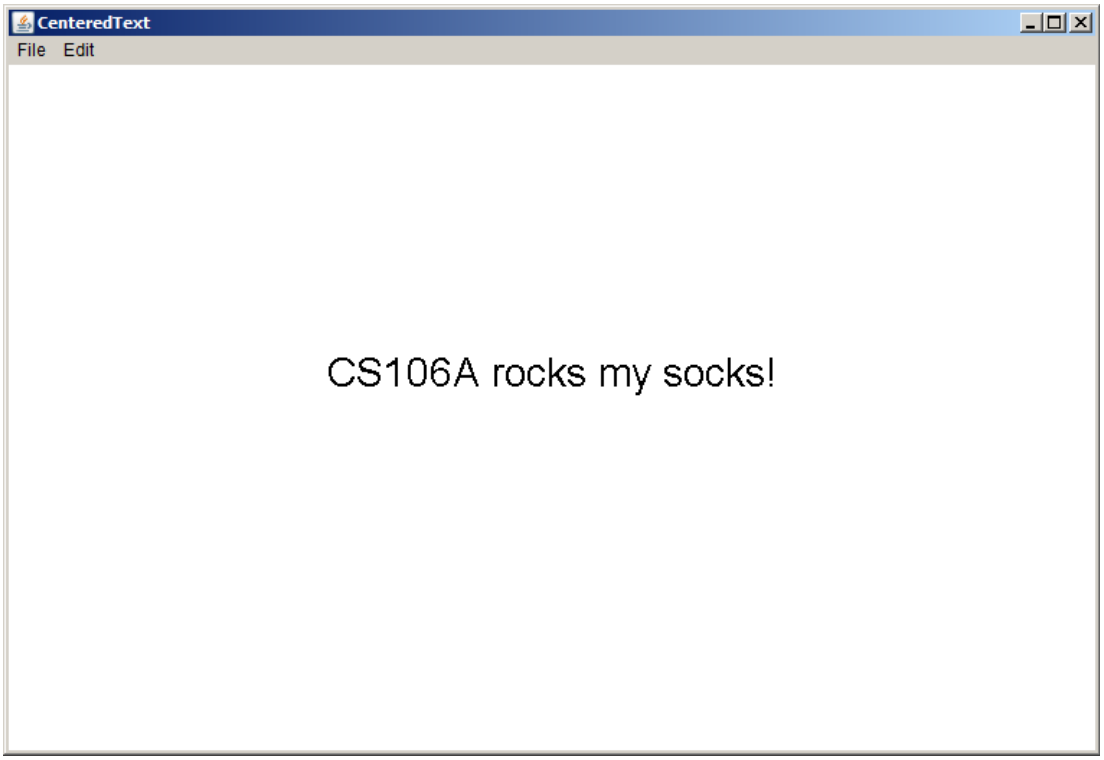
An aside: The Fibonacci sequence has numerous applications in computer science and shows up in surprising places. It's used to efficiently compute logarithms, index and retrieve data, and as a building block in some route-planning algorithms.

2. Drawing centered text

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

CS106A rocks my socks!

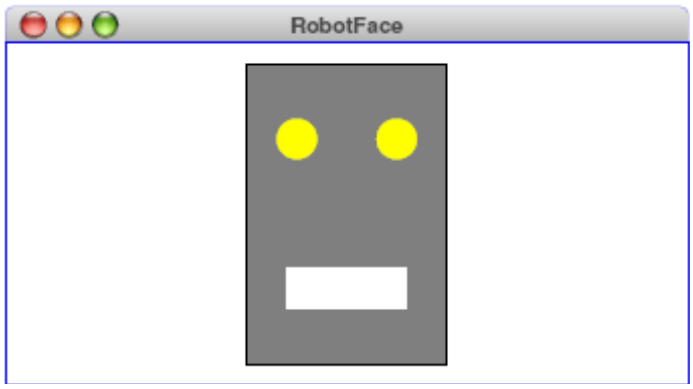
The text should be displayed in SansSerif 28-point font, and centered horizontally and vertically in the middle of the graphics window, looking something like this:



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.

3. 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 interior of the head is gray, although it should be framed in black.
- *The eyes.* The eyes should be cricles 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.