School of
Engineering and Computer Science
Te Kura Mātai Pūkaha, Pūrorohiko

Assignment 1: Input, Output, Variables.

Intro to Programming, XMUT, 2017 : Assignment 1

- Due Sep 28 23:30

Goals

The goal of this assignment is for you to be able to construct programs in Java that
- have buttons
- use methods to get simple user input
- use variables for storing values, and expressions for computing values.
- use methods for output, both text and graphics.

Resources and links

- Copy the files for Assignment 1 from the lab computer to a USB stick and then to your computer, OR
- Download Zip file and unzip it.

To Submit

- Your circuit calculator program: `CircuitCalculator.java`
- Your flag drawer program: `FlagDrawer.java`

Remember to submit the **`.java`** files, NOT the **`.class`** files (the marker can't read these!).

Summary

There are two parts to the assignment:
- Circuit Calculator:
  ➡ Write a program to calculate properties of a voltage divider circuit.
- Flag Drawer:
  ➡ #Write a program to draw several flags.

Marking

Each program in this assignment, as in all assignments, will be marked out of 100. The marks will be allocated according to the following criteria:
- 0: did nothing or submitted too late (after the answers were posted),
- 1-59: attempted, but many errors, or incomplete (Grade: F)
- 60-79: got most of the Core working correctly, but little or none of Completion (Grade: D to C+)
- 80-89: got most of the Core and Completion working (Grade: B to B+)
- 90-100: got the Core and Completion working, and attempted some of the Challenge (Grade: A to A+)

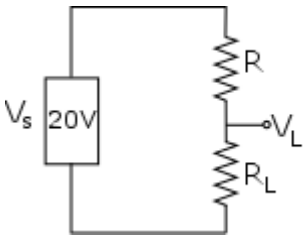
Note since this assignment has two programs, completing the core of one program and doing nothing on the other program, will get you less than 60% on the assignment

Program 1: Calculate Circuit Properties

Complete the **`CircuitCalculator`** program that calculates properties of a voltage divider circuit that has a supply voltage of 20 volts.

Core

Complete the `calculateCircuitCore` method to calculate properties of the following simple voltage divider circuit:



The method should:

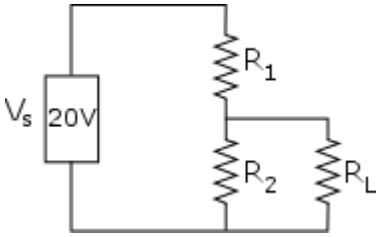
1. Ask the user for the values of R, and the load resistor (R_L).
2. Calculate and print the load voltage (voltage $V_{L<\sub>}$ across R_L), the load current,and the load power.
3. Calculate and print the supply power and the efficiency of the circuit (load power divided by supply power)

For example, if the user enters 300 for R, and enters 100 for R_L, then the method should print out:

- Load voltage is 5.0 V
- Load current is 0.05 A
- Load power is 0.25 W
- Supply power is 1 W
- Efficiency is 25%

Completion

A more realistic voltage divider circuit is given in the following diragram:



Complete the `calculateCircuit` method to ask for the values of the three resistors and then calculate the same properties of this circuit.

Challenge

For real circuits, the load resistance may vary. Depending on the choice of R_1 and R_2, the load voltage may be sensitive to the load resistance. Add a third button to your calculator that will ask for the same three values of the resistors, then print out the possible range of the load voltage and the possible range of the efficiency, if the load resistance varied by plus or minus 10%.

Program 2: Flags of the World (A Shapes Drawer)

Different flags of the world have various shapes on them. In this part of the assignment, you will write a `FlagDrawer` program with methods that draw several flags that are a bit more complicated than in the

exercise. Just like the exercise, your methods should ask the sure for the width of the flag and then draw it.

Note:

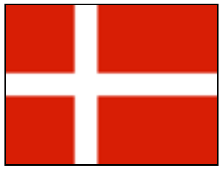
- Use the constants `LEFT` and `TOP` for the position of the flag.
- The exact colours of the flags will also be difficult to match; It is fine to use the standard colours: red, green, blue, orange, etc. (See the Java Documentation on `Color` to find out what standard colors are available, but you can use more accurate colours if you wish.)

Quick Tips

- You can find lots of details, including the correct dimensions and colours, of flags from http://www.crwflags.com/fotw/flags/
- You may not use the `UI.drawImage` method!

Core

Complete the methods for drawing the flags of Denmark and Greece. T


Denmark


Greece

The Denmark flag isn't much harder than the exercises, but note there are at least two very different ways of drawing it.

There is more than one way you can do the Greek flag. Think about the different ways before you start trying to draw the flag.

The dimensions of the Greek flag are straightforward. There are 9 horizontal strips with the same thickness; so each must have a thickness of 1/9 of the height. The cross in the top left corner is the same height as 5 of the strips, so it must be 5/9 of the height. Because it has the same height and width, its width must also be 5/9 of the height. Like the horizontal strips, the thickness of the strips in the cross are 1/9 of the height.

Hint: You can draw shapes on top of other shapes if it makes things easier!

Hint: `Color.red.darker()` would be a darker shade of the red colour. You may want to do something like this to get the dark blue for the Greek flag.

Completion

Complete the method for drawing a pacman flag.

The pacman flag is not an official flag! You will need to use `fillArc` for drawing the pacman; read the UI documentation carefully, and draw yourself some diagrams.


Pacman


China

Challenge

Write a method to draw the flag of the China.

The China flag is tricky to draw because of the stars! You may need to use the documentation to find out more of the drawing actions of the UI in order to do it. You can get 5 of the 10 marks for drawing circles instead of stars, but you need stars to get full marks.