

Lab 04 (Due: Monday, February 22, 2015, 11 : 59 : 00pm)

CSCE 155N

1 Lab Objectives

- Trace simple code that uses control structures: `if`, `switch`, `while`, `for`.
- Develop simple programs that use control structures to manipulate arrays.

2 Prior to Laboratory

- Review the laboratory handout
- Read chapters 4 & 5
- Pseudocode: for more information, check the Supplemental Resources section at the end of the handout
- Venn Diagram: for more information, check the Supplemental Resources section at the end of the handout

3 Topics Covered in Lab

- Trace code that uses control structures
- Simple Applications

4 Activities/Exercises

- Trace code
- Control structures and arrays

Practice

Trace the following code fragments *by hand*, and report the values of each variable.

```
1 a = [ 1 , 2 , 3 , 4 , 5 ];
2 for i = 3 : 5
3     a( i ) = 2 * a( i - 1 ) + a( i - 2 );
4 end
```

Before You Begin

- Download files from <http://cse.unl.edu/~cse155n/labs/04> to your Z:\csce155n directory
- Unzip the file

4.1 Smallest of Three Numbers

- Modify `smallest.m`, so that the function correctly computes the smallest value among three (3) values.
- **Do not use MATLAB's *min* or *max* functions.**

The GUI will display three numbers and the minimum value (according to your program).

4.2 Making Change

- Modify `makeChange.m`, so that the function returns the number of quarters, dimes, nickels, and pennies that can be used to make the provided number of cents.
- The function should return the minimum number of coins needed to achieve this (quarters first, then dimes, nickels, and pennies).
- **fix may be a useful function**

Correct output in the GUI is when the number of quarters, dimes, nickels, and pennies will give the total displayed.

4.3 Factorial

- Modify `findFactorial.m`, so that the function returns values of $n!$ (n factorial). $n!$ is defined as $1 \times 2 \times \dots \times n$ for values greater than 0. $0! = 1$ by definition.
- Block unnecessary output with the semicolon ;.
- **Do not use MATLAB's *prod* or *factorial* functions.**

The GUI will a number and its factorial (according to your program).

4.4 10% Extra Credit: Leap Years

- Modify `isLeapYear.m`, so that the function returns 1 if the provided year is a leap year.
- Leap years are divisible by four (4)
- Years divisible by 100 are only leap years if they are also divisible by 400

See the diagram below for a visualization.

- The larger black circle encloses all numbers
- The larger white circle encloses numbers divisible by 4

- The smaller black circle encloses numbers divisible by 100
- The smaller white circle encloses numbers divisible by 400
- Leap years are in the white areas

The GUI will display green for leap years and red for non-leap years (according to your program).

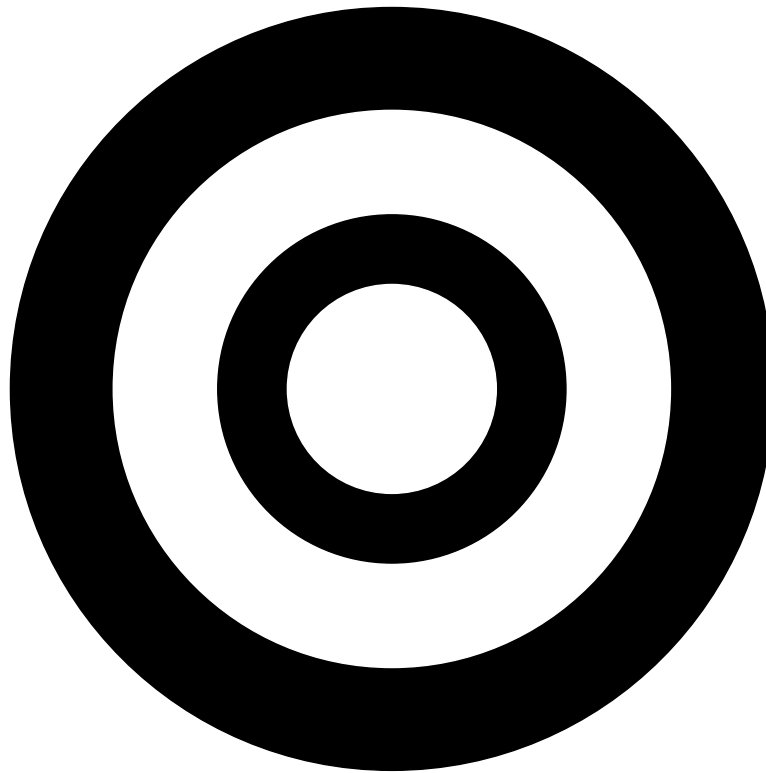


Figure 1: Visualization of Leap Years (white) among All Years (Black)

4.5 members04lab.txt

- Open file members04lab.txt
- Replace wcampbell and galgar with the cse.unl.edu usernames of you and your partner
- Save the File

4.6 contributions04lab.txt

- Open file contributions04lab.txt

- Write **your** explanation of what you and your partner each contributed to completing the lab
- Save the File

5 Code Documentation

Remember to document your files in the way that we did for the previous labs. It will come in handy when you look back at code after a long time, or when someone else is trying to understand what your code does.

6 What to Submit

You will be submitting five (5) or six (6) files (`smallest.m`, `makeChange.m`, `findFactorial.m`, and (maybe) `isLeapYear.m` along with `members04lab.txt` and `contributions04lab.txt`).

All group members should submit `findFactorial.m`. It will be used in Lab 05.

7 Additional Resources

Online MATLAB Documentation

CSE Webhandin

CSE webgrader

8 Think About...

- This lab and the next (with more applications) are very important. MATLAB specializes in using arrays/matrices and control structures (`if` statements and loops). They will be used throughout the course to build larger and more complex programs. Have you encountered any problems completing this lab? Have you discussed them with your lab instructor?
- What is the advantage of writing pseudocode before coding? What hurdles have you encountered that prevented you from writing down in a clear/simple fashion?
- Based on the Venn diagram, have you noticed a single expression that can be used to determine if a year is a leap year? What is it?

9 Point Allocation

Component	Points
<code>smallest.m</code>	25
<code>makeChange.m</code>	25
<code>findFactorial.m</code>	25
<code>members04lab.txt</code>	5
<code>contributions04lab.txt</code>	5
webgrader PDF	15
Total	100