Math 107 Lecture 9

Pseudocode and Nested Loops

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» Announcements and Objectives

Announcements

- Skill Check 3 is in two weeks (10/9, 60 mins then lecture)
- Pre-Notes due before start of next lecture
- Assignments Due Friday (9/27):
  - HW4 Handwritten Questions
  - HW4 Coding Problems
  - HW4 MATLAB File Upload

Objectives

- Develop problem-solving techniques for programming
- Write pseudocode to plan programming tasks
- Use nested loops to perform computations

Pseudocode

» What is Pseudocode?

Pseudocode is a detailed yet readable description of what a computer program or algorithm should do. It uses a mix of programming conventions (e.g., assignment operators, loops, conditional statements) along with informal notation of actions and conditions.

* Pseudocode is NOT a programming language nor can it be compiled into an executable program.
* There is no one approach to writing pseudocode.

» Pseudocode Example

Suppose we are given a vector and want to find the sum of its even elements.

Good Pseudocode

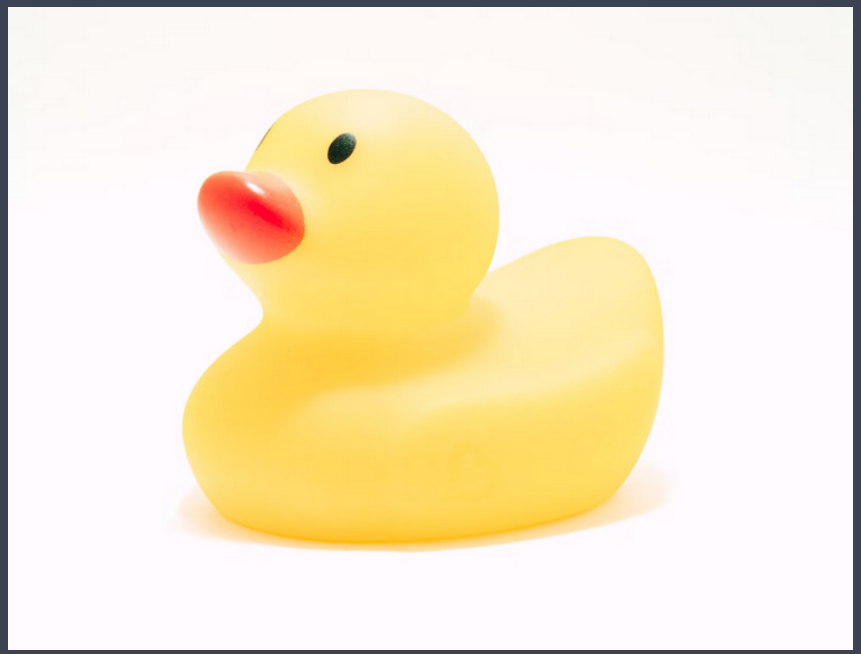
```
initialize sum variable
for each index of array
        if array(index) divisible by 2 then
                add array(index) to sum variable
return sum variable
```

Bad Pseudocode

```
s = 0
for i = 1:20
        if mod(array(i),2) = 0
                s = s + array(i)
        end
end
```

» Rubber Ducking

Rubber ducking is short form for 'rubber duck debugging' and is a method of debugging code. The term is conceptualized from a book where a programmer carried around a rubber duck with them and had to explain their code line-by-line to the rubber duck.



» Leap Year

Our calendar typically consists of 365 days. However, the time it takes for the earth to complete one full rotation around the sun is actually 365.25 days. To account for this, we have an extra day in our calendar every 4 years called a leap year. The requirements for a year to be a leap year are as follows:

1. The year must be divisible by 4.
2. If the year is divisible by 100 (e.g., 1700, 1800, etc.), the year must also be divisible by 400.

Some examples of leap years are 1600, 1712, and 2016. However, 1700 and 1800 are not leap years.

Task: Write a function called leapYear that takes as input the variable year and outputs the variable msg. The variable msg should contain either the string 'This is a leap year.' or 'This is not a leap year.' depending on the value of year. Test your function with the example years above (1600, 1712, 2016, 1700, 1800). **START BY WRITING PSEUDOCODE.**

ATM Activity

Nested Loops

» Nested Loops

A **nested loop** is *a* loop within *a* loop.

Nested for loop

```
for loop_index1 = row_vector1
    for loop_index2 = row_vector2
        (calculation)
    end
end
```

Nested while loop

```
while (condition1)
    while (condition2)
        (calculation)
    end
end
```