



**SUMMER SESSION II 2013**  
**EECS 10 WEEK4 DISCUSSION1**  
Che-Wei Chang

## OUTLINE

- Assignment 4 Part2
  - Option 6-10 of Menu Driven Calculator for floating point number [25pts]
- Concept review: Array



## ASSIGNMENT DISCUSSION

- Assignment 4, Part 2
  - Before you implement your work, review lecture slides about **repetition structure** and **function**.
  - Read the assignment handout carefully
- Option 6-10 of calculator for floating point number
  - What is the input? What is the output?
  - What algorithm to solve this problem?
  - What is the control flow for this program?
  - How to implement this program?



## MENU DRIVEN CALCULATOR

- Prompt a menu and user can choose the operation
- Operation List
  - 1. Add
  - 2. Subtract
  - 3. Multiply
  - 4. Divide
  - 5. Absolute
  - 6. Square Root
  - 7. sine
  - 8. cosine
  - 9. tangent
  - 10. N-th root (Bonus)
  - 11. Quit

Part 1

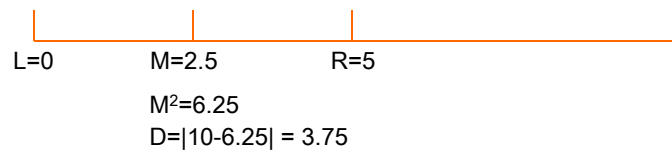
Part 2





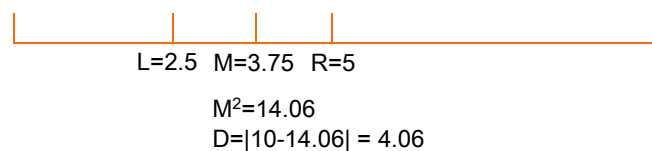
## SQUARE ROOT CALCULATION

- Assumption
  - input is a positive natural number (ex. 0, 1, 2, 3, 4, ...)
- Input / Output
  - Input: positive natural number
  - Output: square root of the input number
- Algorithm
  - Binary search approximation
  - Ex. Square root of **10**



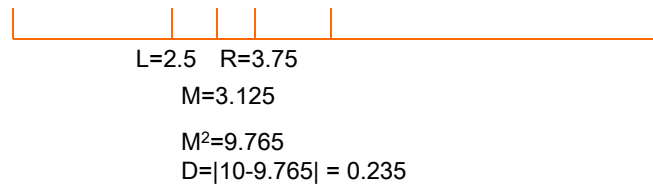
## SQUARE ROOT CALCULATION

- Assumption
  - input is a positive natural number (ex. 0, 1, 2, 3, 4, ...)
- Input / Output
  - Input: positive natural number
  - Output: square root of the input number
- Algorithm
  - Binary search approximation
  - Ex. Square root of **10**



## SQUARE ROOT CALCULATION

- Assumption
  - input is a positive natural number (ex. 0, 1, 2, 3, 4, ...)
- Input / Output
  - Input: positive natural number
  - Output: square root of the input number
- Algorithm
  - Binary search approximation
  - Ex. Square root of **10**



## SQUARE ROOT CALCULATION

- Assumption
  - input is a positive natural number (ex. 0, 1, 2, 3, 4, ...)
- Input / Output
  - Input: positive natural number
  - Output: square root of the input number
- Algorithm
  - Binary search approximation
  - Ex. Square root of **10**
  - Terminate the binary search when
    - $D < 0.00001$



## SQUARE ROOT CALCULATION

### ○ Pseudo Code

- Start with a range of 0 to N
- As long as the range is not accurate enough, repeat the following steps:
- Compute the middle of the range
- Compare the square of the middle value with N
- If the middle value is less than the square root
  - Use middle-to-right as the new range
- Otherwise
  - Use left-to-middle as the new range
- Output the middle of the latest range as result

### ○ What if we want to compute N-th Root ?



## SIN / COSINE / TANGENT

- Exercise of reusing program
- Please reuse your program from assignment 2
- For Tangent calculation, just use Taylor series
  - Can use program from the solution as well
- If the input is out of the range  $\langle -1.3, 1.3 \rangle$ , prompt error message as the error handling, and return to the menu so that the user can choose option again.



## ASSIGNMENT DISCUSSION

- Bonus – N-th root calculation
  - Prompt a message and ask user the value of N
- Briefly describe the control flow for your menu-driven calculator program in txt file
- Name your files **calculator.c**, **calculator.txt** and **calculator.script**.



## CONCEPT REVIEW: COMPLEX DATA STRUCTURE

- Single data elements for basic (non-composite) type
  - Integer types
  - Floating point types
- Complex data structure using composite types
  - **Array**, lists, queues, stacks
  - Trees, graphs
  - Dictionaries
- ANSI C provides built-in support for
  - **Arrays**
  - Structures, unions, enumerators
  - pointers



## ARRAY

### ○ Array

- Composite data type in C
- Fixed number of elements
- Element access by index

### ○ Multiple-dimension array

- Arrays of an array
- How to define a one dimension array of size 10 ?  
`int x [10]`
- How to define a two dimension array of size 4x3 ?  
`int y [4][3]`

## PASSING ARGUMENT TO FUNCTIONS

- What is [Pass by value] ?
  - Only the current value is passed as argument
  - The parameter is a copy of the argument
  - Change to the parameter do not affect the argument
- What is [Pass by reference] ?
  - A reference to the object is passed as argument
  - The parameter is a reference to the argument
  - Change to the parameter do affect the argument
- For the data type we've learned so far, which types in C language are passed by value, and which are passed by reference?
  - Basic types are passed by value
  - Arrays are passed by reference
- Please refer to Slides #28-29 in lecture 7



## STRING

- Array of characters, null-terminated
- How to define a string with initial value of "Hello"?
  - `char mystring[]="Hello";`
- How to display this string by using the `printf()` ?
  - `printf("%s", mystring);`
- How to read standard input to a string?

Example:

```
char s1[6];
printf("Enter a string: ");
scanf("%5s", &s1[0]);
printf("s1 is %s.\n", s1);
```

```
Enter a string: Test
s1 is Test.
```

	s1
0	'T'
1	'e'
2	's'
3	't'
4	0
5	0

- Please refer to slices #30~36 for more details about strings.

