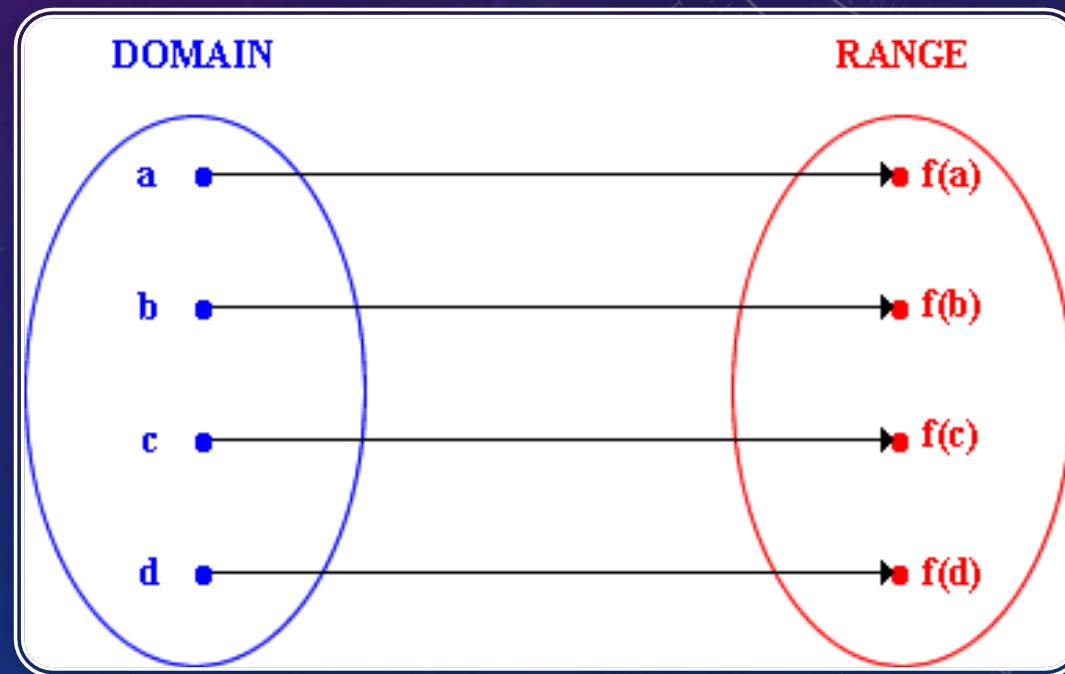


Software Workshop No. 2

UCSB Robotics, Fall 2020 | Alex Mei

LAST TIME...

- Software in Robotics
- Standard Input & Output
- Variables and the 5 Basic Data Types
- User Defined Functions



TODAY'S AGENDA

- Boolean Operators
- Conditional Statements
- Arrays and Strings
- Loops



A LIL' REVIEW

Given a number of cents (n), a cashier returns the smallest number of coins possible from quarters (25c), dimes (10c), nickels (5c), and pennies (1c).

Write a function that takes the number of cents as input and returns the smallest possible number of coins given as exact change.

BOOLEAN OPERATORS

- Equality Operator (`==`): returns True if the operands are equal
- Inequality Operator (`!=`): returns True if the operands are not equal
- Comparison Operators (`>`, `>=`, `<`, `<=`): returns True if the operands satisfy the respective property
- Negation Operator (`!`): negates the boolean value

CONTROL FLOW

- Definition: a branch in the program that proceeds differently based on a condition

```
5      if(1 + 1 == 10){  
6          cout << "Binary!" << endl;  
7      }  
8      else if(true == 1){  
9          cout << "Boolean!" << endl;  
10     }  
11     else{  
12         cout << "Bad Luck!" << endl;  
13     }
```

CONTROL FLOW

- if statement: indication of the start of the conditional block
- else if statement: indication that there is another case within the same conditional block
- else statement: action taken when all other branches have not been taken
- Note: each conditional block has at least 1 if statement, but not necessarily any else if or else statements
- Nested Conditionals: conditional blocks can be nested within each other

YOUR TURN...

Write a function that takes two string arguments which are either "Rock", "Paper", or "Scissors". The function should print the winner of a match of Rock-Paper-Scissors.

As a reminder, Rock crushes Scissors, Paper covers Rock, and Scissors cut Paper.

ARRAYS

- Definition: a collection of a specific type of object
 - Property: Arrays have a fixed size
- Syntax (Declaration): dataType varName[SIZE];
- Syntax (Initialization): dataType varName[] = {value1, value2, ... etc};

ARRAYS

- Array Access: varName[index]
 - Note: the first element of an array is the 0th index of the array
 - Note: if index > array size, C++ won't throw an error

```
int data[5];
bool values[] = {true, false, true, true};
cout << "First element of values array: " << values[0] << endl;
values[0] = !values[0];
cout << "First element of values array: " << values[0] << endl;
```

```
[Running] cd "/Users/alex/Desktop/Robotics/"
First element of values array: 1
First element of values array: 0
```

STRINGS

- Definition: an array of characters
 - Property: characters in a string can be accessed in the same manner as accessing elements within an array
 - Note: unlike arrays, the <string> library has special functions for strings like size() and substr()

```
string s = "a thousand years";
cout << "Fifth character: " << s[4] << endl;
cout << "Size: " << s.size() << endl;
cout << "Substring: " << s.substr(2, 8) << endl;
```

```
[Running] cd "/Users/alex/Desktop/Robotics/"
Fifth character: o
Size: 16
Substring: thousand
```

YOUR TURN...

Pig Latin is a language that morphs an English word by shifting the first letter to the end of the word, followed by the suffix "ay". However, if the first letter is a vowel, the first letter is omitted instead and replaced by the suffix "way".

Write a function which takes an English string returns its translation in Pig Latin.

Example: `pigLatin("stars") = tarssay`

Example: `pigLatin("apple") = ppleway`

LOOPS

- Definition: structure to repeat a task several times
 - For Loop: used when the number of repetitions is fixed
 - While Loop: used when the number of repetitions is dynamic

LOOPS

```
for(int i = 0; i < 4; ++i){  
    cout << "i = " << i << endl;  
}  
  
int j = 2;  
while(j < 20){  
    cout << "j = " << j << endl;  
    j *= j;  
}
```

```
[Running] cd "/Users/alex/Desktop/Robotics/"  
i = 0  
i = 1  
i = 2  
i = 3  
j = 2  
j = 4  
j = 16
```

FOR LOOPS

- For Loop: the first line of the for loop has 3 parts: declaration, condition, increment
 - Declaration: initializes a variable, if necessary
 - Condition: while this condition remains true, the loop will continue
 - Increment: change that occurs with every iteration of the loop

WHILE LOOPS

- While Loop: the first line of the while loop only has the condition
 - Declaration: must be declared outside of the while loop
 - Increment: must be incremented within the loop
 - Infinite Loops: common error when loops forget to increment between iterations

YOUR TURN...

Write a function that takes an array of strings and its length and returns an acronym for that array.

Recall that an acronym is the concatenation of the first letter of each word.

For example, "YOLO" is the acronym for ["You", "Only", "Live", "Once"]