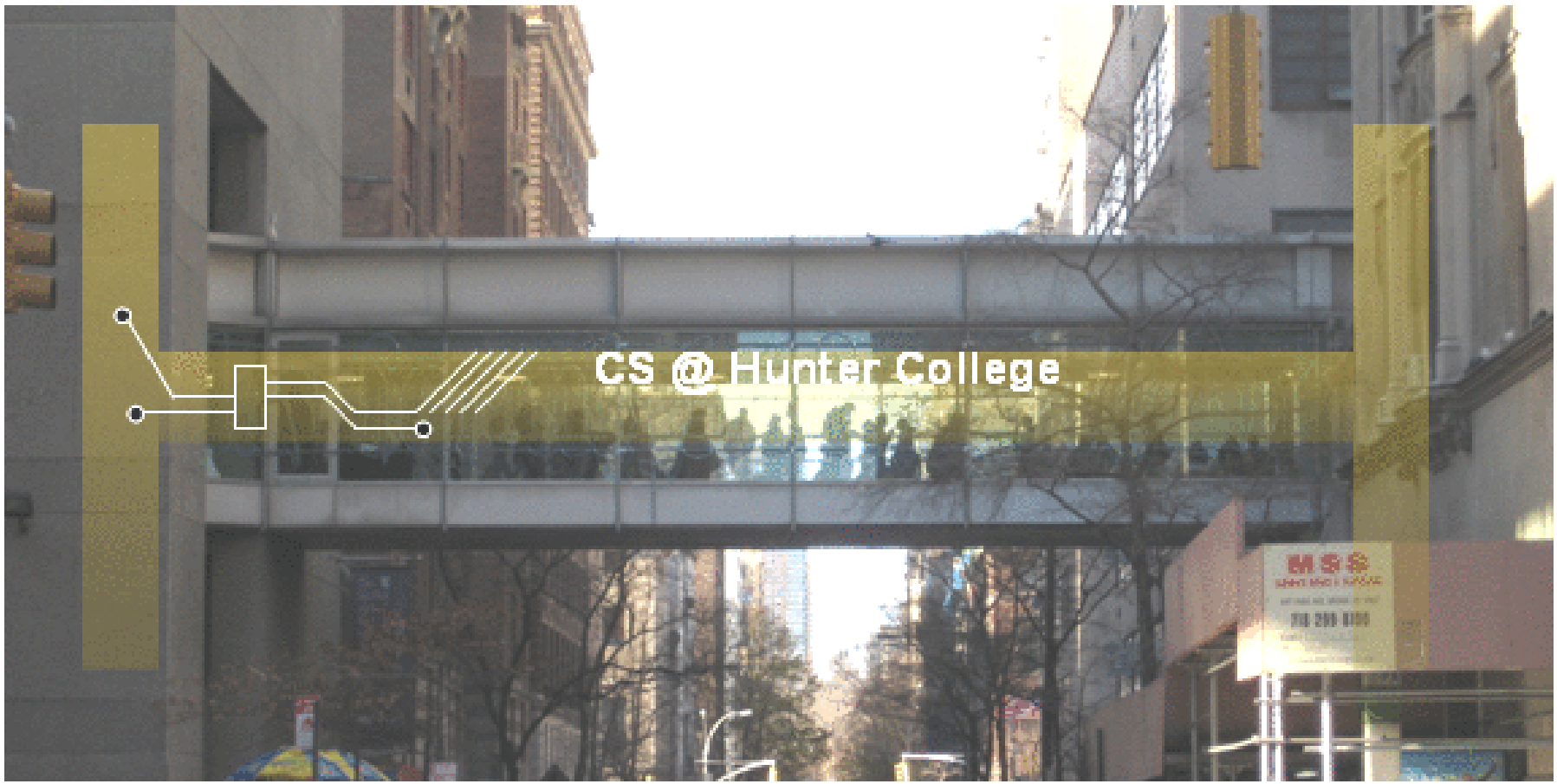
CSci 127: Introduction to Computer Science



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Today's Topics

- Recap: Incrementer Design Challenge
- C++: Basic Format & Variables
- I/O and Definite Loops in C++

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- **Recap: Incrementer Design Challenge**
- C++: Basic Format & Variables
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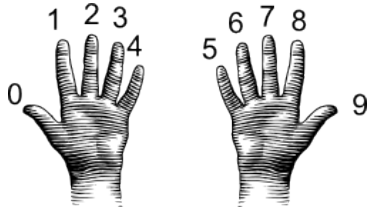
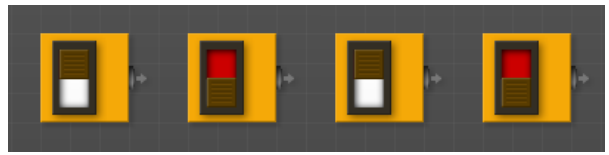
Recap: Design Challenge: Incrementers





- Simplest arithmetic: add one ("increment") a variable.

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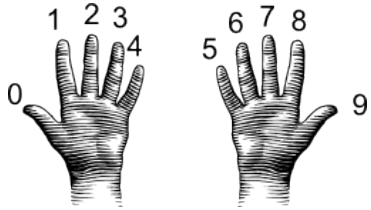

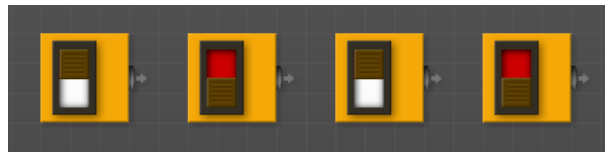

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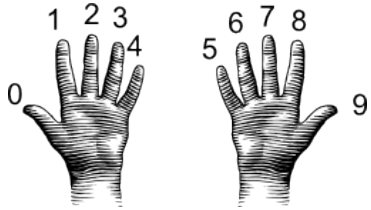

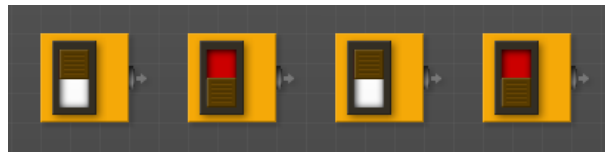

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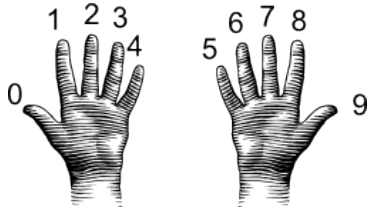

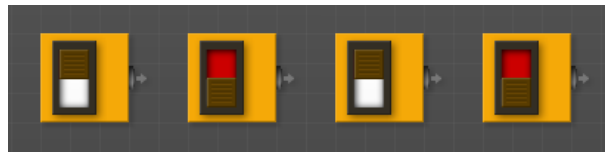

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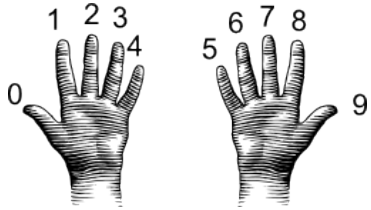

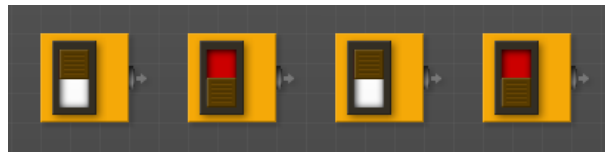

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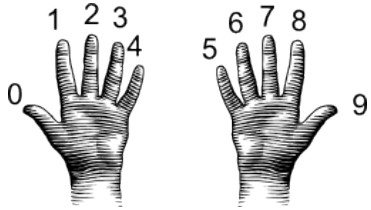

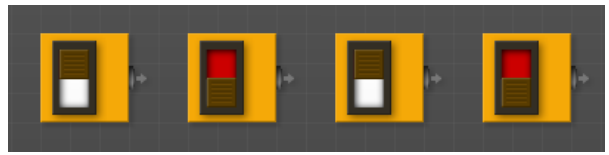

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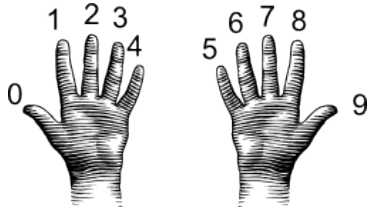

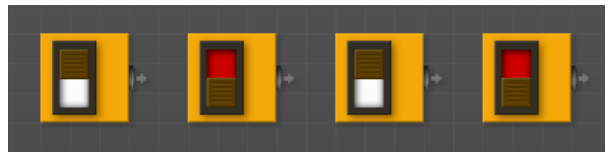

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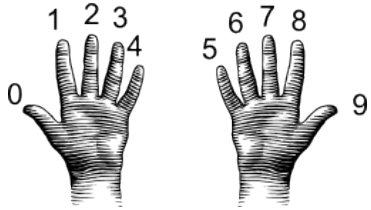

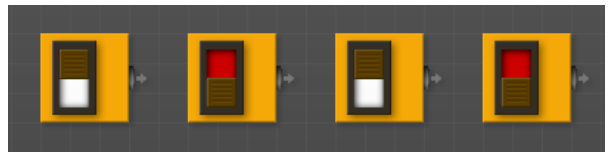

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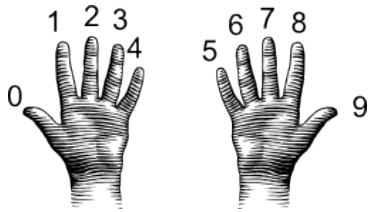

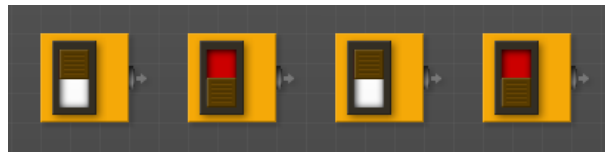

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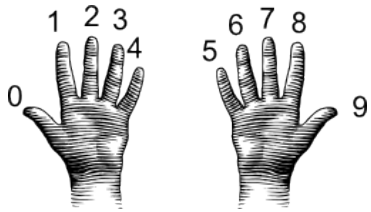

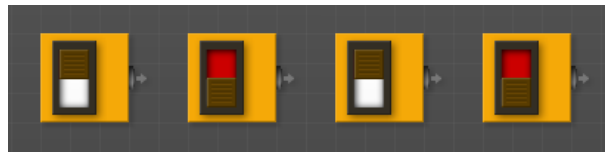

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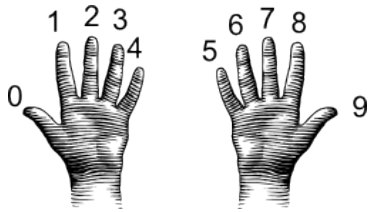

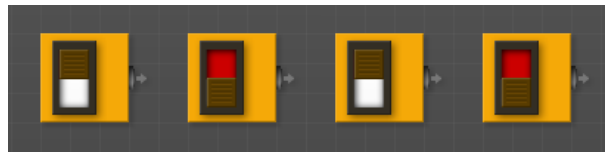

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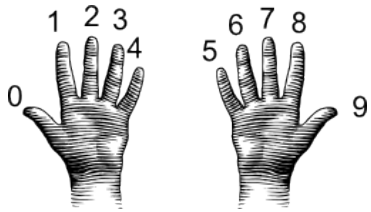

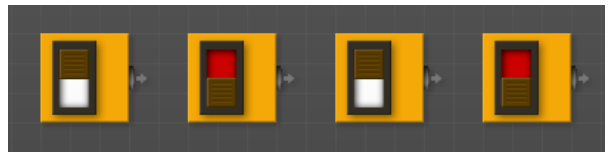

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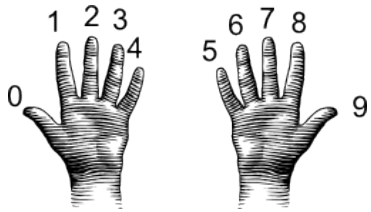

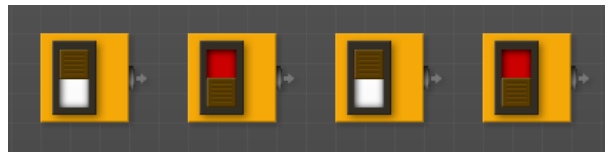

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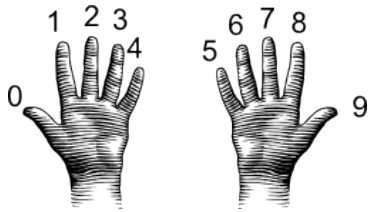

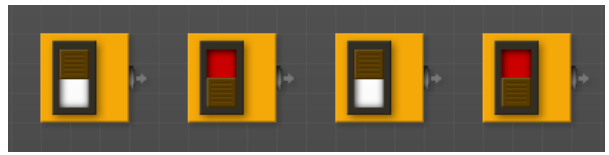

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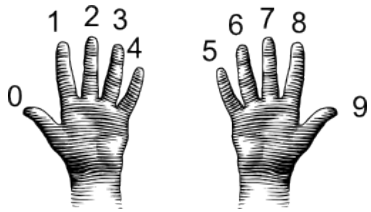

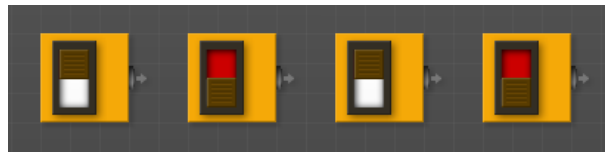

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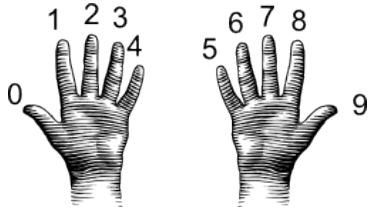

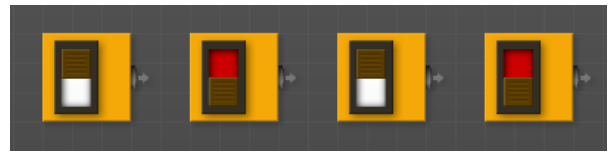

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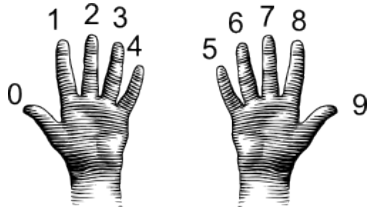

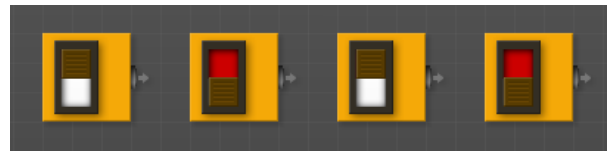

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1. Get user input: `"forty one"`
2. Convert to standard decimal number: `41`

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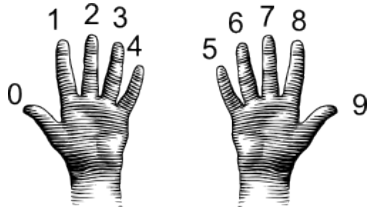

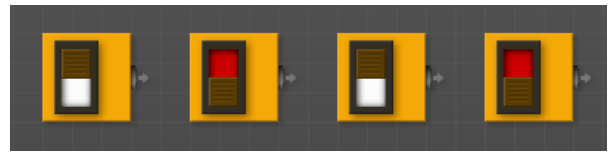

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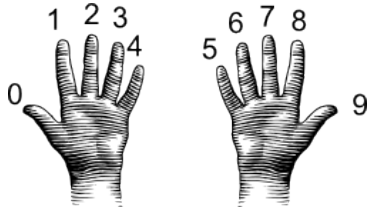

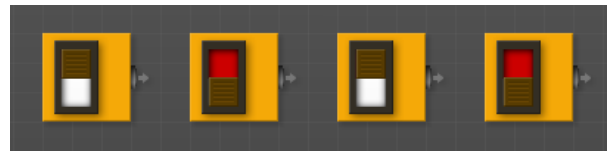

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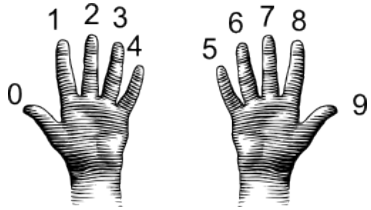

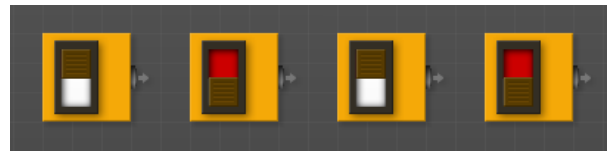

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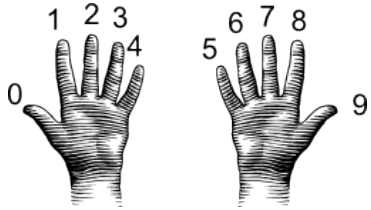

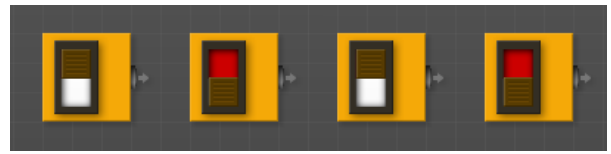

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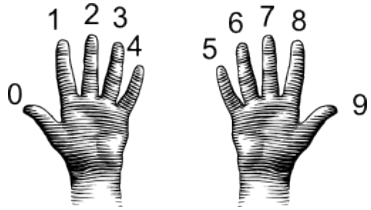
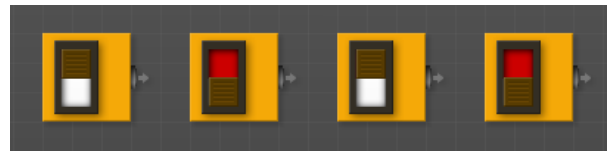
Recap: Incrementer Design Challenge





- Challenge: Write an algorithm for incrementing numbers expressed as words. Example: `"forty one"` $\rightarrow$ `"forty two"`
- Challenge: Write an algorithm for incrementing binary numbers. Example: `"1001"` $\rightarrow$ `"1010"`

Pseudocode same for both questions:

1. Get user input: `"1001"`
2. Convert to standard decimal number: 9

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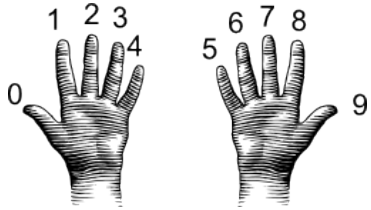

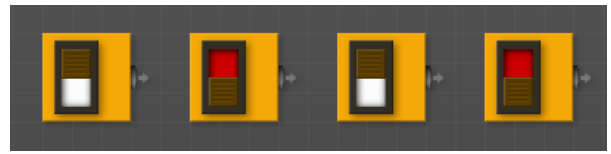

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1. Get user input: `"1001"`
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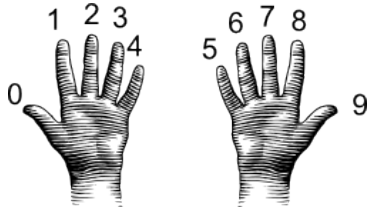

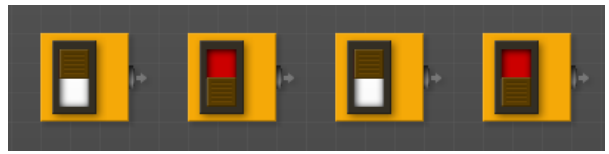

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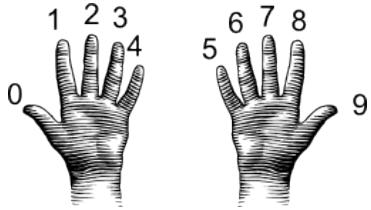

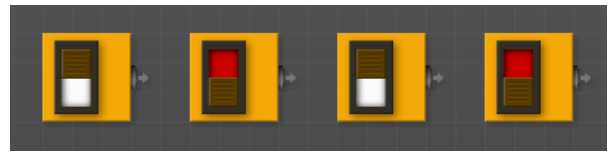

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3. Add one (increment) the standard decimal number: 10
4. Convert back to your format: `"1010"`
5. Print the result.

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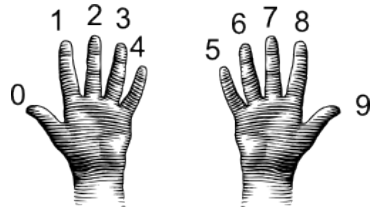

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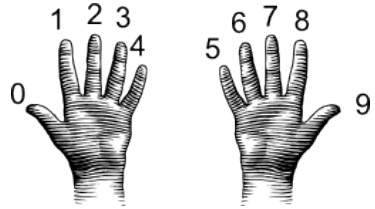

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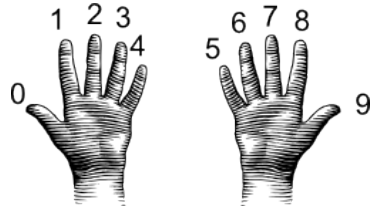

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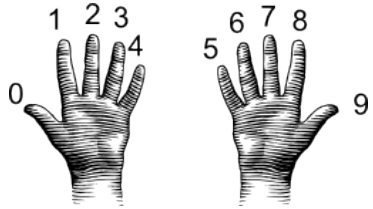

Focus on: Convert to standard decimal number:

```
def convert2Decimal(numString):
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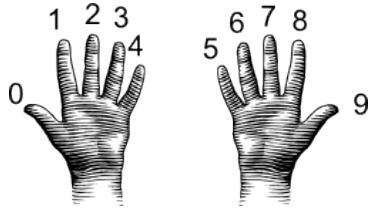

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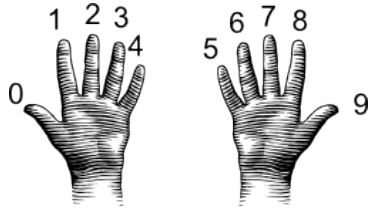

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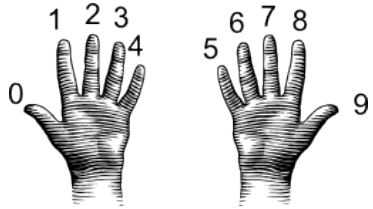

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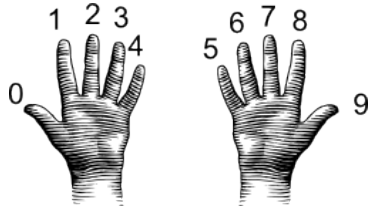

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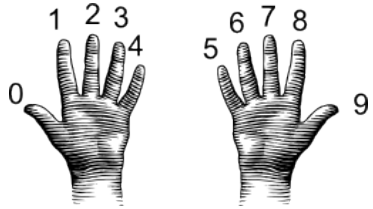

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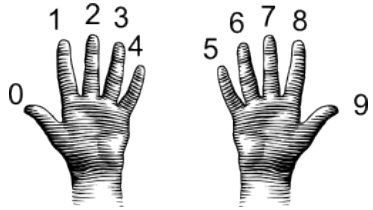
Unit Testing: Incrementer Design Challenge



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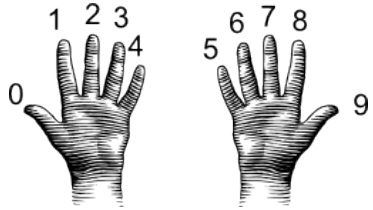

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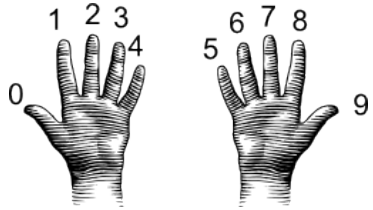

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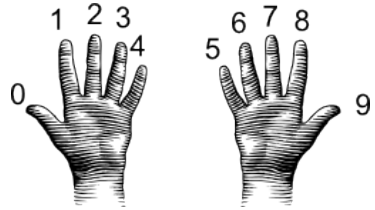

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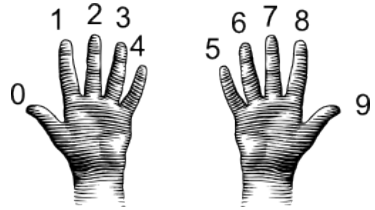

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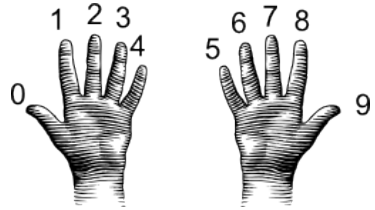

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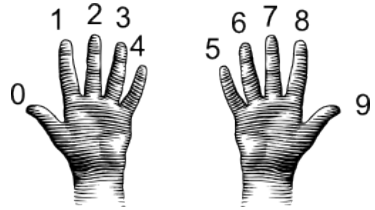

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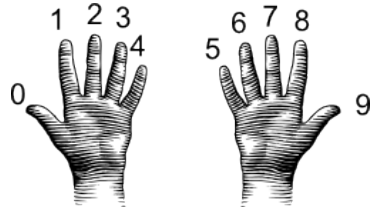

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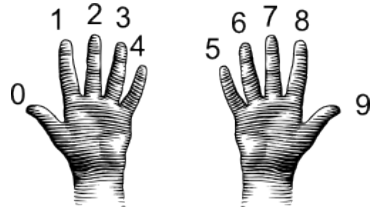

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names = ["zero","one",...,"nine"]
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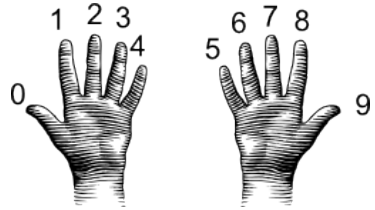

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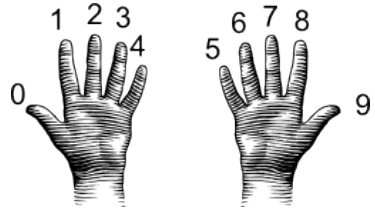

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else:
    #FAIL
```

Today's Topics

- Recap: Incrementer Design Challenge
- **C++: Basic Format & Variables**
- I/O and Definite Loops in C++

Challenge:

- *Using what you know from Python, predict what the C++ code will do:*

```
1  //Another C++ program, demonstrating variables
2  #include <iostream>
3  using namespace std;
4
5  int main ()
6  {
7    int year;
8    cout << "Enter a number: ";
9    cin >> year;
10   cout << "Hello " << year << "!!\n\n";
11   return 0;
12 }
```

onlinegdb demo

```cpp
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(Demo with `onlinegdb`)

Introduction to C++

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- C++ is a popular programming language that extends C.

Introduction to C++

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- Fast, efficient, and powerful.

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- C++ is a popular programming language that extends C.
- Fast, efficient, and powerful.
- Used for systems programming (and future courses!).
- Today, we'll introduce the basic structure and simple input/output (I/O) in C/C++.

Introduction to C++

- Programs are organized in functions.

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Example:

```
int main()
{
    cout << "Hello world!";
    return(0);
}
```

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Introduction to C++

- Programs are organized in functions.
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  `int num;`
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Challenge:

Predict what the following pieces of code will do:

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//Another C++ program, demonstrating I/O & arithmetic
#include <iostream>
using namespace std;

int main ()
{
  float kg, lbs;
  cout << "Enter kg: ";
  cin >> kg;
  lbs = kg * 2.2;
  cout << endl << "Lbs: " << lbs << "\n\n";
  return 0;
}
```
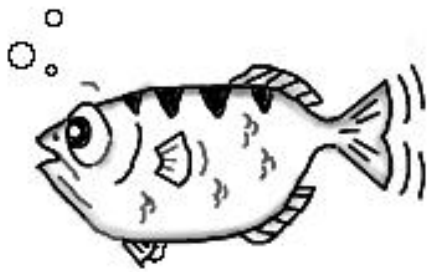

Side Note: gdb



gdb.org

- Part of Richard Stallman's "GNU is Not Unix" (GNU) project.

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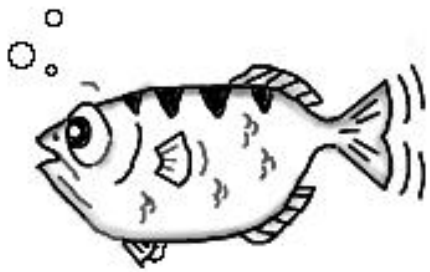

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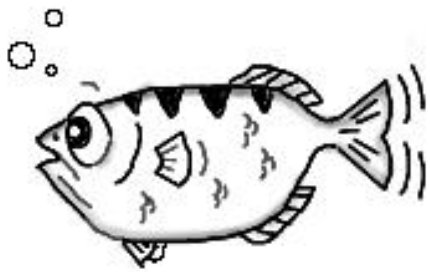

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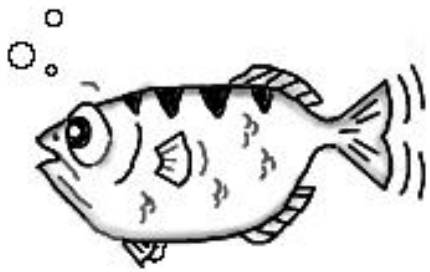

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- Lightweight, widely-available program that allows you to "step through" your code line-by-line.
- Available on the lab machines (via command-line and the IDE spyder) and on-line (onlinegdb.com).

C++ Demo

```cpp
//Another C++ program, demonstrating I/O & arithmetic
#include <iostream>
using namespace std;

int main ()
{
  float kg, lbs;
  cout << "Enter kg: ";
  cin >> kg;
  lbs = kg * 2.2;
  cout << endl << "Lbs: " << lbs << "\n\n";
  return 0;
}
```

(Demo with `onlinegdb`)

Challenge:...

Convert the C++ code to a **Python program**:

```cpp
//Another C++ program, demonstrating I/O & arithmetic
#include <iostream>
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int main ()
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Python Tutor

Convert the C++ code to a **Python program**:

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  cout << endl << "Lbs: " << lbs << "\n\n";
  return 0;
}
```

(Write from scratch in `pythonTutor`.)

Today's Topics

- Recap: Incrementer Design Challenge
- C++: Basic Format & Variables
- **I/O and Definite Loops in C++**

Challenge:

Predict what the following pieces of code will do:

```
//Another C++ program; Demonstrates loops
#include <iostream>
using namespace std;

int main ()
{
  int i,j;
  for (i = 0; i < 4; i++)
  {
      cout << "The world turned upside down...\n";
  }

  for (j = 10; j > 0; j--)
  {
      cout << j << " ";
  }
  cout << "Blast off!!" << endl;

  return 0;
}
```

C++ Demo

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//Another C++ program; Demonstrates loops
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(Demo with `onlinegdb`)

Definite loops

```
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  cout << "Blast off!!" << endl;

  return 0;
}
```

General format:

`for` (*initialization* ; *test* ; *updateAction*)
{

command1;
command2;
command3;
...

}

Challenge:

Predict what the following pieces of code will do:

```
//Another C++ program; Demonstrates loops
#include <iostream>
using namespace std;

int main ()
{
  int i,j,size;
  cout << "Enter size: ";
  cin >> size;
  for (i = 0; i < size; i++)
  {
    for (j = 0; j < size; j++)
      cout << "*";
    cout << endl;
  }
  cout << "\n\n";
  for (i = size; i > 0; i--)
  {
    for (j = 0; j < i; j++)
      cout << "*";
    cout << endl;
  }
  return 0;
}
```

C++ Demo

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int main ()
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  for (i = 0; i < size; i++)
  {
    for (j = 0; j < size; j++)
      cout << "*";
    cout << endl;
  }
  cout << "\n\n";
  for (i = size; i > 0; i--)
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    for (j = 0; j < i; j++)
      cout << "*";
    cout << endl;
  }
  return 0;
}
```

(Demo with `onlinegdb`)

Challenge:

Predict what the following pieces of code will do:

```
//Growth example
#include <iostream>
using namespace std;

int main ()
{
  int population = 100;
  cout << "Year\tPopulation\n";
  for (int year = 0; year < 100; year= year+5)
  {
      cout << year << "\t" << population << "\n";
      population = population * 2;

  }
  return 0;
}
```

Challenge:

Translate the C++ program into Python:

```cpp
//Growth example
#include <iostream>
using namespace std;

int main ()
{
  int population = 100;
  cout << "Year\tPopulation\n";
  for (int year = 0; year < 100; year= year+5)
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  }
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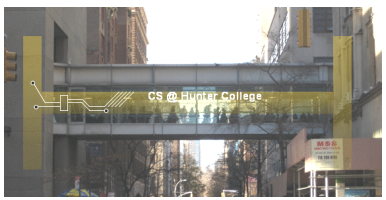
Recap: C++

- C++ is a popular programming language that extends C.



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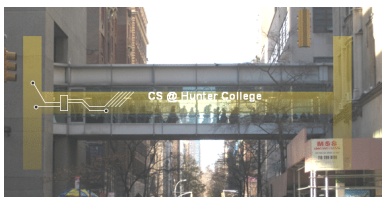

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- Input/Output (I/O):
  - `cin >>`
  - `cout <<`

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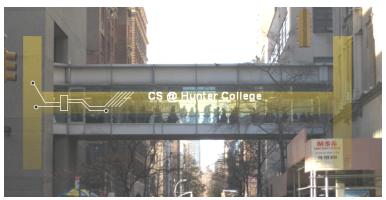

- C++ is a popular programming language that extends C.
- Input/Output (I/O):
  - `cin >>`
  - `cout <<`
- Definite loops:

```
for (i = 0; i < 10; i++) {
    ...
}
```