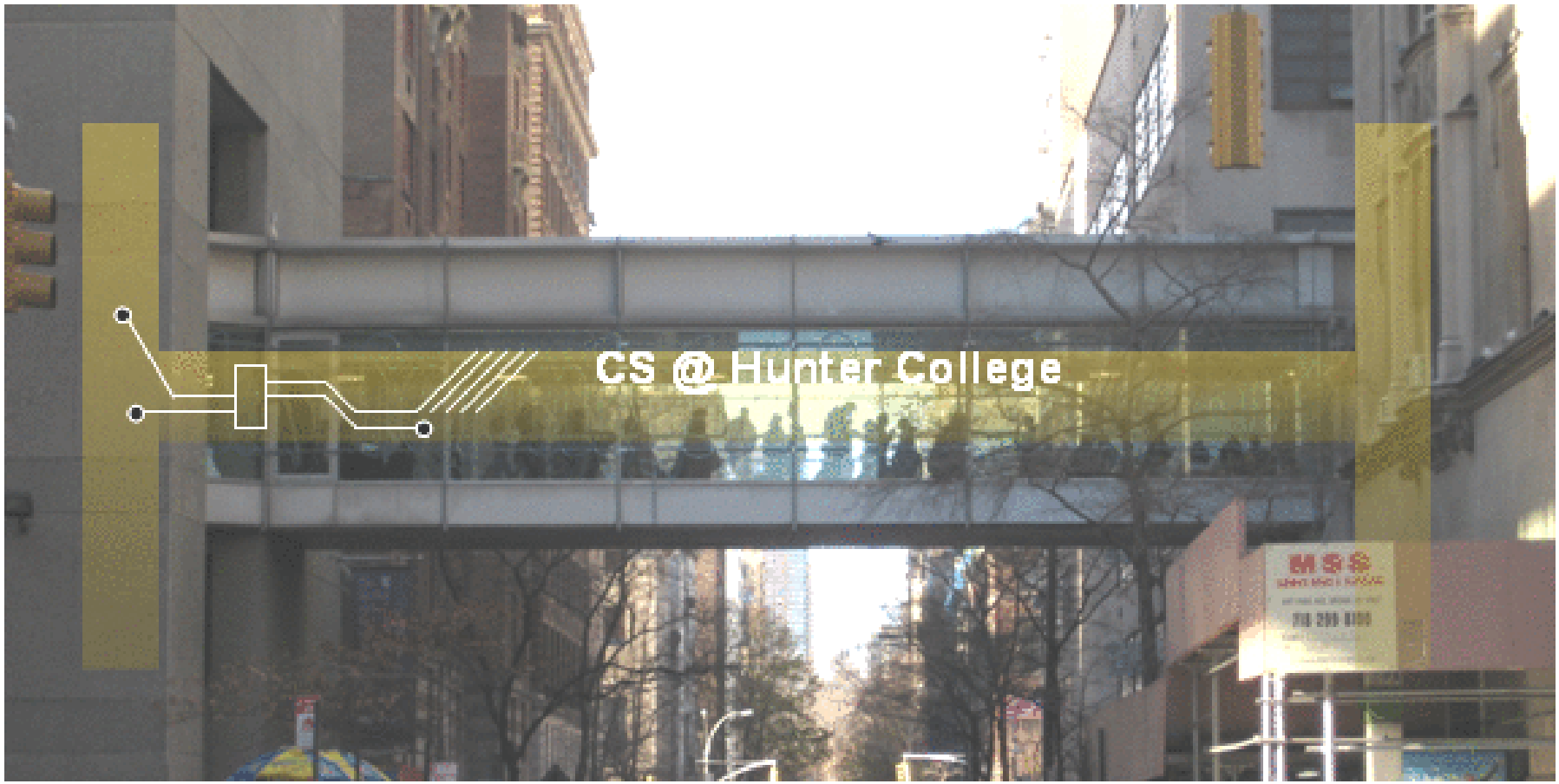
CSci 127: Introduction to Computer Science



hunter.cuny.edu/csci

- This lecture will be recorded

Frequently Asked Questions

From email and tutoring.

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  - *Minors: CSci 133 (More Python) & CSci 232 (Databases)*

A few words on Academic Integrity

From our Syllabus.

Hunter College regards acts of academic dishonesty (e.g., plagiarism, cheating on examinations, obtaining unfair advantage, and falsification of records and official documents) as serious offenses against the values of intellectual honesty. The College is committed to enforcing the CUNY Policy on Academic Integrity and will pursue cases of academic dishonesty according to the Hunter College Academic Integrity Procedures. All incidents of cheating will be reported to the Office of Student Conduct in the Vice President for Student Affairs and Dean of Students office.

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- *If the student is found in violation by the Office of Student Conduct, they will receive a 0 on the exam, which also means they will fail the class.*

Today's Topics

- Recap: Incrementer Design Challenge
- C++: Basic Format & Variables
- I/O and Definite Loops in C++
- More Info on the Final Exam

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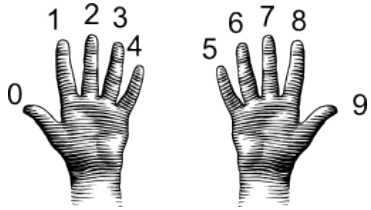

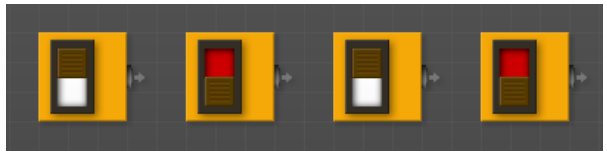

- Simplest arithmetic: add one ("increment") a variable.

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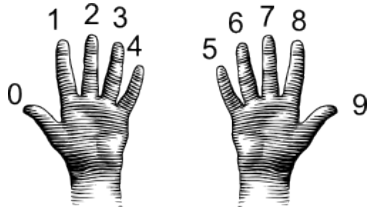

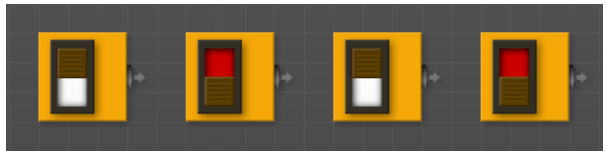

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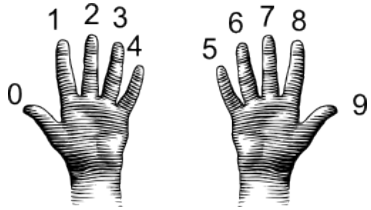

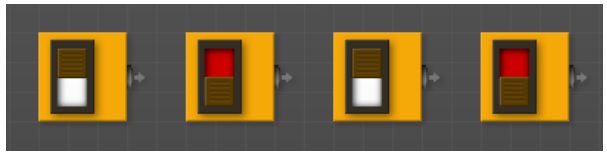

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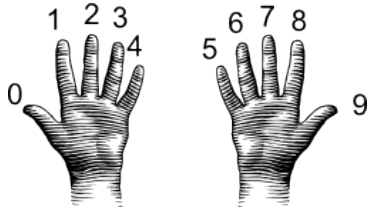

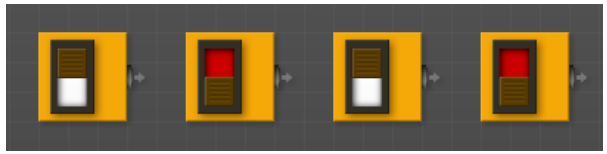

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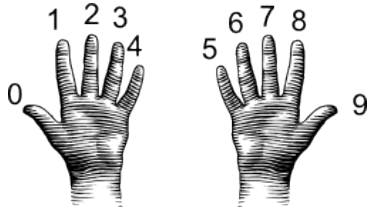

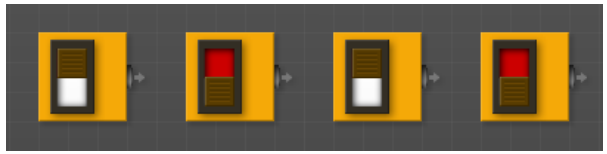

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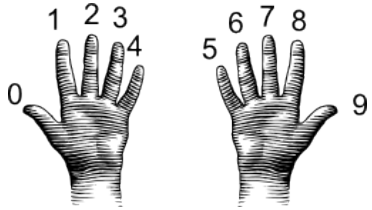

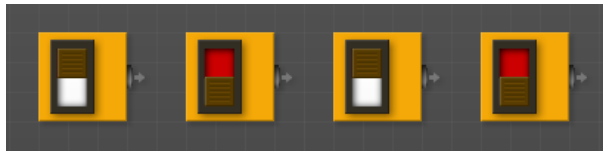

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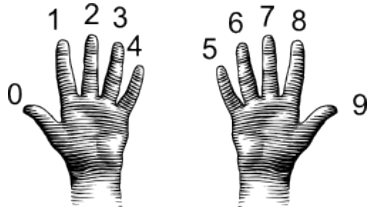

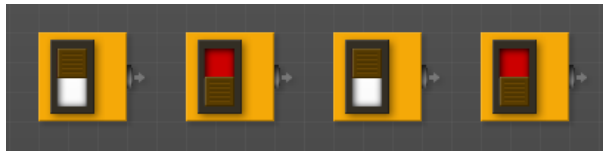

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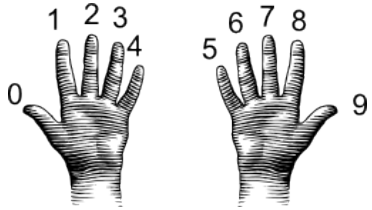

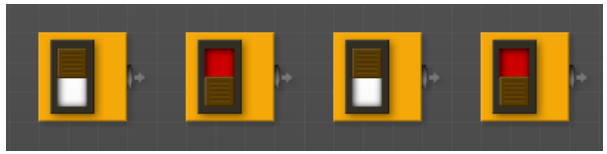

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  Example: `"1001"` → `"1010"`

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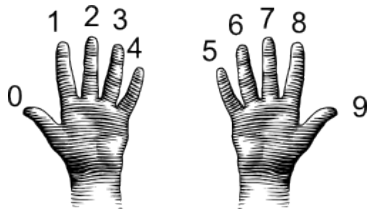

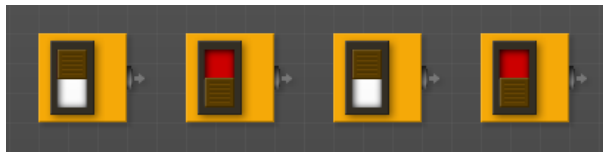

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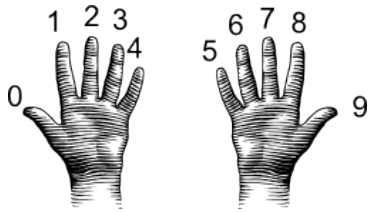

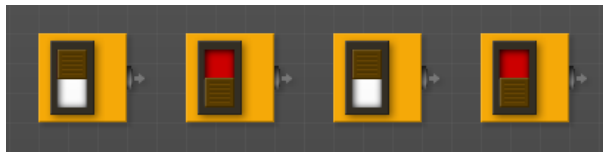

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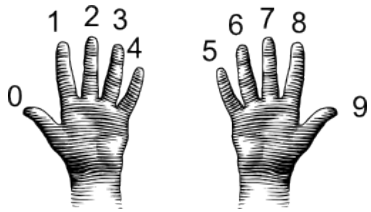

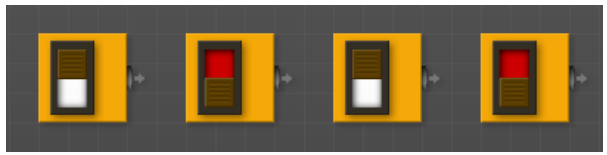

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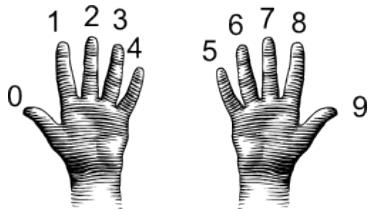

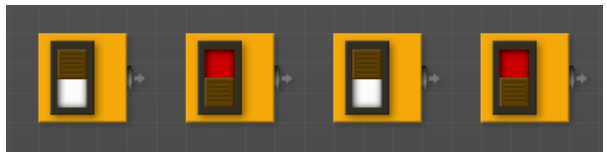

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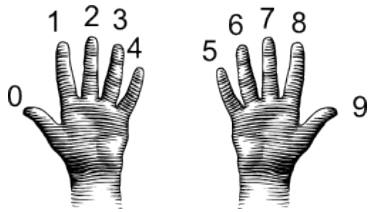

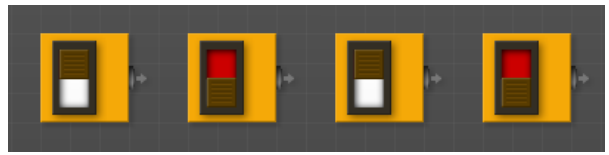

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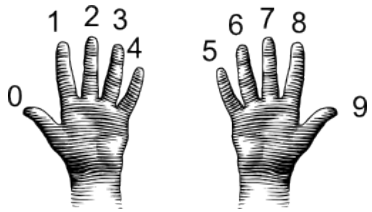

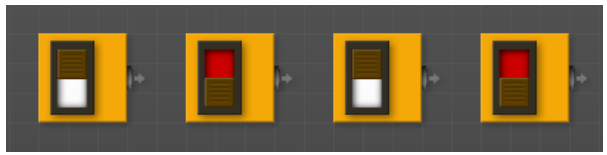

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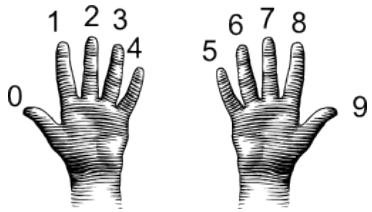

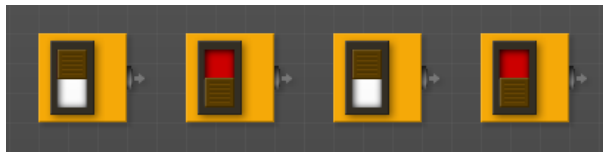

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5. Print the result.

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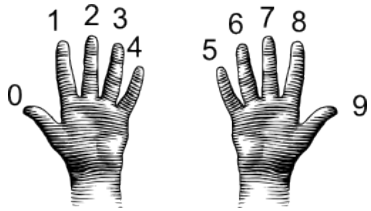

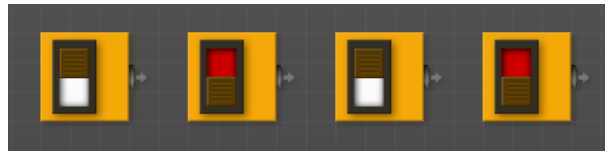

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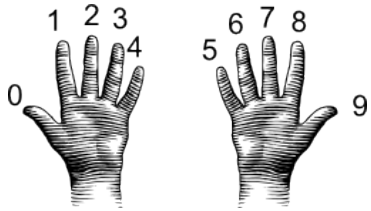

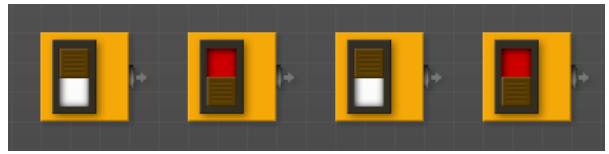

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Pseudocode same for both questions:

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

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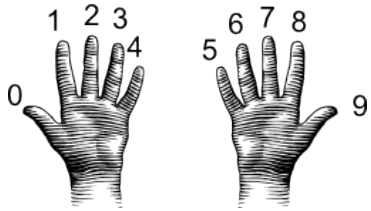

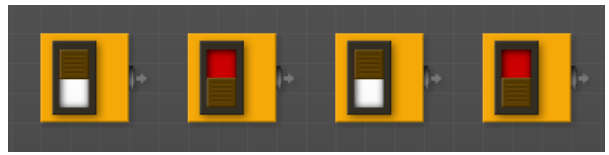

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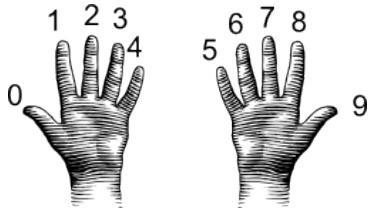
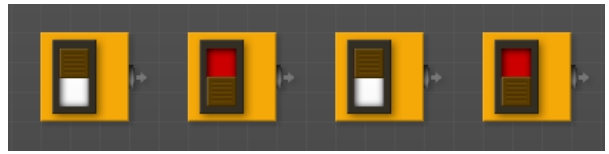
3. Add one (increment) the standard decimal number: `42`

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: `"forty one"`
2. Convert to standard decimal number: `41`
3. Add one (increment) the standard decimal number: `42`
4. Convert back to your format: `"forty two"`

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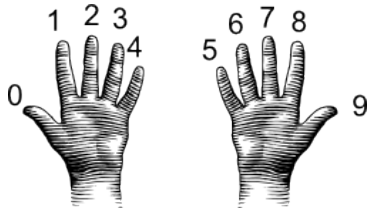

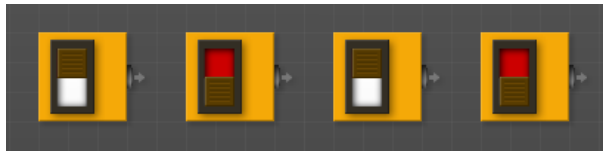

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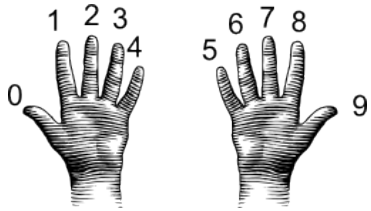

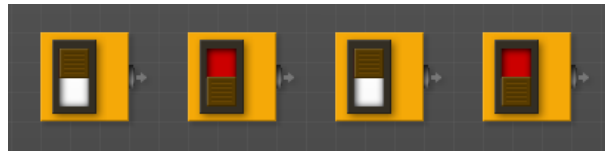

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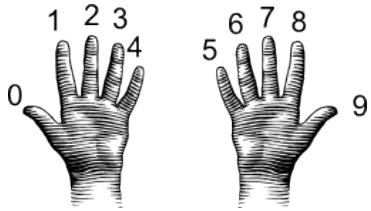

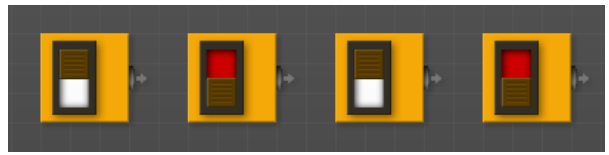

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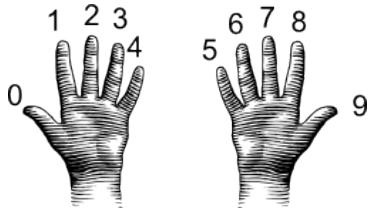
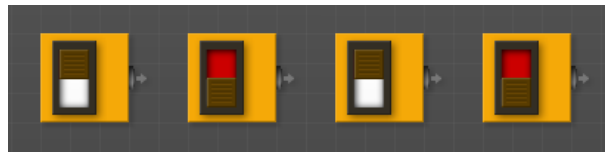
Pseudocode same for both questions:

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

Recap: Incrementer Design Challenge





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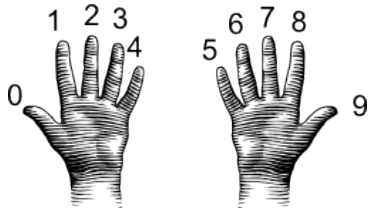
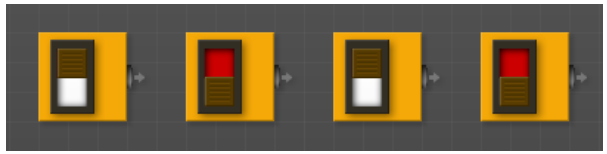
Pseudocode same for both questions:

1. Get user input: `"1001"`
2. Convert to standard decimal number: 9
3. Add one (increment) the standard decimal number: 10

Recap: Incrementer Design Challenge





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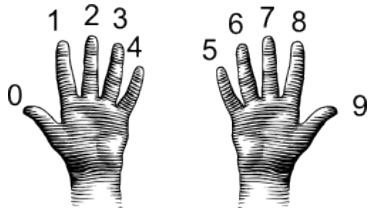
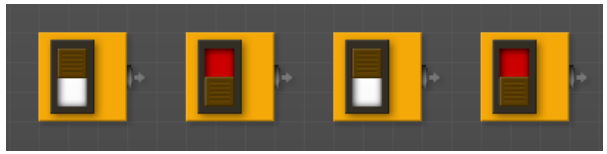
Recap: Incrementer Design Challenge





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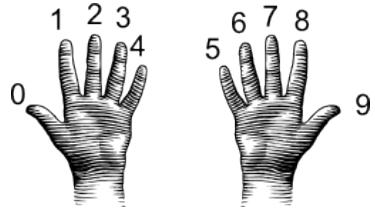
Pseudocode same for both questions:

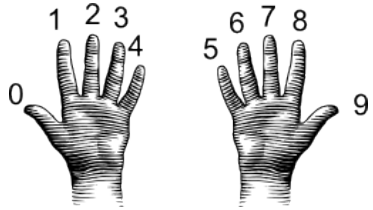
1. Get user input: `"1001"`
2. Convert to standard decimal number: 9
3. Add one (increment) the standard decimal number: 10
4. Convert back to your format: `"1010"`
5. Print the result.

Recap: Incrementer Design Challenge



Focus on: Convert to standard decimal number:

Recap: Incrementer Design Challenge



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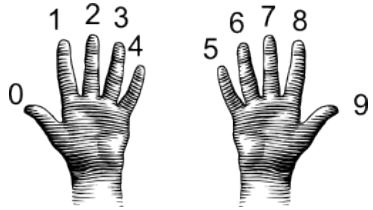

Focus on: Convert to standard decimal number:

```
def convert2Decimal(numString):
    #Start with one-digit numbers:  zero,one,...,nine
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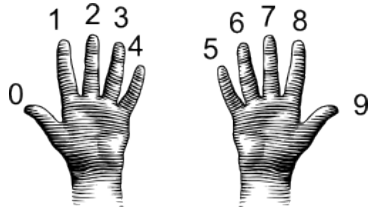

Focus on: Convert to standard decimal number:

```
def convert2Decimal(numString):
    #Start with one-digit numbers:  zero,one,...,nine
    if numString == "zero":
        return(0)
```

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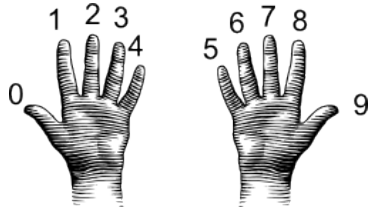

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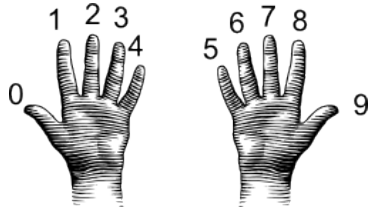

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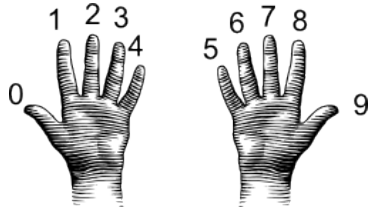

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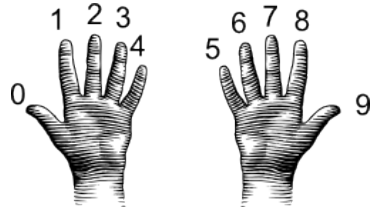

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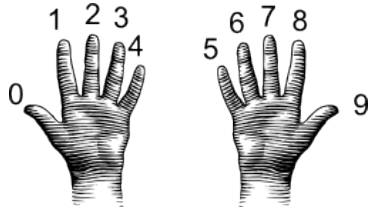
Will this work?

Unit Testing: Incrementer Design Challenge



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Will this work? What inputs would find the error(s)?

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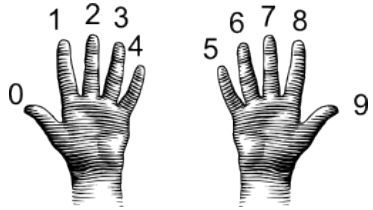

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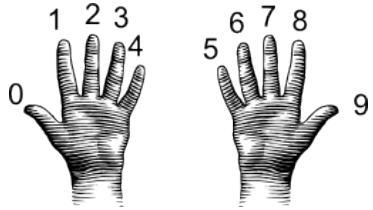

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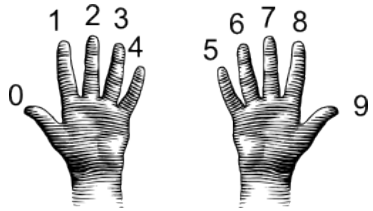

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- To test all branches of code, would need to test all inputs: `"zero"`, `"one"`,..., `"nine"`, & some bad inputs.

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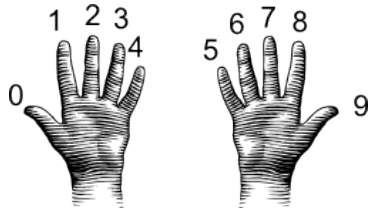

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  Also important to test **edge cases**.

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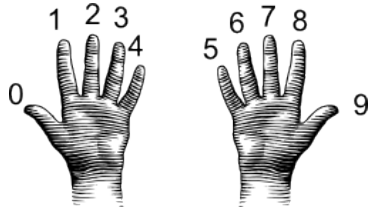

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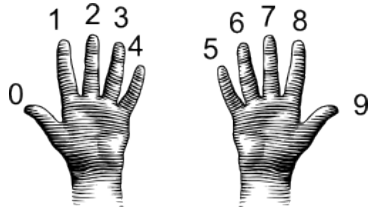

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```
names = ["zero","one",...,"nine"]
```

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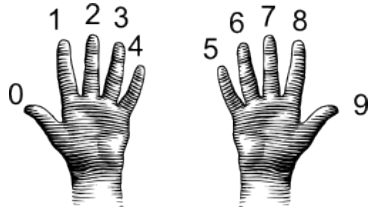

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```
names = ["zero","one",...,"nine"]
x = random.randrange(10)
```

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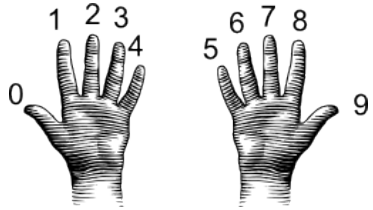

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if x == convert2Decimal(names[x]):
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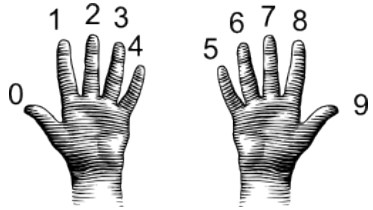

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```
names = ["zero","one",...,"nine"]
x = random.randrange(10)
if x == convert2Decimal(names[x]):
    #PASS
```

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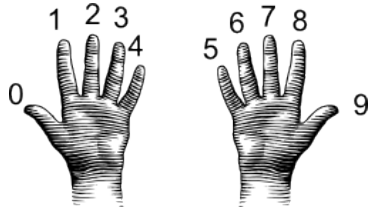

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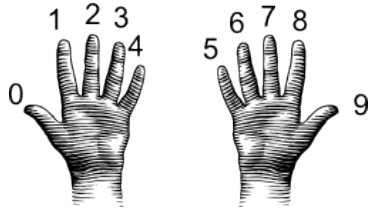

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```
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if x == convert2Decimal(names[x]):
    #PASS
else:
    #FAIL
```

Today's Topics

- Recap: Incrementer Design Challenge
- **C++: Basic Format & Variables**
- I/O and Definite Loops in C++
- More Info on the Final Exam

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
//Another C++ program, demonstrating variables
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int main ()
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}
```

(Demo with `onlinegdb`)

Introduction to C++

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- C++ is a popular programming language that extends C.
- Fast, efficient, and powerful.
- Used for systems programming (and future courses!).

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  return 0;
}
```

- 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.

```
1  //Another C++ program, demonstrating variables
2  #include <iostream>
3  using namespace std;
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5  int main ()
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Example:

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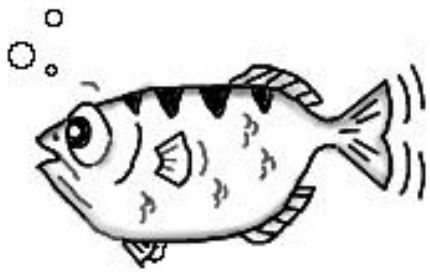
Challenge:

Predict what the following pieces of code will do:

```
//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

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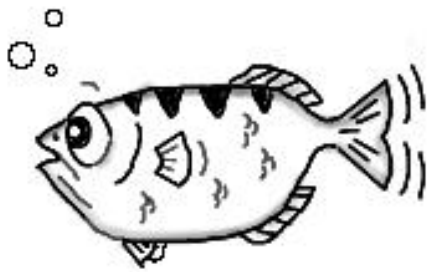

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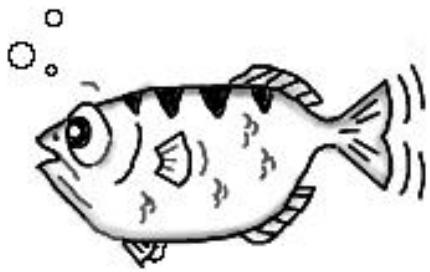

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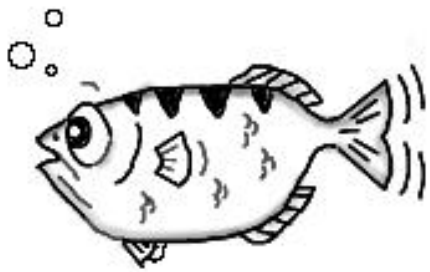

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- Lightweight, widely-available program that allows you to "step through" your code line-by-line.
- Available on-line (`onlinegdb.com`) or follow installation instructions in Lab 12.

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**:

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Python Tutor

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  return 0;
}
```

(Write from scratch in `pythonTutor`.)

Lecture Quiz

- Log-in to Gradescope
- Find LECTURE 12 Quiz
- Take the quiz
- **You have 3 minutes**

Today's Topics

- Recap: Incrementer Design Challenge
- C++: Basic Format & Variables
- **I/O and Definite Loops in C++**
- More Info on the Final Exam

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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Definite loops

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      cout << j << " ";
  }
  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;
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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:

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//Growth example
#include <iostream>
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int main ()
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  int population = 100;
  cout << "Year\tPopulation\n";
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  }
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Recap: C++

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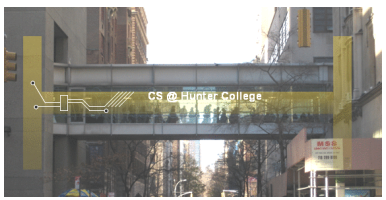

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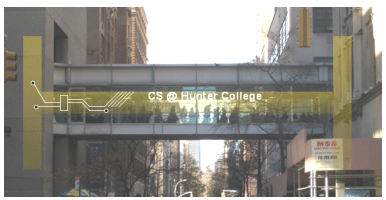

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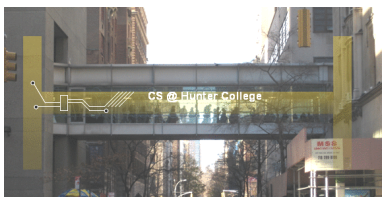

- C++ is a popular programming language that extends C.
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for (i = 0; i < 10; i++) {
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- Recap: Incrementer Design Challenge
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- **More Info on the Final Exam**

Final Exam: When

- The final exam is **Monday, 14 December, 9am-11am**, administered via **Gradescope**.

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- Aim to complete 7 to 10 past exams (one a day in the week leading up to the final).

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All acts of academic dishonesty will be reported to the Office of Academic and Student Affairs and will result in a 0 grade on the exam.

Final Exam Practice Rounds:

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def kg2lbs(kg)
    lbs = kg * 2.2
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- **Write a function that, given a DataFrame, returns the minimal value in the "Manhattan" column.**

```
def getMin(df):
    min = df['Manhattan'].min()
    return(min)
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```
def num2bin(num):
    binStr = ""
    while (num > 0):
        #Divide by 2, and add the remainder to the string
        r = num %2
        binString = str(r) + binStr
        num = num / 2
    return(binStr)
```

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def computePayment(loan,rate,year):
    (Some formula for payment)
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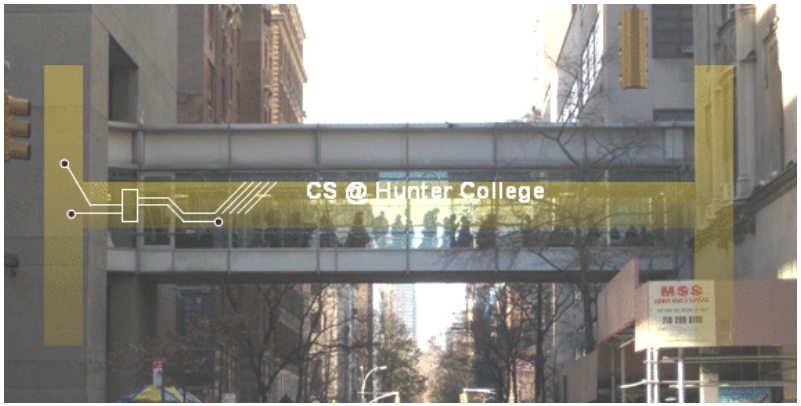

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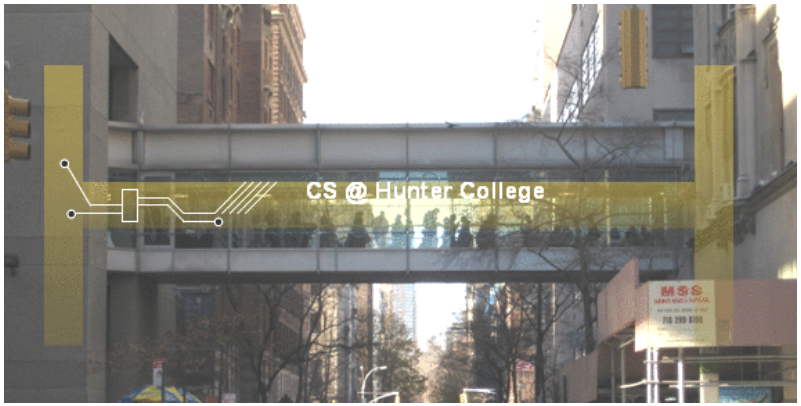

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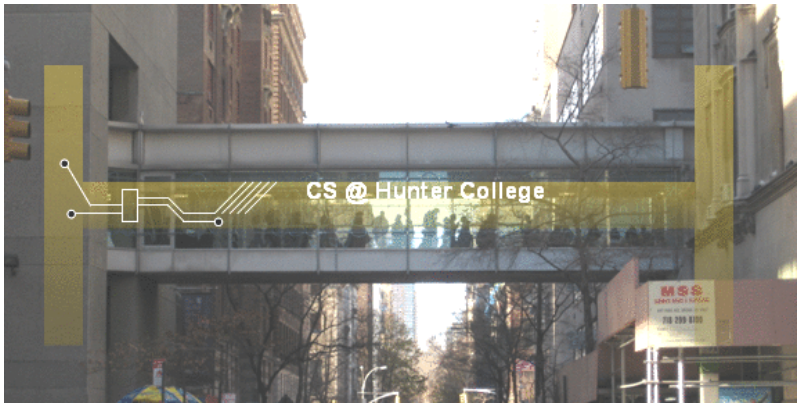

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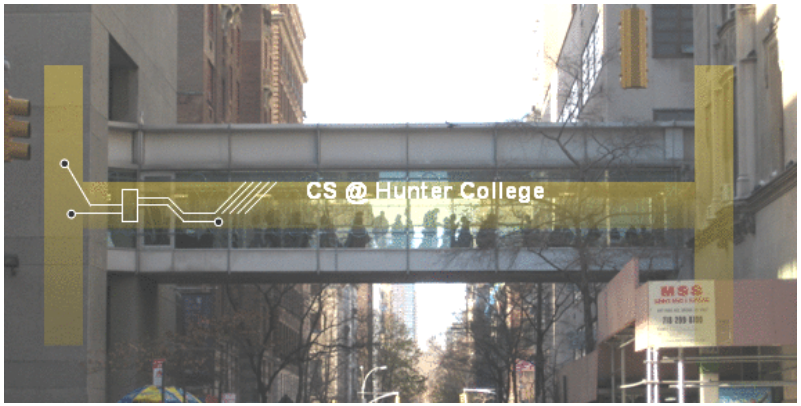

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