

CSci 127: Introduction to Computer Science



hunter.cuny.edu/csci

Frequently Asked Questions

From email and tutoring.

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- ▶ Majors: *CSci 135 (Software Design and Analysis in C++) & CSci 150 (Discrete Structures)*
- ▶ 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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- *Students will get a PEN grade until the investigation is complete. This may delay registration.*
- *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



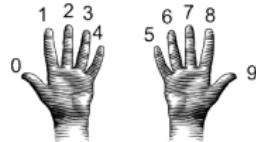
- Recap: Incrementer Design Challenge
- C++: Basic Format & Variables
- I/O and Definite Loops in C++
- More Info on the Final Exam

Today's Topics



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



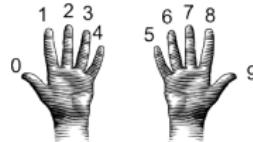
- Simplest arithmetic: add one (“increment”) a variable.

Recap: Design Challenge: Incrementers



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- Example: Increment a decimal number:

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    m = n+1  
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- Challenge: Write an algorithm for incrementing numbers expressed as words.

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Hint: Convert to numbers, increment, and convert back to strings. That is,
"forty one" → 41 → 41 + 1 = 42 → "forty two"

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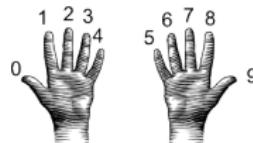
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- Challenge: Write an algorithm for incrementing binary numbers.

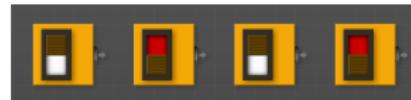
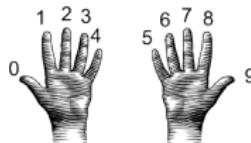
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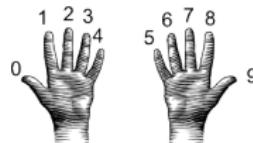
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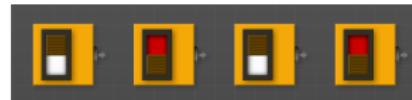
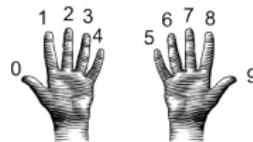


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- "1001" → convert binary number "1001" to decimal number 9 → increase 9 to 10 → convert 10 to binary number "1010" → "1010"

Pseudocode same for both questions:

- ① Get user input.

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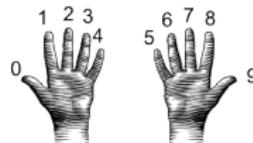


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- ② Convert to standard decimal number.

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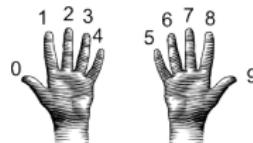


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- ① Get user input.
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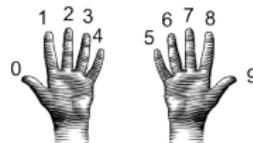


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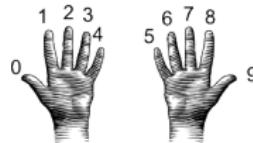


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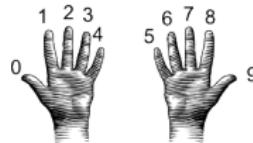


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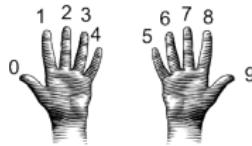


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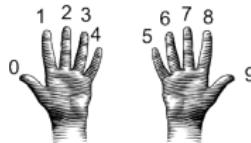


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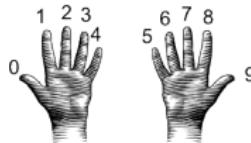


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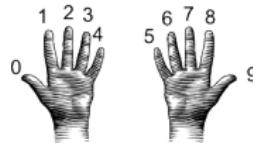


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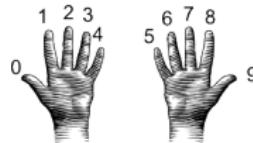


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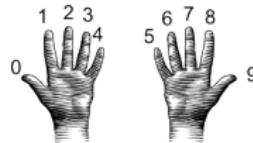


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Pseudocode same for both questions:

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

Recap: Incrementer Design Challenge

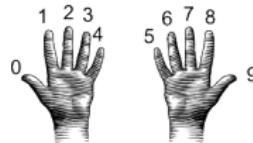


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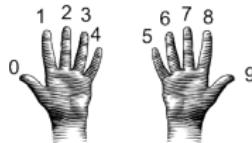


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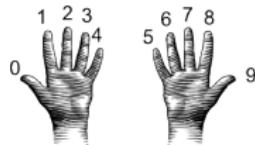


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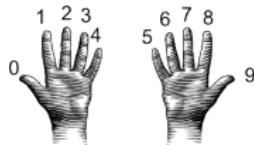
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Recap: Incrementer Design Challenge



Focus on: Convert to standard decimal number:

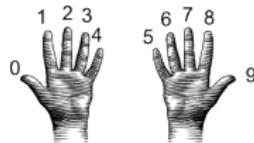
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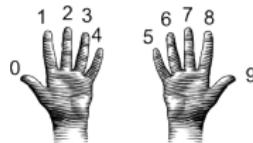
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Focus on: Convert to standard decimal number:

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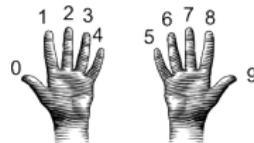
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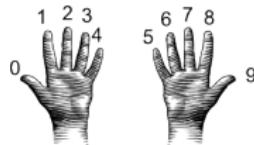
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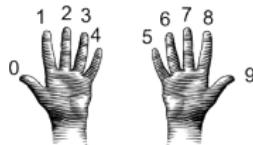
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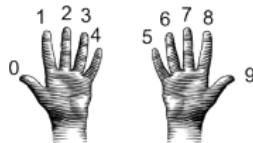
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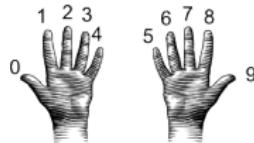


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Will this work?

Unit Testing: Incrementer Design Challenge

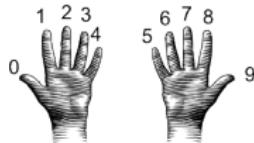


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Will this work? What inputs would find the error(s)?

Unit Testing: Incrementer Design Challenge



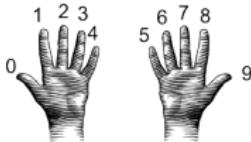
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Unit Testing: testing individual units/functions/blocks of code to verify correctness.

Unit Testing: Incrementer Design Challenge



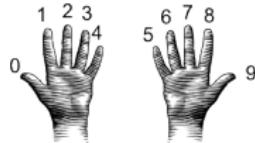
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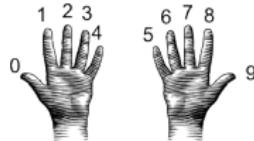
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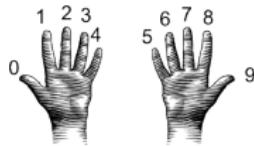
- **Unit Testing:** testing individual units/functions/blocks of code to verify correctness. Often automated (e.g. gradescope).
- To test all branches of code, would need to test all inputs: "zero", "one",..., "nine", & some bad inputs.

Unit Testing: Incrementer Design Challenge



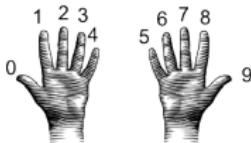
- **Unit Testing:** testing individual units/functions/blocks of code to verify correctness. Often automated (e.g. gradescope).
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Also important to test **edge cases**.

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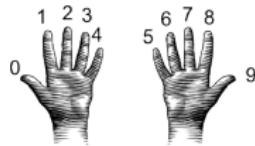
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names = ["zero", "one", ..., "nine"]
```

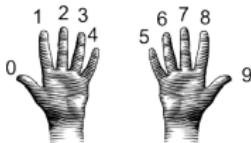
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```
names = ["zero", "one", ..., "nine"]  
x = random.randrange(10)
```

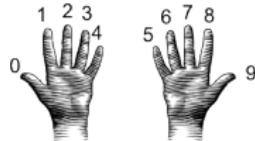
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- If large, design automated tests that will “cover” as many branches as possible and use randomly generated inputs:

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

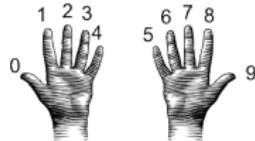
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Also important to test **edge cases**.
- If large, design automated tests that will “cover” as many branches as possible and use randomly generated inputs:

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

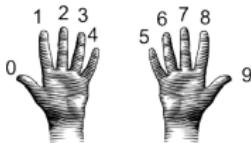
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else:
```

Unit Testing: Incrementer Design Challenge



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Also important to test **edge cases**.
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```
names = ["zero", "one", ..., "nine"]
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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 #include <iostream>
2 using namespace std;
3
4 int main ()
5 {
6     int year;
7     cout << "Enter a number: ";
8     cin >> year;
9     cout << "Hello " << year << "!!\n\n";
10    return 0;
11 }
```

Structure of C++ Program

- ① A simplest C++ program starts with main function. Put code inside the main function, enclosed in matched curly braces { and }.
- ② Need to `#include <iostream>` – similar to import library in python – to use cin and cout.
 - ▶ cin is standard input, like keyboard, `cin >>` means to pull contents from cin to a variable.
 - ▶ cout is standard output, like screen, `cout <<` means to push contents to cout.
 - ▶ Each statement in C++ ends with semicolon (;
- ③ C++ is a strong type language, every variable, when declared, must declare with a type. For example, the return type of main function is int, the type of year is int.

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

onlinegdb demo

Use online C++ compiler gdb. Click

<https://www.onlinegdb.com/ByzFa5TkG>.

```
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2 using namespace std;
3 int main ()
4 {
5     int year;
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Introduction to C++

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

Introduction to C++

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- C++ is a popular programming language that extends C.
- Fast, efficient, and powerful.

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- Used for systems programming (and future courses!).

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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.

```
1 #include <iostream>
2 using namespace std;
3 int main ()
4 {
5     int year;
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Example:

Introduction to C++

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```
int main()
```

Introduction to C++

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```

Example:

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

Introduction to C++

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4 {
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Introduction to C++

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int num;
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int, float, char, ...

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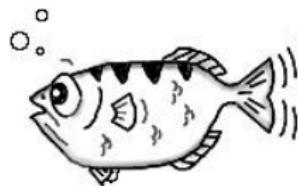
Challenge:

Predict what the following pieces of code will do:

```
1 //C++ program demonstrating I/O & arithmetic
2 #include <iostream>
3 using namespace std;
4 int main ()
{
    5     float kg, lbs;
    6     cout << "Enter kg: ";
    7     cin >> kg;
    8     lbs = kg * 2.2;
    9     cout << endl << "Lbs: " << lbs << "\n\n";
   10
   11     return 0;
}
```

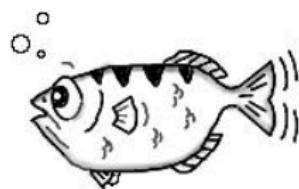
Side Note: gdb

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



gdb.org

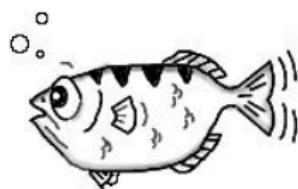
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gdb.org

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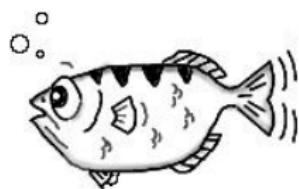
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- Lightweight, widely-available program that allows you to "step through" your code line-by-line.
- Available on-line (onlinegdb.com) or follow installation instructions in Lab 12.

C++ Demo

```
1 //C++ program demonstrating I/O & arithmetic
2 #include <iostream>
3 using namespace std;
4 int main ()
5 {
6     float kg, lbs;
7     cout << "Enter kg: ";
8     cin >> kg;
9     lbs = kg * 2.2;
10    cout << endl << "Lbs: " << lbs << "\n\n";
11    return 0;
12 }
```

http://

Challenge:...

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

```
1 //C++ program demonstrating I/O & arithmetic
2 #include <iostream>
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4 int main ()
5 {
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11    return 0;
12 }
```

Convert the C++ code to a Python program

```
1 #include <iostream>
2 using namespace std;
3 int main ()
4 {
5     float kg, lbs;
6     cout << "Enter kg: ";
7     cin >> kg;
8     lbs = kg * 2.2;
9     cout << endl << "Lbs: " << lbs << "\n\n";
10    return 0;
11 }
```

```
1 kg = float(input("Enter kg: "));
2 lbs = kg * 2.2;
3 print("\nLbs:", lbs, "\n")
```

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 code will do: <https://www.onlinegdb.com/HktpcoT1f>

```
1 #include <iostream>
2 using namespace std;
3 int main () {
4     int i,j;
5     //when loop body has only one statement, no need to
6     //enclose it in {}.
7     for (i = 0; i < 4; i++)
8         cout << "The world turned upside down...\n";
9
10    for (j = 10; j > 0; j--)
11        cout << j << " ";
12
13    cout << "Blast off!!" << endl;
14    return 0;
}
```

C++ Demo

```
//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;
}
```

(Demo with onlinegdb)

Definite loops

```
//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;
}
```

General format:

```
for ( initialization ; test ; updateAction )
{
    command1;
    command2;
    command3;
    ...
}
```

Challenge:

Predict what code will do: <https://www.onlinegdb.com/Sy13ToTyG>

```
1 #include <iostream>
2 using namespace std;
3
4 int main ()
5 {
6     int i,j,size;
7     cout << "Enter size: ";
8     cin >> size;
9     for (i = 0; i < size; i++)
10    {
11        for (j = 0; j < size; j++)
12            cout << "*";
13        cout << endl;
14    }
15    cout << "\n\n";
16    for (i = size; i > 0; i--)
17    {
18        for (j = 0; j < i; j++)
19            cout << "*";
20        cout << endl;
21    }
22    return 0;
23 }
```

Lecture Slips

Which UTA have you spoken with most? Why?

Lecture Slip:

Translate the C++ program into Python:

```
1 #include <iostream>
2 using namespace std;
3
4 int main ()
5 {
6     int population = 100;
7     cout << "Year\tPopulation\n";
8     for (int year = 0; year < 100; year= year+5)
9     {
10         cout << year << "\t" << population << "\n";
11         population = population * 2;
12     }
13
14     return 0;
15 }
```

Lecture Slip:

Translate the C++ program into Python:

```
1 #include <iostream>
2 using namespace std;
3
4 int main ()
{
5     int population = 100;
6     cout << "Year\tPopulation\n";
7     for (int year = 0; year < 100; year= year+5) //In C++, use {} to enclose loop
        body with two or more statements.
8     {
9         cout << year << "\t" << population << "\n";
10        population = population * 2; //same as population *= 2;
11    }
12
13 }
14 return 0;
15 }
```

```
1 population = 100
2 print("Year\tPopulation")
3 for year in range(0, 100, 5): #In Python, use indent to identify loop body
4     print(str(year) + "\t" + str(population))
5     population *= 2
```

Recap: C++

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



Recap: C++

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- Input/Output (I/O):

- ▶ `cin >>`
- ▶ `cout <<`



Recap: C++



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

- Input/Output (I/O):

- ▶ `cin >>`
 - ▶ `cout <<`

- Definite loops:

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

Today's Topics



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

Final Overview: Format

- Closed book. No electronic devices allowed. If we see your phone we will take it until the end of the exam.

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- Closed book. No electronic devices allowed. If we see your phone we will take it until the end of the exam.
- You can have 1 piece of **8.5" x 11"** paper.

Final Overview: Format

- Closed book. No electronic devices allowed. If we see your phone we will take it until the end of the exam.
- You can have 1 piece of **8.5" x 11"** paper.
 - ▶ With notes, examples, programs: what will help you on the exam.

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- Past exams available on webpage (includes answer keys).

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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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- **Write a function that takes a weight in kilograms and returns the weight in pounds.**

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```
def kg2lbs(kg)
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def sLength(str):  
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    ...  
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For each question below, write the function header (name & inputs) and return values (often called the Application Programming Interface (API)):

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

Weekly Reminders!



Before next lecture, don't forget to:

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- If you need help, schedule an appointment for Tutoring in lab 1001G 11:30am-5pm
- Take the Lecture Preview on Blackboard on Monday (or no later than 10:15am on Tuesday)

Lecture Slips & Writing Boards



- Hand your lecture slip to a UTA.
- Return writing boards as you leave.