CSci 127: Introduction to Computer Science

CS @ Hunter College

hunter.cuny.edu/csci

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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Recap: Design Challenge: Incrementers

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

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      m = n+1
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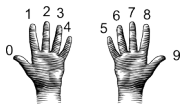
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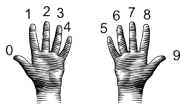- Challenge: Write an algorithm for incrementing binary numbers.

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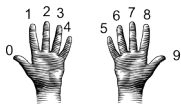- Challenge: Write an algorithm for incrementing numbers expressed as words.
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- Challenge: Write an algorithm for incrementing binary numbers.

  Example: "1001" $\rightarrow$ "1010"

Recap: Incrementer Design Challenge
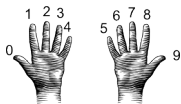
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Pseudocode same for both questions:

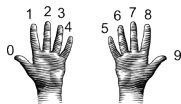1. Get user input.

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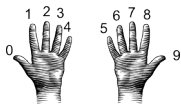2. Convert to standard decimal number.

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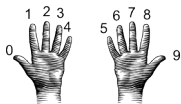
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Pseudocode same for both questions:

1. Get user input.
2. Convert to standard decimal number.
3. Add one (increment) the standard decimal number.
4. Convert back to your format.
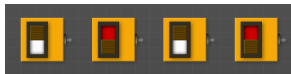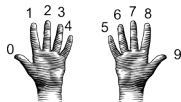
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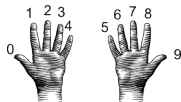5. Print the result.

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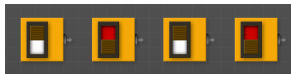1. Get user input: `"forty one"`

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Pseudocode same for both questions:

1. Get user input: "forty one"
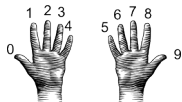2. Convert to standard decimal number: 41
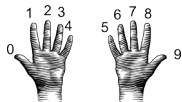
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Pseudocode same for both questions:

1. Get user input: "forty one"
2. Convert to standard decimal number: 41
3. Add one (increment) the standard decimal number: 42
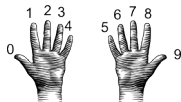
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Pseudocode same for both questions:

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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Pseudocode same for both questions:

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3. Add one (increment) the standard decimal number: 42
4. Convert back to your format: "forty two"
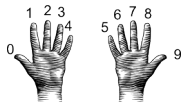5. Print the result.

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Pseudocode same for both questions:

1. Get user input: "1001"

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Pseudocode same for both questions:

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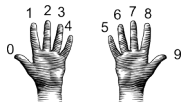2. Convert to standard decimal number: 9

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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
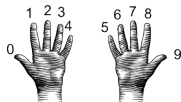
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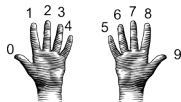4. Convert back to your format: "1010"

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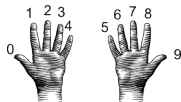- Challenge: Write an algorithm for incrementing numbers expressed as words. Example: "forty one" → "forty two"
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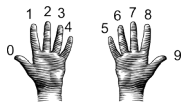
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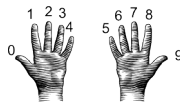
Focus on: Convert to standard decimal number:
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```
def convert2Decimal(numString):
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Focus on: Convert to standard decimal number:

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

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    if numString == "zero":
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        return(1)
```

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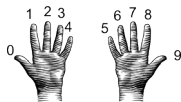
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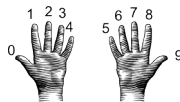
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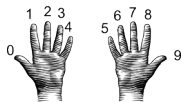
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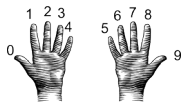
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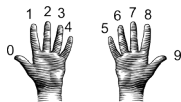
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Will this work?

Unit Testing: Incrementer Design Challenge

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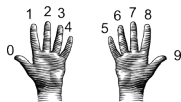
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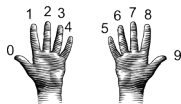
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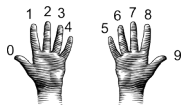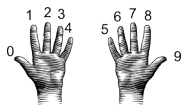
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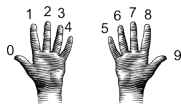
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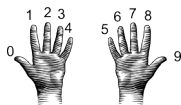- Unit Testing: testing individual units/functions/blocks of code to verify correctness. Often automated (e.g. gradescope).

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  names = ["zero","one",...,"nine"]
  x = random.randrange(10)
  if x == convert2Decimal(names[x]):
  ```
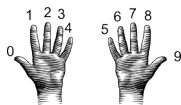
Unit Testing: Incrementer Design Challenge
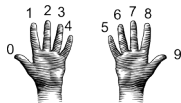
- Unit Testing: testing individual units/functions/blocks of code to verify correctness. Often automated (e.g. gradescope).

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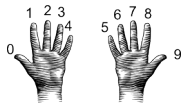
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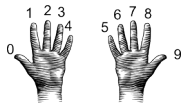
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Unit Testing: Incrementer Design Challenge

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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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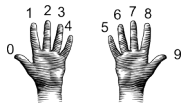- If large, design automated tests that will "cover" as many branches as possible and use randomly generated inputs:
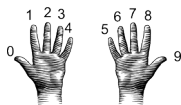
  ```
  names = ["zero","one",...,"nine"]
  x = random.randrange(10)
  if x == convert2Decimal(names[x]):
      #PASS
  else:
      #FAIL
  ```

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:*

```cpp
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;
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```

onlinegdb demo

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(Demo with onlinegdb)

Introduction to C++

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

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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.

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int main ()
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  Example:

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  `int main()`

Introduction to C++

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  Example:

  ```
  int main()
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Introduction to C++

- Programs are organized in functions.

  Example:

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

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12 }
```

Challenge:

Predict what the following pieces of code will do:

```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;
}
```

Side Note: gdb
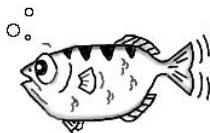
gdb.org

- Part of Richard Stallman's "GNU is Not Unix" (GNU) project.
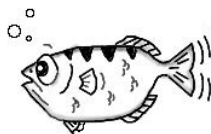
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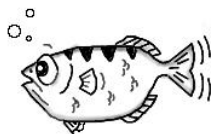
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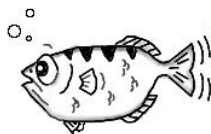
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- Part of Richard Stallman's "GNU is Not Unix" (GNU) project.
- Written in 1986, gdb is the GNU debugger and based on dbx from the Berkeley Distribution of Unix.
- Lightweight, widely-available program that allows you to "step through" your code line-by-line.
- 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**:*

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

int main ()
{
  float kg, lbs;
  cout << "Enter kg: ";
  cin >> kg;
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  return 0;
}
```

Python Tutor

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

```cpp
//Another C++ program, demonstrating I/O & arithmetic
#include <iostream>
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int main ()
{
  float kg, lbs;
  cout << "Enter kg: ";
  cin >> kg;
  lbs = kg * 2.2;
  cout << endl << "Lbs: " << lbs << "\n\n";
  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:

```cpp
//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

```cpp
//Another C++ program; Demonstrates loops
#include <iostream>
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int main ()
{
    int i,j;
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    cout << "Blast off!!" << endl;

    return 0;
}
```

(Demo with `onlinegdb`)

Definite loops

```cpp
//Another C++ program; Demonstrates loops
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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 the following pieces of code will do:

```cpp
//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;
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```

C++ Demo

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int main ()
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  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;
}
```

(Demo with `onlinegdb`)

Challenge:

Predict what the following pieces of code will do:

```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)
  {
      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)
  {
      cout << year << "\t" << population << "\n";
      population = population * 2;

  }
  return 0;
}
```

Recap: C++

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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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  - Questions based on course topics, and are variations on the programming assignments, lab exercises, and lecture design challenges.

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- The exam format:
  - Same format as past exams posted on course website
  - Questions based on course topics, and are variations on the programming assignments, lab exercises, and lecture design challenges.
  - Style of questions: short answer, fill in the program (one line of code per box), multiple choice, select all, replace value, modify program, translate & write complete programs.

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.
  - Best if you design/write yours, it's excellent way to study.
- The exam format:
  - Same format as past exams posted on course website
  - Questions based on course topics, and are variations on the programming assignments, lab exercises, and lecture design challenges.
  - Style of questions: short answer, fill in the program (one line of code per box), multiple choice, select all, replace value, modify program, translate & write complete programs.
- 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:

For each question, write the function header (name & inputs) and return values (often called the Application Programming Interface (API)):

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

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    ...
    return(lbs)
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- **Write a function that takes a weight in kilograms and returns the weight in pounds.**

```
def kg2lbs(kg)
    lbs = kg * 2.2
    return(lbs)
```

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    ...
    return(length)
```

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For each question, write the function header (name & inputs) and return values (often called the Application Programming Interface (API)):

- **Write a function that takes a string and returns its length.**

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def sLength(str):
    length = len(str)
    return(length)
```

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def getMin(df):
    ...
    return(min)
```

Final Exam Practice Rounds:

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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- **Write a function that takes a whole number and returns the corresponding binary number as a string.**

```
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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For each question, write the function header (name & inputs) and return values (often called the Application Programming Interface (API)):

- **Write a function that computes the total monthly payment when given the initial loan amount, annual interest rate, number of years of the loan.**

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```
def computePayment(loan,rate,year):
    ....
    return(payment)
```

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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 computes the total monthly payment
  when given the initial loan amount, annual interest rate,
  number of years of the loan.**

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

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- If you need help, please email cscisummer23@gmail.com or schedule an appointment for Friday tutoring :)