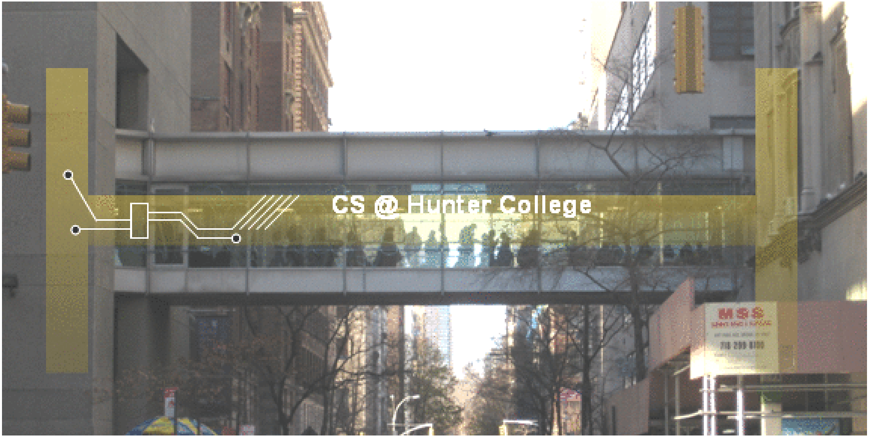
CSci 127: Introduction to Computer Science



hunter.cuny.edu/csci

Announcements

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  Final exam: 13 days!
- We end lecture with a survey of computing research and tech.

  Today: Adrienne Posner,
  Program Manager, Google

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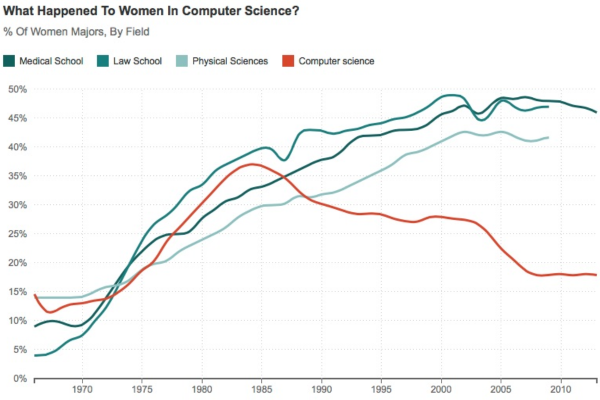

What Happened To Women In Computer Science?

% Of Women Majors, By Field

Source: National Science Foundation, American Bar Association, American Association of Medical Colleges
Credit: Quoctrung Bui/NPR

(PlanetMoney)

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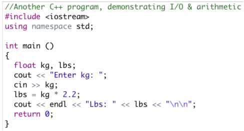

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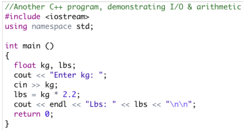

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- Similar questions in network flow, operating systems, and other resource-constrained settings.

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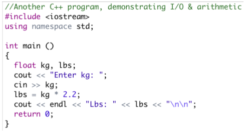

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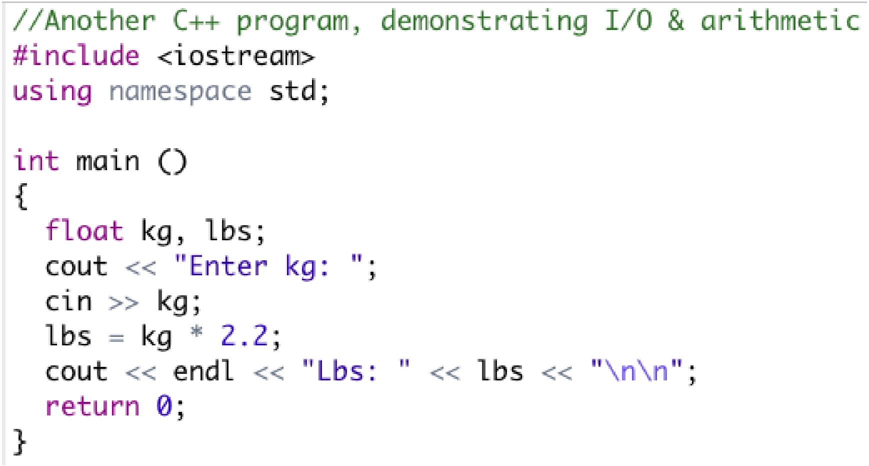

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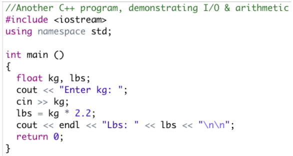

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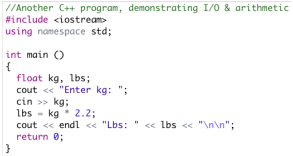

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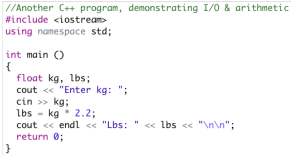

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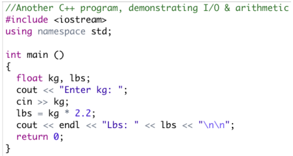

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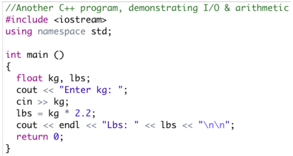

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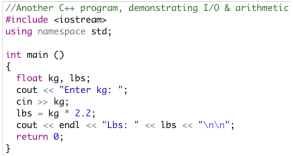

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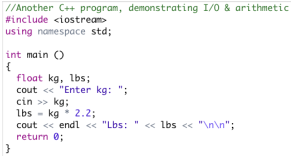
Recap: Basic Form & I/O in C++



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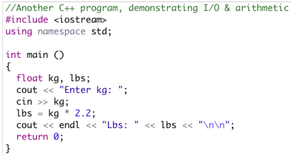

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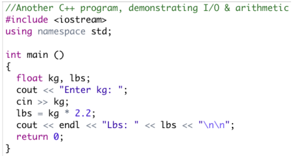

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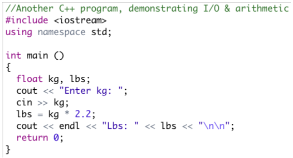

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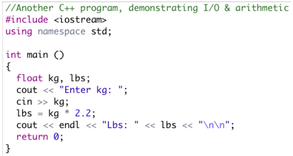

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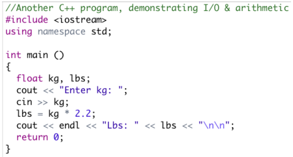

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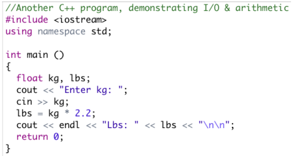

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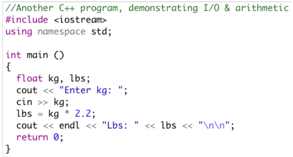

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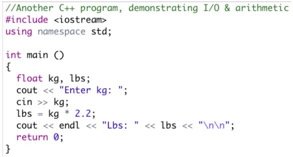

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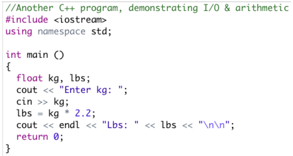

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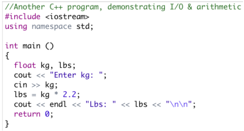
- Blocks of code uses '{' and '}'.
- Commands generally end in ';'.

Today's Topics



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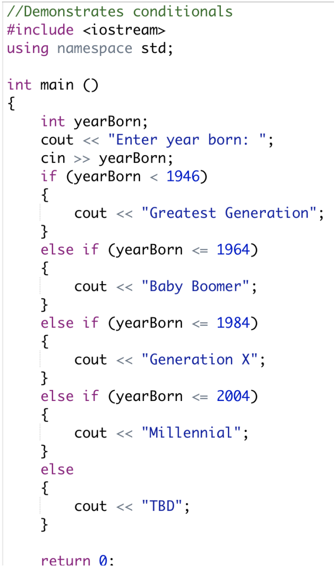
- CS Survey
- Recap: I/O & Definite Loops in C++
- **Conditionals in C++**
- Indefinite Loops in C++
- Recap: C++ & Python

In Pairs or Triples:

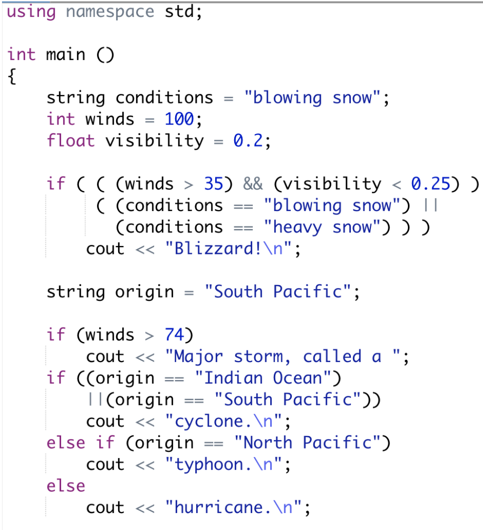
Predict what the following pieces of code will do:



```
//Demonstrates conditionals
#include <iostream>
using namespace std;

int main ()
{
    int yearBorn;
    cout << "Enter year born: ";
    cin >> yearBorn;
    if (yearBorn < 1946)
    {
        cout << "Greatest Generation";
    }
    else if (yearBorn <= 1964)
    {
        cout << "Baby Boomer";
    }
    else if (yearBorn <= 1984)
    {
        cout << "Generation X";
    }
    else if (yearBorn <= 2004)
    {
        cout << "Millennial";
    }
    else
    {
        cout << "TBD";
    }

    return 0;
```



```
using namespace std;

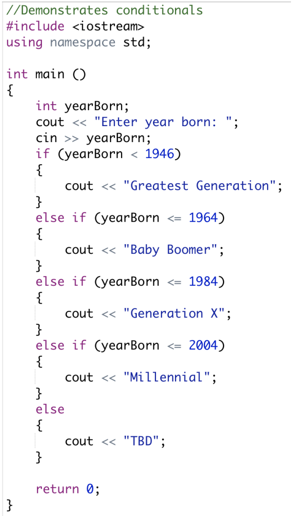
int main ()
{
    string conditions = "blowing snow";
    int winds = 100;
    float visibility = 0.2;

    if ( ( (winds > 35) && (visibility < 0.25) ) ||
         ( (conditions == "blowing snow") ||
           (conditions == "heavy snow") ) )
        cout << "Blizzard!\n";

    string origin = "South Pacific";

    if (winds > 74)
        cout << "Major storm, called a ";
    if ((origin == "Indian Ocean")
        ||(origin == "South Pacific"))
        cout << "cyclone.\n";
    else if (origin == "North Pacific")
        cout << "typhoon.\n";
    else
        cout << "hurricane.\n";
```

C++ Demo



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    return 0;
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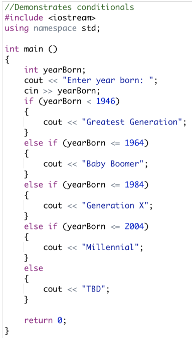
```

(Demo with `onlinegdb`)

Conditionals



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    }
    else
    {
        cout << "TBD";
    }

    return 0;
}
```

General format:

```
if ( logical expression )
{
      command1;
      ...
}
else if ( logical expression )
{
      command1;
      ...
}
else
{
      command1;
      ...
}
```

Logical Operators in C++

Very similar, just different names: `&&`, `||`, and `!`:

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and (`&&`)

`in1`		`in2`	*returns:*
`False`	`&&`	`False`	`False`
`False`	`&&`	`True`	`False`
`True`	`&&`	`False`	`False`
`True`	`&&`	`True`	`True`

Logical Operators in C++

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in1		in2	*returns:*
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False	&&	True	False
True	&&	False	False
True	&&	True	True

or (`||`)

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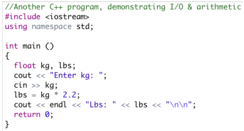
not (`!`)

	in1	*returns:*
!	False	True
!	True	False

Today's Topics



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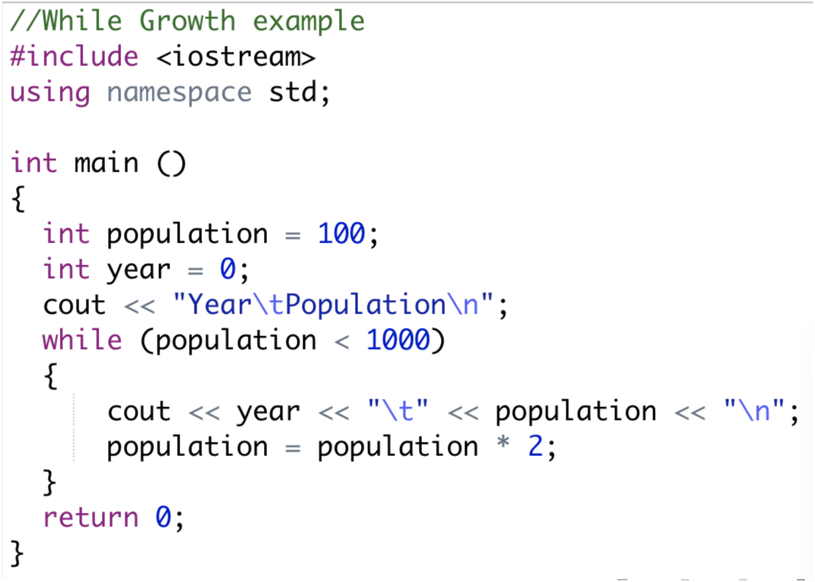
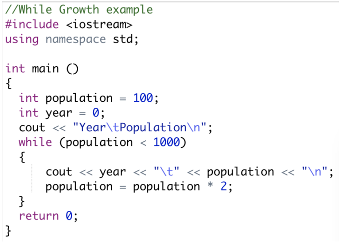


```
//While Growth example
#include <iostream>
using namespace std;

int main ()
{
  int population = 100;
  int year = 0;
  cout << "Year\tPopulation\n";
  while (population < 1000)
  {
      cout << year << "\t" << population << "\n";
      population = population * 2;
  }
  return 0;
}
```

C++ Demo



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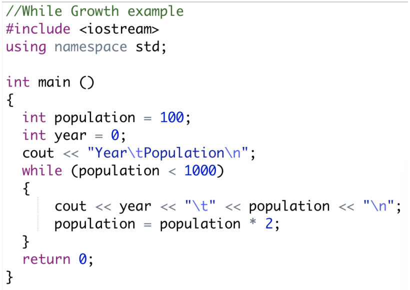
(Demo with `onlinegdb`)

Indefinite Loops: `while`



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      population = population * 2;
  }
  return 0;
}
```

General format:

`while` (*logical expression*)
{

command1;
command2;
command3;
...

}

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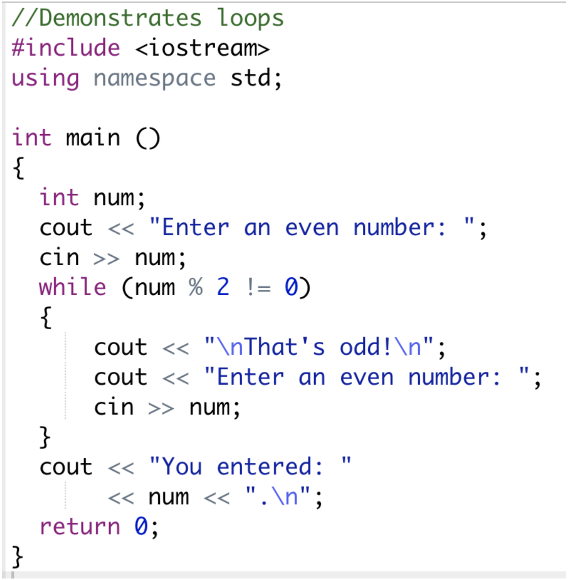
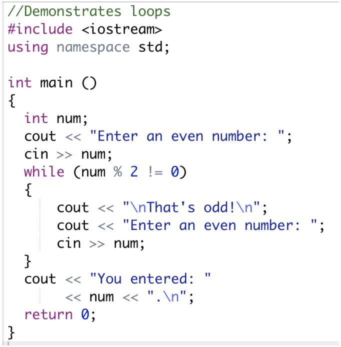


```
//Demonstrates loops
#include <iostream>
using namespace std;

int main ()
{
  int num;
  cout << "Enter an even number: ";
  cin >> num;
  while (num % 2 != 0)
  {
      cout << "\nThat's odd!\n";
      cout << "Enter an even number: ";
      cin >> num;
  }
  cout << "You entered: "
       << num << ".\n";
  return 0;
}
```

C++ Demo



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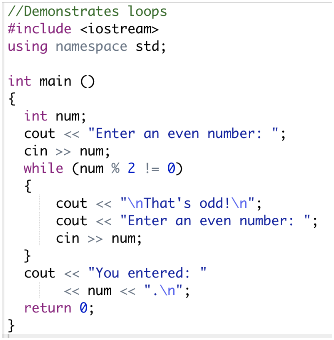

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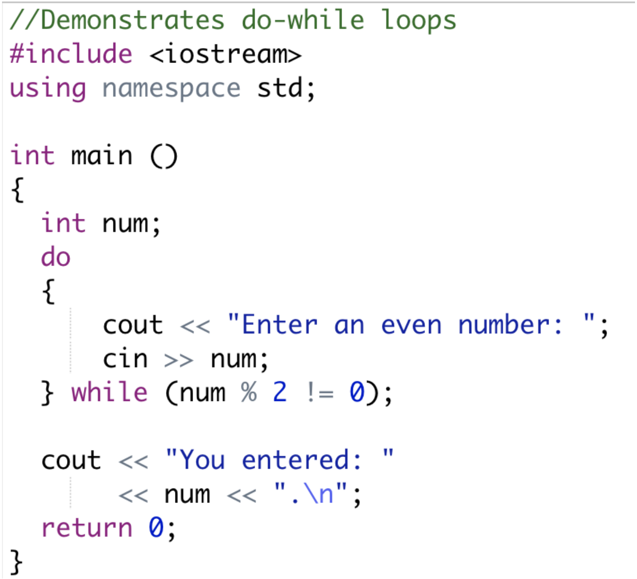

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  return 0;
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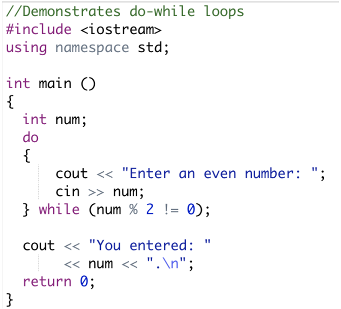
C++ Demo



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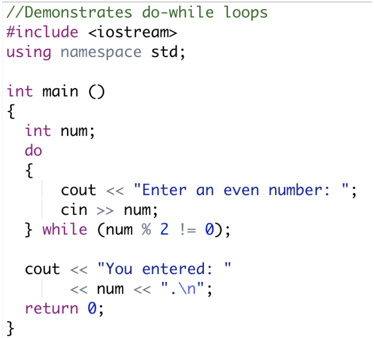
Indefinite Loops: `do-while`



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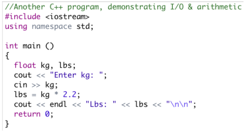
  return 0;
}
```

General format:

```
do
{
      command1;
      command2;
      command3;
      ...
} while ( logical expression );
```

Today's Topics



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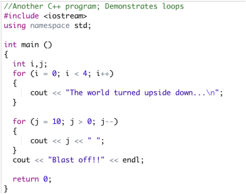
  lbs = kg * 2.2;
  cout << endl << "Lbs: " << lbs << "\n\n";
  return 0;
}
```

- CS Survey
- Recap: I/O & Definite Loops in C++
- Conditionals in C++
- Indefinite Loops in C++
- **Recap: C++ & Python**

Recap: C++ Control Structures

- I/O:



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

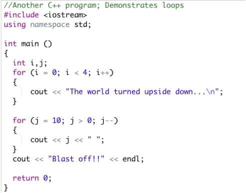
int main ()
{
  int i,j;
  for (i = 0; i < 4; i++)
  {
      cout << "The world turned upside down...\n";
  }

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

  return 0;
}
```

Recap: C++ Control Structures

- I/O: `cin >> ...;`



```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 << " ";
  }
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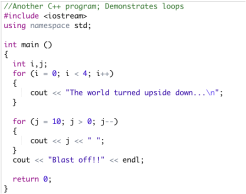
  return 0;
}
```

Recap: C++ Control Structures

- I/O: `cin >> ...;` & `cout << ...;`



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

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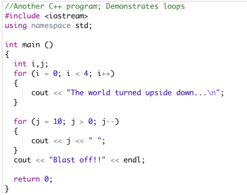
```

Recap: C++ Control Structures

- I/O: `cin >> ...;` & `cout << ...;`
- Definite loops:



```cpp
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using namespace std;

int main ()
{
  int i,j;
  for (i = 0; i < 4; i++)
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  for (j = 10; j > 0; j--)
  {
      cout << j << " ";
  }
  cout << "Blast off!!" << endl;

  return 0;
}
```
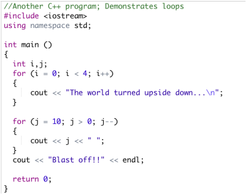

Recap: C++ Control Structures

- I/O: `cin >> ...;` & `cout << ...;`
- Definite loops:

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



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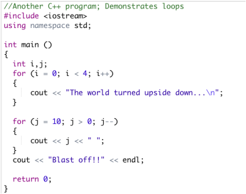
Recap: C++ Control Structures



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  }
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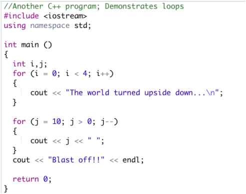
  return 0;
}
```

- I/O: `cin >> ...;` & `cout << ...;`
- Definite loops:

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

- Conditionals:

Recap: C++ Control Structures



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  return 0;
}
```

- I/O: `cin >> ...;` & `cout << ...;`
- Definite loops:

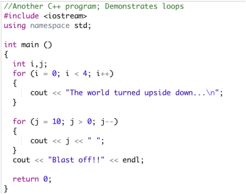
  ```
  for (i = 0; i < 10; i++)
  {
        ...
  }
  ```

- Conditionals:

  `if` (*logical expression*)

  ```
  {
        ...
  }
  else
  {
        ...
  }
  ```

Recap: C++ Control Structures



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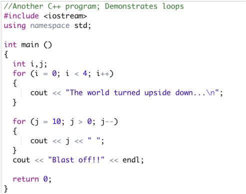
  cout << "Blast off!!" << endl;

  return 0;
}
```

- I/O: `cin >> ...;` & `cout << ...;`
- Definite loops:
  ```
  for (i = 0; i < 10; i++)
  {
        ...
  }
  ```
- Conditionals:

  `if` (*logical expression*)
  ```
  {
        ...
  }
  else
  {
        ...
  }
  ```
- Indefinite loops:

Recap: C++ Control Structures



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}
```

- I/O: `cin >> ...;` & `cout << ...;`
- Definite loops:

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

- Conditionals:

  ```
  if (logical expression)
  {
        ...
  }
  else
  {
        ...
  }
  ```

- Indefinite loops:

  ```
  while (logical expression)
  {
        ...
  }
  ```

In Pairs or Triples: Definite Loops in Python & C++

- *Rewrite this program in C++:*

```
for i in range(2017, 2000, -2):
    print("Year is", i)
```

- *Rewrite this program in Python:*

```
#include <iostream>
using namespace std;
int main()
{
  for (int i = 1; i < 50; i++)
  {
    cout << i << endl;
  }
  return 0;
}
```

In Pairs or Triples: Definite Loops in Python & C++

- *Rewrite this program in C++:*

```
for i in range(2017, 2000, -2):
    print("Year is", i)
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using namespace std;
int main()
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```

In Pairs or Triples: Definite Loops in Python & C++

- *Rewrite this program in C++:*

```
for i in range(2017, 2000, -2):
    print("Year is", i)
```

```
#include <iostream>
using namespace std;
int main()
{
  for (int i = 2017; i >= 2000; i=i-2)
```

In Pairs or Triples: Definite Loops in Python & C++

- *Rewrite this program in C++:*

```
for i in range(2017, 2000, -2):
    print("Year is", i)
```

```
#include <iostream>
using namespace std;
int main()
{
  for (int i = 2017; i >= 2000; i=i-2)
  {
    cout << "Year is" << i << endl;
```

In Pairs or Triples: Definite Loops in Python & C++

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int main()
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  for (int i = 2017; i >= 2000; i=i-2)
  {
    cout << "Year is" << i << endl;
  }
  return 0;
}
```

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In Pairs or Triples: Definite Loops in Python & C++

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  }
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}
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```
for i in range(1, 50):
```

In Pairs or Triples: Definite Loops in Python & C++

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```
#include <iostream>
using namespace std;
int main()
{
  for (int i = 1; i < 50; i++)
  {
    cout << i << endl;
  }
  return 0;
}
```

```
for i in range(1, 50):
    print(i)
```

In Pairs or Triples: Conditionals in Python & C++

- *Python: what is the output?*

  ```
  year = 2016
  if year % 4 == 0 and \
      (not (year % 100 == 0) or (year % 400 == 0)):
       print("Leap!!")
  print("Year")
  ```

- *Write a C++ program that asks the user the number of times they plan to ride transit this week. Your program should then print if it is cheaper to buy single ride metro cards or 7-day unlimited card.*
  (The 7-day card is $33.00, and the cost of single ride, with bonus, is $2.75).

In Pairs or Triples: Conditionals in Python & C++

- *Python: what is the output?*

```
year = 2016
if year % 4 == 0 and \
    (not (year % 100 == 0) or (year % 400 == 0)):
     print("Leap!!")
print("Year")
```

In Pairs or Triples: Conditionals in Python & C++

- *Python: what is the output?*

```
year = 2016
if year % 4 == 0 and \
    (not (year % 100 == 0) or (year % 400 == 0)):
     print("Leap!!")
print("Year")  year = 2016
```

```
if TRUE and \
    (not (year % 100 == 0) or (year % 400 == 0)):
     print("Leap!!")
print("Year")
```

In Pairs or Triples: Conditionals in Python & C++

- *Python: what is the output?*

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year = 2016
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In Pairs or Triples: Conditionals in Python & C++

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print("Year")
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```
year = 2016
if TRUE and \
    (not FALSE or (year % 400 == 0)):
     print("Leap!!")
print("Year")
```

In Pairs or Triples: Conditionals in Python & C++

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```
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if year % 4 == 0 and \
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In Pairs or Triples: Conditionals in Python & C++

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print("Year")
```

```
year = 2016
if TRUE and \
    (TRUE or (year % 400 == 0)):
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print("Year")
```

In Pairs or Triples: Conditionals in Python & C++

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year = 2016
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```
year = 2016
if TRUE and \
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In Pairs or Triples: Conditionals in Python & C++

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```
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    (TRUE or FALSE):
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In Pairs or Triples: Conditionals in Python & C++

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     print("Leap!!")
print("Year")
```

```
year = 2016
if TRUE and \
    (TRUE):
     print("Leap!!")
print("Year")
```

In Pairs or Triples: Conditionals in Python & C++

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year = 2016
if year % 4 == 0 and \
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print("Year")
```

```
year = 2016
if TRUE:
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In Pairs or Triples: Conditionals in Python & C++

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year = 2016
if year % 4 == 0 and \
    (not (year % 100 == 0) or (year % 400 == 0)):
     print("Leap!!")
print("Year")
```

```
year = 2016
if TRUE:
     print("Leap!!")
print("Year")
```

Prints: `Leap!`
`Year`

In Pairs or Triples: Conditionals in Python & C++

- *Your program should then print if it is cheaper to buy single ride metro cards ($2.75 per ride) or 7-day unlimited card ($33.00).*

  ```
  #include <iostream>
  using namespace std;
  ```

In Pairs or Triples: Conditionals in Python & C++

- *Your program should then print if it is cheaper to buy single ride metro cards ($2.75 per ride) or 7-day unlimited card ($33.00).*

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In Pairs or Triples: Conditionals in Python & C++

- *Your program should then print if it is cheaper to buy single ride metro cards ($2.75 per ride) or 7-day unlimited card ($33.00).*

```
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using namespace std;
int main()
{
  int rides;
```

In Pairs or Triples: Conditionals in Python & C++

- *Your program should then print if it is cheaper to buy single ride metro cards ($2.75 per ride) or 7-day unlimited card ($33.00).*

```
#include <iostream>
using namespace std;
int main()
{
  int rides;
  cout << "Enter number of rides:";
```

In Pairs or Triples: Conditionals in Python & C++

- *Your program should then print if it is cheaper to buy single ride metro cards ($2.75 per ride) or 7-day unlimited card ($33.00).*

```
#include <iostream>
using namespace std;
int main()
{
  int rides;
  cout << "Enter number of rides:";
  cin >> rides;
```

In Pairs or Triples: Conditionals in Python & C++

- *Your program should then print if it is cheaper to buy single ride metro cards ($2.75 per ride) or 7-day unlimited card ($33.00).*

```
#include <iostream>
using namespace std;
int main()
{
  int rides;
  cout << "Enter number of rides:";
  cin >> rides;
  if (2.75 * rides < 33.00)
```

In Pairs or Triples: Conditionals in Python & C++

- *Your program should then print if it is cheaper to buy single ride metro cards ($2.75 per ride) or 7-day unlimited card ($33.00).*

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#include <iostream>
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{
  int rides;
  cout << "Enter number of rides:";
  cin >> rides;
  if (2.75 * rides < 33.00)
  {
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  }
```

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  int rides;
  cout << "Enter number of rides:";
  cin >> rides;
  if (2.75 * rides < 33.00)
  {
    cout << "Cheaper to buy single ride metro cards.\n";
  }
  else
```

In Pairs or Triples: Conditionals in Python & C++

- *Your program should then print if it is cheaper to buy single ride metro cards ($2.75 per ride) or 7-day unlimited card ($33.00).*

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  cin >> rides;
  if (2.75 * rides < 33.00)
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    cout << "Cheaper to buy single ride metro cards.\n";
  }
  else
  {
    cout << "Cheaper to buy 7-day unlimited card.\n";
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```

In Pairs or Triples: Conditionals in Python & C++

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{
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  cout << "Enter number of rides:";
  cin >> rides;
  if (2.75 * rides < 33.00)
  {
    cout << "Cheaper to buy single ride metro cards.\n";
  }
  else
  {
    cout << "Cheaper to buy 7-day unlimited card.\n";
  }
  return 0;
}
```

In Pairs or Triples: Indefinite Loops in Python & C++

- Write Python code that repeatedly prompts for a non-empty string.

- Write C++ code that repeatedly prompts until an odd number is entered.

In Pairs or Triples: Indefinite Loops in Python & C++

- Write Python code that repeatedly prompts for a non-empty string.

In Pairs or Triples: Indefinite Loops in Python & C++

- Write Python code that repeatedly prompts for a non-empty string.

```
s = ""
```

In Pairs or Triples: Indefinite Loops in Python & C++

- Write Python code that repeatedly prompts for a non-empty string.

```
s = ""
while s == "":
```

In Pairs or Triples: Indefinite Loops in Python & C++

- Write Python code that repeatedly prompts for a non-empty string.

```
s = ""
while s == "":
  s = input("Enter a non-empty string:  ")
```

In Pairs or Triples: Indefinite Loops in Python & C++

- Write Python code that repeatedly prompts for a non-empty string.

```
s = ""
while s == "":
  s = input("Enter a non-empty string:  ")
print("You entered:  ", s)
```

In Pairs or Triples: Indefinite Loops in Python & C++

- Write Python code that repeatedly prompts for a non-empty string.

  ```
  s = ""
  while s == "":
    s = input("Enter a non-empty string:  ")
  print("You entered:  ", s)
  ```

- Write C++ code that repeatedly prompts until an odd number is entered.

In Pairs or Triples: Indefinite Loops in Python & C++

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s = ""
while s == "":
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print("You entered:  ", s)
```

- Write C++ code that repeatedly prompts until an odd number is entered.

```
#include <iostream>
using namespace std;
```

In Pairs or Triples: Indefinite Loops in Python & C++

- Write Python code that repeatedly prompts for a non-empty string.

```python
s = ""
while s == "":
  s = input("Enter a non-empty string:  ")
print("You entered:  ", s)
```

- Write C++ code that repeatedly prompts until an odd number is entered.

```cpp
#include <iostream>
using namespace std;
int main()
```

In Pairs or Triples: Indefinite Loops in Python & C++

- Write Python code that repeatedly prompts for a non-empty string.

```
s = ""
while s == "":
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print("You entered:  ", s)
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- Write C++ code that repeatedly prompts until an odd number is entered.

```
#include <iostream>
using namespace std;
int main()
{
  int num = 0;
```

In Pairs or Triples: Indefinite Loops in Python & C++

- Write Python code that repeatedly prompts for a non-empty string.

```
s = ""
while s == "":
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print("You entered:  ", s)
```

- Write C++ code that repeatedly prompts until an odd number is entered.

```
#include <iostream>
using namespace std;
int main()
{
  int num = 0;
  while (num % 2 == 0)
```

In Pairs or Triples: Indefinite Loops in Python & C++

- Write Python code that repeatedly prompts for a non-empty string.

```
s = ""
while s == "":
  s = input("Enter a non-empty string:  ")
print("You entered:  ", s)
```

- Write C++ code that repeatedly prompts until an odd number is entered.

```
#include <iostream>
using namespace std;
int main()
{
  int num = 0;
  while (num % 2 == 0)
  {
    cout << "Enter an odd number:";
```

In Pairs or Triples: Indefinite Loops in Python & C++

- Write Python code that repeatedly prompts for a non-empty string.

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using namespace std;
int main()
{
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  while (num % 2 == 0)
  {
    cout << "Enter an odd number:";
    cin >> num;
```

In Pairs or Triples: Indefinite Loops in Python & C++

- Write Python code that repeatedly prompts for a non-empty string.

```
s = ""
while s == "":
  s = input("Enter a non-empty string:  ")
print("You entered:  ", s)
```

- Write C++ code that repeatedly prompts until an odd number is entered.

```
#include <iostream>
using namespace std;
int main()
{
  int num = 0;
  while (num % 2 == 0)
  {
    cout << "Enter an odd number:";
    cin >> num;
  }
```

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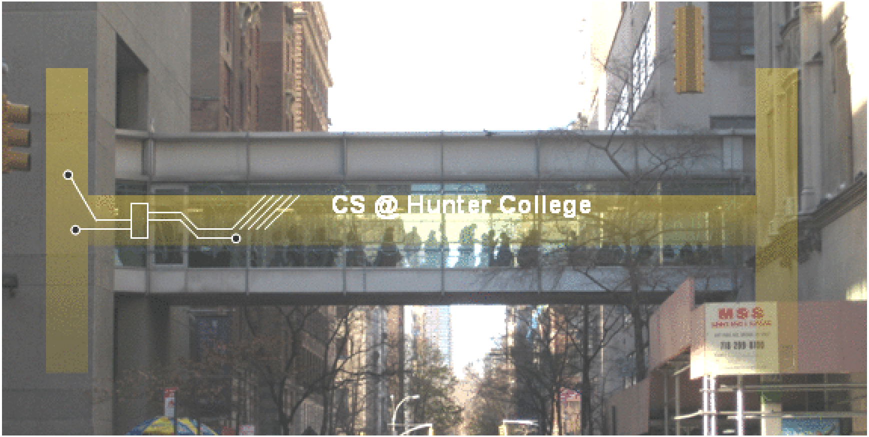
  while (num % 2 == 0)
  {
    cout << "Enter an odd number:";
    cin >> num;
  }
  return 0;
}
```

Lecture Slips & Writing Boards



- Hand lecture slips to UTA's & return writing boards as you leave...