Loops 1

CS 124 – Intro to Software Development

Macbeth – Lesson 6.1

Agenda

- Opening Prayer
- Scripture
- Q&A
- While Loops
- For Loops
- Looking Ahead

Scripture

2 Nephi 11:5

"Come ye and let us walk in the light of the Lord."

Loops

- Print out the numbers 1 to 100. Which is easier:

Without a Loop	With a Loop

``cout << 1 << endl;
cout << 2 << endl;
cout << 3 << endl;
cout << 4 << endl;
cout << 5 << endl;
cout << 6 << endl;
cout << 7 << endl;
cout << 8 << endl;
cout << 9 << endl;
cout << 10 << endl;
cout << 11 << endl;
cout << 12 << endl;
cout << 13 << endl;
…
cout << 99 << endl;
cout << 100 << endl;```
	``for (int i=1; i<=100; i++)
	{
	    cout << i << endl;
	}```

While Loop

- The While Loop is the basic loop.
- The code inside the loop will continue to run while the boolean expression is True
- The loop will stop when the boolean expression is evaluated as False
- The boolean expression is checked everytime before performing the code inside the loop

```
while (<boolean expression>)
{
    // Do something
}
```

Example

- Display the numbers from 0 to 100.

```
int i = 0;
while (i <= 100)
{
    cout << i << endl;
    i++;
}
```

Example

- Display the <u>even</u> numbers from 0 to 100.

```
int i = 0;
while (i <= 100)
{
    cout << i << endl;
    i+=2;
}
```

Example

- Add all numbers from 1 to 100.

```
int sum = 0;
int i = 1;
while (i <= 100)
{
    sum = sum + i;
    i++;
}
```

Example

- Add all numbers from 1 to 100 that are divisible by 13.

```
int sum = 0;
int i = 1;
while (i <= 100)
{
    if (i % 13 == 0)
    {
        sum = sum + i;
    }
    i++;
}
```

For Loops

- A For Loop is a short hand version of a While Loop

```
int sum = 0;
int i = 1;
while (i <= 100)
{
    if (i % 13 == 0)
    {
        sum = sum + i;
    }
    i++;
}
```

=

```
int sum = 0;
for (int i=1; i<=100; i++)
{
    if (i % 13 == 0)
    {
        sum = sum + i;
    }
}
```

For Loops

- A For Loop specifies the loop variable and its initial value, a boolean condition to determine when to stop, and an expression that occurs after each loop.
- Each of the 3 parts is separated by a semicolon

```
for (<initial value>; <boolean condition>; <expression>)
{
    // Do something
}
```

Print 1 to 10 (loop variable in the loop)	Print 1 to 10 (loop variable outside the loop)	Print 10 to 1

`for (int i=1; i<=10; i++)`
`{`
`   cout << i << endl;`
`}`
	`int i;`
	
	`for (i=1; i<=10; i++)`
	`{`
	`    cout << i << endl;`
	`}`
		`for (int i=10; i>0; i--)`
		`{`
		`   cout << i << endl;`
		`}`

Example

- Display the numbers from 0 to 100.

```
for (int i=0; i<=100; i++)
{
    cout << i << endl;
}
```

Example

- Display the numbers from 100 to 0.

```cpp
for (int i=100; i>=0; i--)
{
    cout << i << endl;
}
```

Example

- Display the even numbers from 0 to 100.

```
for (int i=0; i<=100; i=i+2)
{
    cout << i << endl;
}
```

Example

- Ask the user for 20 numbers and then display the average:

```cpp
float sum = 0.0;
float avg = 0.0;
for (int i=1; i<=20; i++)
{
    float number;
    cout << "Enter number: ";
    cin >> number;
    sum = sum + number;
}
avg = sum / 20.0;
cout << "Average = " << avg;
```

Example

- What is the output:

```
int i = 0;
for (i=0; i<10; i++)
{
    cout << i << " ";
}
```

```
0 1 2 3 4 5 6 7 8 9
```

Example

- What is the output:

```
int i = 0;
for (i=0; i<10; i++)
{
    cout << i << " ";
}
cout << i;
```

```
0 1 2 3 4 5 6 7 8 9 10
```

Example

- What is the output:

```
for (int i=0; i<10; i--)
{
    cout << i << " ";
}
```

```
0 -1 -2 -3 -4 -5 -6 -7 … forever
```

Example

- What is the output:

```
for (int i=0; i>-10; i--)
{
    cout << i << " ";
}
```

```
0 -1 -2 -3 -4 -5 -6 -7 -8 -9
```

Example

- What is the output:

```
int j = 0;
for (int i=0; i<10; i++, j--)
{
    cout << j << " ";
}
```

```
0 -1 -2 -3 -4 -5 -6 -7 -8 -9
```

Example

- What is the output:

```
for (int i=1; i<=4; i++)
{
    for (int j=1; j<=4; j++)
    {
        cout << setw(2) << i*j << "  ";
    }
    cout << endl;
}
```

```
 1   2   3   4
 2   4   6   8
 3   6   9  12
 4   8  12  16
```

Example

- How would I display the following output (mini calendar):

```
 1    2    3    4
 5    6    7    8
 9   10   11   12
13   14   15   16
```

```
for (int i=1; i<=16; i++)
{
    cout << setw(2) << i << "   ";
    if (i % 4 == 0)
    {
        cout << endl;
    }
}
```

Looking Forward

- Before Class on Wednesday
  - Read Section 2.4 – Loop Output
  - Assignment 2.4 – The description is I-Learn. There is no testbed for the assignment.