CS 111

while for repeat decisions, loops, blocks of code

If v. While

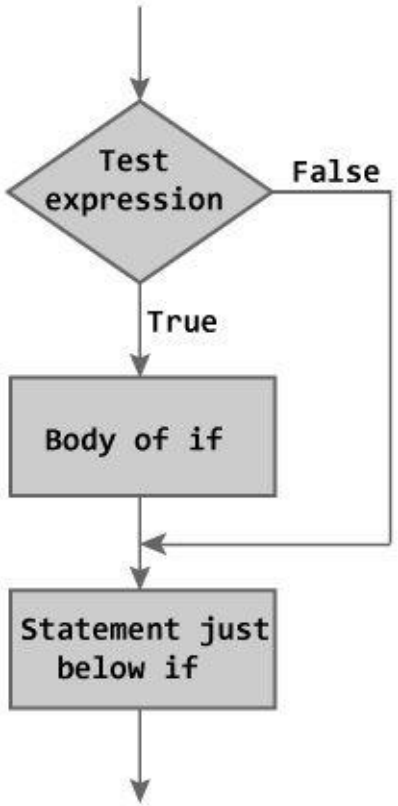

Figure: Flowchart of if Statement

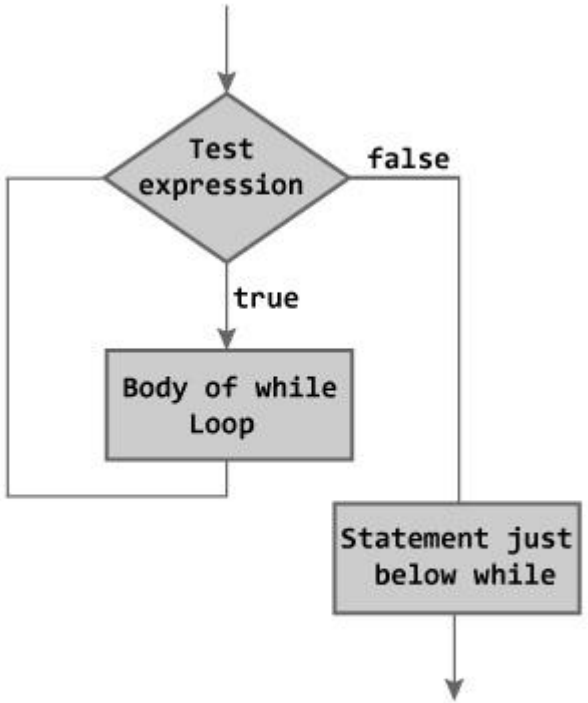

Figure: Flowchart of while Loop

Model of a while repeat decision

- Single statement:

```
while (BOOLEAN_EXPRESSION) STATEMENT;
```

- Multiple statements

```
while (BOOLEAN_EXPRESSION) {
        STATEMENT(s);
}
```

while loop used for input validation

- In example where user enters number for month, we could validate the input using while.

```
int month;
cout << “Enter a month: “;
cin >> month;
while (month < 1 || month > 12){
        cout << “Invalid input! Try again: “;
        cin >> month;
}
```

Example of while loop with an incrementing value

```
int x = 1;
while (x <= 10) {
        cout << x << endl;
        x = x + 1;
}
```

- The above will print all numbers from 1 to 10 in a column

The dreaded Infinite Loop

- In any loop, you MUST have a reachable stopping condition, otherwise the loop could run forever (aka “infinite loop”)
- If the program appears to “hang” you may be in an infinite loop

Practice Problem 1

- Write a while loop to print all positive integers greater than 0 whose square is less than 100. How many times does the loop's conditional statement execute?

Solution

```
#include<iostream>
using namespace std;
int main(){
	int x = 1, counter = 0;
	while( x * x < 100){
		counter = counter + 1;
		cout << x << "^2 = " << x * x << endl;
		x = x + 1;
	}
	cout << "The loop ran " << counter << " times.";
	return 0;
}
```

Practice Problem 2

- Write a while loop to find the sum of all digits of an *n*-digit integer.

Solution

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

int main(){
	int sum = 0, num;
	cout << "Enter a number: ";
	cin >> num;
	while(num != 0){
		sum = sum + num % 10;
		num = num / 10;
	}
	cout << "Sum of digits = " << sum;
	return 0;
}
```

Pseudocode 6.3

```
Function Main
    // Calculates number of days for daily salary to exceed $10,000 when
    // the salary is doubled each day
    Declare integer to store count of days and initialize to 1
    Declare double to store salary and initialize it to 0.01
    While salary is less than 10000
        Print count of days and salary values separated by a tab character
        Increment count of days by 1
        Update salary to equal salary times 2
    Print count of days and salary value separated by a tab character
```