

CIS 22A – Lecture 9

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Logical Operator-Notes

- ! has highest precedence, followed by &&, then ||
- If the value of an expression can be determined by evaluating just the sub-expression on left side of a logical operator, then the sub-expression on the right side will not be evaluated (*short circuit evaluation*)
- Checking Numeric Ranges with Logical Operators
 - Used to test to see if a value falls **inside** a range:

```
if (grade >= 0 && grade <= 100)
    cout << "Valid grade";
```
 - Can also test to see if value falls **outside** of range:

```
if (grade <= 0 || grade >= 100)
    cout << "Invalid grade";
```
 - Cannot use mathematical notation:

```
if (0 <= grade <= 100) //doesn't work!
```

Comparing Characters

- Characters are compared using their ASCII values
- 'A' < 'B'
 - The ASCII value of 'A' (65) is less than the ASCII value of 'B' (66)
- '1' < '2'
 - The ASCII value of '1' (49) is less than the ASCII value of '2' (50)
- Lowercase letters have higher ASCII codes than uppercase letters, so 'a' > 'Z'

Relational Operators Compare Characters in Program 4-20

```
10 // Get a character from the user.
11 cout << "Enter a digit or a letter: ";
12 ch = cin.get();
13
14 // Determine what the user entered.
15 if (ch >= '0' && ch <= '9')
16     cout << "You entered a digit.\n";
17 else if (ch >= 'A' && ch <= 'Z')
18     cout << "You entered an uppercase letter.\n";
19 else if (ch >= 'a' && ch <= 'z')
20     cout << "You entered a lowercase letter.\n";
21 else
22     cout << "That is not a digit or a letter.\n";
```

Comparing `string` Objects

- Like characters, strings are compared using their ASCII values

```
string name1 = "Mary";  
string name2 = "Mark";
```

The characters in each string must match before they are equal

```
name1 > name2 // true  
name1 <= name2 // false  
name1 != name2 // true
```

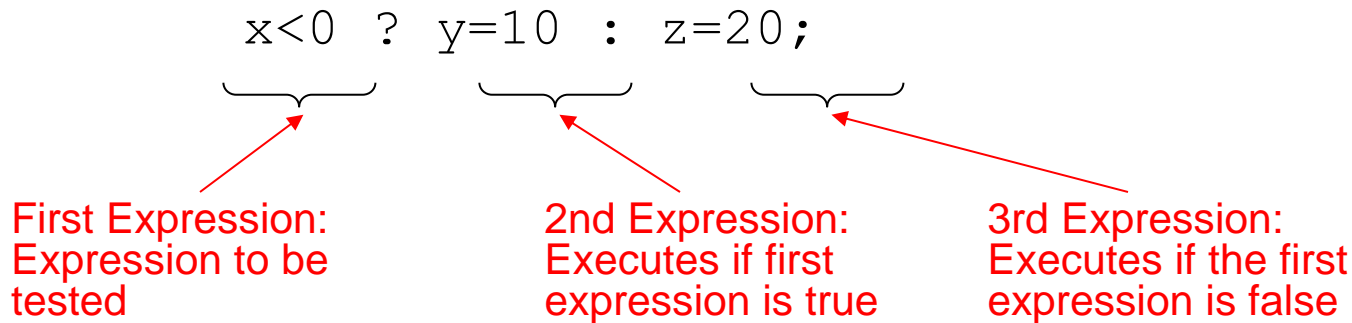
```
name1 < "Mary Jane" // true
```

Relational Operators Compare Strings in Program 4-21

```
26      // Determine and display the correct price
27      if (partNum == "S-29A")
28          cout << "The price is $" << PRICE_A << endl;
29      else if (partNum == "S-29B")
30          cout << "The price is $" << PRICE_B << endl;
31      else
32          cout << partNum << " is not a valid part number.\n";
```

The Conditional Operator

- Can use to create short `if/else` statements
- Format: `exprCond ? exprT : exprF;`



- The value of a conditional expression is
 - The value of the second expression if the first expression is true
 - The value of the third expression if the first expression is false
- Parentheses () may be needed in an expression due to precedence of conditional operator

Using `switch` in Menu Systems

- `switch` statement is a natural choice for creating menus:
 - display the menu
 - then, get the user's menu selection
 - use user input as expression in `switch` statement
 - use menu choices as *expr* in *case* statements

```
19 // Constants for menu choices
20 const int ADULT_CHOICE = 1,
21          CHILD_CHOICE = 2,
22          SENIOR_CHOICE = 3,
23          QUIT_CHOICE = 4;
24
25 // Display the menu and get a choice.
26 cout << "\t\tHealth Club Membership Menu\n\n"
27      << "1. Standard Adult Membership\n"
28      << "2. Child Membership\n"
29      << "3. Senior Citizen Membership\n"
30      << "4. Quit the Program\n\n"
31      << "Enter your choice: ";
32 cin >> choice;
33
34 // Set the numeric output formatting.
35 cout << fixed << showpoint << setprecision(2);
36
37 // Respond to the user's menu selection.
38 if (choice == ADULT_CHOICE)
39 {
40     cout << "For how many months? ";
41     cin >> months;
42     charges = months * ADULT;
43     cout << "The total charges are $" << charges << endl;
44 }
45 else if (choice == CHILD_CHOICE)
46 {
47     cout << "For how many months? ";
48     cin >> months;
49     charges = months * CHILD;
50     cout << "The total charges are $" << charges << endl;
51 }
52 else if (choice == SENIOR_CHOICE)
53 {
54     cout << "For how many months? ";
55     cin >> months;
56     charges = months * SENIOR;
57     cout << "The total charges are $" << charges << endl;
58 }
59 else if (choice == QUIT_CHOICE)
60 {
61     cout << "Program ending.\n";
62 }
63 else
64 {
65     cout << "The valid choices are 1 through 4. Run the\n"
66         << "program again and select one of those.\n";
67 }
```


More About Blocks and Scope

- Scope of a variable is the block in which it is defined, from the point of definition to the end of the block
- Usually defined at beginning of function
- May be defined close to first use

```
16  if (income >= MIN_INCOME)
17  {
18      // Get the number of years at the current job.
19      cout << "How many years have you worked at "
20           << "your current job? ";
21      int years;    // Variable definition
22      cin >> years;
23
24      if (years > MIN_YEARS)
25          cout << "You qualify.\n";
26      else
27      {
28          cout << "You must have been employed for\n"
29               << "more than " << MIN_YEARS
30               << " years to qualify.\n";
31      }
32  }
```

Variables with the Same Name

- Variables defined inside { } have local or block scope
- When inside a block within another block, can define variables with the same name as in the outer block.
 - When in inner block, outer definition is not available
 - Not a good idea

Program 4-30

```
1 // This program uses two variables with the name number.
2 #include <iostream>
3 using namespace std;
4
5 int main()
6 {
7     // Define a variable named number.
8     int number;
9
10    cout << "Enter a number greater than 0: ";
11    cin >> number;
12    if (number > 0)
13    {
14        int number; // Another variable named number.
15        cout << "Now enter another number: ";
16        cin >> number;
17        cout << "The second number you entered was "
18             << number << endl;
19    }
20    cout << "Your first number was " << number << endl;
21    return 0;
22 }
```

Program Output with Example Input Shown in Bold

```
Enter a number greater than 0: 2 [Enter]
Now enter another number: 7 [Enter]
The second number you entered was 7
Your first number was 2
```