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## Logical Operators and if/else statement

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## If Statement

- We may want to execute some code if an expression is **true**, and execute *some other code* when the expression is **false**.
- This can be done with two if statements...

```
if (value >= LIMIT)
{
    // do something
}
if (value < LIMIT)
{
    // do something else
}
```

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## If/Else (4.3)

- C++ provides a shortcut to combine two **if** statements:
- The statements in the else clause are executed only when the expression is false.

```
if (expression)
{
    // do stuff
}
else
{
    // do other stuff
}
```

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## Example

```
int number;
cout << "Enter a number, I'll tell you";
cout << " if it is odd or even: ";
cin >> number;

// use an if/else statement here
```

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## if/else/if statements (4.4)

- What if there are more than two alternatives?

```
cout << "Enter two numbers: ";
cin >> num1 >> num2;

if(num1 > num2)
{
    cout << num1 << "is greater" << endl;
}
else if(num2 > num1)
{
    cout << num2 << "is greater" << endl;
}
else
{
    cout << "Numbers are equal" << endl;
}
```

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## Logical Operators (4.7)

- There are three logical operators

&&	And
	Or
!	Not

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## Evaluating Expressions: And &&

- `expr1 && expr2`
- For the complete expression to be true, both `expr1` and `expr2` have to be true
- Example:  
`temp > HOT && humidity > STICKY`
  - These are unbearable heat **and** humidity conditions
  - Both must be true for the entire expression to be true

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## Evaluating Expressions: Or ||

- `expr1 || expr2`
- The complete expression is true if either `expr1` or `expr2` is true
- Examples:  
`salary < MIN_SALARY || MARRIED == status`
  - To qualify for financial aid, salary has to be less than some minimum salary **or** you must be married
  - Only one condition has to be true

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## Evaluating Expressions: Not !

- `!expr`
- Unary operator: Negation
- Examples:  
`!(salary < MIN_SALARY)`
  - What makes this true? False?

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## Precedence

### Precedence Operators (Highest to Lowest)

- (negation)    ! (Logical NOT)  
\* / %  
- +

<= => > <  
== !=

&&  
||

= += -= \*= /= %=

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## Expression Evaluation

- According to the operator precedence and associativity rules given on the previous slide, how will the following expressions be evaluated?

`x < min + max`

`min <= x && x <= max`

`!x == y + 2`

`x = a + b % 7 * 2`

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## Practice

- Are these two code snippets equivalent?

```
int x, y;  
if(x > y)  
{  
    x += y;  
}  
if(y < x)  
{  
    y += x;  
}
```

```
int x, y;  
if(x > y)  
{  
    x += y;  
}  
else  
{  
    y += x;  
}
```

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## Problem

- Write a C++ program segment that allows the user the ability to input an integer from the keyboard.
- If the integer is positive, increment a variable **posCount** by 1. If the integer is **negative**, increment a variable **negCount** by 1. If neither, increment **zeroCount** by 1

```
int posCount=0, negCount=0, zeroCount=0;
```

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## Problem

- Write a program that displays a letter grade corresponding to an exam score

```
90 - 100 A      double examGrade;  
80 - 89 B      cin >> examGrade;  
70 - 79 C  
60 - 69 D  
0 - 59 F
```

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## Nested if Statements (4.6)

- Note the indentation of the inner if

```
if (actual > expected)  
{  
    if (MAX == actual)  
    {  
    }  
    else  
    {  
    }  
}  
else  
{  
}
```

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## Example

- Write nested if statements that set the correct value in the `wage` variable:

If your status is full time, and you worked more than 10 years, your wage is \$25. All other full time workers have a wage of \$15. If your status is part time, you have a wage of \$10.

```
const int FULLTIME=0, PARTTIME=1;
double wage;
int yearsWorked, status;
```

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## Example

- Your local bookstore has asked you to write a program to help them determine the cost of shipping of customers orders. If the order is \$30 or less then shipping will cost \$5, if the order is over \$30 then shipping will be \$3

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## Problem

- The bookstore has now changed it's shipping policy so that
  - If the order is \$30 or less, shipping is \$5
  - If the order is over \$30 but less than \$50, shipping is \$3
  - If the order is over \$50 then shipping is \$2

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