



Decision-Making in C

It is often necessary to perform one set of operations in one situation, and another set in a different situation.

C has statements that can perform decisions:

```
if
if-else
switch-case
```

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The if statement

if(exp)s

Operation:

- The expression exp is evaluated. Usually, exp is a "logical expression"
- If the expression is true, then the statement s
 is executed.
- o If the expression is false, s is ignored

Notes:

'if' is a keyword (lower case)

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```
Logical Operators and Expressions

Logical operators produce the values "true" or "false"

| Compared to compared
```

```
Some if Statement Examples
         if(a > 10) a = 10;
         bigger = a;
         if(b > a) bigger = b;
         cout << "The bigger value is " << bigger << endl;</pre>
         if(x > y) x = y;
          if(x > y)
            x = y;
         if(x > y)
            x = y;
y = 0;
          if(x > y)
             x = y;
             y = 0;
            } // END if
        Note: { } are used to create a "compound statement"
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```





The if-else statement

```
if (exp) s1 else s2
```

The expression exp is evaluated. If the result is "true," then s1 is executed. If the result is "false," then s2 is executed.

Examples:

```
if(x > y)
                                         if(x > y) {
if(a > b)
                                             x = y;
   bigger = a;
                         x = y;
                                             y = 0;
else
                         y = 0;
   bigger = b;
                                         else
cout << bigger;</pre>
                    else
                                             y = x;
                                             x = 0;
                         y = x;
                                           } // END if
                         x = 0;
                       } // END if
```

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What Do "true" and "false" Mean?

Most of the time, logical expressions are used in if statements. However, any expression can be used:

If the expression value is 0, it is treated as "false"

If the expression value is non-zero, it is treated as "true."

When the computer performs a logical expression, it assigns a '1' for true.

```
if(a+10) b = c;

if (3) x = 1.0;

if (a = b) c = d; // be careful with this one!

r = s >= t;
```

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The bool Data Type

C++ implements the bool data type. It is specifically used for "true-false" values

```
bool y, n = false;
int a = 10, b = 5;

y = a < 10;
if(y)
    a = 0;
else
    b = 0;</pre>
```

The bool data type is named after George Boole, a 19th century mathematician who invented Boolean algebra, the theory behind all digital computers!

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Connective Operators

The connective operators allow us to create more complicated logical expressions.

&& ("AND")

```
| | ("OR")

if(a < b && c < d) x = 3;

if(x > 0.0 && x <= 10.0) y = x;

v = r || s && !t;
```

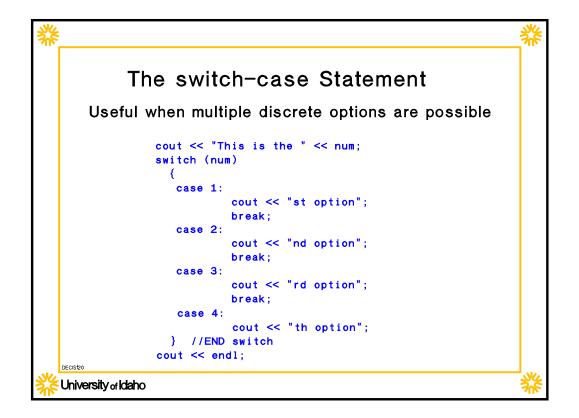
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```
Operator Hierarchy (Update)
   Highest
                                   Unary NOT, unary plus, unary minus
                                   multiplication, division, modulus
                                   addition, subtraction
                                   relational inequality operators
                          == !=
                                   relational equality operations
                                   logical AND
                              &&
                              Ш
                                   logical OR
           = += -= <del>*</del>= /= %=
                                   assignment operators
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```

```
Nested if Statements
  if (fnlave >= 90.0)
                                   if (fnlave >= 90.0)
     grade = 'A';
                                      grade = 'A';
  else
                                  else if (fnlave >= 80.0)
     if (fnlave >= 80.0)
                                      grade = 'B';
        grade = 'B';
                                  else if (fnlave >= 70.0)
     else
                                      grade = 'C";
        if (fnlave >= 70.0)
                                  else if (fnlave >= 60.0)
           grade = 'C';
                                      grade = 'D';
        else
                                  else
           if (fnlave >= 60.0)
                                      grade = 'F';
              grade = 'D';
           else
              grade = 'F';
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```



```
The switch-case Statement
                            default clause
               cout << "This is the " << num;</pre>
               switch (num)
                  case 1:
                            cout << "st option";</pre>
                            break;
                   case 2:
                            cout << "nd option";</pre>
                            break;
                   case 3:
                            cout << "rd option";</pre>
                            break;
                   default:
                            cout << "th option";</pre>
                 } //END switch
               cout << endl;</pre>
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```

