CSC 211: Computer Programming

Expressions and Selection Statements

Michael Conti

Department of Computer Science and Statistics University of Rhode Island

Summer 2024



Expressions

Common arithmetic operators





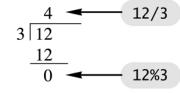


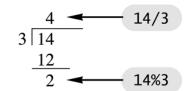




- Can be used with any numeric type (integers and floating point numbers)
- Result of the **operator** depends on the type of the **operands**
- Be aware of the integer division (fractional part discarded)
 22/4 is 5

Integer Division





from: Problem Solving with C++, 10th Edition, Walter Savitch

"Rules"

- · Use parentheses!
 - ✓ even when redundant
- · Use whitespaces!

$$((b * b) - (4 * a * c)) / (2 * a) \stackrel{1}{\leftarrow}$$

Boolean expressions

- Expressions that evaluate to either true or false
- Can use comparison operators











· Can use logical operators





Truth Tables

Exp_1	Exp_2	Exp_1 && Exp_2
true	true	true
true	false	false
false	true	false
false	false	false

OR

Exp_1	Exp_2	Exp_1 Exp_2
true	true	true
true	false	true
false	true	true
false	fa1se	fa1se

NOT

Exp	!(<i>Exp</i>)
true	false
fa1se	true

from: Problem Solving with C++, 10th Edition, Walter Savitch

Comparison Operators

Math Symbol	English	C++ Notation	C++ Sample	Math Equivalent
=	equal to	==	x + 7 == 2*y	x + 7 = 2y
≠	not equal to	!=	ans != 'n'	ans ≠ 'n'
<	less than	<	count < m + 3	count < m + 3
≤	less than or equal to	<=	time <= limit	time ≤ limit
>	greater than	>	time > limit	time > limit
≥	greater than or equal to	>=	age >= 21	age ≥ 21

Precedence Rules

The unary operators +, -, ++, --, and !. The binary arithmetic operations *, /, % The binary arithmetic operations +, -The Boolean operations <, >, <=, >=The Boolean operations ==, != The Boolean operations && The Boolean operations | |

Highest precedence (done first)

Lowest precedence (done last)

What is the value of this expression?

$$x = 5$$

 $(x + 1) > 2 | | (x + 1) < -3$

Recommended style

$$((x + 1) > 2) \mid | ((x + 1) < -3)$$

from: Problem Solving with C++, 10th Edition, Walter Savitch

In C++ any nonzero value is true and zero is false

What is the value of this expression?

false

What is the value of this expression?

What is the value of this expression?

```
a=0; \quad b=1; \quad c=15; \quad d=5; \quad e=20; (!b && !!c) || (d == e) || (!a && ((d + e) % 10 == 0));
```

14

Selection Statements if and switch

if statements

- · Allow conditional execution of code
- · General idea:

```
if (expression)
    true statement
else
    false statement
```

The if statement (basic syntax)

```
if (expression)
    statementA
    statementA
    else if (expressionB)
        statementB

if (expression)
        statementA
else
    statementB
    statementN
```

Example

```
int value;
std::cout << "Enter a number: ";
std::cin >> value;

if (value > 0) {
    std::cout << "positive number" << std::endl;
} else if (value < 0) {
    std::cout << "negative number" << std::endl;
} else {
    std::cout << "zero" << std::endl;
}</pre>
```

17

Compound statements

```
if (expression) {
    statementA
                       Recommended to
    statementB
                        always use braces,
    statementC
                        even with single
                        statements
} else {
                       Develop a good
    statementL
                        and consistent
    statementM
                        programming style
    statementN
}
```

Compound statements

```
#include <iostream>

int main()

double fuelGaugeReading;

std::cout << "Enter fuel gauge reading: ";

std::cin >> fuelGaugeReading;

f(fuelGaugeReading < 0.75)

if (fuelGaugeReading < 0.25)

std::cout << "Fuel very low. Caution!\n";

else

std::cout << "Fuel over 3/4. Dont stop now!\n";

tif (fuelGaugeReading < 0.75)

if (fuelGaugeReading < 0.75)

std::cout << "Fuel very low. Caution!\n";

tif (fuelGaugeReading < 0.75)

if (fuelGaugeReading < 0.75)

std::cout << "Fuel very low. Caution!\n";

else

std::cout << "Fuel very low. Caution!\n";

else

std::cout << "Fuel over 3/4. Don't stop now!\n";

return 0;

return 0;

}</pre>
```

Compound Statements Used with if-else

```
if (my_score > your_score)
{
    cout << "I win!\n";
    wager = wager + 100;
}
else
{
    cout << "I wish these were golf scores.\n";
    wager = 0;
}</pre>
```

from: Problem Solving with C++, 10th Edition, Walter Savitch

An if-else Statement within an if Statement

from: Problem Solving with C++, 10th Edition, Walter Savitch

_

switch statements

- Allow conditional execution of code based on the value of an integer expression
- · Basic syntax:

```
switch (expression) {
   case valueA:
       statementA
   case valueB:
       statementB
    .
   case valueN:
       statementN
   default:
       statement
}
```

if expression equals to a value, control executes corresponding statement (can be a compound statement), then continue executing statements until break is encountered

switch statements

switch statements

Exercise

- Write a program in C++ (**on paper**) that:
 - ✓ reads the number of **hours**
 - ✓ calculates payment:
 - if number of hours no greater than 40, **payment** is calculated using the regular hourly rate of \$35
 - if overtime, **payment** is calculated using the regular hourly rate for the first 40 hours and the special rate of \$50 for the remaining hours
 - ✓ prints the calculated **payment**

A switch Statement (part 1 of 2) characters (ascii values) can also //Program to illustrate the switch statement. #include <iostream> be used in switch statements using namespace std; int main() char grade; Aswitch Statement (part 2 of 2) cout << "Enter your midterm grade and press Return: ";</pre> Sample Dialogue 1 switch (grade) Enter your midterm grade and press Return: A Excellent. You need not take the final. End of program. cout << "Excellent. " << "You need not take the final.\n"; Sample Dialogue 2 case 'B': cout << "Very good. ";</pre> Enter your midterm grade and press Return: B grade = 'A'; Very good. Your midterm grade is now A. cout << "Your midterm grade is now " End of program. << grade << endl; Sample Dialogue 3 case 'C': cout << "Passing.\n";</pre> Enter your midterm grade and press Return: D break: Not good. Go study. case 'D': End of program. case 'F': cout << "Not good. " Sample Dialogue 4 << "Go study.\n"; break; Enter your midterm grade and press Return: E default: That is not a possible grade. cout << "That is not a possible grade.\n";</pre> End of program. cout << "End of program.\n"; return 0; from: Problem Solving with C++, 10th Edition, Walter Savitch