Programming in C++ – Table of Contents

Programming in C++

Table of Contents

1. Introduction to C++

- 1.1 Programming (general)
- 1.2 Programming basics
- 1.3 Comments and whitespace
- 1.4 Errors and warnings
- 1.5 Computers and programs (general)
- 1.6 Computer tour
- 1.7 Language history
- 1.8 Problem solving
- 1.9 Why programming
- 1.10 C++ example: Salary Calculation
- 1.11 C++ example: Married-couple names

2. Variables / Assignments

- 2.1 Variables and assignments (general)
- 2.2 Variables (int)
- 2.3 Identifiers
- 2.4 Arithmetic expressions (general)
- 2.5 Arithmetic expressions (int)
- 2.6 Example: Health data
- 2.7 Floating-point numbers (double)
- 2.8 Scientific notation for floating-point literals
- 2.9 Constant variables
- 2.10 Using math functions
- 2.11 Integer division and modulo
- 2.12 Type conversions
- 2.13 Binary
- 2.14 Characters
- 2.15 Strings
- 2.16 Integer overflow
- 2.17 Numeric data types
- 2.18 Unsigned
- 2.19 Random numbers
- 2.20 Debugging
- 2.21 Auto (since C++11)
- 2.22 Style guidelines
- 2.23 C++ example: Salary calculation with variables
- 2.24 C++ example: Married-couple names with variables

3. Branches

- 3.1 If-else branches (general)
- 3.2 If-else
- 3.3 More if-else
- 3.4 Equality and relational operators
- 3.5 Detecting ranges (general)
- 3.6 Detecting ranges with if-else statements
- 3.7 Logical operators
- 3.8 Order of evaluation
- 3.9 Example: Toll calculation
- 3.10 Switch statements
- 3.11 Boolean data type
- 3.12 String comparisons
- 3.13 String access operations
- 3.14 Character operations
- 3.15 More string operations
- 3.16 Conditional expressions
- 3.17 Floating-point comparison
- 3.18 Short circuit evaluation
- 3.19 C++ example: Salary calculation with branches
- 3.20 C++ example: Search for name using branches

4. Loops

- 4.1 Loops (general)
- 4.2 While loops
- 4.3 More while examples
- 4.4 For loops
- 4.5 More for loop examples
- 4.6 Loops and strings
- 4.7 Nested loops
- 4.8 Developing programs incrementally
- 4.9 Break and continue
- 4.10 Variable name scope
- 4.11 Enumerations
- 4.12 C++ example: Salary calculation with loops
- 4.13 C++ example: Domain name validation with loops

5. Arrays / Vectors

- 5.1 Array/vector concept (general)
- 5.2 Vectors
- 5.3 Array/vector iteration drill
- 5.4 Iterating through vectors
- 5.5 Multiple vectors
- 5.6 Vector resize
- 5.7 Vector push_back
- 5.8 Loop-modifying or copying/comparing vectors
- 5.9 Swapping two variables (General)
- 5.10 Debugging example: Reversing a vector
- 5.11 Arrays vs. vectors
- 5.12 Two-dimensional arrays

- 5.13 Char arrays / C strings
- 5.14 String library functions
- 5.15 Char library functions: ctype
- 5.16 C++ example: Salary calculation with vectors
- 5.17 C++ example: Domain name validation with vectors

6. User-Defined Functions

- 6.1 User-defined function basics
- 6.2 Return
- 6.3 Reasons for defining functions
- 6.4 Functions with branches/loops
- 6.5 Unit testing (functions)
- 6.6 How functions work
- 6.7 Functions: Common errors
- 6.8 Pass by reference
- 6.9 Functions with string/vector parameters
- 6.10 Functions with C string parameters
- 6.11 Scope of variable/function definitions
- 6.12 Default parameter values
- 6.13 Function name overloading
- 6.14 Parameter error checking
- 6.15 Preprocessor and include
- 6.16 Separate files
- 6.17 C++ example: Salary calculation with functions
- 6.18 C++ example: Domain name validation with functions

7. Objects and Classes

- 7.1 Objects: Introduction
- "7.2 Using a class
- 7.3 Defining a class
- 7.4 Inline member functions"
- 7.5 Mutators, accessors, and private helpers
- 7.6 Initialization and constructors
- 7.7 Classes and vectors/classes
- 7.8 Separate files for classes
- 7.9 Choosing classes to create
- 7.10 Unit testing (classes)
- 7.11 Constructor overloading
- 7.12 Constructor initializer lists
- 7.13 The 'this' implicit parameter
- 7.14 Operator overloading
- 7.15 Vector ADT
- 7.16 Namespaces
- 7.17 Static data members and functions
- 7.18 C++ example: Salary calculation with classes
- 7.19 C++ example: Domain name availability with classes

8. Pointers

- 8.1 Why pointers: A list example
- 8.2 Pointer basics

- 8.3 Operators: new, delete, and ->
- 8.4 String functions with pointers
- 8.5 A first linked list
- 8.6 Memory regions: Heap/Stack
- 8.7 Miscellaneous pointer issues
- 8.8 Memory leaks
- 8.9 Destructors
- 8.10 Copy constructors
- 8.11 Copy assignment operator
- 8.12 Rule of three
- 8.13 C++ example: Employee list using vectors

9. Streams

- 9.1 The ostream and cout streams
- 9.2 The istream and cin streams
- 9.3 Output formatting
- 9.4 String streams
- 9.5 File input and output
- 9.6 Stream errors
- 9.7 Extraction before getline

10. Inheritance

- 10.1 Derived classes
- 10.2 Access by members of derived classes
- 10.3 Overriding member functions
- 10.4 Polymorphism and virtual member functions
- 10.5 Is-a versus has-a relationships
- 10.6 C++ example: Employees and overriding class functions
- 10.7 C++ example: Employees using an abstract class

11. Recursion

- 11.1 Recursion: Introduction
- 11.2 Recursive functions
- 11.3 Recursive algorithm: Search
- 11.4 Adding output statements for debugging
- 11.5 Creating a recursive function
- 11.6 Recursive math functions
- 11.7 Recursive exploration of all possibilities
- 11.8 Stack overflow
- 11.9 C++ example: Recursively output permutations

12. Exceptions

- 12.1 Exception basics
- 12.2 Exceptions with functions
- 12.3 Multiple handlers
- 12.4 C++ example: Generate number format exception

13. Templates

13.1 Function templates

- 13.2 Class templates
- 13.3 C++ example: Map values using a function template

14. Containers

- 14.1 Range-based for loop
- 14.2 List
- 14.3 Pair
- 14.4 Map
- 14.5 Set
- 14.6 Queue
- 14.7 Deque
- 14.8 find() function
- 14.9 sort() function

15. Searching and Sorting Alg.

- 15.1 Searching and algorithms
- 15.2 Binary search
- 15.3 O notation
- 15.4 Algorithm analysis
- 15.5 Sorting: Introduction
- 15.6 Selection sort
- 15.7 Insertion sort
- 15.8 Quicksort
- 15.9 Merge sort

16. Additional Material

- 16.1 Do-while loops
- 16.2 Arrays
- 16.3 Iterating through arrays
- 16.4 Multiple arrays
- 16.5 Loop-modifying or copying/comparing arrays
- 16.6 Debugging example: Reversing an array
- 16.7 Engineering examples
- 16.8 Functions with array parameters
- 16.9 Functions with array parameters: Common errors
- 16.10 Engineering examples using functions
- 16.11 Grouping data: struct
- 16.12 Structs and functions
- 16.13 Structs and vectors
- 16.14 Structs, vectors, and functions: A seat reservation example
- 16.15 Command-line arguments
- 16.16 Command-line arguments and files
- 16.17 The #define directive
- 16.18 Modular compilation
- 16.19 Makefiles
- 16.20 Additional practice: Output art
- 16.21 Additional practice: Grade calculation
- 16.22 Additional practice: Tweet decoder
- 16.23 Additional practice: Dice statistics
- 16.24 zyBooks built-in programming window