

Contents

1	General	1–1
1.1	Scope	1–1
1.2	Normative references	1–1
1.3	Implementation compliance	1–2
1.4	Definitions.....	1–2
1.5	Syntax notation	1–3
1.6	The C++ memory model	1–4
1.7	The C++ object model.....	1–4
1.8	Program execution	1–5
2	Lexical conventions	2–1
2.1	Phases of translation.....	2–1
2.2	Basic source character set	2–2
2.3	Trigraph sequences.....	2–2
2.4	Preprocessing tokens.....	2–3
2.5	Alternative tokens	2–4
2.6	Tokens	2–4
2.7	Comments	2–4
2.8	Header names	2–5
2.9	Preprocessing numbers.....	2–5
2.10	Identifiers	2–5
2.11	Keywords	2–6

2.12 Operators and punctuators.....	2-7
2.13 Literals.....	2-7
2.13.1 Integer literals.....	2-7
2.13.2 Character literals	2-8
2.13.3 Floating literals	2-10
2.13.4 String literals	2-10
2.13.5 Boolean literals.....	2-11
3 Basic concepts.....	3-1
3.1 Declarations and definitions.....	3-1
3.2 One definition rule	3-2
3.3 Declarative regions and scopes	3-4
3.3.1 Point of declaration	3-5
3.3.2 Local scope.....	3-6
3.3.3 Function prototype scope	3-6
3.3.4 Function scope	3-6
3.3.5 Namespace scope	3-6
3.3.6 Class scope.....	3-7
3.3.7 Name hiding	3-8
3.4 Name look up	3-8
3.4.1 Unqualified name look up	3-9
3.4.2 Argument-dependent name lookup.....	3-12
3.4.3 Qualified name look up	3-13
3.4.3.1 Class members	3-14
3.4.3.2 Namespace members.....	3-14
3.4.4 Elaborated type specifiers	3-17
3.4.5 Class member access.....	3-18
3.4.6 Using-directives and namespace aliases	3-19
3.5 Program and linkage	3-19
3.6 Start and termination	3-21
3.6.1 Main function	3-21
3.6.2 Initialization of non-local objects.....	3-22
3.6.3 Termination	3-23
3.7 Storage duration	3-24
3.7.1 Static storage duration.....	3-24
3.7.2 Automatic storage duration.....	3-24
3.7.3 Dynamic storage duration	3-24
3.7.3.1 Allocation functions	3-25
3.7.3.2 Deallocation functions	3-26
3.7.4 Duration of sub-objects	3-26
3.8 Object Lifetime	3-26
3.9 Types.....	3-29
3.9.1 Fundamental types	3-31
3.9.2 Compound types	3-32

3.9.3 CV-qualifiers.....	3–33
3.10 Lvalues and rvalues.....	3–34
4 Standard conversions	4–1
4.1 Lvalue-to-rvalue conversion	4–2
4.2 Array-to-pointer conversion.....	4–2
4.3 Function-to-pointer conversion.....	4–2
4.4 Qualification conversions.....	4–2
4.5 Integral promotions	4–3
4.6 Floating point promotion	4–4
4.7 Integral conversions	4–4
4.8 Floating point conversions	4–4
4.9 Floating-integral conversions.....	4–4
4.10 Pointer conversions	4–4
4.11 Pointer to member conversions.....	4–5
4.12 Boolean conversions	4–5
5 Expressions	5–1
5.1 Primary expressions	5–2
5.2 Postfix expressions.....	5–4
5.2.1 Subscripting	5–4
5.2.2 Function call.....	5–4
5.2.3 Explicit type conversion (functional notation).....	5–6
5.2.4 Pseudo destructor call	5–6
5.2.5 Class member access.....	5–6
5.2.6 Increment and decrement	5–7
5.2.7 Dynamic cast.....	5–8
5.2.8 Type identification	5–9
5.2.9 Static cast	5–10
5.2.10 Reinterpret cast.....	5–11
5.2.11 Const cast	5–12
5.3 Unary expressions	5–13
5.3.1 Unary operators	5–14
5.3.2 Increment and decrement	5–15
5.3.3 Sizeof.....	5–15
5.3.4 New	5–15
5.3.5 Delete	5–18

5.4	Explicit type conversion (cast notation).....	5–19
5.5	Pointer-to-member operators	5–20
5.6	Multiplicative operators	5–21
5.7	Additive operators	5–21
5.8	Shift operators	5–22
5.9	Relational operators	5–23
5.10	Equality operators	5–24
5.11	Bitwise AND operator	5–24
5.12	Bitwise exclusive OR operator	5–24
5.13	Bitwise inclusive OR operator.....	5–25
5.14	Logical AND operator	5–25
5.15	Logical OR operator	5–25
5.16	Conditional operator.....	5–25
5.17	Assignment operators.....	5–26
5.18	Comma operator.....	5–27
5.19	Constant expressions.....	5–27
6	Statements	6–1
6.1	Labeled statement.....	6–1
6.2	Expression statement.....	6–1
6.3	Compound statement or block	6–1
6.4	Selection statements	6–2
6.4.1	The <code>if</code> statement	6–3
6.4.2	The <code>switch</code> statement.....	6–3
6.5	Iteration statements	6–3
6.5.1	The <code>while</code> statement	6–4
6.5.2	The <code>do</code> statement	6–5
6.5.3	The <code>for</code> statement.....	6–5
6.6	Jump statements	6–5
6.6.1	The <code>break</code> statement	6–6
6.6.2	The <code>continue</code> statement	6–6
6.6.3	The <code>return</code> statement.....	6–6
6.6.4	The <code>goto</code> statement.....	6–6

6.7 Declaration statement	6–6
6.8 Ambiguity resolution	6–7
7 Declarations.....	7–1
7.1 Specifiers.....	7–2
7.1.1 Storage class specifiers	7–3
7.1.2 Function specifiers	7–4
7.1.3 The <code>typedef</code> specifier.....	7–5
7.1.4 The <code>friend</code> specifier.....	7–6
7.1.5 Type specifiers	7–6
7.1.5.1 The <i>cv-qualifiers</i>	7–7
7.1.5.2 Simple type specifiers	7–8
7.1.5.3 Elaborated type specifiers	7–9
7.2 Enumeration declarations.....	7–10
7.3 Namespaces.....	7–12
7.3.1 Namespace definition.....	7–12
7.3.1.1 Unnamed namespaces	7–13
7.3.1.2 Namespace member definitions.....	7–14
7.3.2 Namespace alias	7–15
7.3.3 The <code>using</code> declaration.....	7–16
7.3.4 Using directive	7–21
7.4 The <code>asm</code> declaration.....	7–23
7.5 Linkage specifications.....	7–24
8 Declarators	8–1
8.1 Type names	8–2
8.2 Ambiguity resolution	8–3
8.3 Meaning of declarators.....	8–4
8.3.1 Pointers.....	8–5
8.3.2 References	8–6
8.3.3 Pointers to members.....	8–7
8.3.4 Arrays	8–8
8.3.5 Functions	8–9
8.3.6 Default arguments	8–11
8.4 Function definitions	8–14
8.5 Initializers.....	8–15
8.5.1 Aggregates.....	8–18
8.5.2 Character arrays.....	8–20
8.5.3 References	8–21
9 Classes.....	9–1
9.1 Class names	9–2

9.2	Class members	9–3
9.3	Member functions	9–5
9.3.1	Nonstatic member functions	9–6
9.3.2	The <code>this</code> pointer.....	9–7
9.4	Static members	9–8
9.4.1	Static member functions.....	9–9
9.4.2	Static data members	9–9
9.5	Unions	9–10
9.6	Bit-fields.....	9–11
9.7	Nested class declarations.....	9–12
9.8	Local class declarations.....	9–13
9.9	Nested type names.....	9–13
10	Derived classes.....	10–1
10.1	Multiple base classes.....	10–2
10.2	Member name lookup	10–4
10.3	Virtual functions.....	10–6
10.4	Abstract classes	10–10
11	Member access control.....	11–1
11.1	Access specifiers	11–2
11.2	Accessibility of base classes and base class members	11–3
11.3	Access declarations	11–4
11.4	Friends.....	11–5
11.5	Protected member access	11–8
11.6	Access to virtual functions	11–9
11.7	Multiple access.....	11–9
11.8	Nested classes.....	11–10
12	Special member functions	12–1
12.1	Constructors	12–1
12.2	Temporary objects.....	12–2

12.3	Conversions	12-4
12.3.1	Conversion by constructor	12-4
12.3.2	Conversion functions	12-5
12.4	Destructors	12-7
12.5	Free store	12-9
12.6	Initialization	12-11
12.6.1	Explicit initialization	12-11
12.6.2	Initializing bases and members	12-12
12.7	Construction and destruction.....	12-16
12.8	Copying class objects.....	12-19
13	Overloading.....	13-1
13.1	Overloadable declarations	13-1
13.2	Declaration matching	13-3
13.3	Overload resolution	13-4
13.3.1	Candidate functions and argument lists	13-5
13.3.1.1	Function call syntax	13-6
13.3.1.1.1	Call to named function	13-6
13.3.1.1.2	Call to object of class type	13-7
13.3.1.2	Operators in expressions	13-8
13.3.1.3	Initialization by constructor	13-10
13.3.1.4	Copy-initialization of class by user-defined conversion	13-10
13.3.1.5	Initialization by conversion function	13-11
13.3.1.6	Initialization by conversion function for direct reference binding.....	13-11
13.3.2	Viable functions	13-11
13.3.3	Best Viable Function.....	13-12
13.3.3.1	Implicit conversion sequences	13-13
13.3.3.1.1	Standard conversion sequences.....	13-14
13.3.3.1.2	User-defined conversion sequences	13-15
13.3.3.1.3	Ellipsis conversion sequences	13-15
13.3.3.1.4	Reference binding	13-15
13.3.3.2	Ranking implicit conversion sequences	13-16
13.4	Address of overloaded function	13-18
13.5	Overloaded operators	13-19
13.5.1	Unary operators	13-20
13.5.2	Binary operators	13-20
13.5.3	Assignment.....	13-21
13.5.4	Function call.....	13-21
13.5.5	Subscripting	13-21
13.5.6	Class member access	13-22
13.5.7	Increment and decrement	13-22
13.6	Built-in operators	13-22

14	Templates	14-1
14.1	Template parameters	14-2
14.2	Names of template specializations	14-3
14.3	Template arguments	14-5
14.4	Type equivalence	14-7
14.5	Template declarations	14-8
14.5.1	Class templates.....	14-8
14.5.1.1	Member functions of class templates	14-8
14.5.1.2	Member classes of class templates.....	14-9
14.5.1.3	Static data members of class templates.....	14-9
14.5.2	Member templates.....	14-10
14.5.3	Friends.....	14-11
14.5.4	Class template partial specializations.....	14-12
14.5.4.1	Matching of class template partial specializations.....	14-13
14.5.4.2	Partial ordering of class template specializations	14-13
14.5.4.3	Members of class template specializations	14-14
14.5.5	Function templates	14-15
14.5.5.1	Function template overloading.....	14-15
14.5.5.2	Partial ordering of function templates.....	14-16
14.6	Name resolution	14-16
14.6.1	Locally declared names	14-19
14.6.2	Dependent names	14-20
14.6.2.1	Dependent types	14-23
14.6.2.2	Type-dependent expressions	14-23
14.6.2.3	Value-dependent expressions	14-24
14.6.2.4	Dependent template arguments	14-24
14.6.3	Non-dependent names	14-25
14.6.4	Dependent name resolution.....	14-25
14.6.4.1	Point of instantiation	14-25
14.6.4.2	Candidate Functions.....	14-26
14.6.4.3	Conversions.....	14-26
14.6.5	Friend names declared within a class template	14-26
14.7	Template specialization.....	14-27
14.7.1	Implicit instantiation	14-27
14.7.2	Explicit instantiation	14-30
14.7.3	Explicit specialization	14-31
14.8	Function template specializations	14-34
14.8.1	Explicit template argument specification.....	14-35
14.8.2	Template argument deduction.....	14-36
14.8.3	Overload resolution	14-41
15	Exception handling.....	15-1
15.1	Throwing an exception.....	15-2
15.2	Constructors and destructors	15-3

15.3	Handling an exception.....	15-4
15.4	Exception specifications.....	15-5
15.5	Special functions	15-8
15.5.1	The <code>terminate()</code> function.....	15-8
15.5.2	The <code>unexpected()</code> function	15-9
15.5.3	The <code>uncaught_exception()</code> function	15-9
15.6	Exceptions and access	15-9
16	Preprocessing directives.....	16-1
16.1	Conditional inclusion	16-2
16.2	Source file inclusion.....	16-3
16.3	Macro replacement.....	16-4
16.3.1	Argument substitution.....	16-5
16.3.2	The <code>#</code> operator.....	16-5
16.3.3	The <code>##</code> operator	16-6
16.3.4	Rescanning and further replacement.....	16-6
16.3.5	Scope of macro definitions.....	16-6
16.4	Line control	16-8
16.5	Error directive	16-8
16.6	Pragma directive.....	16-8
16.7	Null directive.....	16-9
16.8	Predefined macro names	16-9
17	Library introduction	17-1
17.1	Definitions.....	17-1
17.2	Method of description (Informative).....	17-2
17.2.1	Structure of each subclause	17-2
17.2.1.1	Summary	17-3
17.2.1.2	Requirements.....	17-3
17.2.1.3	Specifications	17-3
17.2.1.4	C Library	17-4
17.2.2	Other conventions	17-4
17.2.2.1	Type descriptions	17-4
17.2.2.1.1	Enumerated types.....	17-5
17.2.2.1.2	Bitmask types.....	17-5
17.2.2.1.3	Character sequences	17-6
17.2.2.1.3.1	Byte strings	17-6
17.2.2.1.3.2	Multibyte strings	17-6
17.2.2.1.3.3	Wide-character sequences	17-6
17.2.2.2	Functions within classes.....	17-7
17.2.2.3	Private members.....	17-7

17.3	Library-wide requirements.....	17-7
17.3.1	Library contents and organization.....	17-7
17.3.1.1	Library contents	17-7
17.3.1.2	Headers.....	17-8
17.3.1.3	Freestanding implementations	17-8
17.3.2	Using the library.....	17-9
17.3.2.1	Headers.....	17-9
17.3.2.2	Linkage.....	17-9
17.3.3	Constraints on programs	17-10
17.3.3.1	Reserved names.....	17-10
17.3.3.1.1	Macro names	17-10
17.3.3.1.2	Global names.....	17-10
17.3.3.1.3	External linkage	17-10
17.3.3.2	Headers.....	17-11
17.3.3.3	Derived classes.....	17-11
17.3.3.4	Replacement functions	17-11
17.3.3.5	Handler functions	17-11
17.3.3.6	Other functions.....	17-12
17.3.3.7	Function arguments.....	17-12
17.3.3.8	Required paragraph	17-12
17.3.4	Conforming implementations	17-12
17.3.4.1	Headers.....	17-12
17.3.4.2	Restrictions on macro definitions.....	17-13
17.3.4.3	Global functions.....	17-13
17.3.4.4	Member functions	17-13
17.3.4.5	Reentrancy.....	17-14
17.3.4.6	Protection within classes	17-14
17.3.4.7	Derived classes.....	17-14
17.3.4.8	Restrictions on exception handling	17-14
18	Language support library	18-1
18.1	Types	18-1
18.2	Implementation properties	18-2
18.2.1	Numeric limits.....	18-2
18.2.1.1	Template class <code>numeric_limits</code>	18-2
18.2.1.2	<code>numeric_limits</code> members	18-3
18.2.1.3	Type <code>float_round_style</code>	18-7
18.2.1.4	<code>numeric_limits</code> specializations.....	18-7
18.2.2	C Library	18-8
18.3	Start and termination.....	18-9
18.4	Dynamic memory management	18-10
18.4.1	Storage allocation and deallocation	18-10
18.4.1.1	Single-object forms	18-10
18.4.1.2	Array forms	18-12
18.4.1.3	Placement forms.....	18-12
18.4.2	Storage allocation errors	18-13
18.4.2.1	Class <code>bad_alloc</code>	18-13
18.4.2.2	Type <code>new_handler</code>	18-13
18.4.2.3	<code>set_new_handler</code>	18-14

18.5 Type identification	18–14
18.5.1 Class <code>type_info</code>	18–14
18.5.2 Class <code>bad_cast</code>	18–15
18.5.3 Class <code>bad_typeid</code>	18–15
18.6 Exception handling.....	18–16
18.6.1 Class <code>exception</code>	18–16
18.6.2 Violating <i>exception-specifications</i>	18–17
18.6.2.1 Class <code>bad_exception</code>	18–17
18.6.2.2 Type <code>unexpected_handler</code>	18–17
18.6.2.3 <code>set_unexpected</code>	18–18
18.6.2.4 <code>unexpected</code>	18–18
18.6.3 Abnormal termination	18–18
18.6.3.1 Type <code>terminate_handler</code>	18–18
18.6.3.2 <code>set_terminate</code>	18–18
18.6.3.3 <code>terminate</code>	18–18
18.6.4 <code>uncaught_exception</code>	18–19
18.7 Other runtime support	18–19
19 Diagnostics library	19–1
19.1 Exception classes	19–1
19.1.1 Class <code>logic_error</code>	19–1
19.1.2 Class <code>domain_error</code>	19–2
19.1.3 Class <code>invalid_argument</code>	19–2
19.1.4 Class <code>length_error</code>	19–2
19.1.5 Class <code>out_of_range</code>	19–3
19.1.6 Class <code>runtime_error</code>	19–3
19.1.7 Class <code>range_error</code>	19–3
19.1.8 Class <code>overflow_error</code>	19–3
19.1.9 Class <code>underflow_error</code>	19–4
19.2 Assertions.....	19–4
19.3 Error numbers.....	19–4
20 General utilities library	20–1
20.1 Requirements.....	20–1
20.1.1 Equality comparison.....	20–1
20.1.2 Less than comparison.....	20–2
20.1.3 Copy construction	20–2
20.1.4 Default construction	20–2
20.1.5 Allocator requirements.....	20–2
20.2 Utility components	20–5
20.2.1 Operators	20–5
20.2.2 Pairs	20–6
20.3 Function objects	20–7
20.3.1 Base	20–8
20.3.2 Arithmetic operations	20–9
20.3.3 Comparisons.....	20–9

20.3.4 Logical operations	20–10
20.3.5 Negators	20–10
20.3.6 Binders	20–11
20.3.6.1 Template class <code>binder1st</code>	20–11
20.3.6.2 <code>binder1st</code>	20–12
20.3.6.3 Template class <code>binder2nd</code>	20–12
20.3.6.4 <code>binder2nd</code>	20–12
20.3.7 Adaptors for pointers to functions.....	20–12
20.3.8 Adaptors for pointers to members.....	20–13
 20.4 Memory	20–14
20.4.1 The default allocator	20–15
20.4.1.1 <code>allocator</code> members	20–16
20.4.1.2 <code>allocator</code> globals.....	20–16
20.4.2 Raw storage iterator	20–16
20.4.3 Temporary buffers.....	20–17
20.4.4 Specialized algorithms	20–17
20.4.4.1 <code>uninitialized_copy</code>	20–17
20.4.4.2 <code>uninitialized_fill</code>	20–18
20.4.4.3 <code>uninitialized_fill_n</code>	20–18
20.4.5 Template class <code>auto_ptr</code>	20–18
20.4.5.1 <code>auto_ptr</code> constructors	20–19
20.4.5.2 <code>auto_ptr</code> members.....	20–19
20.4.6 C Library	20–20
 20.5 Date and time	20–20
 21 Strings library.....	21–1
21.1 Character traits	21–1
21.1.1 Definitions.....	21–1
21.1.2 Character traits requirements	21–2
21.1.3 traits typedefs	21–4
21.1.4 <code>char_traits</code> specializations.....	21–4
21.1.4.1 <code>struct char_traits<char></code>	21–5
21.1.4.2 <code>struct char_traits<wchar_t></code>	21–5
 21.2 String classes.....	21–6
21.3 Template class <code>basic_string</code>	21–9
21.3.1 <code>basic_string</code> constructors	21–12
21.3.2 <code>basic_string</code> iterator support	21–15
21.3.3 <code>basic_string</code> capacity.....	21–15
21.3.4 <code>basic_string</code> element access	21–16
21.3.5 <code>basic_string</code> modifiers.....	21–16
21.3.5.1 <code>basic_string::operator+=</code>	21–16
21.3.5.2 <code>basic_string::append</code>	21–16
21.3.5.3 <code>basic_string::assign</code>	21–17
21.3.5.4 <code>basic_string::insert</code>	21–17
21.3.5.5 <code>basic_string::erase</code>	21–18
21.3.5.6 <code>basic_string::replace</code>	21–19
21.3.5.7 <code>basic_string::copy</code>	21–20
21.3.5.8 <code>basic_string::swap</code>	21–20
21.3.6 <code>basic_string</code> string operations	21–20

21.3.6.1	<code>basic_string::find</code>	21–21
21.3.6.2	<code>basic_string::rfind</code>	21–21
21.3.6.3	<code>basic_string::find_first_of</code>	21–22
21.3.6.4	<code>basic_string::find_last_of</code>	21–22
21.3.6.5	<code>basic_string::find_first_not_of</code>	21–23
21.3.6.6	<code>basic_string::find_last_not_of</code>	21–23
21.3.6.7	<code>basic_string::substr</code>	21–23
21.3.6.8	<code>basic_string::compare</code>	21–24
21.3.7	<code>basic_string</code> non-member functions.....	21–24
21.3.7.1	<code>operator+</code>	21–24
21.3.7.2	<code>operator==</code>	21–25
21.3.7.3	<code>operator!=</code>	21–25
21.3.7.4	<code>operator<</code>	21–26
21.3.7.5	<code>operator></code>	21–26
21.3.7.6	<code>operator<=</code>	21–26
21.3.7.7	<code>operator>=</code>	21–27
21.3.7.8	<code>swap</code>	21–27
21.3.7.9	Inverters and extractors.....	21–27
21.4	Null-terminated sequence utilities.....	21–28
22	Localization library	22–1
22.1	Locales	22–1
22.1.1	Class <code>locale</code>	22–2
22.1.1.1	<code>locale</code> types.....	22–4
22.1.1.1.1	Type <code>locale::category</code>	22–4
22.1.1.1.2	Class <code>locale::facet</code>	22–6
22.1.1.1.3	Class <code>locale::id</code>	22–7
22.1.1.2	<code>locale</code> constructors and destructor	22–7
22.1.1.3	<code>locale</code> members.....	22–8
22.1.1.4	<code>locale</code> operators	22–8
22.1.1.5	<code>locale</code> static members	22–9
22.1.2	<code>locale</code> globals.....	22–9
22.1.3	Convenience interfaces	22–9
22.1.3.1	Character classification	22–9
22.1.3.2	Character conversions	22–10
22.2	Standard <code>locale</code> categories.....	22–10
22.2.1	The <code>ctype</code> category	22–10
22.2.1.1	Template class <code>ctype</code>	22–10
22.2.1.1.1	<code>ctype</code> members	22–11
22.2.1.1.2	<code>ctype</code> virtual functions	22–12
22.2.1.2	Template class <code>ctype_byname</code>	22–13
22.2.1.3	<code>ctype</code> specializations	22–13
22.2.1.3.1	<code>ctype<char></code> destructor	22–14
22.2.1.3.2	<code>ctype<char></code> members	22–14
22.2.1.3.3	<code>ctype<char></code> static members	22–15
22.2.1.3.4	<code>ctype<char></code> virtual functions	22–16
22.2.1.4	Class <code>ctype_byname<char></code>	22–16
22.2.1.5	Template class <code>codecvt</code>	22–16
22.2.1.5.1	<code>codecvt</code> members	22–17
22.2.1.5.2	<code>codecvt</code> virtual functions.....	22–18
22.2.1.6	Template class <code>codecvt_byname</code>	22–19

22.2.2	The numeric category.....	22–20
22.2.2.1	Template class <code>num_get</code>	22–20
22.2.2.1.1	<code>num_get</code> members	22–21
22.2.2.1.2	<code>num_get</code> virtual functions.....	22–22
22.2.2.2	Template class <code>num_put</code>	22–24
22.2.2.2.1	<code>num_put</code> members	22–25
22.2.2.2.2	<code>num_put</code> virtual functions.....	22–25
22.2.3	The numeric punctuation facet.....	22–28
22.2.3.1	Template class <code>numpunct</code>	22–28
22.2.3.1.1	<code>numpunct</code> members	22–29
22.2.3.1.2	<code>numpunct</code> virtual functions	22–29
22.2.3.2	Template class <code>numpunct_byname</code>	22–30
22.2.4	The collate category	22–30
22.2.4.1	Template class <code>collate</code>	22–30
22.2.4.1.1	<code>collate</code> members	22–31
22.2.4.1.2	<code>collate</code> virtual functions.....	22–31
22.2.4.2	Template class <code>collate_byname</code>	22–31
22.2.5	The time category.....	22–32
22.2.5.1	Template class <code>time_get</code>	22–32
22.2.5.1.1	<code>time_get</code> members	22–33
22.2.5.1.2	<code>time_get</code> virtual functions	22–33
22.2.5.2	Template class <code>time_get_byname</code>	22–34
22.2.5.3	Template class <code>time_put</code>	22–35
22.2.5.3.1	<code>time_put</code> members	22–35
22.2.5.3.2	<code>time_put</code> virtual functions	22–35
22.2.5.4	Template class <code>time_put_byname</code>	22–35
22.2.6	The monetary category.....	22–36
22.2.6.1	Template class <code>money_get</code>	22–36
22.2.6.1.1	<code>money_get</code> members	22–37
22.2.6.1.2	<code>money_get</code> virtual functions	22–37
22.2.6.2	Template class <code>money_put</code>	22–37
22.2.6.2.1	<code>money_put</code> members	22–38
22.2.6.2.2	<code>money_put</code> virtual functions	22–38
22.2.6.3	Template class <code>moneypunct</code>	22–38
22.2.6.3.1	<code>moneypunct</code> members	22–39
22.2.6.3.2	<code>moneypunct</code> virtual functions	22–39
22.2.6.4	Template class <code>moneypunct_byname</code>	22–40
22.2.7	The message retrieval category	22–41
22.2.7.1	Template class <code>messages</code>	22–41
22.2.7.1.1	<code>messages</code> members	22–41
22.2.7.1.2	<code>messages</code> virtual functions	22–41
22.2.7.2	Template class <code>messages_byname</code>	22–42
22.2.8	Program-defined facets	22–42
22.3	C Library Locales.....	22–45
23	Containers library.....	23–1
23.1	Container requirements	23–1
23.1.1	Sequences	23–4
23.1.2	Associative containers.....	23–6
23.2	Sequences	23–9
23.2.1	Template class <code>deque</code>	23–11

23.2.1.1	deque constructors, copy, and assignment.....	23–13
23.2.1.2	deque capacity	23–14
23.2.1.3	deque modifiers	23–14
23.2.1.4	deque specialized algorithms.....	23–14
23.2.2	Template class <code>list</code>	23–15
23.2.2.1	<code>list</code> constructors, copy, and assignment.....	23–17
23.2.2.2	<code>list</code> capacity.....	23–17
23.2.2.3	<code>list</code> modifiers.....	23–18
23.2.2.4	<code>list</code> operations	23–18
23.2.2.5	<code>list</code> specialized algorithms	23–19
23.2.3	Container adapters.....	23–19
23.2.3.1	Template class <code>queue</code>	23–19
23.2.3.2	Template class <code>priority_queue</code>	23–20
23.2.3.2.1	<code>priority_queue</code> constructors.....	23–21
23.2.3.2.2	<code>priority_queue</code> members	23–21
23.2.3.3	Template class <code>stack</code>	23–22
23.2.4	Template class <code>vector</code>	23–22
23.2.4.1	<code>vector</code> constructors, copy, and assignment	23–24
23.2.4.2	<code>vector</code> capacity	23–25
23.2.4.3	<code>vector</code> modifiers	23–25
23.2.4.4	<code>vector</code> specialized algorithms	23–25
23.2.5	Class <code>vector<bool></code>	23–26
23.3	Associative containers.....	23–28
23.3.1	Template class <code>map</code>	23–29
23.3.1.1	<code>map</code> constructors, copy, and assignment	23–32
23.3.1.2	<code>map</code> element access.....	23–32
23.3.1.3	<code>map</code> operations.....	23–32
23.3.1.4	<code>map</code> specialized algorithms.....	23–32
23.3.2	Template class <code>multimap</code>	23–33
23.3.2.1	<code>multimap</code> constructors	23–35
23.3.2.2	<code>multimap</code> operations.....	23–35
23.3.2.3	<code>multimap</code> specialized algorithms.....	23–36
23.3.3	Template class <code>set</code>	23–36
23.3.3.1	<code>set</code> constructors, copy, and assignment	23–38
23.3.3.2	<code>set</code> specialized algorithms.....	23–38
23.3.4	Template class <code>multiset</code>	23–38
23.3.4.1	<code>multiset</code> constructors	23–40
23.3.4.2	<code>multiset</code> specialized algorithms.....	23–41
23.3.5	Template class <code>bitset</code>	23–41
23.3.5.1	<code>bitset</code> constructors	23–43
23.3.5.2	<code>bitset</code> members	23–43
23.3.5.3	<code>bitset</code> operators	23–45
24	Iterators library	24–1
24.1	Iterator requirements	24–1
24.1.1	Input iterators	24–2
24.1.2	Output iterators.....	24–3
24.1.3	Forward iterators	24–4
24.1.4	Bidirectional iterators.....	24–4
24.1.5	Random access iterators	24–5
24.2	Header <code><iostream></code> synopsis	24–6

24.3 Iterator primitives.....	24-8
24.3.1 Iterator traits	24-8
24.3.2 Basic iterator	24-9
24.3.3 Standard iterator tags.....	24-9
24.3.4 Iterator operations	24-10
24.4 Predefined iterators	24-11
24.4.1 Reverse iterators.....	24-11
24.4.1.1 Template class <code>reverse_iterator</code>	24-11
24.4.1.2 <code>reverse_iterator</code> requirements	24-12
24.4.1.3 <code>reverse_iterator</code> operations.....	24-12
24.4.1.3.1 <code>reverse_iterator</code> constructor	24-12
24.4.1.3.2 Conversion	24-13
24.4.1.3.3 <code>operator*</code>	24-13
24.4.1.3.4 <code>operator-></code>	24-13
24.4.1.3.5 <code>operator++</code>	24-13
24.4.1.3.6 <code>operator--</code>	24-13
24.4.1.3.7 <code>operator+</code>	24-13
24.4.1.3.8 <code>operator+=</code>	24-13
24.4.1.3.9 <code>operator-</code>	24-14
24.4.1.3.10 <code>operator-=</code>	24-14
24.4.1.3.11 <code>operator[]</code>	24-14
24.4.1.3.12 <code>operator==</code>	24-14
24.4.1.3.13 <code>operator<</code>	24-14
24.4.1.3.14 <code>operator!=</code>	24-14
24.4.1.3.15 <code>operator></code>	24-14
24.4.1.3.16 <code>operator>=</code>	24-14
24.4.1.3.17 <code>operator<=</code>	24-15
24.4.1.3.18 <code>operator-</code>	24-15
24.4.1.3.19 <code>operator+</code>	24-15
24.4.2 Insert iterators.....	24-15
24.4.2.1 Template class <code>back_insert_iterator</code>	24-15
24.4.2.2 <code>back_insert_iterator</code> operations.....	24-16
24.4.2.2.1 <code>back_insert_iterator</code> constructor.....	24-16
24.4.2.2.2 <code>back_insert_iterator::operator=</code>	24-16
24.4.2.2.3 <code>back_insert_iterator::operator*</code>	24-16
24.4.2.2.4 <code>back_insert_iterator::operator++</code>	24-16
24.4.2.2.5 <code>back_inserter</code>	24-16
24.4.2.3 Template class <code>front_insert_iterator</code>	24-16
24.4.2.4 <code>front_insert_iterator</code> operations.....	24-17
24.4.2.4.1 <code>front_insert_iterator</code> constructor	24-17
24.4.2.4.2 <code>front_insert_iterator::operator=</code>	24-17
24.4.2.4.3 <code>front_insert_iterator::operator*</code>	24-17
24.4.2.4.4 <code>front_insert_iterator::operator++</code>	24-17
24.4.2.4.5 <code>front_inserter</code>	24-17
24.4.2.5 Template class <code>insert_iterator</code>	24-17
24.4.2.6 <code>insert_iterator</code> operations	24-18
24.4.2.6.1 <code>insert_iterator</code> constructor.....	24-18
24.4.2.6.2 <code>insert_iterator::operator=</code>	24-18
24.4.2.6.3 <code>insert_iterator::operator*</code>	24-18
24.4.2.6.4 <code>insert_iterator::operator++</code>	24-18
24.4.2.6.5 <code>inserter</code>	24-18
24.5 Stream iterators	24-18

24.5.1	Template class <code>istream_iterator</code>	24–19
24.5.1.1	<code>istream_iterator</code> constructors and destructor	24–20
24.5.1.2	<code>istream_iterator</code> operations.....	24–20
24.5.2	Template class <code>ostream_iterator</code>	24–20
24.5.2.1	<code>ostream_iterator</code> constructors and destructor	24–21
24.5.2.2	<code>ostream_iterator</code> operations.....	24–21
24.5.3	Template class <code>istreambuf_iterator</code>	24–21
24.5.3.1	<code>Template class istreambuf_iterator::proxy</code>	24–22
24.5.3.2	<code>istreambuf_iterator</code> constructors.....	24–23
24.5.3.3	<code>istreambuf_iterator::operator*</code>	24–23
24.5.3.4	<code>istreambuf_iterator::operator++</code>	24–23
24.5.3.5	<code>istreambuf_iterator::equal</code>	24–24
24.5.3.6	<code>operator==</code>	24–24
24.5.3.7	<code>operator!=</code>	24–24
24.5.4	Template class <code>ostreambuf_iterator</code>	24–24
24.5.4.1	<code>ostreambuf_iterator</code> constructors.....	24–24
24.5.4.2	<code>ostreambuf_iterator</code> operations	24–25
25	Algorithms library	25–1
25.1	Non-modifying sequence operations.....	25–9
25.1.1	For each.....	25–9
25.1.2	Find	25–10
25.1.3	Find End	25–10
25.1.4	Find First	25–10
25.1.5	Adjacent find	25–11
25.1.6	Count	25–11
25.1.7	Mismatch.....	25–11
25.1.8	Equal	25–11
25.1.9	Search	25–12
25.2	Mutating sequence operations.....	25–12
25.2.1	Copy	25–12
25.2.2	Swap	25–13
25.2.3	Transform	25–13
25.2.4	Replace	25–14
25.2.5	Fill	25–14
25.2.6	Generate	25–15
25.2.7	Remove	25–15
25.2.8	Unique	25–15
25.2.9	Reverse	25–16
25.2.10	Rotate	25–16
25.2.11	Random shuffle	25–17
25.2.12	Partitions	25–17
25.3	Sorting and related operations.....	25–18
25.3.1	Sorting	25–18
25.3.1.1	<code>sort</code>	25–18
25.3.1.2	<code>stable_sort</code>	25–19
25.3.1.3	<code>partial_sort</code>	25–19
25.3.1.4	<code>partial_sort_copy</code>	25–19
25.3.2	Nth element	25–19
25.3.3	Binary search.....	25–20
25.3.3.1	<code>lower_bound</code>	25–20

25.3.3.2 <code>upper_bound</code>	25–20
25.3.3.3 <code>equal_range</code>	25–21
25.3.3.4 <code>binary_search</code>	25–21
25.3.4 <code>Merge</code>	25–21
25.3.5 Set operations on sorted structures	25–22
25.3.5.1 <code>includes</code>	25–22
25.3.5.2 <code>set_union</code>	25–22
25.3.5.3 <code>set_intersection</code>	25–23
25.3.5.4 <code>set_difference</code>	25–23
25.3.5.5 <code>set_symmetric_difference</code>	25–23
25.3.6 Heap operations	25–24
25.3.6.1 <code>push_heap</code>	25–24
25.3.6.2 <code>pop_heap</code>	25–24
25.3.6.3 <code>make_heap</code>	25–25
25.3.6.4 <code>sort_heap</code>	25–25
25.3.7 Minimum and maximum	25–25
25.3.8 Lexicographical comparison	25–26
25.3.9 Permutation generators	25–26
25.4 C library algorithms	25–27
26 Numerics library	26–1
26.1 Numeric type requirements	26–1
26.2 Complex numbers	26–2
26.2.1 Header <code><complex></code> synopsis	26–2
26.2.2 Template class <code>complex</code>	26–3
26.2.3 <code>complex</code> specializations	26–4
26.2.4 <code>complex</code> member functions	26–5
26.2.5 <code>complex</code> member operators	26–6
26.2.6 <code>complex</code> non-member operations	26–6
26.2.7 <code>complex</code> value operations	26–8
26.2.8 <code>complex</code> transcendentals	26–8
26.3 Numeric arrays	26–9
26.3.1 Header <code><valarray></code> synopsis	26–9
26.3.2 Template class <code>valarray</code>	26–12
26.3.2.1 <code>valarray</code> constructors	26–13
26.3.2.2 <code>valarray</code> assignment	26–14
26.3.2.3 <code>valarray</code> element access	26–14
26.3.2.4 <code>valarray</code> subset operations	26–15
26.3.2.5 <code>valarray</code> unary operators	26–15
26.3.2.6 <code>valarray</code> computed assignment	26–15
26.3.2.7 <code>valarray</code> member functions	26–16
26.3.3 <code>valarray</code> non-member operations	26–17
26.3.3.1 <code>valarray</code> binary operators	26–17
26.3.3.2 <code>valarray</code> logical operators	26–18
26.3.3.3 <code>valarray</code> transcendentals	26–19
26.3.4 Class <code>slice</code>	26–19
26.3.4.1 <code>slice</code> constructors	26–20
26.3.4.2 <code>slice</code> access functions	26–20
26.3.5 Template class <code>slice_array</code>	26–20
26.3.5.1 <code>slice_array</code> constructors	26–21

26.3.5.2	slice_array assignment	26-21
26.3.5.3	slice_array computed assignment.....	26-21
26.3.5.4	slice_array fill function	26-22
26.3.6	The gslice class	26-22
26.3.6.1	gslice constructors	26-23
26.3.6.2	gslice access functions	26-23
26.3.7	Template class gslice_array	26-23
26.3.7.1	gslice_array constructors	26-24
26.3.7.2	gslice_array assignment	26-24
26.3.7.3	gslice_array computed assignment	26-24
26.3.7.4	gslice_array fill function	26-25
26.3.8	Template class mask_array	26-25
26.3.8.1	mask_array constructors	26-25
26.3.8.2	mask_array assignment	26-25
26.3.8.3	mask_array computed assignment	26-26
26.3.8.4	mask_array fill function	26-26
26.3.9	Template class indirect_array	26-26
26.3.9.1	indirect_array constructors	26-27
26.3.9.2	indirect_array assignment	26-27
26.3.9.3	indirect_array computed assignment	26-27
26.3.9.4	indirect_array fill function	26-27
26.4	Generalized numeric operations	26-27
26.4.1	Accumulate	26-28
26.4.2	Inner product	26-28
26.4.3	Partial sum	26-29
26.4.4	Adjacent difference	26-29
26.5	C Library	26-30
27	Input/output library	27-1
27.1	Iostreams requirements	27-1
27.1.1	Definitions	27-1
27.1.2	Limitations	27-2
27.1.2.1	Imbue Limitations	27-2
27.1.2.2	Positioning Type Limitations	27-2
27.2	Forward declarations	27-2
27.3	Standard iostream objects	27-5
27.3.1	Narrow stream objects	27-5
27.3.2	Wide stream objects	27-6
27.4	Iostreams base classes	27-6
27.4.1	Types	27-7
27.4.2	Class ios_base	27-7
27.4.2.1	Types	27-9
27.4.2.1.1	Class ios_base::failure	27-9
27.4.2.1.2	Type ios_base::fmtflags	27-10
27.4.2.1.3	Type ios_base::iostate	27-10
27.4.2.1.4	Type ios_base::openmode	27-11
27.4.2.1.5	Type ios_base::seekdir	27-11
27.4.2.1.6	Class ios_base::Init	27-11

27.4.2.2	<code>ios_base::fmtflags</code> state functions	27-12
27.4.2.3	<code>ios_base::locale</code> functions	27-13
27.4.2.4	<code>ios_base</code> static members	27-13
27.4.2.5	<code>ios_base</code> storage functions	27-13
27.4.2.6	<code>ios_base</code> callbacks	27-14
27.4.2.7	<code>ios_base</code> constructors/destructors	27-14
27.4.3	Template class <code>fpos</code>	27-14
27.4.3.1	<code>fpos</code> Constructor	27-14
27.4.3.2	<code>fpos</code> Members	27-14
27.4.4	<code>fpos</code> requirements	27-15
27.4.5	Template class <code>basic_ios</code>	27-15
27.4.5.1	<code>basic_ios</code> constructors	27-16
27.4.5.2	Member functions	27-17
27.4.5.3	<code>basic_ios::iostate</code> flags functions	27-18
27.4.6	<code>ios_base</code> manipulators	27-19
27.4.6.1	<code>fmtflags</code> manipulators	27-19
27.4.6.2	<code>adjustfield</code> manipulators	27-20
27.4.6.3	<code>basefield</code> manipulators	27-20
27.4.6.4	<code>floatfield</code> manipulators	27-20
27.5	Stream buffers	27-21
27.5.1	Stream buffer requirements	27-21
27.5.2	Template class <code>basic_streambuf<charT, traits></code>	27-22
27.5.2.1	<code>basic_streambuf</code> constructors	27-23
27.5.2.2	<code>basic_streambuf</code> public member functions	27-24
27.5.2.2.1	Locales	27-24
27.5.2.2.2	Buffer management and positioning	27-24
27.5.2.2.3	Get area	27-24
27.5.2.2.4	Putback	27-25
27.5.2.2.5	Put area	27-25
27.5.2.3	<code>basic_streambuf</code> protected member functions	27-25
27.5.2.3.1	Get area access	27-25
27.5.2.3.2	Put area access	27-25
27.5.2.4	<code>basic_streambuf</code> virtual functions	27-26
27.5.2.4.1	Locales	27-26
27.5.2.4.2	Buffer management and positioning	27-26
27.5.2.4.3	Get area	27-26
27.5.2.4.4	Putback	27-28
27.5.2.4.5	Put area	27-28
27.6	Formatting and manipulators	27-29
27.6.1	Input streams	27-29
27.6.1.1	Template class <code>basic_istream</code>	27-30
27.6.1.1.1	<code>basic_istream</code> constructors	27-31
27.6.1.1.2	Class <code>basic_istream::sentry</code>	27-32
27.6.1.2	Formatted input functions	27-33
27.6.1.2.1	Common requirements	27-33
27.6.1.2.2	Arithmetic Extractors	27-33
27.6.1.2.3	<code>basic_istream::operator>></code>	27-34
27.6.1.3	Unformatted input functions	27-35
27.6.1.4	Standard <code>basic_istream</code> manipulators	27-39
27.6.1.5	Template class <code>basic_iostream</code>	27-39
27.6.1.5.1	<code>basic_iostream</code> constructors	27-39
27.6.1.5.2	<code>basic_iostream</code> destructor	27-39

27.6.2 Output streams	27-39
27.6.2.1 Template class <code>basic_ostream</code>	27-39
27.6.2.2 <code>basic_ostream</code> constructors	27-41
27.6.2.3 Class <code>basic_ostream::sentry</code>	27-42
27.6.2.4 <code>basic_ostream</code> seek members.....	27-42
27.6.2.5 Formatted output functions	27-43
27.6.2.5.1 Common requirements	27-43
27.6.2.5.2 Arithmetic Inserters.....	27-43
27.6.2.5.3 <code>basic_ostream::operator<<</code>	27-43
27.6.2.5.4 Character inserter template functions.....	27-44
27.6.2.6 Unformatted output functions	27-45
27.6.2.7 Standard <code>basic_ostream</code> manipulators	27-46
27.6.3 Standard manipulators.....	27-46
 27.7 String-based streams	27-48
27.7.1 Template class <code>basic_stringbuf</code>	27-48
27.7.1.1 <code>basic_stringbuf</code> constructors	27-49
27.7.1.2 Member functions	27-49
27.7.1.3 Overridden virtual functions	27-50
27.7.2 Template class <code>basic_istringstream</code>	27-52
27.7.2.1 <code>basic_istringstream</code> constructors.....	27-52
27.7.2.2 Member functions	27-53
27.7.3 Class <code>basic_ostringstream</code>	27-53
27.7.3.1 <code>basic_ostringstream</code> constructors.....	27-53
27.7.3.2 Member functions	27-54
27.7.4 Template class <code>basic_stringstream</code>	27-54
27.7.5 <code>basic_stringstream</code> constructors	27-55
27.7.6 Member functions	27-55
 27.8 File-based streams.....	27-55
27.8.1 File streams	27-55
27.8.1.1 Template class <code>basic_filebuf</code>	27-56
27.8.1.2 <code>basic_filebuf</code> constructors	27-57
27.8.1.3 Member functions	27-57
27.8.1.4 Overridden virtual functions	27-59
27.8.1.5 Template class <code>basic_ifstream</code>	27-61
27.8.1.6 <code>basic_ifstream</code> constructors.....	27-61
27.8.1.7 Member functions	27-62
27.8.1.8 Template class <code>basic_ofstream</code>	27-62
27.8.1.9 <code>basic_ofstream</code> constructors.....	27-63
27.8.1.10 Member functions	27-63
27.8.1.11 Template class <code>basic_fstream</code>	27-63
27.8.1.12 <code>basic_fstream</code> constructors	27-64
27.8.1.13 Member functions	27-64
27.8.2 C Library files	27-64
 A Grammar summary.....	A-1
A.1 Keywords.....	A-1
A.2 Lexical conventions.....	A-1
A.3 Basic concepts	A-5

A.4	Expressions.....	A-5
A.5	Statements	A-8
A.6	Declarations.....	A-9
A.7	Declarators.....	A-11
A.8	Classes	A-13
A.9	Derived classes	A-14
A.10	Special member functions	A-14
A.11	Overloading.....	A-14
A.12	Templates	A-15
A.13	Exception handling.....	A-15
A.14	Preprocessing directives	A-16
B	Implementation quantities	B-1
C	Compatibility	C-1
C.1	Extensions.....	C-1
C.1.1	C++ features available in 1985	C-1
C.1.2	C++ features added since 1985	C-2
C.2	C++ and ISO C.....	C-2
C.2.1	Clause 2: lexical conventions	C-2
C.2.2	Clause 3: basic concepts	C-3
C.2.3	Clause 5: expressions.....	C-5
C.2.4	Clause 6: statements	C-6
C.2.5	Clause 7: declarations	C-6
C.2.6	Clause 8: declarators	C-8
C.2.7	Clause 9: classes	C-9
C.2.8	Clause 12: special member functions	C-11
C.2.9	Clause 16: preprocessing directives.....	C-11
C.3	Anachronisms	C-11
C.3.1	Old style function definitions	C-12
C.3.2	Old style base class initializer.....	C-12
C.3.3	Assignment to <code>this</code>	C-12
C.3.4	Cast of bound pointer.....	C-13
C.3.5	Nonnested classes	C-13
C.4	Standard C library	C-13
C.4.1	Modifications to headers.....	C-15
C.4.2	Modifications to definitions.....	C-15
C.4.2.1	Type <code>wchar_t</code>	C-15
C.4.2.2	Header <code><iso646.h></code>	C-15
C.4.2.3	Macro <code>NULL</code>	C-16

C.4.3	Modifications to declarations.....	C-16
C.4.4	Modifications to behavior	C-16
C.4.4.1	Macro <code>offsetof(type, member-designator)</code>	C-16
C.4.4.2	Memory allocation functions.....	C-16
D	Compatibility features	D-1
D.1	Postfix increment operator	D-1
D.2	<code>static</code> keyword.....	D-1
D.3	Access declarations	D-1
D.4	Implicit conversion from <code>const</code> strings	D-1
D.5	Standard C library headers	D-1
D.6	Old iostreams members	D-2
D.7	<code>char*</code> streams.....	D-3
D.7.1	Class <code>strstreambuf</code>	D-3
D.7.1.1	<code>strstreambuf</code> constructors.....	D-5
D.7.1.2	Member functions.....	D-6
D.7.1.3	<code>strstreambuf</code> overridden virtual functions.....	D-6
D.7.2	Class <code>istrstream</code>	D-9
D.7.2.1	<code>istrstream</code> constructors	D-9
D.7.2.2	Member functions.....	D-9
D.7.3	Class <code>ostrstream</code>	D-10
D.7.3.1	<code>ostrstream</code> constructors	D-10
D.7.3.2	Member functions.....	D-10
D.7.4	Class <code>strstream</code>	D-11
D.7.4.1	<code>strstream</code> constructors	D-11
D.7.4.2	<code>strstream</code> destructor	D-11
D.7.4.3	<code>strstream</code> operations.....	D-12
E	Universal-character-names for identifiers	E-1