

# Index

, —see comma operator  
! —see logical negation operator  
!= —see inequality operator  
# operator 16–5  
## operator 16–6  
% —see modulus operator  
%= operator 5–24  
&  
—see address-of operator  
—see bitwise AND operator  
reference declarator 8–6  
&& —see logical AND operator  
&= operator 5–24  
( )  
—see function call operator  
function declarator 8–9  
\*  
—see indirection operator  
—see multiplication operator  
pointer declarator 8–5  
\*= operator 5–24  
+  
—see addition operator  
—see unary plus operator  
++ —see increment operator  
+= operator 5–14, 24  
-  
—see subtraction operator  
—see unary minus operator  
-- —see decrement operator  
-= operator 5–24  
-> —see class member access operator  
->\* —see pointer to member operator  
. —see class member access operator  
. \* —see pointer to member operator  
. . . —see ellipsis  
/ —see division operator  
/\* \*/ comment 2–4  
// comment 2–4  
/= operator 5–24  
:  
field declaration 9–11  
label specifier 6–1  
::  
—see scope resolution operator  
scope resolution operator 3–12  
:::, pointer to member declarator 8–7  
<

—see less than operator  
template and 14–2  
= —see assignment operator  
== —see equality operator  
> —see greater than operator  
>= —see greater than or equal operator  
>> —see right shift operator  
>>= operator 5–24  
?: —see conditional expression operator  
[ ]  
—see subscripting operator  
array declarator 8–7  
\ —see backslash  
^ —see bitwise exclusive OR operator  
^= operator 5–24  
, underscore in identifier 2–4  
{ }  
block statement 6–1  
class declaration 9–1  
class definition 9–1  
enum declaration 7–10  
initializer list 8–17  
| —see bitwise inclusive OR operator  
|= operator 5–24  
|| —see logical OR operator  
~  
—see destructor  
—see one's complement operator  
0  
—see also zero, null  
null character 2–9  
string terminator 2–9

## A

abort 3–21, 6–5, 17–16, 18–15, 20  
abs 26–19, 32  
abstract  
class 10–9  
class, constructor and 10–10  
class, pointer to 10–9  
*abstract-declarator* 8–2  
access  
adjusting base class member 11–4  
ambiguity, member 10–4

and `friend`, class 11–6  
 and `friend` function 11–5  
 base class 11–3  
 base class member 10–1  
 class member 5–6  
 control 11–1  
 control, anonymous union 9–10  
 control default 11–1  
 control, member function and 12–1  
 control, overloading resolution and 10–4  
 declaration 11–4  
 example, member name 11–4  
 member name 11–1  
 overloading and 13–4  
 rules, template 14–23  
 specifier 11–2/3  
 specifier and `friend` 11–6  
 specifier and object layout 11–3  
`struct` default member 9–1  
 union default member 9–1  
 virtual function 11–8  
`access-specifier` 10–1  
`accumulate` 26–29  
`acos` 26–19, 32  
`complex` 26–8  
 addition operator 5–19  
 additive operator 5–19  
`additive-expression` 5–19  
 address  
   of bit-field 9–11  
   of bit-field restriction 9–11  
   of constructor 12–2  
   of cv-qualified name 5–13  
   of member function, unspecified 17–20  
   of overloaded function 5–13, 13–17  
 address-of operator 5–13  
`adjacent_find` 25–10  
 adjusting base class member access 11–4  
 adjustment  
   array parameter 8–9  
   function parameter 8–9  
 advance 24–13  
 aggregate 8–17  
 alert 2–8  
`<algorithm>` 25–1  
 alias 7–15  
 alignment  
   of bit-field 9–11  
   of bit-field, implementation defined 9–11  
   requirement, implementation-defined 3–27  
 allocation  
   function 3–22, 5–16, 12–9  
   implementation defined bit-field 9–11  
   `new`, storage 5–15  
   unspecified 9–5, 11–3  
 Allocator requirements 20–2  
 allocator 20–13  
 allowing an exception 15–6  
 alternate definition 17–18  
`always_noconv`, `codecvt` 22–19  
 ambiguity  
   base class member 10–4  
   class conversion 10–6  
   declaration type 7–2  
   declaration versus cast 8–3  
   declaration versus expression 6–6  
   detection, overloaded function 13–4  
   function declaration 8–16  
   member access 10–4  
   parentheses and 5–15  
   resolution, scoping 10–4  
 Amendment 1 17–18  
 anachronism C–11  
 C function definition C–11  
 assignment to `this` C–12  
 cast of pointer to member C–12  
 free store and constructor C–12  
 free store and destructor C–12  
 memory management C–12  
 nonnested class C–12  
 old style base class initializer C–12  
 old style function definition C–11  
`overload` keyword C–11  
 pointer to member conversion C–12  
 scope of nested class C–12  
`this` and constructor C–12  
`this` and destructor C–12  
 AND  
   operator, bitwise 5–22  
   operator, logical 5–23  
   operator, side effects and logical 5–23  
 anonymous  
   union 9–10  
   union access control 9–10  
   union at namespace scope 9–10  
   union, extension to C C–1  
   union, global 9–10  
   union restriction 9–10  
 any, `bitset` 23–15  
`append`, `basic_string` 21–13  
`apply`, `valarray` 26–16  
`arg`, `complex` 26–7  
`argc` 3–19  
 argument 1–2, 17–19/20, 19–3  
   and name hiding, default 8–13  
   and virtual function, default 8–14  
   binding of default 8–12  
   conversion 8–9  
   declaration, default 8–11  
   deduction, template 14–25  
   evaluation of default 8–12/13  
   evaluation, order of 5–5  
   evaluation, unspecified order of 5–5  
   example of default 8–11/12  
   list, empty 8–9  
   list, variable 8–9  
   matching —see overload resolution  
   overloaded operator and default 13–19  
   passing 5–5  
   passing, reference and 8–20  
   reference 5–5  
   scope of default 8–13  
   specification, template 14–24  
   substitution 16–5  
   template 14–21  
   to constructor, unspecified 5–17  
   type checking 5–5  
   type checking of default 8–12  
   type, unknown 8–9  
 arguments, implementation-defined order of evaluation of  
   function 8–13  
`argv[ ]` 3–19  
 arithmetic  
   conversions, usual 5–2  
   exception 5–1  
   exception, undefined 5–1  
   extension to C single precision C–1  
   pointer 5–20  
   type 3–29  
   `unsigned` 3–28  
 array  
   bound 8–7

**const** 3–30  
**declaration** 8–7  
**declarator [ ]** 8–7  
**declarator, multidimensional** 8–8  
**delete** 5–17  
**example** 8–8  
**initialization** 8–17  
**member** 9–4  
**multidimensional** 8–8  
**new** 5–15  
 of class objects and constructor 12–12  
 of class objects and new 5–16  
 of class objects initialization 8–19, 12–12  
 order of execution, constructor and 12–11  
 order of execution, destructor and 12–7  
 overloading and pointer versus 13–2  
 parameter adjustment 8–9  
 pointer conversion 4–2  
 size, default 8–8  
**sizeof** 5–14  
 storage of 8–8  
 type 3–29, 8–9  
 array-to-pointer conversion 4–2  
 arrow operator —see class member access operator  
**asin** 26–19, 32  
 complex 26–8  
**asm**  
 declaration 7–22  
 implementation-defined 7–22  
 assembler 7–22  
**<assert.h>** 17–16/D–1  
**assign**  
**basic\_string** 21–13  
 deque 23–17  
 list 23–21  
 string 21–28  
**string\_char\_traits** 21–4/5  
 vector 23–27  
 wstring 21–29/30  
**Assignable requirements** 23–1  
**assignment**  
 and initialization, overloaded 12–12  
 and lvalue 5–24  
 base class object 5–24  
 conversion by 5–24  
 derived class object 5–24  
 expression 5–24  
 extension to C memberwise C–2  
 operator 5–24, 17–7  
 operator, copy 12–21  
 operator, overloaded 13–19  
 operator restriction, copy 12–22  
 reference 8–20  
 to class object 5–24  
 to reference 5–24  
 to **this** anachronism C–12  
**assignment-expression** 5–24  
**assignment-operator** 5–24  
**at, basic\_string** 21–12  
**atan** 26–19, 32  
 complex 26–8  
**atan2** 26–19, 32  
 complex 26–8  
**atexit** 3–21, 6–6, 17–16, 18–10  
**auto** 7–3  
 destruction of 6–5/6  
 initialization 6–6  
 object initialization 8–15  
 restriction 7–3  
 specifier 7–3  
 storage duration 3–22  
 automatic initialization 6–6  
**auto\_ptr** 20–18  
 auto\_ptr 20–19  
 auto\_ptr 20–19  
 get 20–19  
 operator\* 20–19  
 operator-> 20–19  
 operator= 20–19  
 release 20–19  
 reset 20–19  
 ~auto\_ptr 20–19  
 ~auto\_ptr, auto\_ptr 20–19

## B

**back\_inserter** 24–22  
**back\_insert\_iterator** 24–21  
 back\_insert\_iterator 24–21  
 back\_insert\_iterator 24–21  
 operator\* 24–21  
 operator++ 24–21  
 operator= 24–21  
 backslash character 2–8  
 backspace 2–8  
**bad\_basic\_ios** 27–22  
**bad\_alloc** 5–17, 18–11, 15  
 bad\_alloc 18–14  
 bad\_alloc 18–14  
 operator= 18–14  
 what 18–14  
**bad\_alloc::what, implementation-defined** 18–14  
**bad\_cast** 5–8, 18–16  
 bad\_cast 18–16  
 bad\_cast 18–16  
 operator= 18–16  
 what 18–16  
**bad\_cast::what, implementation-defined** 18–17  
**bad\_exception** 18–18  
 bad\_exception 18–18/19  
 bad\_exception 18–18/19  
 operator= 18–19  
 what 18–19  
**bad\_exception::what, implementation-defined** 18–19  
**bad\_typeid** 5–9, 18–17  
 bad\_typeid 18–17  
 bad\_typeid 18–17  
 operator= 18–17  
 what 18–17  
**bad\_typeid::what, implementation-defined** 18–17  
**base**  
 class 17–18, 21  
 class 10–1/2  
 class access 11–3  
 class cast 5–10  
 class constructor order of execution 12–2  
 class conversion 4–5  
 class destructor order of execution 12–7  
 class, direct 10–1  
 class, indirect 10–1  
 class initialization 12–13  
 class initialization, order of 12–14  
 class initializer 8–14  
 class initialized anachronism, old style C–12  
 class member access 10–1  
 class member access, adjusting 11–4  
 class member ambiguity 10–4  
 class object, assignment 5–24  
 class, private 11–3  
 class, public 11–3  
 class virtual —see virtual base class

of integer literal 2–6  
*base-specifier* 10–1  
*base-specifier-list* 10–1  
basic execution character set 1–4  
`basic_filebuf` 27–65  
  `basic_filebuf` 27–66  
  `basic_filebuf` 27–66  
  `close` 27–67  
  `imbue` 27–70  
  `is_open` 27–67  
  `open` 27–67  
  `overflow` 27–68  
  `pbackfail` 27–68  
  `seekoff` 27–69  
  `seekpos` 27–70  
  `setbuf` 27–69  
  `showmany` 27–68  
  `sync` 27–70  
  `underflow` 27–68  
  `~basic_filebuf` 27–66  
~`basic_filebuf`, `basic_filebuf` 27–66  
`basic_filebuf<char>` 27–65  
`basic_filebuf<wchar_t>` 27–65  
`basic_ifstream` 27–70  
  `basic_ifstream` 27–71  
  `basic_ifstream` 27–71  
  `close` 27–71  
  `is_open` 27–71  
  `open` 27–71  
  `rdbuf` 27–71  
`basic_ifstream<char>` 27–65  
`basic_ifstream<wchar_t>` 27–65  
`basic_ios` 27–18  
  `bad` 27–22  
  `basic_ios` 27–19  
  `basic_ios` 27–19  
  `clear` 27–22  
  `copyfmt` 27–21  
  `eof` 27–22  
  `exceptions` 27–23  
  `fail` 27–22  
  `fill` 27–21  
  `good` 27–22  
  `init` 27–38, 49  
  `operator bool` 27–22  
  `operator!` 27–22  
  `rdbuf` 27–20  
  `rdstate` 27–22  
  `setstate` 27–22  
  `tie` 27–20  
`basic_ios<char>` 27–4  
`basic_ios<char>` 27–7  
`basic_ios::failure` argument, implementation-defined  
  27–22  
`basic_ios<wchar_t>` 27–4  
`basic_ios<wchar_t>` 27–7  
`basic_istream` 27–36  
  `basic_istream` 27–38  
`basic_istream` 27–38  
  `gcount` 27–44  
  `get` 27–44  
  `getline` 27–45  
  `ignore` 27–45  
  `ipfx` 27–38  
  `isfx` 27–39  
  `operator>>` 27–41  
  `peek` 27–46  
  `putback` 27–46  
  `read` 27–46  
  `readsome` 27–46  
  `seekg` 27–47  
  `sync` 27–46  
  `tellg` 27–47  
  `unget` 27–46  
  `basic_istream<char>` 27–4  
  `basic_istream<char>` 27–35  
  `basic_istream<wchar_t>` 27–4  
  `basic_istream<wchar_t>` 27–35  
  `basic_istringstream` 27–62  
  `basic_istringstream` 27–63  
  `basic_istringstream` 27–63  
  `rdbuf` 27–63  
  `str` 27–63  
  `basic_istringstream<char>` 27–57  
  `basic_istringstream<wchar_t>` 27–57  
  `basic_ofstream` 27–72  
  `basic_ofstream` 27–72  
  `close` 27–73  
  `is_open` 27–72  
  `open` 27–73  
  `rdbuf` 27–72  
  `basic_ofstream<char>` 27–65  
  `basic_ofstream<wchar_t>` 27–65  
  `basic_ostream`  
    `basic_ostream` 27–49  
    `basic_ostream` 27–49  
    `flush` 27–55  
    `operator<<` 27–53  
    `opfix` 27–49  
    `osfix` 27–49  
    `put` 27–55  
    `seekp` 27–50  
    `tellp` 27–50  
    `write` 27–55  
    `~basic_ostream` 27–49  
~`basic_ostream`, `basic_ostream` 27–49  
`basic_ostream<char>` 27–4  
`basic_ostream<char>` 27–35  
`basic_ostream<wchar_t>` 27–4  
`basic_ostream<wchar_t>` 27–35  
`basic_ostringstream` 27–63  
  `basic_ostringstream` 27–64  
  `basic_ostringstream` 27–64  
  `rdbuf` 27–64  
  `str` 27–64  
  `basic_ostringstream<char>` 27–57  
  `basic_ostringstream<wchar_t>` 27–57  
`basic_streampbuf` 27–26  
  `basic_streampbuf` 27–28  
  `basic_streampbuf` 27–28  
  `eback` 27–30  
  `egptr` 27–30  
  `eptr` 27–31  
  `gbump` 27–30  
  `getloc` 27–28  
  `gptr` 27–30  
  `imbue` 27–31  
  `in_avail` 27–29  
  `overflow` 27–34  
  `pbackfail` 27–34  
  `pbase` 27–31  
  `pbump` 27–31  
  `pptr` 27–31  
  `pubimbue` 27–28  
  `pubseekoff` 27–29  
  `pubseekpos` 27–29  
  `pubsetbuf` 27–29  
  `pubsync` 27–29  
  `sbumpc` 27–29  
  `seekoff` 27–31  
  `seekpos` 27–32

setbuf 27–31  
 setg 27–31  
 setp 27–31  
 sgetc 27–29  
 sgetn 27–30  
 showmany 27–32, 68  
 snextc 27–29  
 sputbackc 27–30  
 sputc 27–30  
 sputn 27–30  
 sungetc 27–30  
 sync 27–32  
 uflow 27–33  
 underflow 27–33  
 xsgetn 27–32  
 xsputn 27–34  
*basic\_streambuf<char>* 27–25  
*basic\_streambuf<wchar\_t>* 27–25  
*basic\_string* 21–5, 23, 27–57  
 append 21–13  
 assign 21–13  
 at 21–12  
*basic\_string* 21–8  
*basic\_string* 21–8  
 begin 21–11  
*c\_str* 21–18  
 capacity 21–12  
 compare 21–22  
 copy 21–17  
 data 21–18  
 empty 21–12  
 end 21–11  
 erase 21–15  
 find 21–18  
 find\_first\_not\_of 21–20  
 find\_first\_of 21–19  
 find\_last\_not\_of 21–21  
 find\_last\_of 21–20  
 getline 21–26  
 insert 21–14  
 max\_size 21–11  
 operator!= 21–24  
 operator+ 21–23  
 operator+= 21–12  
 operator< 21–24  
 operator<< 21–26  
 operator<= 21–25  
 operator= 21–10  
 operator== 21–23  
 operator> 21–25  
 operator>= 21–25  
 operator>> 21–26  
 operator[] 21–12  
 rbegin 21–11  
 rend 21–11  
 replace 21–16  
 reserve 21–12  
 resize 21–11  
 rfind 21–19  
 size 21–11  
 substr 21–21  
 swap 21–18, 26  
*basic\_stringbuf* 27–58  
*basic\_stringbuf* 27–58  
*basic\_stringbuf* 27–58  
 overflow 27–60  
 pbackfail 27–60  
 seekoff 27–60  
 seekpos 27–61  
 str 27–59  
 underflow 27–60

*basic\_stringbuf<char>* 27–57  
*basic\_stringbuf<wchar\_t>* 27–57  
 before, *type\_info* 18–16  
 begin, *basic\_string* 21–11  
 behavior  
 default 17–1, 4  
 implementation-defined 1–3  
 locale-specific 1–3  
 reentrancy, implementation-defined 17–21  
 required 17–2, 4  
 undefined 1–3  
 unspecified 1–3  
 Ben 13–3  
 bidirectional\_iterator 24–11  
 distance\_type 24–13  
 iterator\_category 24–12  
 value\_type 24–13  
 bidirectional\_iterator\_tag 24–11  
 binary  
 operator, interpretation of 13–19  
 operator, overloaded 13–19  
 binary\_function 20–8  
 binary\_negate 20–10  
 binary\_search 25–23  
 bind1st 20–11  
 bind2nd 20–12  
 binder1st 20–11  
 binder2nd 20–11  
 binding  
 —see virtual function, dynamic  
 of default argument 8–12  
 reference 8–21  
 bit-field 9–11  
 address of 9–11  
 alignment of 9–11  
 allocation, implementation defined 9–11  
 declaration 9–11  
 implementation defined alignment of 9–11  
 implementation-defined sign of 9–11  
 layout 9–11  
 restriction 9–11  
 restriction, address of 9–11  
 restriction, pointer to 9–11  
 type of 9–11  
 unnamed 9–11  
 zero width of 9–11  
 bit-fields, Boolean 9–11  
 bitmask type 17–5  
*<bitset>* 23–9  
 bitset 23–10  
 any 23–15  
 bitset 23–12  
 bitset 23–12  
 count 23–14  
 flip 23–14  
 none 23–15  
 operator!= 23–14  
 operator& 23–15  
 operator&= 23–12  
 operator<< 23–15  
 operator<<= 23–13  
 operator== 23–14  
 operator>> 23–15  
 operator>>= 23–13  
 operator^ 23–15  
 operator^= 23–13  
 operator| 23–15  
 operator|= 23–13  
 operator~ 23–14  
 reset 23–13  
 set 23–13

size 23–14  
 test 23–14  
 to\_string 23–14  
 to\_ulong 23–14  
 bitwise  
   AND operator 5–22  
   exclusive OR operator 5–23  
   inclusive OR operator 5–23  
   operator 5–22  
 block  
   initialization in 6–6  
   scope —see local scope  
   statement {} 6–1  
   structure 6–6  
 body, function 8–14  
 bool promotion to int 4–3  
**bool**  
   increment 5–7, 14  
   type-specifier 7–8  
**boolalpha** 27–23  
 Boolean  
   bit-fields 9–11  
   conversion 4–5  
   literal 2–10  
   type 3–28  
   type 3–28  
*boolean-literal* 2–9  
 bound array 8–7  
 bound, of array 8–7  
 bound pointer to member function, undefined C–12  
 break statement 6–5  
 built-in type —see fundamental type  
 byte 5–14  
   string, null-terminated 17–6

## C

**C**  
 anonymous union, extension to C–1  
 class, extension to C–1  
 const, extension to C–1  
 dangerous extension to C–11  
 declaration statement, extension to C–1  
 delete, extension to C–1  
 destructor, extension to C–2  
 expression evaluation, difference from C–1  
 extension to C–1/2  
 function definition anachronism C–11  
 header 17–16, 18, 17–20/D–1  
 implementation-defined extension to C–11  
 inline function, extension to C–1  
 library, Standard 17–1, 6, 17–15/C–13, C–15  
 linkage to 7–23  
 memberwise assignment, extension to C–2  
 memberwise initialization, extension to C–2  
 multiple inheritance, extension to C–2  
 new, extension to C–1  
 overloading delete, extension to C–2  
 overloading, extension to C–1  
 overloading new, extension to C–2  
 pointer to member, extension to C–2  
 protected, extension to C–2  
 reference type, extension to C–1  
 single precision arithmetic, extension to C–1  
 summary, compatibility with C–1  
 summary, compatibility with ISO C–2  
 type checking, extension to C–1  
 user-defined type, extension to C–1  
 void\* pointer type extension to C–1  
 volatile, extension to C–2

call  
   —see also function call, member function call, overloaded  
     function call, virtual function call  
 by reference 5–5  
 by value 5–5  
 operator function 13–18  
 calloc 20–20/C–16  
 capacity  
   basic\_string 21–12  
   vector 23–28  
 carriage return 2–8  
 case label 6–1, 3  
 <cassert> 17–16, 19–4  
 cast  
   ambiguity, declaration versus 8–3  
   base class 5–10  
   const 5–12  
   derived class 5–10  
   dynamic 5–7, 18–16  
   integer to pointer 5–11  
   lvalue 5–9/10  
   of pointer to member anachronism C–12  
   operator 5–13, 18, 8–2  
   pointer to function 5–11  
   pointer to integer 5–11  
   pointer to member 5–10/11  
   reference 5–10/11  
   reinterpret 5–10  
   reinterpret\_cast, lvalue 5–10  
   reinterpret\_cast, reference 5–11  
   static 5–9  
   static\_cast, lvalue 5–9  
   static\_cast, reference 5–10  
   to incomplete class 5–11  
   undefined pointer to function 5–11  
 cast-expression 5–18  
 casting 5–6, 18  
 catch 15–1  
 category 17–1  
 category, locale 22–4  
 c-char 2–7  
 c-char-sequence 2–7  
 <cctype> 21–30  
 ceil 26–32  
 cerr 27–5  
 <cerrno> 17–17, 19–4  
 <cfloat> 18–9  
**C++**  
   Standard library 17–1, 18/19, 21  
   Standard library exception specifications 17–21  
   header D–1  
   headers 17–15  
 change  
   to const object, undefined 7–7  
   to string literal, undefined 2–9  
 char  
   implementation-defined sign of 3–28  
   literal, implementation-defined value of 2–8  
 type 3–28  
   type, signed 3–28  
   type specifier 7–8  
   type, unsigned 3–28  
 character  
   array initialization 8–20  
   decimal-point 17–6  
   literal 2–7  
   literal, type of 2–7  
   multibyte 1–3  
   set, basic execution 1–4  
   signed 3–28  
   string 2–9

type 3–28  
 underscore 17–17/18  
*character-literal* 2–7  
 CHAR\_T 27–2  
 checking  
     point of error 14–4  
     syntax 14–4  
 cin 27–5  
 <ciso646> C–15  
 class 3–29, 9–1  
     abstract 10–9  
     access and friend 11–6  
     anachronism, nonnested C–12  
     and type 9–1  
     base 17–18, 21  
     base—see base class  
     cast to incomplete 5–11  
     constructor and abstract 10–10  
     conversion 12–4  
     conversion ambiguity 10–6  
     conversion, base 4–5  
     declaration, forward 9–2, 10–1  
     declaration { } 9–1  
     definition 9–1, 4  
     definition 3–2  
     definition, empty 9–1  
     definition example 9–4  
     definition name hiding 9–2  
     definition, scope of 9–2  
     definition { } 9–1  
     derived 17–21  
     derived—see derived class  
     extension to C C–1  
     generated 14–9  
     gslice 26–22  
     linkage of 3–17  
     linkage specification 7–23  
     local—see local class  
     member—see also member  
     member access 5–6  
     member access operator 5–6  
     member declaration 9–3  
     member function 9–5  
     member initialization 8–16  
     member semantics 5–6  
     member, static 3–21  
     member storage duration 3–23  
     member syntax 5–6  
     name 8–2  
     name as type definition 9–2  
     name declaration 3–1  
     name, elaborated 7–9, 9–2/3  
     name, point of declaration 9–3  
     name, scope of 9–2  
     name, *typedef* 7–6, 9–3  
     nested—see nested class  
     object, assignment to 5–24  
     object, const 3–30  
     object copy 12–19  
     object copy—see also copy constructor  
     object initialization 8–17, 12–11/12  
     object initialization—see also constructor  
     object layout 9–5, 10–2  
     object, member 9–4  
     object, operations on 9–1  
     object, *sizeof* 5–14  
     objects and constructor, array of 12–12  
     objects and *new*, array of 5–16  
     objects initialization, array of 8–19, 12–12  
     point of declaration, friend 3–5  
     pointer to abstract 10–9

polymorphic 10–6  
 scope 3–7  
 scope of enumerator 7–11  
*sizeof*, empty 9–1  
 specialized 14–9, 17  
 template 14–2, 23–11  
 type restriction, member of 12–14  
 unnamed 7–6  
 class  
     type specifier 7–9  
     versus struct 9–1  
     versus union 9–1  
     classic, locale 22–9  
     classic\_table, ctype<char> 22–18  
     class-key 7–9, 9–1  
     class-name 9–1  
     class-specifier 9–1  
     clear, basic\_ios 27–22  
 <climits> 18–9, 23–12/D–6  
 <clocale> 17–6, 22–43/C–15  
 clog 27–5  
 close  
     basic\_filebuf 27–67  
     basic\_ifstream 27–71  
     basic\_ofstream 27–73  
     messages 22–39  
 <cmath> 26–31  
 codecvt 22–18  
     always\_noconv 22–19  
     convert 22–19  
     do\_always\_noconv 22–20  
     do\_convert 22–20  
     do\_length 22–20  
     do\_max\_length 22–20  
     length 22–19  
     max\_length 22–19  
 codecvt\_byname 22–21  
 collate 22–27  
     compare 22–28  
     do\_compare 22–28  
     do\_hash 22–28  
     do\_transform 22–28  
     hash 22–28  
     transform 22–28  
 collate\_byname 22–29  
 comma  
     operator 5–25  
     operator, side effects and 5–25  
 comment 2–3  
     /\* \*/ 2–4  
     // 2–4  
 compare  
     basic\_string 21–22  
     collate 22–28  
     string 21–28  
     string\_char\_traits 21–4  
     wstring 21–29  
 comparison  
     function 17–1  
     pointer 5–21/22  
     pointer to function 5–21  
     undefined pointer 5–20, 22  
     unspecified pointer 5–22  
     void\* pointer 5–21  
 compatibility  
     with C summary C–1  
     with ISO C summary C–2  
 compilation, separate 2–1  
 compiler control line—see preprocessing directive  
 complete object 1–4  
 completely-defined object type 3–27

<complex> 26–2  
 complex 26–3  
   acos 26–8  
   arg 26–7  
   asin 26–8  
   atan 26–8  
   atan2 26–8  
   complex 26–5  
   complex 26–5  
   conj 26–7  
   cos 26–8  
   cosh 26–8  
   exp 26–8  
   imag 26–7  
   log 26–8  
   log10 26–8  
   norm 26–7  
   operator!= 26–6  
   operator\* 26–6  
   operator\*= 26–5  
   operator+ 26–6  
   operator+= 26–5  
   operator- 26–6  
   operator-= 26–5  
   operator/= 26–5  
   operator<< 26–7  
   operator== 26–6  
   operator>> 26–7  
   polar 26–7  
   pow 26–8  
   real 26–7  
   sin 26–8  
   sinh 26–8  
   sqrt 26–8  
   tan 26–8  
   tanh 26–8  
 component 17–1  
 compound  
   statement 6–1  
   type 3–29  
*compound-statement* 6–1  
 concatenation  
   string 2–9  
   undefined string literal 2–9  
*condition* 6–2  
 conditional  
   expression operator 5–23  
   inclusion 16–2  
 conditional-expression, throw-expression in 5–24  
*conditions*, rules for 6–2  
 conj, complex 26–7  
 consistency  
   example, linkage 7–3  
   linkage 7–3  
   linkage specification 7–23  
   type declaration 3–18  
 const cast 5–12  
*\*const* example 8–5  
 const 3–30  
   array 3–30  
   class object 3–30  
   constructor and 9–8, 12–1  
   destructor and 9–8, 12–7  
   example 8–5  
   extension to C  C–1  
   initialization 7–7, 8–17  
   linkage of 3–17, 7–3  
   member function 9–7  
   member initialization 12–14  
   object, undefined change to 7–7  
   operand 5–1

overloading and 13–2  
 reference 8–21  
 type 7–6  
 constant 2–5, 3–29, 5–3  
   enumeration 7–10  
   expression 5–25  
   expression, pointer to member 5–13  
 initializer 9–4  
 null pointer 4–4  
 pointer declaration 8–5  
 pointer example 8–5  
*constant-expression* 5–25  
*constant-initializer* 9–4  
 constructor 12–1  
   address of 12–2  
   anachronism, free store and C–12  
   anachronism, this and C–12  
   and abstract class 10–10  
   and array order of execution 12–11  
   and const 9–8, 12–1  
   and initialization 12–11/12  
   and initialization example 12–12  
   and member function 12–2  
   and new 5–16  
   and new, unspecified 5–17  
   and return 6–5  
   and static objects order of execution 12–13  
   and virtual function call 12–17  
   and volatile 9–8, 12–1  
   array of class objects and 12–12  
   call, explicit 12–2  
   conversion by 12–4  
   conversion by—see also user-defined conversion  
   copy 12–2/3, 19, 17–7  
   default—see default constructor  
   definition 8–14  
   example 12–2  
   exception handling 15–3  
   for temporary 12–3  
   inheritance of 12–1  
   non-trivial 12–1  
   order of execution, base class 12–2  
   order of execution, member 12–2  
   restriction 12–1/2  
   restriction, copy 12–20  
   type of 12–2  
   union 9–10  
   unspecified argument to 5–17  
 Container Requirements 23–1  
 continue  
   in for statement 6–4  
   statement 6–5  
 control line—see preprocessing directive  
 convention 17–4  
 conversion  
   Boolean 4–5  
   ambiguity, class 10–6  
   anachronism, pointer to member C–12  
   and name hiding, user-defined 12–6  
   argument 8–9  
   array pointer 4–2  
   array-to-pointer 4–2  
   base class 4–5  
   by assignment 5–24  
   by constructor 12–4  
   class 12–4  
   explicit type—see casting  
   floating point 4–4  
   floating-integral 4–4  
   function—see also user-defined conversion  
   function-to-pointer 4–2

implementation defined pointer integer 5–11  
 implementation-defined floating point 4–4  
 implicit 4–1, 5–2, 12–4  
 implicit user-defined 12–6  
 inheritance of user-defined 12–6  
 integer 4–3  
 lvalue-to-rvalue 4–2  
 operator 5–2, 12–5  
 overload resolution and 13–11  
 overload resolution and pointer 13–18  
 pointer 4–4  
 pointer to function 4–2  
 pointer to member 4–4  
 pointer to member `void*` 4–5  
 rank 13–14  
 return type 6–5  
`reverse_bidirectional_iterator` 24–15  
`reverse_iterator` 24–18  
 sequence, implicit 13–12  
 sequence, standard 4–1  
 signed unsigned integer 4–3  
 standard 4–1  
 to enumeration type 5–10  
 to enumeration type, `static_cast`, 5–10  
 to rvalue, lvalue 4–2  
 type of 12–5  
 undefined floating point 4–4  
 user-defined 5–2, 12–4/5  
 virtual user-defined 12–6  
*conversion-function-id* 12–5  
 conversions  
   qualification 4–2  
   usual arithmetic 5–2  
`convert, codecvt` 22–19  
`copy`  
   assignment operator 12–21  
   assignment operator 12–19  
   assignment operator, implicitly-declared 12–21  
   assignment operator restriction 12–22  
 class object 12–19  
 constructor 12–2/3, 19, 17–7  
 constructor, implicitly-declared 12–19  
 constructor restriction 12–20  
`copy` 25–13  
`basic_string` 21–17  
`ios_traits` 27–10  
`string` 21–28  
`string_char_traits` 21–4  
`wstring` 21–29  
`copy_backward` 25–13  
`CopyConstructible` requirements 20–2  
`copyfmt, basic_ios` 27–21  
`cos` 26–19, 32  
   `complex` 26–8  
`cosh` 26–19, 32  
   `complex` 26–8  
`count` 25–11  
`bitset` 23–14  
`count_if` 25–11  
`cout` 27–5  
`_cplusplus` 16–9  
`<csetjmp>` 17–18, 18–20  
`cshift, valarray` 26–16  
`<csignal>` 18–21  
`<cstdarg>` 8–9, 17–18, 18–20  
`<cstddef>` 5–14, 20, 18–1/C–15  
`<cstdio>` 27–5/6, 40, 51, 65, 67, 69, 27–73/C–15  
`<cstdlib>` 3–19, 21, 17–16, 18–9, 21, 20–20, 21–31,  
   25–30, 26–31/C–15  
`c_str, basic_string` 21–18  
`<cstring>` 17–6, 20–20, 21–30/D–6, D–11/C–15

`<ctime>` 18–21, 20–20, 22–2/C–15  
`ctor-initializer` 12–13  
`ctype` 22–12  
   `do_is` 22–14  
   `do_narrow` 22–15  
   `do_scan_is` 22–14  
   `do_scan_not` 22–14  
   `do_tolower` 22–14  
   `do_toupper` 22–14  
   `do_widen` 22–14  
   `is` 22–13  
   `narrow` 22–13  
   `scan_is` 22–13  
   `scan_not` 22–13  
   `tolower` 22–13  
   `toupper` 22–13  
   `widen` 22–13  
`ctype_byname` 22–15  
`ctype_byname<char>` 22–18  
`ctype<char>`  
   `classic_table` 22–18  
   `ctype<char>` 22–16  
   `ctype<char>` 22–16  
   `is` 22–16  
   `narrow` 22–17  
   `scan_is` 22–17  
   `scan_not` 22–17  
   `table` 22–17  
   `tolower` 22–17  
   `toupper` 22–17  
   `widen` 22–17  
`~ctype<char>` 22–16  
`~ctype<char>, ctype<char>` 22–16  
`<ctype.h>` D–1  
 cv-qualified name, address of 5–13  
 cv-qualified 3–30  
`cv-qualified` 8–2  
`<cwchar>` 17–6, 18, 21–30/C–15  
`<cwctype>` 17–18, 21–30

## D

`DAG`  
   multiple inheritance 10–3  
   nonvirtual base class 10–3  
   virtual base class 10–3  
 dangerous extension to C C–11  
 data  
   member —see member  
   `member, static` 9–8  
`data, basic_string` 21–18  
`date_order, time_get` 22–30  
 deallocation  
   —see `delete`  
   function 3–23, 5–18, 12–9  
`dec` 27–24, 41, 53  
`decimal literal` 2–6  
`decimal-literal` 2–6  
`decimal-point character` 17–6  
`decimal_point, numpunct` 22–26  
 declaration 3–1, 7–1  
   `:`, field 9–11  
   access 11–4  
   ambiguity, function 8–16  
   array 8–7  
   as definition 7–2  
   `asm` 7–22  
   bit-field 9–11  
   class member 9–3  
   class name 3–1

class name, point of 9–3  
 consistency, type 3–18  
 constant pointer 8–5  
 default argument 8–11  
 definition versus 3–1  
 ellipsis in function 5–5, 8–9  
 enumerator point of 3–5  
 example 3–2, 8–11  
 example, function 8–10  
*extern* 3–1  
*extern* reference 8–20  
 forward 7–4  
 forward class 9–2, 10–1  
 friend class point of 3–5  
 friend function point of 3–5  
 function 3–1, 8–9  
 function template 14–30  
 hiding —see name hiding  
 in *for*, scope of 6–4  
 in *for* statement 6–4  
 in *switch* statement 6–3  
 matching, overloaded function 13–3  
 member 9–3  
 multiple 3–18  
 name 3–1  
 name, point of 3–5  
 overloaded 13–1  
 overloaded name and *friend* 11–5  
 parameter 8–9  
 parentheses in 8–3, 5  
 pointer 8–5  
 reference 8–6  
*register* 7–3  
 scope of friend 3–8  
 specifier 7–2  
 statement 6–6  
 statement, extension to C C–1  
*static* member 3–1  
 storage class 7–3  
 type 8–4  
 type ambiguity 7–2  
*typedef* 3–1  
*typedef* as type 7–5  
 versus cast ambiguity 8–3  
 versus expression ambiguity 6–6  
 {}, class 9–1  
 {}, enum 7–10  
*declaration* 7–1  
*declaration-seq* 7–22  
*declaration-statement* 6–6  
 declarative region 3–1, 4  
 declarator 7–1, 8–1  
 &, reference 8–6  
 (), function 8–9  
 \*, pointer 8–5  
 ::\*, pointer to member 8–7  
 [], array 8–7  
 example 8–2  
 initializer, temporary and 12–3  
 meaning of 8–4  
 multidimensional array 8–8  
*declarator* 8–1  
*declarator-id* 8–2  
*decl-specifier* 7–2  
 decrement  
     operator 5–7, 13/14  
     operator, overloaded 13–21  
 deduction, template argument 14–25  
 default  
     access control 11–1  
     argument and name hiding 8–13  
     argument and virtual function 8–14  
     argument, binding of 8–12  
     argument declaration 8–11  
     argument, evaluation of 8–12/13  
     argument, example of 8–11/12  
     argument, overload resolution and 13–11  
     argument, overloaded operator and 13–19  
     argument, scope of 8–13  
     argument, type checking of 8–12  
     array size 8–8  
     behavior 17–1, 4  
     constructor 12–1  
     constructor and initialization 12–11  
     constructor and *new* 5–16  
     destructor 12–7  
     initialization 8–15  
     initializers, overloading and 13–3  
     member access, *struct* 9–1  
     member access, *union* 9–1  
     default label 6–1, 3  
     #define 16–5  
     definition 3–1, 17–1  
         alternate 17–18  
         and initialization 7–2  
     class 3–2  
     class 9–1, 4  
     class name as type 9–2  
     constructor 8–14  
     declaration as 7–2  
     empty class 9–1  
     enumerator 3–2  
     enumerator point of 7–10  
     example 3–1  
     example, function 8–14  
     example, nested class 9–12  
     function 3–2  
     function 8–14  
     function template 14–30  
     local class 9–13  
     member function 9–5  
     name hiding, class 9–2  
     namespace 7–12  
     nested class 9–11  
     object 3–2  
     of template 14–1  
     pure virtual function 10–9  
     scope, macro 16–6  
     scope of class 9–2  
     *static* member 9–9  
     versus declaration 3–1  
     virtual function 10–8  
     {}, class 9–1  
     definitions, implementation-generated 3–2  
     delete  
         array 5–17  
         object 5–17  
     delete 3–22, 5–17/18, 12–9  
         destructor and 5–18, 12–7  
         example 12–10  
         example, destructor and 12–10  
         example, scope of 12–10  
         extension to C C–1  
         extension to C overloading C–2  
         operator 17–18, 18–12, 20–20  
         overloading and 3–23  
         type of 12–10  
         undefined 5–17  
     delete[], operator 17–18, 18–13  
     deleted object, undefined 3–23  
     *delete-expression* 5–17  
     dependent name 14–7

deprecated features 5–7, 14  
`<deque>` 23–9  
`deque` 23–16  
   `assign` 23–17  
   `erase` 23–18  
   `insert` 23–18  
   `resize` 23–18  
 dereferencing—see also indirection  
 derivation—see inheritance  
 derived  
   class 17–21  
   class 10–1  
   class cast 5–10  
   class example 10–1  
   class, most 1–4  
   class object, assignment 5–24  
   class, overloading and 13–3  
   object, most 1–4  
 destination type 8–16  
 destruction  
   of `auto` 6–5/6  
   of `local static` 6–6  
   of `local variable` 6–5/6  
   of `temporary` 12–3  
   of `temporary, order of` 12–3  
 destructor 12–7, 17–7  
 anachronism, free store and C–12  
 anachronism, `this` and C–12  
 and array order of execution 12–7  
 and `const` 9–8, 12–7  
 and `delete` 5–18, 12–7  
 and `delete example` 12–10  
 and exception, explicit 12–9  
 and exit from scope 6–5  
 and fundamental type 12–9  
 and member function 12–7  
 and placement of object 12–8  
 and virtual function call 12–17  
 and `volatile` 9–8, 12–7  
 call example, explicit 12–8  
 call, explicit 12–8  
 call, implicit 12–7  
 call, unspecified 6–6  
 default 12–7  
 exception handling 15–3  
 extension to C C–2  
 for temporary 12–3  
 non-trivial 12–7  
 order of execution 12–7  
 order of execution, base class 12–7  
 order of execution, member 12–7  
 program termination and 12–7  
 pure virtual 12–7  
 restriction 12–7  
 static object 3–20  
 union 9–10  
 virtual 12–7  
 diagnostic message 1–2  
 difference from C expression evaluation C–1  
`digit` 2–4  
`digit-sequence` 2–8  
`digraph` 2–3  
 direct base class 10–1  
`direct-abstract-declarator` 8–2  
`direct-declarator` 8–1  
 directed acyclic graph—see DAG  
 directive  
   error 16–8  
   null 16–9  
   pragma 16–8  
   preprocessing 16–1

`direct-new-declarator` 5–15  
`distance` 24–13  
`distance_type`  
   `T*` 24–13  
`bidirectional_iterator` 24–13  
`forward_iterator` 24–13  
`input_iterator` 24–13  
`random_access_iterator` 24–13  
 distinct string 2–9  
`div` 26–32  
`divides` 20–8  
 division  
   by zero, undefined 5–1, 19  
   implementation defined 5–19  
   operator 5–19  
`djacent_difference` 26–30  
`do statement` 6–3/4  
`do_always_noconv, codecvt` 22–20  
`do_close, messages` 22–39  
`do_compare, collate` 22–28  
`do_convert, codecvt` 22–20  
`do_curr_symbol, moneypunct` 22–37  
`do_date_order, time_get` 22–31  
`do_decimal_point`  
   `moneypunct` 22–37  
   `numpunct` 22–26  
`do_falsename, numpunct do_truename` 22–27  
`do_frac_digits, moneypunct` 22–37  
`do_get`  
   `messages` 22–39  
   `money_get` 22–34  
   `num_get` 22–23  
`do_get_date, time_get` 22–31  
`do_get_monthname, time_get` 22–31  
`do_get_time, time_get` 22–31  
`do_get_weekday, time_get` 22–31  
`do_get_year, time_get` 22–31  
`do_grouping`  
   `moneypunct` 22–37  
   `numpunct` 22–26  
`do_hash, collate` 22–28  
`do_is, ctype` 22–14  
`do_length, codecvt` 22–20  
`domain_error` 19–2  
   `domain_error` 19–2  
   `domain_error` 19–2  
`do_max_length, codecvt` 22–20  
 dominance, virtual base class 10–5  
`do_narrow, ctype` 22–15  
`do_negative_sign, moneypunct` 22–37  
`do_neg_format, moneypunct` 22–37  
`do_open, messages` 22–39  
`do_pos_format, moneypunct` 22–37  
`do_positive_sign, moneypunct` 22–37  
`do_put`  
   `money_put` 22–35  
   `num_put` 22–24  
   `time_put` 22–33  
`do_scan_is, ctype` 22–14  
`do_scan_not, ctype` 22–14  
 dot operator—see class member access operator  
`do_thousands_sep`  
   `moneypunct` 22–37  
   `numpunct` 22–26  
`do_tolower, ctype` 22–14  
`do_toupper, ctype` 22–14  
`do_transform, collate` 22–28  
`do_truename do_falsename, numpunct` 22–27  
 double quote 2–8  
 double  
   literal 2–9

type 3–29  
 type specifier 7–8  
`do_widen`, `ctype` 22–14  
 dynamic  
   binding —see virtual function  
   cast 5–7, 18–16  
   initialization 3–19  
   storage duration 3–22, 5–15  
   type 1–2

**E**

E suffix 2–9  
`eback`, `basic_streambuf` 27–30  
 effect, side 1–5  
`egptr`, `basic_streambuf` 27–30  
 elaborated  
   class name 7–9, 9–2/3  
   enum name 7–9  
   type specifier 14–5  
   type specifier —see elaborated class name  
*elaborated-type-specifier* 7–9  
`#elif` 16–2  
 elimination of temporary 12–2  
 ellipsis  
   example 8–9  
   in function declaration 5–5, 8–9  
   overload resolution and 13–11  
`#else` 16–3  
`else` 6–2  
 empty  
   argument list 8–9  
   class definition 9–1  
   class `sizeof` 9–1  
   statement 6–1  
   empty 24–11  
     `basic_string` 21–12  
   end, `basic_string` 21–11  
`#endif` 16–3  
`endl` 27–53, 55  
 end-of-file 23–15  
`ends` 27–55  
 entity 3–1  
 enum name, `typedef` 7–6  
 enum 3–29  
   declaration {} 7–10  
   name, elaborated 7–9  
   overloading and 13–2  
   type of 7–10/11  
   type specifier 7–9  
 enumerated type 3–29, 17–5  
 enumeration 7–10  
   constant 7–10  
   example 7–11  
   linkage of 3–17  
   type, conversion to 5–10  
 type, `static_cast`, conversion to 5–10  
 underlying type 7–11  
 enumerator  
   class, scope of 7–11  
   definition 3–2  
   member 7–11  
   point of declaration 3–5  
   point of definition 7–10  
   redefinition 7–10  
   restriction 7–10  
   value of 7–10  
`enumerator` 7–10  
 environment, program 3–19  
`eof`

`basic_ios` 27–22  
`ios_traits` 27–9  
`eos`  
   `ios_traits` 27–9  
   `string` 21–28  
   `string_char_traits` 21–4, 18  
   `wstring` 21–29  
`eptr`, `basic_streambuf` 27–31  
`eq`  
   `string` 21–28  
   `string_char_traits` 21–4, 18/21  
   `wstring` 21–29  
`eq_char_type`, `ios_traits` 27–10  
`eq_int_type`, `ios_traits` 27–10  
`equal` 25–12  
   `istreambuf_iterator` 24–28  
`equality operator` 5–22  
`EqualityComparable` requirements 20–1  
*equality-expression* 5–22  
`equal_range` 25–22  
`equal_to` 20–9  
`equivalence`  
   template type 14–24  
   type 7–5, 9–2  
`equivalent`  
   parameter declarations 13–2  
   parameter declarations, overloading and 13–2  
`erase`  
   `basic_string` 21–15  
   `deque` 23–18  
   `list` 23–21  
   `vector` 23–29  
`<errno.h>` D–1  
`error`  
   checking, point of 14–4  
   directive 16–8  
`#error` 16–8  
`escape`  
   character —see backslash  
   sequence 2–8  
   sequence, undefined 2–8  
*escape-sequence* 2–7  
`evaluation`  
   difference from C expression C–1  
   new, unspecified order of 5–17  
   of default argument 8–12/13  
   of expression, order of 1–6  
   order of argument 5–5  
   unspecified order of 3–20, 5–1  
   unspecified order of argument 5–5  
   unspecified order of function call 5–5  
`example`  
   `*const` 8–5  
   array 8–8  
   class definition 9–4  
   `const` 8–5  
   constant pointer 8–5  
   constructor 12–2  
   constructor and initialization 12–12  
   declaration 3–2, 8–11  
   declarator 8–2  
   definition 3–1  
   `delete` 12–10  
   derived class 10–1  
   destructor and `delete` 12–10  
   ellipsis 8–9  
   enumeration 7–11  
   explicit destructor call 12–8  
   explicit qualification 10–4  
   `friend` 9–2  
   `friend function` 11–5

function declaration 8–10  
 function definition 8–14  
 linkage consistency 7–3  
 local class 9–13  
 member function 9–6, 11–5  
 member name access 11–4  
 nested class 9–11  
 nested class definition 9–12  
 nested class forward declaration 9–12  
 nested type name 9–13  
 of default argument 8–11/12  
 of incomplete type 3–27  
 of overloading 13–1  
 pointer to member 8–7  
 pure virtual function 10–9  
 scope of `delete` 12–10  
 scope resolution operator 10–4  
 static member 9–9  
 subscripting 8–8  
 type name 8–2  
`typedef` 7–5  
 unnamed parameter 8–14  
 variable parameter list 8–9  
 virtual function 10–7/8  
 exception  
     allowing an 15–6  
     and `new` 5–17  
     arithmetic 5–1  
     declaration scope 3–6  
     explicit destructor and 12–9  
     handler 15–3, 17–21  
     handler, incomplete@type@in 15–3  
     handling 15–1  
     handling constructor 15–3  
     handling destructor 15–3  
     specifications, C++ Standard library 17–21  
     specifications, Standard C library 17–21  
     specifications, implementation-defined 17–21  
     throwing 15–2  
     types, implementation-defined 17–21  
     undefined arithmetic 5–1  
`<exception>` 18–17  
`exception`  
     `exception` 18–18  
     `exception` 18–18  
     `operator=` 18–18  
     `what` 18–18  
     `~exception` 18–18  
     `~exception, exception` 18–18  
`exception-declaration` 15–1  
`exceptions, basic_ios` 27–23  
`exception-specification` 15–5  
`exception::what` message, implementation-defined  
     18–18  
 execution character set, basic 1–4  
 exit from scope, destructor and 6–5  
 exit 3–19/20, 6–5, 17–16, 18–10, 15  
`exp` 26–19, 32  
     `complex` 26–8  
 explanation, subscripting 8–8  
 explicit  
     constructor call 12–2  
     destructor and exception 12–9  
     destructor call 12–8  
     destructor call example 12–8  
     instantiation syntax 14–15  
     qualification 3–11  
     qualification example 10–4  
     type conversion —see casting  
 explicit specifier 7–5  
`exponent-part` 2–8  
 expression 5–1  
 ambiguity, declaration versus 6–6  
 assignment 5–24  
 constant 5–25  
 evaluation, difference from C C–1  
 order of evaluation of 1–6  
 parenthesized 5–3  
 pointer to member constant 5–13  
 postfix 5–4  
 primary 5–2  
 reference 5–2  
 statement 6–1  
 unary 5–13  
`expression` 5–25  
`expression-list` 5–4  
`expression-statement` 6–1  
 extension  
     to C C–1/2  
     to C anonymous union C–1  
     to C class C–1  
     to C `const` C–1  
     to C, dangerous C–11  
     to C declaration statement C–1  
     to C `delete` C–1  
     to C destructor C–2  
     to C, implementation-defined C–11  
     to C inline function C–1  
     to C memberwise assignment C–2  
     to C memberwise initialization C–2  
     to C multiple inheritance C–2  
     to C `new` C–1  
     to C overloading C–1  
     to C overloading `delete` C–2  
     to C overloading `new` C–2  
     to C pointer to member C–2  
     to C `protected` C–2  
     to C reference type C–1  
     to C single precision arithmetic C–1  
     to C type checking C–1  
     to C user-defined type C–1  
     to C, `void*` pointer type C–1  
     to C `volatile` C–2  
`extern` 7–3  
     " C" 17–16, 18  
     " C++" 17–16, 18  
 declaration 3–1  
 linkage of 7–3  
 linkage specification 7–22  
 reference declaration 8–20  
 restriction 7–3  
 external linkage 3–17, 17–16/18

## F

F suffix 2–9  
`f` suffix 2–9  
`facet, locale` 22–6  
`fail, basic_ios` 27–22  
`failed, ostreambuf_iterator` 24–30  
`failure, ios_base::failure` 27–13  
`falsename, numpunct truename` 22–26  
`fclose` 27–67  
 field declaration : 9–11  
`file` 2–1  
     scope 17–17  
     source 2–1, 17–16, 18  
`filebuf` 27–65  
`fill` 25–15  
     `basic_ios` 27–21  
`gslice_array` 26–25

**indirect\_array** 26–29  
**mask\_array** 26–27  
**slice\_array** 26–22  
**valarray** 26–16  
**fill\_n** 25–15  
final overrider 10–6  
**find** 25–9  
  **basic\_string** 21–18  
  **string** 21–28  
  **string\_char\_traits** 21–4  
**wstring** 21–29  
**find\_end** 25–10  
**find\_first\_not\_of, basic\_string** 21–20  
**find\_first\_of** 25–10  
  **basic\_string** 21–19  
**find\_if** 25–9  
**find\_last\_not\_of, basic\_string** 21–21  
**find\_last\_of, basic\_string** 21–20  
**floctal-digit** 2–6  
**fixed** 27–25  
**flags, ios\_base** 22–11, 27–16  
**flip, bitset** 23–14  
**float**  
  literal 2–9  
  type 3–29  
  type specifier 7–8  
**<float.h>** D–1  
**floating**  
  point conversion 4–4  
  point conversion, implementation-defined 4–4  
  point conversion, undefined 4–4  
  point literal 2–9  
  point literal, type of 2–9  
  point promotion 4–3  
  point type 3–28  
  point type 3–29  
  point type, implementation-defined 3–29  
**floating-integral conversion** 4–4  
**floating-literal** 2–8  
**floating-suffix** 2–8  
**float\_round\_style** 18–8  
**floor** 26–32  
**flush** 27–16, 38, 49/50, 56  
  **basic\_ostream** 27–55  
**fmtflags**  
  **ios** 27–56  
  **ios\_base** 27–14  
**fopen** 27–67  
**for**  
  scope of declaration in 6–4  
  statement 6–3/4  
  statement, continue in 6–4  
  statement, declaration in 6–4  
**for\_each** 25–9  
form feed 2–8  
**formal**  
  argument —see also parameter  
  argument —see parameter  
**forward**  
  class declaration 9–2, 10–1  
  declaration 7–4  
  declaration example, nested class 9–12  
**forward\_iterator** 24–11  
  **distance\_type** 24–13  
  **iterator\_category** 24–12  
  **value\_type** 24–13  
**forward\_iterator\_tag** 24–11  
**fprintf** 27–51  
**fractional-constant** 2–8  
**free**  
  store —see also new, delete  
**store and constructor anachronism** C–12  
**store and destructor anachronism** C–12  
**free** 20–20  
  **valarray** 26–17  
**freestanding implementation** 17–15  
**freeze**  
  **osறstream** D–11  
  **strstreambuf** D–6  
**frexp** 26–32  
**friend**  
  class point of declaration 3–5  
  declaration, scope of 3–8  
  function point of declaration 3–5  
  specifier 17–21  
**friend**  
  access specifier and 11–6  
  class access and 11–6  
  declaration, overloaded name and 11–5  
  example 9–2  
  function, access and 11–5  
  function example 11–5  
  function, inline 11–6  
  function, linkage of 11–6  
  function, member function and 11–5  
  function, nested class 9–12  
  inheritance and 11–6  
  member function 11–5  
  specifier 7–6  
  template and 14–34  
  virtual and 10–8  
**front\_inserter** 24–22/23  
**front\_insert\_iterator** 24–22  
  **front\_insert\_iterator** 24–22  
  **front\_insert\_iterator** 24–22  
  operator\* 24–22  
  operator++ 24–23  
  operator= 24–22  
**fscanf** 27–40  
**fseek** 27–67  
**<fstream>** 27–64  
full-expression 1–6  
**function**  
  —see also friend function, member function, inline  
    function, virtual function  
  allocation 3–22, 5–16, 12–9  
  argument —see argument  
  arguments, implementation-defined order of evaluation of  
    8–13  
  body 8–14  
  call 5–5  
  call evaluation, unspecified order of 5–5  
  call operator 5–4, 13–18  
  call operator, overloaded 13–20  
  call, recursive 5–5  
  call, undefined 5–11  
  cast, pointer to 5–11  
  cast, undefined pointer to 5–11  
  comparison 17–1  
  comparison, pointer to 5–21  
  conversion, pointer to 4–2  
  deallocation 3–23, 5–18, 12–9  
  declaration 3–1, 8–9  
  declaration ambiguity 8–16  
  declaration, ellipsis in 5–5, 8–9  
  declaration example 8–10  
  declaration matching, overloaded 13–3  
  declarator () 8–9  
  definition 8–14  
  definition 3–2  
  definition anachronism, C C–11  
  definition anachronism, old style C–11

definition example 8–14  
 generated 14–9  
 global 17–18, 20  
 handler 17–1  
 linkage specification 7–23  
 linkage specification overloaded 7–23  
 modifier 17–2  
 name hiding 13–3  
 name, overloaded 13–1  
 observer 17–2  
 operator 13–18  
 overloaded—see also overloading  
 parameter—see parameter  
 parameter adjustment 8–9  
 point of declaration, friend 3–5  
 pointer to member 5–19  
 prototype scope 3–6  
 replacement 17–2  
 reserved 17–2  
 return—see return  
 return type—see return type  
 scope 3–6  
 specialized 14–9  
 specifier 7–4  
 template 14–24  
 template declaration 14–30  
 template definition 14–30  
 type 3–29, 8–9  
 typedef 8–10  
 viable 13–4  
 virtual—see virtual function  
 virtual member 17–18, 20  
`<functional>` 20–6  
*function-body* 8–14  
*function-definition* 8–14  
 function-like macro 16–4  
*function-specifier* 7–4  
 function-to-pointer conversion 4–2  
*function-try-block* 15–1  
 fundamental  
 type 3–28  
 type conversion—see conversion, user-defined conversion  
 type, destructor and 12–9

## G

`gbump`, `basic_streambuf` 27–30  
`gcount`, `basic_istream` 27–44  
 generate 25–15  
 generated  
 class 14–9  
 destructor—see default destructor  
 function 14–9  
`generate_n` 25–15  
 get  
`auto_ptr` 20–19  
`basic_istream` 27–44  
`money_get` 22–34  
`num_get` 22–22  
`get_date`, `time_get` 22–30  
 getline  
`basic_istream` 27–45  
`basic_string` 21–26  
`getloc`  
`basic_streambuf` 27–28  
`ios_base` 27–17  
`get_mounthname`, `time_get` 22–30  
`get_pos`, `ios_traits` 27–10  
`get_state`, `ios_traits` 27–10  
`get_temporary_buffer` 20–17

`get_time`, `time_get` 22–30  
`get_weekday`, `time_get` 22–30  
`get_year`, `time_get` 22–30  
 global  
 anonymous union 9–10  
 function 17–18, 20  
 name 3–7  
 namespace scope 3–7  
 scope 3–7  
`global`, `locale` 22–9  
`good`, `basic_ios` 27–22  
`goto`  
 initialization and 6–6  
 statement 6–1, 5/6  
`gptr`, `basic_streambuf` 27–30  
 grammar A–1  
 greater  
 than operator 5–21  
 than or equal to operator 5–21  
 greater 20–9  
 greater\_equal 20–9  
 grouping, `num_punct` 22–26  
`gslice`  
 class 26–22  
`gslice` 26–24  
`gslice` 26–24  
 length 26–24  
 start 26–24  
 stride 26–24  
`gslice_array` 26–24/25  
 fill 26–25  
`gslice_array` 26–25  
`gslice_array` 26–25  
`operator%>` 26–25  
`operator&=` 26–25  
`operator&=` 26–25  
`operator*>` 26–25  
`operator+=` 26–25  
`operator-=` 26–25  
`operator/=` 26–25  
`operator<<=` 26–25  
`operator=` 26–25  
`operator>>=` 26–25  
`operator^=` 26–25  
`operator|=` 26–25

## H

handler  
 exception 15–3, 17–21  
 function 17–1  
`incomplete@type@` in exception 15–3  
*handler* 15–1  
*handler-seq* 15–1  
`hasfacet`, `locale` 22–10  
`hash`, `collate` 22–28  
 header  
 C 17–16, 18, 17–20/D–1  
 C++ D–1  
 headers, C++ 17–15  
 hex number 2–8  
 hex 27–24  
 hexadecimal literal 2–6  
*hexadecimal-digit* 2–6  
*hexadecimal-escape-sequence* 2–7  
*hexadecimal-literal* 2–6  
 hiding—see name hiding  
 horizontal tab 2–8  
 hosted implementation 17–15

## I

id, qualified 5–3  
 id, *locale* 22–7  
 identifier 2–4, 5–3, 7–1  
   \_, underscore in 2–4  
*identifier* 2–4  
 identities and overloading, operator 13–19  
 id-expression 5–3  
*id-expression* 5–3  
**#if** 16–2, 17–20  
**if** statement 6–2/3  
**#ifdef** 16–3  
**#ifndef** 16–3  
**ifstream** 27–65  
**ignore**, *basic\_istream* 27–45  
 ill-formed program 1–3  
**imag** 26–6  
   complex 26–7  
**imbue**  
   *basic\_filebuf* 27–70  
   *basic\_streambuf* 27–31  
   *ios\_base* 27–17  
 implementation  
   defined alignment of bit-field 9–11  
   defined bit-field allocation 9–11  
   defined division 5–19  
   defined modulus 5–19  
   defined pointer integer conversion 5–11  
   defined pointer subtraction 5–20  
   defined right shift 5–21  
   defined *sizeof* expression 5–14  
   defined type of *ptrdiff\_t* 5–20  
   defined type of *size\_t* 5–14  
   freestanding 17–15  
   hosted 17–15  
   limits 1–3  
 implementation-defined 4–3, 8–21, 17–15, 18, 18–1, 10, 14,  
   16/19, 27–3/C–15  
   `_STDC_` 16–9  
 alignment requirement 3–27  
**asm** 7–22  
**bad\_alloc**::*what* 18–14  
**bad\_cast**::*what* 18–17  
**bad\_exception**::*what* 18–19  
**bad\_typeid**::*what* 18–17  
**basic\_ios**::*failure* argument 27–22  
 behavior 1–3  
 behavior reentrancy 17–21  
 exception specifications 17–21  
 exception types 17–21  
**exception**::*what* message 18–18  
 extension to C C–11  
 floating point conversion 4–4  
 floating point type 3–29  
 generation of temporary 12–2  
 linkage of *main()* 3–19  
 linkage specification 7–23  
 object linkage 7–24  
 order of evaluation of function arguments 8–13  
 parameters to *main()* 3–19  
 sign of bit-field 9–11  
 sign of *char* 3–28  
*sizeof* integral type 3–28  
*sizeof* type 3–28  
**smanip** 27–56  
**streamoff** D–2  
**streampos** D–2  
 string literal 2–9  
 type of integer literal 2–7  
**type\_info**::*name* 18–16

value of *char* literal 2–8  
 value of multicharacter literal 2–7  
**volatile** 7–8  
**wchar\_t** 3–28  
**wstreamoff** 27–7  
**wstreampos** 27–8  
 implementation-dependent 27–38, 49  
 implementation-generated definitions 3–2  
 implemetation-defined types 17–5  
**implicit**  
   conversion 4–1, 5–2, 12–4  
   conversion sequence 13–12  
   conversion sequences implied object parameter 13–5  
   destructor call 12–7  
   user-defined conversion 12–6  
**implicitly-declared**  
   copy assignment operator 12–21  
   copy constructor 12–19  
   default constructor 12–1  
   default constructor —see default constructor  
**implicit** object argument 13–5  
**implied**  
   object parameter 13–5  
   object parameter, implicit conversion sequences 13–5  
**in\_avail**, *basic\_streambuf* 27–29  
**#include** 16–3, 17–16  
**includes** 25–24  
**inclusion**  
   conditional 16–2  
   source file 16–3  
**incomplete**  
   class, cast to 5–11  
   type 3–27  
   type, example of 3–27  
**incompletely-defined object type** 3–27  
**incomplete@type@** in exception handler 15–3  
**increment**  
   **bool** 5–7, 14  
   operator 5–7, 13/14  
   operator, overloaded 13–21  
**indeterminate uninitialized variable** 8–15  
**indirect base class** 10–1  
**indirect\_array** 26–27  
   fill 26–29  
   **indirect\_array** 26–28  
   **indirect\_array** 26–28  
   operator%=: 26–28  
   operator&=: 26–28  
   operator\*=: 26–28  
   operator+=: 26–28  
   operator-=: 26–28  
   operator/=: 26–28  
   operator<=: 26–28  
   operator=: 26–28  
   operator>>=: 26–28  
   operator^=: 26–28  
   operator|=: 26–28  
**indirection** 5–13  
   operator 5–13  
**inequality operator** 5–22  
**inheritance** 10–1  
   —see also multiple inheritance  
   and *friend* 11–6  
   of constructor 12–1  
   of overloaded operator 13–19  
   of user-defined conversion 12–6  
**Init**, *ios\_base*::**Init** 27–16  
**init**, *basic\_ios* 27–38, 49  
**~Init**, *ios\_base*::**Init** 27–16  
**init-declarator** 8–1  
**init-declarator-list** 8–1

initialization 8–15  
 and `goto` 6–6  
 and `new` 5–16  
 array 8–17  
 array of class objects 8–19, 12–12  
`auto` 6–6  
`auto object` 8–15  
 automatic 6–6  
 base class 12–13  
 character array 8–20  
 class member 8–16  
 class object 8–17, 12–11/12  
 class object —see also constructor  
`const` 7–7, 8–17  
`const member` 12–14  
 constructor and 12–11/12  
`default` 8–15  
 default constructor and 12–11  
 definition and 7–2  
 dynamic 3–19  
 example, constructor and 12–12  
 extension to C memberwise C–2  
 in block 6–6  
 jump past 6–3, 6  
 local `static` 6–6  
 member 12–13  
 member object 12–13  
 order of 3–19, 10–2  
 order of base class 12–14  
 order of member 12–14  
 order of virtual base class 12–14  
 overloaded assignment and 12–12  
 parameter 5–5  
 reference 8–6, 20  
 reference member 12–14  
 run-time 3–19  
 static member 9–9  
 static object 3–19, 8–15  
 struct 8–17  
 union 8–19, 9–10  
 virtual base class 12–14, 21  
 initializer 8–15  
 base class 8–14  
 constant 9–4  
`list {}` 8–17  
 member 8–14  
 scope of member 12–15  
 temporary and declarator 12–3  
`initializer` 8–15  
`initializer-clause` 8–15  
`initializer-list` 8–15  
 injection from template, name 14–9  
 inline 17–20  
     friend function 11–6  
     function 7–4  
     function, extension to C C–1  
     function, linkage of 7–3  
     member function 9–5  
 inline  
     linkage of 3–17  
     specifier 7–4  
`inner_product` 26–30  
`inplace_merge` 25–24  
`input_iterator` 24–11  
     `distance_type` 24–13  
     `iterator_category` 24–12  
     `value_type` 24–13  
`input_iterator_tag` 24–11  
`insert`  
     `basic_string` 21–14  
     `dequeue` 23–18  
     `list` 23–21  
     `vector` 23–28  
`inserter` 24–24  
     `insert_iterator` 24–23  
     `insert_iterator` 24–23  
     `insert_iterator` 24–23  
     `operator*` 24–24  
     `operator++` 24–24  
     `operator=` 24–23  
 instantiation  
     and specialization 14–14  
     multiple 14–14  
     point of 14–10  
     syntax, explicit 14–15  
     template 14–9  
`int, bool` promotion to 4–3  
`int`  
     type 3–28  
     type specifier 7–8  
     type, `unsigned` 3–28  
`integer`  
     cast, pointer to 5–11  
     conversion 4–3  
     conversion, implementation defined pointer 5–11  
     conversion, `signed unsigned` 4–3  
     literal 2–6  
     literal, base of 2–6  
     literal, implementation-defined type of 2–7  
     literal, type of 2–7  
     to pointer cast 5–11  
     type 3–28  
`integer-literal` 2–6  
`integer-suffix` 2–6  
`integral`  
     promotion 4–3  
     type 3–28  
     type 3–28  
     type, implementation-defined `sizeof` 3–28  
     value, undefined unrepresentable 4–4  
`internal linkage` 3–17  
`internal` 27–24  
`interpretation`  
     of binary operator 13–19  
     of unary operator 13–19  
`INT_T` 27–2  
`invalid_argument` 19–2, 23–12  
     `invalid_argument` 19–2  
     `invalid_argument` 19–2  
`invocation, macro` 16–5  
`<iomanip>` 27–35  
`<ios>` 27–6  
`ios` 27–4, 7  
     `fmtflags` 27–56  
`ios_base` 27–11  
     `flags` 22–11, 27–16  
     `fmtflags` 27–14  
     `getloc` 27–17  
     `imbuf` 27–17  
     `ios_base` 27–18  
     `ios_base` 27–18  
     `iostate` 27–14  
     `iword` 27–17  
     `openmode` 27–15  
     `precision` 22–11, 27–17  
     `pword` 27–18  
     `seekdir` 27–15  
     `setf` 27–16  
     `unsetf` 27–17  
     `width` 22–11, 27–17  
     `xalloc` 27–17  
`ios_base::failure` 27–13

failure 27–13  
 what 27–13  
`ios_base::Init` 27–15  
`Init` 27–16  
`~Init` 27–16  
`<iostream>` 27–4  
`iostate, ios_base` 27–14  
`ios_traits` 27–8  
`copy` 27–10  
`eof` 27–9  
`eos` 27–9  
`eq_char_type` 27–10  
`eq_int_type` 27–10  
`get_pos` 27–10  
`get_state` 27–10  
`is_eof` 27–10  
`is whitespace` 27–10  
`length` 27–9  
`newline` 27–9  
`not_eof` 27–9  
`to_char_type` 27–10  
`to_int_type` 27–10  
`ios_traits<char>` 27–7, 9  
`ios_traits<wchar_t>` 27–7, 9  
`<iostream>` 27–5  
`ipfx, basic_istream` 27–38  
`is`  
`ctype` 22–13  
`ctype<char>` 22–16  
`isalnum` 22–10  
`isalpha` 22–10  
`iscntrl` 22–10  
`isdigit` 22–10  
`is_eof, ios_traits` 27–10  
`isfx, basic_istream` 27–39  
`isgraph` 22–10  
`islower` 22–10  
 ISO C summary, compatibility with C–2  
`<iso646.h>` D–1/C–15  
`is_open`  
`basic_filebuf` 27–67  
`basic_ifstream` 27–71  
`basic_ofstream` 27–72  
`isprint` 22–10  
`ispunct` 22–10  
`isspace` 22–10  
`<istream>` 27–35  
`istream` 27–4, 35  
`istreambuf_iterator` 24–25  
`equal` 24–28  
`istreambuf_iterator` 24–27  
`istreambuf_iterator` 24–27  
`iterator_category` 24–28  
`operator!=` 24–28  
`operator*` 24–28  
`operator++` 24–28  
`operator==` 24–28  
`proxy` 24–27  
`istream_iterator` 24–24  
`operator==` 24–25  
`istringstream` 27–57  
`istrstream` D–10  
`istrstream` D–10  
`istrstream` D–10  
`rdbuf` D–10  
`str` D–10  
`isupper` 22–10  
`is whitespace, ios_traits` 27–10  
`isxdigit` 22–10  
 iteration statement 6–3  
`iteration-statement` 6–3, 5

scope 6–4  
`IteratorRequirements` 24–1  
`<iterator>` 24–8  
`iterator_category`  
`T*` 24–12  
`bidirectional_iterator` 24–12  
`forward_iterator` 24–12  
`input_iterator` 24–12  
`istreambuf_iterator` 24–28  
`ostreambuf_iterator` 24–30  
`output_iterator` 24–12  
`random_access_iterator` 24–12  
`iter_swap` 25–13  
`iword, ios_base` 27–17

## J

`Jessie` 12–4  
`jump`  
`past initialization` 6–3, 6  
`statement` 6–5  
`jump-statement` 6–5

## K

`keyword` A–1  
`anachronism, overload` C–11  
`list` 2–5

## L

`L`  
`prefix` 2–7, 9  
`suffix` 2–7, 9  
`l suffix` 2–7, 9  
`label` 6–6  
`case` 6–1, 3  
`default` 6–1, 3  
`name space` 6–1  
`scope of` 3–6, 6–1  
`specifier :` 6–1  
`labeled statement` 6–1  
`lattice`—see DAG, sub-object  
`layout`  
`access specifier and object` 11–3  
`bit-field` 9–11  
`class object` 9–5, 10–2  
`layout-compatible type` 3–28  
`left`  
`shift operator` 5–21  
`shift, undefined` 5–21  
`left` 27–24  
`length of name` 2–4  
`length`  
`codecvt` 22–19  
`gslice` 26–24  
`ios_traits` 27–9  
`slice` 26–21  
`string` 21–28  
`string_char_traits` 21–4, 9, 11, 13/16, 19/21, 23/24  
`valarray` 26–16  
`wstring` 21–29  
`length_error` 19–2, 21–8  
`length_error` 19–3  
`length_error` 19–3  
`less`  
`than operator` 5–21  
`than or equal to operator` 5–21  
`less` 20–9

**less\_equal** 20–9  
**LessThanComparable** requirements 20–1  
 lexical conventions 2–1  
**lexicographical\_compare** 25–28  
 library  
   C++ Standard 17–1, 18/19, 21  
   Standard C 17–1, 6, 17–15/C–13, C–15  
 limits, implementation 1–3  
   *<limits>* 18–2  
   *<limits.h>* D–1  
   *#line* 16–8  
 linkage 3–1, 17  
   consistency 7–3  
   consistency example 7–3  
   external 3–17, 17–16/18  
   implementation-defined object 7–24  
   internal 3–17  
   of class 3–17  
   of **const** 3–17, 7–3  
   of enumeration 3–17  
   of **extern** 7–3  
   of **friend** function 11–6  
   of **inline** 3–17  
   of inline function 7–3  
   of **main()**, implementation-defined 3–19  
   of **static** 3–17, 7–3, 23  
   overloading and 14–31  
   specification 7–22  
   specification class 7–23  
   specification consistency 7–23  
   specification, **extern** 7–22  
   specification function 7–23  
   specification, implementation-defined 7–23  
   specification object 7–23/24  
   specification overloaded function 7–23  
   template 14–10  
   to C 7–23  
*linkage-specification* 7–22  
 list  
   keyword 2–5  
   operator 2–5, 13–18  
   {}, initializer 8–17  
   *<list>* 23–9  
 list 23–19  
   assign 23–21  
   erase 23–21  
   insert 23–21  
   merge 23–22  
   remove 23–22  
   resize 23–21  
   reverse 23–22  
   sort 23–23  
   splice 23–22  
   unique 23–22  
 literal 2–5, 5–3  
   base of integer 2–6  
   character 2–7  
   decimal 2–6  
   double 2–9  
   float 2–9  
   floating point 2–9  
   hexadecimal 2–6  
   implementation-defined string 2–9  
   implementation-defined type of integer 2–7  
   implementation-defined value of **char** 2–8  
   implementation-defined value of multicharacter 2–7  
   integer 2–6  
   long 2–6/7  
   long double 2–9  
   multicharacter 2–7  
   octal 2–6  
   type of character 2–7  
   type of floating point 2–9  
   type of integer 2–7  
   **unsigned** 2–6/7  
   wide string 2–9  
 literal 2–5  
 local  
   class definition 9–13  
   class example 9–13  
   class member function 9–13  
   class, member function in 9–6  
   class nested class 9–13  
   class restriction 9–13  
   class restriction, **static** member 9–10  
   class, scope of 9–13  
   object, **static** 3–21  
   object storage duration 3–22  
   scope 3–5  
   **static**, destruction of 6–6  
   **static** initialization 6–6  
   variable, destruction of 6–5/6  
   *<locale>* 22–1  
 locale  
   category 22–4  
   classic 22–9  
   facet 22–6  
   global 22–9  
   hasfacet 22–10  
   id 22–7  
   **locale()** 22–7  
   name 22–8  
   **operator!=** 22–8  
   **operator()** 22–9  
   **operator==** 22–8  
   transparent 22–9  
   usefacet 22–9  
   **~locale()** 22–8  
   **locale()**, **locale** 22–7  
   **~locale()**, **locale** 22–8  
   *<locale.h>* D–1  
   locale-specific behavior 1–3  
   log 26–19, 32  
     complex 26–8  
   **log10** 26–19, 32  
     complex 26–8  
 logical  
   AND operator 5–23  
   AND operator, side effects and 5–23  
   OR operator 5–23  
   OR operator, side effects and 5–23  
   negation operator 5–13/14  
   **logical\_and** 20–10  
   **logical\_not** 20–10  
   **logical\_or** 20–10  
   **logic\_error** 19–2  
     **logic\_error** 19–2  
     **logic\_error** 19–2  
 long  
   **double** literal 2–9  
   **double** type 3–29  
   literal 2–6/7  
   type 3–28  
   type specifier 7–8  
   type, **unsigned** 3–28  
   **typedef** and 7–2  
   **longjmp** 18–21  
   **long-suffix** 2–6  
 look up, name 3–8  
 lookup  
   member name 10–4  
   name 3–1

template name 14–3  
**lower\_bound** 25–21  
 lowercase 17–6  
**lt**  
 string 21–28  
 string\_char\_traits 21–4  
 wstring 21–29  
**lvalue** 3–30  
 assignment and 5–24  
 cast 5–9/10  
 cast, reinterpret\_cast, 5–10  
 cast, static\_cast, 5–9  
 conversion to rvalue 4–2  
 modifiable 3–30  
 lvalue-to-rvalue conversion 4–2

## M

**macro**  
 definition scope 16–6  
 function-like 16–4  
**invocation** 16–5  
 masking 17–20  
 name 16–5  
 object-like 16–4  
 parameters 16–5  
 preprocessor 16–1  
 replacement 16–4  
**main()** 3–19  
 implementation-defined linkage of 3–19  
 implementation-defined parameters to 3–19  
 parameters to 3–19  
 return from 3–19/20  
**make\_heap** 25–27  
**make\_pair** 20–6  
**malloc** 20–20/C–16  
 management anachronism, memory C–12  
**<map>** 23–31  
**map** 23–32  
 operator< 23–34  
 operator== 23–34  
 operator[] 23–35  
**mask\_array** 26–26  
 fill 26–27  
**mask\_array** 26–26  
**mask\_array** 26–26  
 operator% 26–27  
 operator&= 26–27  
 operator\*= 26–27  
 operator+= 26–27  
 operator-= 26–27  
 operator/= 26–27  
 operator<= 26–27  
 operator= 26–26  
 operator>= 26–27  
 operator^= 26–27  
 operator|= 26–27  
 masking macro 17–20  
**<math.h>** D–1  
**max** 25–28  
 valarray 26–19  
**max\_element** 25–28  
**max\_length, codecvt** 22–19  
**max\_size, basic\_string** 21–11  
 meaning of declarator 8–4  
**member**  
 —see also base class member  
 access operator, overloaded 13–20  
 access ambiguity 10–4  
 access, base class 10–1

access, class 5–6  
 access, struct default 9–1  
 access, union default 9–1  
 array 9–4  
 cast, pointer to 5–10/11  
 class object 9–4  
 constructor order of execution 12–2  
 declaration 9–3  
 declaration, class 9–3  
 declaration, static 3–1  
 definition, static 9–9  
 destructor order of execution 12–7  
 enumerator 7–11  
 example, static 9–9  
 function and access control 12–1  
 function and friend function 11–5  
 function call, undefined 9–6  
 function, class 9–5  
 function, const 9–7  
 function, constructor and 12–2  
 function definition 9–5  
 function, destructor and 12–7  
 function example 9–6, 11–5  
 function, friend 11–5  
 function in local class 9–6  
 function, inline 9–5  
 function, local class 9–13  
 function, nested class 9–11  
 function, overload resolution and 13–5  
 function, static 9–8/9  
 function template 14–33  
 function, union 9–10  
 function, virtual 17–18, 20  
 function, volatile 9–7  
 initialization 12–13  
 initialization, const 12–14  
 initialization, order of 12–14  
 initialization, reference 12–14  
 initialization, static 9–9  
 initializer 8–14  
 initializer, scope of 12–15  
 local class restriction, static 9–10  
 name access 11–1  
 name access example 11–4  
 name lookup 10–4  
 name, overloaded 9–4  
 object initialization 12–13  
 of class type restriction 12–14  
 pointer to —see pointer to member  
 pointer value, null 4–4  
 static 9–8  
 static class 3–21  
 storage duration, class 3–23  
 template and static 14–35  
 type of static 5–13  
 use, static 9–8  
*member-declaration* 9–3  
*member-declarator* 9–3  
*member-specification* 9–3  
**memberwise**  
 assignment, extension to C C–2  
 initialization, extension to C C–2  
**memchr** 21–28, 32  
**memcmp** 21–28  
**memcpy** 21–28, 22–17  
*mem-initializer* 12–13  
*mem-initializer-id* 12–13  
**memmove** 21–28  
**memory**  
 management —see also new, delete  
 management anachronism C–12

model 1–4  
`<memory>` 20–13  
`memset` 21–28  
`merge` 25–23  
`list` 23–22  
`message, diagnostic` 1–2  
`messages` 22–38  
`close` 22–39  
`do_close` 22–39  
`do_get` 22–39  
`do_open` 22–39  
`open` 22–39  
`messages_byname` 22–40  
`min` 25–28  
`valarray` 26–19  
`min_element` 25–28  
`minus` 20–8  
`mismatch` 25–11  
`missing storage class specifier` 7–3  
`mod` 26–32  
`modf` 26–32  
`modifiable lvalue` 3–30  
`modifier function` 17–2  
`modulus`  
`implementation defined` 5–19  
`operator` 5–19  
`modulus` 20–8  
`money_get` 22–33  
`do_get` 22–34  
`get` 22–34  
`moneypunct` 22–36  
`do_curr_symbol` 22–37  
`do_decimal_point` 22–37  
`do_frac_digits` 22–37  
`do_grouping` 22–37  
`do_neg_format` 22–37  
`do_negative_sign` 22–37  
`do_pos_format` 22–37  
`do_positive_sign` 22–37  
`do_thousands_sep` 22–37  
`moneypunct_byname` 22–38  
`money_put` 22–35  
`do_put` 22–35  
`put` 22–35  
`most`  
`derived class` 1–4  
`derived object` 1–4  
`move`  
`string` 21–28  
`string_char_traits` 21–5  
`wstring` 21–30  
`multibyte`  
`character` 1–3  
`string, null-terminated` 17–6  
`multicharacter`  
`literal` 2–7  
`literal, implementation-defined value of` 2–7  
`multidimensional`  
`array` 8–8  
`array declarator` 8–8  
`multimap` 23–35  
`operator<` 23–37  
`operator==` 23–37  
`multiple`  
`declaration` 3–18  
`inheritance` 10–1/2  
`inheritance DAG` 10–3  
`inheritance, extension to C` C–2  
`inheritance, virtual and` 10–8  
`instantiation` 14–14  
`multiplication operator` 5–19  
`multiplicative operator` 5–19  
`multiplicative-expression` 5–19  
`multiset` 23–39  
`operator<` 23–41  
`operator==` 23–41  
`mutable` 7–3

## N

`name` 2–4, 3–1, 5–3  
`address of cv-qualified` 5–13  
`and translation unit` 3–1  
`class—see class name`  
`declaration` 3–1  
`dependent` 14–7  
`elaborated enum` 7–9  
`global` 3–7  
`hiding` 3–5, 8, 5–3, 6–6  
`hiding, class definition` 9–2  
`hiding, function` 13–3  
`hiding, overloading versus` 13–3  
`hiding, user-defined conversion and` 12–6  
`injection from template` 14–9  
`length of` 2–4  
`look up` 3–8  
`lookup` 3–1  
`lookup, member` 10–4  
`lookup, template` 14–3  
`macro` 16–5  
`overloaded function` 13–1  
`overloaded member` 9–4  
`point of declaration` 3–5  
`qualified` 3–11  
`reserved` 17–17  
`resolution, template` 14–3  
`scope of` 3–4  
`space, label` 6–1  
`unqualified` 3–8  
`use of template` 14–5  
`name`  
`locale` 22–8  
`type_info` 18–16  
`namespace` 17–8, 17–17/D–1  
`definition` 7–12  
`scope` 3–6  
`scope, anonymous union at` 9–10  
`scope, global` 3–7  
`std` 17–17  
`namespaces` 7–12  
`narrow`  
`ctype` 22–13  
`ctype<char>` 22–17  
`NDEBUG` 17–16  
`ne`  
`string` 21–28  
`string_char_traits` 21–4  
`wstring` 21–29  
`negate` 20–8  
`negation operator, logical` 5–13/14  
`nested`  
`class anachronism, scope of` C–12  
`class definition` 9–11  
`class definition example` 9–12  
`class example` 9–11  
`class forward declaration example` 9–12  
`class friend function` 9–12  
`class, local class` 9–13  
`class member function` 9–11  
`class, scope of` 9–11  
`type name` 9–13

type name example 9–13  
 type name, scope of 9–13  
`<new>` 17–18, 18–10  
`new` 3–22, 5–15/16, 12–9  
     array 5–15  
     array of class objects and 5–16  
     constructor and 5–16  
     default constructor and 5–16  
     exception and 5–17  
     extension to C 1–1  
     extension to C overloading C–2  
     initialization and 5–16  
     operator 17–18, 18–11, 13/14, 20–20  
     placement syntax 5–16  
     scoping and 5–15  
     storage allocation 5–15  
     type of 12–9  
     unspecified constructor and 5–17  
     unspecified order of evaluation 5–17  
`new[ ]`, operator 17–18, 18–12/14  
`new-declarator` 5–15  
`new-expression` 5–15  
`new_handler` 3–22, 17–18, 18–15  
`new-initializer` 5–15  
`new-line` 2–8  
`newline, ios_traits` 27–9  
`new-placement` 5–15  
`new-type-id` 5–15  
`next_permutation` 25–29  
`noboolalpha` 27–23  
`nondigit` 2–4  
`none, bitset` 23–15  
 nonnested class anachronism C–12  
 non-trivial  
     constructor 12–1  
     destructor 12–7  
 nonvirtual base class DAG 10–3  
`nonzero-digit` 2–6  
`norm, complex` 26–7  
`noshowbase` 27–23  
`noshowpoint` 27–23  
`noshowpos` 27–23  
`noskipws` 27–24  
`not1` 20–10  
`not2` 20–11  
 notation, syntax 1–3  
`not_eof, ios_traits` 27–9  
`not_equal_to` 20–9  
`nouppercase` 27–24  
`NTBS` 17–6, 27–51, 53, 27–67/D–11  
     static 17–6  
`nth_element` 25–21  
`NTMBS` 17–6  
     static 17–6  
`NTWCS` 17–6/7  
     static 17–7  
`null`  
     character 0 2–9  
     directive 16–9  
 member pointer value 4–4  
 pointer constant 4–4  
 pointer value 4–4  
 reference 8–6  
 statement 6–1  
`NULL` 18–1  
 null-terminated  
     byte string 17–6  
     multibyte string 17–6  
     wide-character string 17–6  
 number  
     hex 2–8

octal 2–8  
 Numeric type Requirements 26–1  
`<numeric>` 26–29  
`numeric_limits` 3–29, 18–2  
`num_get` 22–21  
     `do_get` 22–23  
     `get` 22–22  
`numpunct` 22–25  
     `decimal_point` 22–26  
     `do_decimal_point` 22–26  
     `do_grouping` 22–26  
     `do_thousands_sep` 22–26  
     `do_truename do_falsename` 22–27  
     `grouping` 22–26  
     `thousands_sep` 22–26  
     `truename falsename` 22–26  
`numpunct_byname` 22–27  
`num_put` 22–23  
     `do_put` 22–24  
     `put` 22–24

## O

object 1–4, 3–1, 30  
 class —see also class object  
 complete 1–4  
 definition 3–2  
 delete 5–17  
 destructor and placement of 12–8  
 destructor static 3–20  
 initialization, auto 8–15  
 initialization, static 3–19, 8–15  
 layout, access specifier and 11–3  
 lifetime 3–23  
 linkage, implementation-defined 7–24  
 linkage specification 7–23/24  
 representation 3–27  
 state 17–2  
     `static local` 3–21  
 storage duration, local 3–22  
 temporary —see temporary  
 type, completely-defined 3–27  
 type, incompletely-defined 3–27  
 undefined deleted 3–23  
 unnamed 12–2  
 object-expression 5–2  
 object-like macro 16–4  
 observer function 17–2  
`oct` 27–25  
 octal  
     literal 2–6  
     number 2–8  
`octal-escape-sequence` 2–7  
`octal-literal` 2–6  
 of overloading, example 13–1  
`offsetof` 18–2/C–15  
`OFF_T` 27–2  
`ofstream` 27–65  
 old  
     style base class initializer anachronism C–12  
     style function definition anachronism C–11  
 one-definition rule 3–2  
 one's complement operator 5–13/14  
 open  
     `basic_filebuf` 27–67  
     `basic_ifstream` 27–71  
     `basic_ofstream` 27–73  
     messages 22–39  
 openmode, `ios_base` 27–15  
 operand

```

const 5–1
reference 5–1
volatile 5–1
operations on class object 9–1
operator
  %= 5–24
  &= 5–24
  *= 5–24
  += 5–14, 24
  -= 5–24
  /= 5–24
  <<= 5–24
  >>= 5–24
  ^= 5–24
  additive 5–19
  address-of 5–13
  assignment 5–24, 17–7
  bitwise 5–22
  bitwise AND 5–22
  bitwise exclusive OR 5–23
  bitwise inclusive OR 5–23
  cast 5–13, 18, 8–2
  class member access 5–6
  comma 5–25
  conditional expression 5–23
  conversion 5–2, 12–5
  copy assignment 12–19
  decrement 5–7, 13/14
  division 5–19
  equality 5–22
  example, scope resolution 10–4
  function call 5–4, 13–18
  function call 13–18
  greater than 5–21
  greater than or equal to 5–21
  identities and overloading 13–19
  increment 5–7, 13/14
  indirection 5–13
  inequality 5–22
  left shift —see left shift operator
  less than 5–21
  less than or equal to 5–21
  list 2–5, 13–18
  logical AND 5–23
  logical OR 5–23
  logical negation 5–13/14
  modulus 5–19
  multiplication 5–19
  multiplicative 5–19
  new —see new
  one's complement 5–13/14
  overloaded 5–1
  overloading —see also overloaded operator
  overloading restrictions 13–18
  pointer to member 5–19
  precedence of 1–6
  relational 5–21
  right shift; right shift operator 5–21
  scope resolution 5–2/3, 9–5, 10–1, 9
  shift —see left shift operator, right shift operator
  side effects and comma 5–25
  side effects and logical AND 5–23
  side effects and logical OR 5–23
  sizeof 5–13/14
  subscripting 5–4, 13–18
  unary 5–13
  unary minus 5–13/14
  unary plus 5–13/14
  use, scope resolution 9–9
  |= 5–24
operator T*, valarray 26–16
operator bool, basic_ios 27–22
operator
  delete 17–18, 18–12, 20–20
  delete 5–18, 12–9
  delete—see delete
  delete[] 17–18, 18–13
  delete[] 5–18, 12–9
  function 13–18
  new 17–18, 18–11, 13/14, 20–20
  new 5–16, 12–9
  new[] 17–18, 18–12/14
  new[] 5–16, 12–9
  overloaded 13–18
operator!
  basic_ios 27–22
  valarray 26–14
operator!= 20–5
basic_string 21–24
bitset 23–14
complex 26–6
istreambuf_iterator 24–28
locale 22–8
type_info 18–16
valarray 26–18
operator%, valarray 26–17
operator%=
  gslice_array 26–25
  indirect_array 26–28
  mask_array 26–27
  slice_array 26–22
  valarray 26–15
operator&
  bitset 23–15
  valarray 26–17
operator&&, valarray 26–17
operator&=
  bitset 23–12
  gslice_array 26–25
  indirect_array 26–28
  mask_array 26–27
  slice_array 26–22
  valarray 26–15
operator(), locale 22–9
operator*
  auto_ptr 20–19
  back_insert_iterator 24–21
  complex 26–6
  front_insert_iterator 24–22
  insert_iterator 24–24
  istreambuf_iterator 24–28
  ostreambuf_iterator 24–29
  reverse_bidirectional_iterator 24–15
  reverse_iterator 24–18
  valarray 26–17
operator*=
  complex 26–5
  gslice_array 26–25
  indirect_array 26–28
  mask_array 26–27
  slice_array 26–22
  valarray 26–15
operator+
  basic_string 21–23
  complex 26–6
  reverse_iterator 24–17
  reverse_iterator 24–19
  valarray 26–14, 17
operator++
  back_insert_iterator 24–21
  front_insert_iterator 24–23
  insert_iterator 24–24

```

istreambuf\_iterator 24-28  
ostreambuf\_iterator 24-29  
reverse\_bidirectional\_iterator 24-16  
reverse\_iterator 24-18  
operator+=  
  basic\_string 21-12  
  complex 26-5  
  gslice\_array 26-25  
  indirect\_array 26-28  
  mask\_array 26-27  
  reverse\_iterator 24-19  
  slice\_array 26-22  
  valarray 26-15  
operator-  
  complex 26-6  
  reverse\_iterator 24-19/20  
  valarray 26-14, 17  
operator--  
  reverse\_bidirectional\_iterator 24-16  
  reverse\_iterator 24-18  
operator-=  
  complex 26-5  
  gslice\_array 26-25  
  indirect\_array 26-28  
  mask\_array 26-27  
  reverse\_iterator 24-19  
  slice\_array 26-22  
  valarray 26-15  
operator->  
  auto\_ptr 20-19  
  reverse\_bidirectional\_iterator 24-15  
  reverse\_iterator 24-18  
operator/, valarray 26-17  
operator/=  
  complex 26-5  
  gslice\_array 26-25  
  indirect\_array 26-28  
  mask\_array 26-27  
  slice\_array 26-22  
  valarray 26-15  
operator< 26-19  
  basic\_string 21-24  
  map 23-34  
  multimap 23-37  
  multiset 23-41  
  pair 20-6  
  queue 23-24  
  reverse\_iterator 24-20  
  set 23-39  
  stack 23-25  
  valarray 26-18  
  vector 23-27  
  vector<bool> 23-31  
operator<< 22-10, 27-24  
  basic\_ostream 27-53  
  basic\_string 21-26  
  bitset 23-15  
  complex 26-7  
  valarray 26-17  
operator<=>  
  bitset 23-13  
  gslice\_array 26-25  
  indirect\_array 26-28  
  mask\_array 26-27  
  slice\_array 26-22  
  valarray 26-15  
operator<= 20-5  
  basic\_string 21-25  
  valarray 26-18  
operator>> 22-10  
  basic\_istream 27-41  
  basic\_string 21-26  
  bitset 23-15  
  complex 26-7  
  valarray 26-17  
operator>>=>  
  bitset 23-13  
  gslice\_array 26-25  
  indirect\_array 26-28  
  mask\_array 26-27  
  slice\_array 26-22  
  valarray 26-15  
operator[]  
  basic\_string 21-12  
  map 23-35  
  reverse\_iterator 24-19  
  valarray 26-14  
operator^  
  bitset 23-15  
  valarray 26-17  
operator^=  
  bitset 23-13  
  gslice\_array 26-25  
  indirect\_array 26-28  
  mask\_array 26-27  
  slice\_array 26-22  
  valarray 26-15  
operator|

bitset 23–15  
 valarray 26–17  
 operator |=  
 bitset 23–13  
 gslice\_array 26–25  
 indirect\_array 26–28  
 mask\_array 26–27  
 slice\_array 26–22  
 valarray 26–15  
 operator||, valarray 26–17  
 operator~  
 bitset 23–14  
 valarray 26–14  
 operator 13–18  
*operator-function-id* 13–18  
 opfx, basic\_ostream 27–49  
 optimization of temporary —see elimination of temporary  
 OR  
 operator, bitwise exclusive 5–23  
 operator, bitwise inclusive 5–23  
 operator, logical 5–23  
 operator, side effects and logical 5–23  
 order  
 of argument evaluation 5–5  
 of argument evaluation, unspecified 5–5  
 of base class initialization 12–14  
 of destruction of temporary 12–3  
 of evaluation new, unspecified 5–17  
 of evaluation of expression 1–6  
 of evaluation of function arguments, implementation-defined  
     8–13  
 of evaluation, unspecified 3–20, 5–1  
 of execution, base class constructor 12–2  
 of execution, base class destructor 12–7  
 of execution, constructor and array 12–11  
 of execution, constructor and static objects 12–13  
 of execution, destructor 12–7  
 of execution, destructor and array 12–7  
 of execution, member constructor 12–2  
 of execution, member destructor 12–7  
 of function call evaluation, unspecified 5–5  
 of initialization 3–19, 10–2  
 of member initialization 12–14  
 of virtual base class initialization 12–14  
 osfx, basic\_ostream 27–49  
 <ostream> 27–35  
 ostream 27–4, 35  
 ostreambuf\_iterator 24–29  
 failed 24–30  
 iterator\_category 24–30  
 operator\* 24–29  
 operator++ 24–29  
 operator= 24–29  
 ostreambuf\_iterator 24–29  
 ostreambuf\_iterator 24–29  
 ostream\_iterator 24–25  
 ostringstream 27–57  
 ostrstream D–11  
     :pcount D–12  
     freeze D–11  
     ostrstream D–11  
     ostrstream D–11  
     rdbuf D–11  
     str D–11  
 out\_of\_range 19–3, 21–8, 23–12/15  
 out\_of\_range 19–3  
 out\_of\_range 19–3  
 output\_iterator 24–11  
     iterator\_category 24–12  
     output\_iterator\_tag 24–11  
 overflow 5–1  
 undefined 5–1  
 overflow  
     basic\_filebuf 27–68  
     basic\_streambuf 27–34  
     basic\_stringbuf 27–60  
     strstreambuf D–7  
 overflow\_error 19–4, 23–12, 14  
     overflow\_error 19–4  
     overflow\_error 19–4  
 overload  
     resolution 13–4  
     resolution and conversion 13–11  
     resolution and default argument 13–11  
     resolution and ellipsis 13–11  
     resolution and member function 13–5  
     resolution and pointer conversion 13–18  
     resolution contexts 13–4  
     resolution, template 14–29, 32  
 overload keyword anachronism C–11  
 overloaded  
     assignment and initialization 12–12  
     assignment operator 13–19  
     binary operator 13–19  
     declaration 13–1  
     decrement operator 13–21  
     function, address of 5–13, 13–17  
     function ambiguity detection 13–4  
     function call operator 13–20  
     function call resolution —see also argument matching,  
         overload resolution  
     function declaration matching 13–3  
     function, linkage specification 7–23  
     function name 13–1  
     increment operator 13–21  
     member access operator 13–20  
     member name 9–4  
     name and friend declaration 11–5  
     operator 13–18  
     operator 5–1  
     operator 13–18  
     operator and default argument 13–19  
     operator, inheritance of 13–19  
     subscripting operator 13–20  
     unary operator 13–19  
 overloading 8–9, 9–2, 13–1  
     and access 13–4  
     and const 13–2  
     and default initializers 13–3  
     and delete 3–23  
     and derived class 13–3  
     and enum 13–2  
     and equivalent parameter declarations 13–2  
     and linkage 14–31  
     and pointer versus array 13–2  
     and return type 13–1  
     and scope 13–3  
     and specialization 14–31  
     and static 13–1  
     and typedef 13–2  
     and volatile 13–2  
     delete, extension to C C–2  
     extension to C C–1  
     new, extension to C C–2  
     operator identities and 13–19  
     postfix ++ and -- 13–21  
     prefix ++ and -- 13–21  
     resolution and access control 10–4  
     resolution, template function 14–24  
     restriction 13–19  
     subsequence rule 13–15  
     versus name hiding 13–3

overrider, final 10–6

## P

*pair* 20–5  
*operator<* 20–6  
*operator==* 20–6  
 parameter 1–3, 8–14  
   adjustment, array 8–9  
   adjustment, function 8–9  
   declaration 8–9  
   example, unnamed 8–14  
   initialization 5–5  
   list example, variable 8–9  
   list, variable 5–5, 8–9  
   reference 8–6  
   scope of 3–6  
   *void* 8–9  
*parameter type list* 8–9  
*parameter-declaration* 8–9  
 parameterized type —see template  
 parameters  
   macro 16–5  
   to *main()* 3–19  
   to *main()*, implementation-defined 3–19  
 parentheses  
   and ambiguity 5–15  
   in declaration 8–3, 5  
 parenthesized expression 5–3  
*partial\_sort* 25–20  
*partial\_sort\_copy* 25–20  
*partial\_sum* 26–30  
*partition* 25–18  
*pbackfail*  
   *basic\_filebuf* 27–68  
   *basic\_streambuf* 27–34  
   *basic\_stringbuf* 27–60  
   *strstreibuf* D–7  
*pbase*, *basic\_streambuf* 27–31  
*pbump*, *basic\_streambuf* 27–31  
*:pcount*, *ostrstream* D–12  
*pcount*, *strstreibuf* D–6  
*peek*, *basic\_istream* 27–46  
*period* 17–6  
*phases*, translation 2–1  
*placement*  
   of object, destructor and 12–8  
   syntax, *new* 5–16  
*plus* 20–8  
*pm-expression* 5–19  
 POD  
   class type 5–16  
   type 3–27  
   type 5–16  
 POD-struct 9–1  
 point  
   of declaration class name 9–3  
   of declaration, enumerator 3–5  
   of declaration, friend class 3–5  
   of declaration, friend function 3–5  
   of declaration name 3–5  
   of definition, enumerator 7–10  
   of error checking 14–4  
   of instantiation 14–10  
   promotion, floating 4–3  
   type, floating 3–28  
 pointer  
   —see also *void\**  
   arithmetic 5–20  
   cast, integer to 5–11  
   comparison 5–21/22  
   comparison, undefined 5–20, 22  
   comparison, unspecified 5–22  
   comparison, *void\** 5–21  
   constant, null 4–4  
   conversion 4–4  
   conversion, array 4–2  
   conversion, overload resolution and 13–18  
   declaration 8–5  
   declarator \* 8–5  
   example, constant 8–5  
   integer conversion, implementation defined 5–11  
   subtraction, implementation defined 5–20  
   terminology 3–29  
   to abstract class 10–9  
   to bit-field restriction 9–11  
   to function cast 5–11  
   to function cast, undefined 5–11  
   to function comparison 5–21  
   to function conversion 4–2  
   to integer cast 5–11  
   to member 3–29, 5–19  
   to member anachronism, cast of C–12  
   to member cast 5–10/11  
   to member constant expression 5–13  
   to member conversion 4–4  
   to member conversion anachronism C–12  
   to member declarator :: \* 8–7  
   to member example 8–7  
   to member, extension to C C–2  
   to member function 5–19  
   to member function, undefined bound C–12  
   to member operator 5–19  
   to member *void\** conversion 4–5  
   type 3–29  
   type extension to C, *void\** C–1  
   value, null 4–4  
   value, null member 4–4  
   versus array, overloading and 13–2  
   zero 4–4  
*pointer\_to\_binary\_function* 20–12  
*pointer\_to\_unary\_function* 20–12  
*polar*, *complex* 26–7  
*polymorphic*  
   class 10–6  
   type 10–6  
*pop*, *priority\_queue* 23–25  
*pop\_heap* 25–27  
*POS\_T* 27–3  
*postfix*  
   ++ and -- 5–7  
   ++ and --, overloading 13–21  
   expression 5–4  
   potential scope 3–4  
*pow* 26–19, 32  
   *complex* 26–8  
*pp-number* 2–4  
*pptr*, *basic\_streambuf* 27–31  
*pragma directive* 16–8  
*#pragma* 16–8  
*precedence of operator* 1–6  
*precision*, *ios\_base* 22–11, 27–17  
*prefix*  
   ++ and -- 5–14  
   ++ and --, overloading 13–21  
   L 2–7, 9  
*preprocessing* 16–1  
   directive 16–1  
*preprocessing-op-or-punc* 2–5  
*preprocessing-token* 2–2  
*preprocessor*, macro 16–1

`prev_permutation` 25–29  
**primary**  
  expression 5–2  
  template 14–17  
**priority\_queue** 23–24  
  `pop` 23–25  
  **priority\_queue** 23–24  
  **priority\_queue** 23–24  
  `push` 23–25  
**private** 11–1  
  base class 11–3  
**program** 3–17  
  environment 3–19  
  ill-formed 1–3  
  start 3–19  
  startup 17–16, 18  
  termination 3–19/21  
  termination and destructor 12–7  
  well-formed 1–3  
**promotion**  
  floating point 4–3  
  integral 4–3  
  to int, bool 4–3  
**protected** 11–1  
  extension to C C–2  
**protection** 17–21  
  —see access control  
**proxy, istreambuf\_iterator** 24–27  
**ptrdiff\_t** 5–20  
  implementation defined type of 5–20  
**ptr\_fun** 20–12  
**ptr-operator** 8–1  
**pubimbuf, basic\_streambuf** 27–28  
**public** 11–1  
  base class 11–3  
**pubseekoff, basic\_streambuf** 27–29  
**pubseekpos, basic\_streambuf** 27–29  
**pubsetbuf, basic\_streambuf** 27–29  
**pubsync, basic\_streambuf** 27–29  
**punctuators** 2–5  
**pure**  
  specifier 9–3  
  virtual destructor 12–7  
  virtual function 10–9/10  
  virtual function call, undefined 10–10  
  virtual function definition 10–9  
  virtual function example 10–9  
**pure-specifier** 9–3  
**push, priority\_queue** 23–25  
**push\_heap** 25–27  
**put**  
  **basic\_ostream** 27–55  
  `money_put` 22–35  
  `num_put` 22–24  
  `time_put` 22–32  
**putback, basic\_istream** 27–46  
**pword, ios\_base** 27–18

## Q

**qualification**  
  conversions 4–2  
  explicit 3–11  
**qualified**  
  id 5–3  
  name 3–11  
**qualified-id** 5–3  
**question mark** 2–8  
**<queue>** 23–9  
**queue** 23–23

`operator<` 23–24  
`operator==` 23–23  
**quote**  
  double 2–8  
  single 2–8

## R

**random\_access\_iterator** 24–11  
**distance\_type** 24–13  
**iterator\_category** 24–12  
**value\_type** 24–13  
**random\_access\_iterator\_tag** 24–11  
**random\_shuffle** 25–18  
**range\_error** 19–3  
  **range\_error** 19–3  
  **range\_error** 19–3  
**rank, conversion** 13–14  
**rbegin, basic\_string** 21–11  
**rdbuf**  
  **basic\_ifstream** 27–71  
  **basic\_ios** 27–20  
  **basic\_istringstream** 27–63  
  **basic\_ofstream** 27–72  
  **basic\_ostringstream** 27–64  
  **istrstream** D–10  
  **osrstream** D–11  
**rdstate, basic\_ios** 27–22  
**read, basic\_istream** 27–46  
**readsome, basic\_istream** 27–46  
**real** 26–6  
  **complex** 26–7  
**realloc** 20–20  
**recursive function call** 5–5  
**redefinition**  
  enumerator 7–10  
  **typedef** 7–5  
**reentrancy** 17–21  
  implementation-defined behavior 17–21  
**reference** 3–29  
  and argument passing 8–20  
  and return 8–20  
  argument 5–5  
  assignment 8–20  
  assignment to 5–24  
  binding 8–21  
  call by 5–5  
  cast 5–10/11  
  cast, `reinterpret_cast`, 5–11  
  cast, `static_cast`, 5–10  
  **const** 8–21  
  declaration 8–6  
  declaration, `extern` 8–20  
  declarator & 8–6  
  expression 5–2  
  initialization 8–6, 20  
  member initialization 12–14  
  null 8–6  
  operand 5–1  
  parameter 8–6  
  restriction 8–6  
  **sizeof** 5–14  
  type, extension to C C–1  
**reference-compatible** 8–21  
**reference-related** 8–21  
**region, declarative** 3–1, 4  
**register** 7–3  
  declaration 7–3  
  restriction 7–3  
**reinterpret cast** 5–10

**reinterpret\_cast**  
 lvalue cast 5–10  
 reference cast 5–11  
 relational operator 5–21  
*relational-expression* 5–21  
**release, auto\_ptr** 20–19  
 remainder operator—see modulus operator  
**remove** 25–16  
 list 23–22  
**remove\_copy** 25–16  
**remove\_copy\_if** 25–16  
**remove\_if** 25–16  
**rend, basic\_string** 21–11  
**replace** 25–14  
 basic\_string 21–16  
**replace\_copy** 25–14  
**replace\_copy\_if** 25–14  
**replace\_if** 25–14  
 replacement  
 function 17–2  
 macro 16–4  
 representation  
 object 3–27  
 value 3–27  
 required behavior 17–2, 4  
 Requirements 17–3  
 Container 23–1  
 Iterator 24–1  
 Numeric type 26–1  
 requirements  
 Allocator 20–2  
 Assignable 23–1  
 CopyConstructible 20–2  
 EqualityComparable 20–1  
 LessThanComparable 20–1  
 reraise 15–3  
 rescanning and replacement 16–6  
**reserve**  
 basic\_string 21–12  
 vector 23–28  
 reserved  
 function 17–2  
 identifier 2–4  
 name 17–17  
 word—see keyword  
**reset**  
 auto\_ptr 20–19  
 bitset 23–13  
**resetiosflags** 27–56  
**resize**  
 basic\_string 21–11  
 deque 23–18  
 list 23–21  
 vector 23–28  
 resolution  
 and conversion, overload 13–11  
 and default argument, overload 13–11  
 and ellipsis, overload 13–11  
 and member function, overload 13–5  
 and pointer conversion, overload 13–18  
 argument matching—see overload  
 overload 13–4  
 overloaded function call resolution—see also argument  
 matching, overload  
 overloading—see overload resolution  
 resolution overloading—see overload  
 scoping ambiguity 10–4  
 template function overloading 14–24  
 template name 14–3  
 template overload 14–29, 32  
 restriction 17–19/21  
 address of bit-field 9–11  
 anonymous union 9–10  
 auto 7–3  
 bit-field 9–11  
 constructor 12–1/2  
 copy assignment operator 12–22  
 copy constructor 12–20  
 destructor 12–7  
 enumerator 7–10  
 extern 7–3  
 local class 9–13  
 member of class type 12–14  
 overloading 13–19  
 pointer to bit-field 9–11  
 reference 8–6  
 register 7–3  
 static 7–3  
 static member local class 9–10  
 union 9–10, 12–2  
 restrictions, operator overloading 13–18  
**rethrow** 15–3  
**return**  
 type 8–10  
 type conversion 6–5  
 type, overloading and 13–1  
**return** 6–5  
 constructor and 6–5  
 from main() 3–19/20  
 reference and 8–20  
 statement—see also return  
**reverse** 25–17  
 list 23–22  
**reverse\_bidirectional\_iterator** 24–14  
 conversion 24–15  
 operator\* 24–15  
 operator++ 24–16  
 operator-- 24–16  
 operator-> 24–15  
 operator== 24–16  
 reverse\_bidirectional\_iterator 24–15  
 reverse\_bidirectional\_iterator 24–15  
**reverse\_copy** 25–17  
**reverse\_iterator** 24–16  
 conversion 24–18  
 operator\* 24–18  
 operator+ 24–19  
 operator+ 24–17  
 operator++ 24–18  
 operator+= 24–19  
 operator- 24–19/20  
 operator-- 24–18  
 operator-= 24–19  
 operator-> 24–18  
 operator< 24–20  
 operator== 24–19/20  
 operator[] 24–19  
**reverse\_iterator** 24–17  
**reverse\_iterator** 24–17  
**rfind, basic\_string** 21–19  
**right**  
 shift, implementation defined 5–21  
 shift operator 5–21  
**right** 27–24  
**rotate** 25–17  
**rotate\_copy** 25–18  
 rounding 4–4  
 rule, one-definition 3–2  
 rules  
 for conditions 6–2  
 summary, scope 3–8  
 run-time initialization 3–19

`runtime_error` 19–3  
`runtime_error` 19–3  
`runtime_error` 19–3  
`rvalue` 3–30  
`lvalue conversion to` 4–2

## S

`sbufpc, basic_streambuf` 27–29  
`scalar type` 3–27  
`scan_is`  
`ctype` 22–13  
`ctype<char>` 22–17  
`scan_not`  
`ctype` 22–13  
`ctype<char>` 22–17  
`s-char` 2–9  
`s-char-sequence` 2–9  
`scientific` 27–25  
`scope` 3–1, 4  
`anonymous union at namespace` 9–10  
`class` 3–7  
`destructor and exit from` 6–5  
`exception declaration` 3–6  
`file` 17–17  
`function` 3–6  
`function prototype` 3–6  
`global` 3–7  
`global namespace` 3–7  
`iteration-statement` 6–4  
`local` 3–5  
`macro definition` 16–6  
`namespace` 3–6  
`of class definition` 9–2  
`of class name` 9–2  
`of declaration in for` 6–4  
`of default argument` 8–13  
`of delete example` 12–10  
`of enumerator class` 7–11  
`of friend declaration` 3–8  
`of label` 3–6, 6–1  
`of local class` 9–13  
`of member initializer` 12–15  
`of name` 3–4  
`of nested class` 9–11  
`of nested class anachronism` C–12  
`of nested type name` 9–13  
`of parameter` 3–6  
`overloading and` 13–3  
`potential` 3–4  
`resolution operator` 5–2/3, 9–5, 10–1, 9  
`resolution operator ::` 3–12  
`resolution operator example` 10–4  
`resolution operator use` 9–9  
`rules summary` 3–8  
`selection-statement` 6–2  
`scoping`  
`ambiguity resolution` 10–4  
`and new` 5–15  
`search` 25–12  
`seekdir, ios_base` 27–15  
`seekg, basic_istream` 27–47  
`seekoff`  
`basic_filebuf` 27–69  
`basic_streambuf` 27–31  
`basic_stringbuf` 27–60  
`strstreambuf` D–8  
`seekp, basic_ostream` 27–50  
`seekpos`  
`basic_filebuf` 27–70

`basic_streambuf` 27–32  
`basic_stringbuf` 27–61  
`strstreambuf` D–9  
`selection statement` 6–2  
`selection-statement` 6–2  
`scope` 6–2  
`semantics, class member` 5–6  
`separate`  
`compilation` 2–1  
`translation` 2–1  
`sequence`  
`implicit conversion` 13–12  
`point` 1–5, 5–1  
`standard conversion` 4–1  
`statement` 6–1  
`sequencing operator` —see comma operator  
`<set>` 23–32  
`set` 23–37  
`bitset` 23–13  
`operator<` 23–39  
`operator==` 23–39  
`setbase` 27–56  
`setbuf`  
`basic_filebuf` 27–69  
`basic_streambuf` 27–31  
`streambuf` D–10  
`strstreambuf` D–10  
`set_difference` 25–25  
`setf, ios_base` 27–16  
`setfill` 27–56  
`setg, basic_streambuf` 27–31  
`set_intersection` 25–25  
`setiosflags` 27–56  
`setjmp` 17–18  
`<setjmp.h>` D–1  
`setlocale` 17–6  
`set_new_handler` 17–19, 18–15  
`setp, basic_streambuf` 27–31  
`setprecision` 27–57  
`setstate, basic_ios` 27–22  
`set_symmetric_difference` 25–26  
`set_terminate` 17–19, 18–20  
`set_unexpected` 17–19, 18–19  
`set_union` 25–24  
`setw` 27–57  
`sgetc, basic_streambuf` 27–29  
`sgetn, basic_streambuf` 27–30  
`shift operator` —see left shift operator, right shift operator  
`shift, valarray` 26–16  
`shift-expression` 5–21  
`short`  
`type` 3–28  
`type specifier` 7–8  
`type, unsigned` 3–28  
`typedef and` 7–2  
`showbase` 27–23  
`showmanyC`  
`basic_filebuf` 27–68  
`basic_streambuf` 27–32, 68  
`showpoint` 27–23  
`showpos` 27–23  
`side`  
`effect` 1–5  
`effects` 5–1  
`effects and comma operator` 5–25  
`effects and logical AND operator` 5–23  
`effects and logical OR operator` 5–23  
`sign`  
`of bit-field, implementation-defined` 9–11  
`of char, implementation-defined` 3–28  
`sign` 2–8

<signal.h> D-1  
 signature 1-3  
 signed  
   char type 3-28  
   character 3-28  
   typedef and 7-2  
   unsigned integer conversion 4-3  
*simple-escape-sequence* 2-7  
*simple-type-specifier* 7-8  
 sin 26-19, 32  
   complex 26-8  
 single  
   precision arithmetic, extension to C C-1  
   quote 2-8  
 sinh 26-32  
   complex 26-8  
 sink 26-19  
 size  
   basic\_string 21-11  
   bitset 23-14  
 sizeof  
   array 5-14  
   class object 5-14  
   empty class 9-1  
   expression, implementation defined 5-14  
   integral type, implementation-defined 3-28  
 operator 5-13/14  
   reference 5-14  
   string 2-9  
   type, implementation-defined 3-28  
 size\_t 5-14  
   implementation defined type of 5-14  
 skipws 27-24  
 slice 26-20  
   length 26-21  
   slice 26-20  
   slice 26-20  
   start 26-21  
   stride 26-21  
 slice\_array 26-21  
   fill 26-22  
   operator% 26-22  
   operator& 26-22  
   operator\* 26-22  
   operator+= 26-22  
   operator-= 26-22  
   operator/= 26-22  
   operator<<= 26-22  
   operator= 26-22  
   operator>>= 26-22  
   operator^= 26-22  
   operator|= 26-22  
   slice\_array 26-22  
   slice\_array 26-22  
 smanip 27-56  
   implementation-defined 27-56  
 snextc, basic\_streambuf 27-29  
 sort 25-19  
   list 23-23  
   sort\_heap 25-27  
 source  
   file 2-1, 17-16, 18  
   file inclusion 16-3  
 space, white 2-3  
 special member function —see also constructor, destructor,  
   inline function, user-defined conversion, virtual function  
 specialization 14-9  
 instantiation and 14-14  
 overloading and 14-31  
 template 14-15  
 specialized  
 class 14-9, 17  
 function 14-9  
 specification, template argument 14-24  
 specifications  
   C++ Standard library exception 17-21  
   Standard C library exception 17-21  
   implementation-defined exception 17-21  
 specifier  
   access —see access specifier  
   auto 7-3  
   declaration 7-2  
   explicit 7-5  
   friend 7-6  
   friend 17-21  
   function 7-4  
   inline 7-4  
   missing storage class 7-3  
   static 7-3  
   storage class 7-3  
   type —see type specifier  
   typedef 7-5  
   virtual 7-5  
 splice, list 23-22  
 sputbackc, basic\_streambuf 27-30  
 sputc, basic\_streambuf 27-30  
 sputn, basic\_streambuf 27-30  
 sqrt 26-19, 32  
   complex 26-8  
*<sstream>* 27-57  
 stable\_partition 25-19  
 stable\_sort 25-20  
 stack unwinding 15-3  
*<stack>* 23-10  
 stack 23-25  
   operator< 23-25  
   operator== 23-25  
 Standard  
   C library 17-1, 6, 17-15/C-13, C-15  
   C library exception specifications 17-21  
   library, C++ 17-1, 18/19, 21  
 standard  
   conversion 4-1  
   conversion sequence 4-1  
 start, program 3-19  
 start  
   gslice 26-24  
   slice 26-21  
 startup, program 17-16, 18  
 state, object 17-2  
 statement 6-1  
   —see also return, return  
   break 6-5  
   compound 6-1  
   continue 6-5  
   continue in for 6-4  
   declaration 6-6  
   declaration in for 6-4  
   declaration in switch 6-3  
   do 6-3/4  
   empty 6-1  
   expression 6-1  
   extension to C declaration C-1  
   for 6-3/4  
   goto 6-1, 5/6  
   if 6-2/3  
   iteration 6-3  
   jump 6-5  
   labeled 6-1  
   null 6-1  
   selection 6-2  
   sequence 6-1

**switch** 6–2/3, 5  
**while** 6–3/4  
 { }, block 6–1  
**statement** 6–1  
**STATE\_T** 27–3  
**static**  
 NTBS 17–6  
 NTMBS 17–6  
 NTWCS 17–7  
**cast** 5–9  
**type** 1–3  
**static** 7–3  
 class member 3–21  
 data member 9–8  
 destruction of local 6–6  
 initialization, local 6–6  
 linkage of 3–17, 7–3, 23  
 local object 3–21  
 member 9–8  
 member declaration 3–1  
 member definition 9–9  
 member example 9–9  
 member function 9–8/9  
 member initialization 9–9  
 member local class restriction 9–10  
 member, template and 14–35  
 member, type of 5–13  
 member use 9–8  
 object, destructor 3–20  
 object initialization 3–19, 8–15  
 objects order of execution, constructor and 12–13  
 overloading and 13–1  
 restriction 7–3  
 specifier 7–3  
 variable, template and 14–35  
**static\_cast**  
 conversion to enumeration type 5–10  
 lvalue cast 5–9  
 reference cast 5–10  
**std**.namespace 17–17  
**<stdarg.h>** D–1  
**\_STDC\_** 16–9  
 implementation-defined 16–9  
**<stddef.h>** 2–7, 2–9/D–1  
**<stdexcept>** 19–1  
**<stdio.h>** D–1  
**<stdlib.h>** D–1  
**storage**  
 allocation new 5–15  
 class 3–1  
 class declaration 7–3  
 class specifier 7–3  
 class specifier, missing 7–3  
 duration 3–21  
 duration, auto 3–22  
 duration, class member 3–23  
 duration, dynamic 3–22, 5–15  
 duration, local object 3–22  
 management—see new, delete  
 of array 8–8  
**str**  
**basic\_istringstream** 27–63  
**basic\_ostringstream** 27–64  
**basic\_stringbuf** 27–59  
**istrstream** D–10  
**ostrstream** D–11  
**strstreambuf** D–6  
**strchr** 21–31  
**<streambuf>** 27–25  
**streambuf** 27–25  
 setbuf D–10  
**streamoff** D–2  
 implementation-defined D–2  
**streampos**, implementation-defined D–2  
**streamsize** 27–8  
**strftime** 22–33  
**stride**  
**gslice** 26–24  
**slice** 26–21  
**string**  
 concatenation 2–9  
 distinct 2–9  
 literal 2–9  
 literal concatenation, undefined 2–9  
 literal, implementation-defined 2–9  
 literal, type of 2–9  
 literal, undefined change to 2–9  
 literal, wide 2–9  
 null-terminated byte 17–6  
 null-terminated multibyte 17–6  
 null-terminated wide-character 17–6  
**sizeof** 2–9  
**terminator 0** 2–9  
**type of** 2–9  
**<string>** 21–1  
**string** 21–27  
 assign 21–28  
 compare 21–28  
 copy 21–28  
 eos 21–28  
 eq 21–28  
 find 21–28  
 length 21–28  
 lt 21–28  
 move 21–28  
 ne 21–28  
**stringbuf** 27–57  
**string\_char\_traits** 21–3  
 assign 21–4/5  
 compare 21–4  
 copy 21–4  
 eos 21–4, 18  
 eq 21–4, 18/21  
 find 21–4  
 length 21–4, 9, 11, 13/16, 19/21, 23/24  
 lt 21–4  
 move 21–5  
 ne 21–4  
**string\_char\_traits<char>** 21–27  
**string\_char\_traits<wchar\_t>** 21–28  
**<string.h>** D–1  
**string-literal** 2–9  
**strlen** 21–28/D–6, D–11  
**strpbrk** 21–31  
**strrchr** 21–31  
**strstr** 21–32  
**strstreambuf** D–3  
 freeze D–6  
 overflow D–7  
**pbackfail** D–7  
**pcount** D–6  
**seekoff** D–8  
**seekpos** D–9  
**setbuf** D–10  
**str** D–6  
**strstreambuf** D–5  
**strstreambuf** D–5  
 underflow D–8  
**~strstreambuf** D–6  
**~strstreambuf, strstreambuf** D–6  
**struct**  
 class versus 9–1

default member access 9–1  
 initialization 8–17  
 type specifier 7–9  
 structure 9–1  
   tag —see class name  
 sub-object 1–4  
 lattice —see DAG  
 subscripting  
   example 8–8  
   explanation 8–8  
 operator 5–4, 13–18  
   operator, overloaded 13–20  
 subsequence rule, overloading 13–15  
`substr, basic_string` 21–21  
 subtraction  
   implementation defined pointer 5–20  
   operator 5–19  
 suffix  
   E 2–9  
   F 2–9  
   L 2–7, 9  
   U 2–7  
   f 2–9  
   l 2–7, 9  
   u 2–7  
`sum, valarray` 26–16  
 summary  
   compatibility with C C–1  
   compatibility with ISO C C–2  
   scope rules 3–8  
   syntax A–1  
`sungetc, basic_streambuf` 27–30  
`swap` 25–13  
   `basic_string` 21–18, 26  
`swap_ranges` 25–13  
`switch`  
   statement 6–2/3, 5  
   statement, declaration in 6–3  
`sync`  
   `basic_filebuf` 27–70  
   `basic_istream` 27–46  
   `basic_streambuf` 27–32  
`synonym` 7–15  
   type name as 7–5  
`syntax`  
   checking 14–4  
   class member 5–6  
   explicit instantiation 14–15  
   notation 1–3  
   summary A–1  
`SZ_T` 27–3

**T**

`T*`  
   `distance_type` 24–13  
   `iterator_category` 24–12  
   `valarray` operator 26–16  
   `value_type` 24–13  
`table, ctype<char>` 22–17  
`tan` 26–19, 32  
   `complex` 26–8  
   `tanh` 26–19, 32  
     `complex` 26–8  
`tellg, basic_istream` 27–47  
`tellp, basic_oiostream` 27–50  
`template` 14–1  
   access rules 14–23  
   and < 14–2  
   and friend 14–34

and static member 14–35  
 and static variable 14–35  
 argument 14–21  
 argument deduction 14–25  
 argument specification 14–24  
 class 14–2, 23–11  
   definition of 14–1  
   function 14–24  
   function overloading resolution 14–24  
 instantiation 14–9  
 linkage 14–10  
 member function 14–33  
   name injection from 14–9  
   name lookup 14–3  
   name resolution 14–3  
   name, use of 14–5  
 overload resolution 14–29, 32  
 primary 14–17  
   specialization 14–15  
   type equivalence 14–24  
 template 14–1  
   *template-argument* 14–2  
   *template-argument-list* 14–2  
   *template-declaration* 14–1  
   *template-id* 14–2  
   *template-name* 14–2  
   *template-parameter* 14–20  
   *template-parameter-list* 14–1  
 temporary 12–2  
   and declarator initializer 12–3  
   constructor for 12–3  
   destruction of 12–3  
   destructor for 12–3  
   elimination of 12–2  
   implementation-defined generation of 12–2  
   order of destruction of 12–3  
`terminate` 3–20, 15–7, 18–10, 19/20  
`terminate()` 15–7  
`terminate_handler` 17–19, 18–20  
 termination  
   and destructor, program 12–7  
   program 3–19/21  
`terminator` 0, string 2–9  
 terminology, pointer 3–29  
`test, bitset` 23–14  
`this` 5–3  
   anachronism, assignment to C–12  
   and constructor anachronism C–12  
   and destructor anachronism C–12  
   pointer —see `this`  
   type of 9–7  
`thousands_sep, numpunct` 22–26  
`throw` 15–1  
 throw-expression in conditional-expression 5–24  
`throw-expression` 15–1  
 throwing, exception 15–2  
 throw-point 15–1  
`tie, basic_ios` 27–20  
`time_get` 22–29  
   `date_order` 22–30  
   `do_date_order` 22–31  
   `do_get_date` 22–31  
   `do_get_monthname` 22–31  
   `do_get_time` 22–31  
   `do_get_weekday` 22–31  
   `do_get_year` 22–31  
   `get_date` 22–30  
   `get_monthname` 22–30  
   `get_time` 22–30  
   `get_weekday` 22–30  
   `get_year` 22–30

time\_get\_byname 22–32  
`<time.h>` D–1  
 time\_put 22–32  
   do\_put 22–33  
   put 22–32  
 time\_put\_byname 22–33  
 times 20–8  
 to  
   int, bool promotion 4–3  
   rvalue, lvalue conversion 4–2  
 to\_char\_type, ios\_traits 27–10  
 to\_int\_type, ios\_traits 27–10  
 token 2–4/5  
*token* 2–3  
 tolower 22–11  
   ctype 22–13  
     ctype<char> 22–17  
 to\_string, bitset 23–14  
 to\_ulong, bitset 23–14  
 toupper 22–11  
   ctype 22–13  
     ctype<char> 22–17  
 transform 25–14  
   collate 22–28  
 translation  
   phases 2–1  
   separate 2–1  
   unit 17–16/17  
   unit 2–1, 3–17  
   unit, name and 3–1  
 transparent, locale 22–9  
 trigraph 2–1/2  
 truename falsename, numpunct 22–26  
 truncation 4–4  
 try 15–1  
*try-block* 15–1  
 type 3–1  
   Boolean 3–28  
   POD 3–27  
 Requirements, Numeric 26–1  
 ambiguity, declaration 7–2  
 arithmetic 3–29  
 array 3–29, 8–9  
 bitmask 17–5  
 char 3–28  
 character 3–28  
 checking, argument 5–5  
 checking, extension to C C–1  
 checking of default argument 8–12  
 class and 9–1  
 completely-defined object 3–27  
 compound 3–29  
 const 7–6  
 conversion, explicit —see casting  
 declaration 8–4  
 declaration consistency 3–18  
 declaration, `typedef` as 7–5  
 definition, class name as 9–2  
 destination 8–16  
 double 3–29  
 dynamic 1–2  
 enumerated 3–29, 17–5  
 enumeration underlying 7–11  
 equivalence 7–5, 9–2  
 equivalence, template 14–24  
 example of incomplete 3–27  
 extension to C reference C–1  
 extension to C user-defined C–1  
 float 3–29  
 floating point 3–28  
 function 3–29, 8–9  
 fundamental 3–28  
 generator —see template  
 implementation-defined `sizeof` 3–28  
 incomplete 3–27  
 incompletely-defined object 3–27  
 int 3–28  
 integral 3–28  
 long 3–28  
 long double 3–29  
 name 8–2  
 name as synonym 7–5  
 name example 8–2  
 name example, nested 9–13  
 name, nested 9–13  
 name, scope of nested 9–13  
 of bit-field 9–11  
 of character literal 2–7  
 of constructor 12–2  
 of conversion 12–5  
 of delete 12–10  
 of enum 7–10/11  
 of floating point literal 2–9  
 of integer literal 2–7  
 of integer literal, implementation-defined 2–7  
 of new 12–9  
 of `ptrdiff_t`, implementation defined 5–20  
 of `size_t`, implementation defined 5–14  
 of static member 5–13  
 of string 2–9  
 of string literal 2–9  
 of `this` 9–7  
 pointer 3–29  
 polymorphic 10–6  
 short 3–28  
 signed char 3–28  
 specifier, char 7–8  
 specifier, class 7–9  
 specifier, double 7–8  
 specifier, elaborated 14–5  
 specifier, enum 7–9  
 specifier, float 7–8  
 specifier, int 7–8  
 specifier, long 7–8  
 specifier, short 7–8  
 specifier, struct 7–9  
 specifier, union 7–9  
 specifier, unsigned 7–8  
 specifier, void 7–8  
 specifier, volatile 7–8  
 static 1–3  
 unsigned 3–28  
 unsigned char 3–28  
 unsigned int 3–28  
 unsigned long 3–28  
 unsigned short 3–28  
 void 3–29  
 void\* 3–29  
 volatile 7–6  
 wchar\_t 3–28  
 wchar\_t underlying 3–28  
 typedef, function 8–10  
`typedef`  
   and long 7–2  
   and short 7–2  
   and signed 7–2  
   and unsigned 7–2  
   as type declaration 7–5  
   class name 7–6, 9–3  
   declaration 3–1  
   enum name 7–6  
   example 7–5

overloading and 13–2  
 redefinition 7–5  
 specifier 7–5  
*typedef-name* 7–5  
 typeid 5–9  
*type-id* 8–2  
*type-id-list* 15–5  
`<typeinfo>` 18–15  
*type\_info* 5–9, 18–15  
 before 18–16  
 name 18–16  
*operator!=* 18–16  
*operator=* 18–16  
*operator==* 18–16  
*type\_info* 18–16  
*type\_info* 18–16  
*type\_info*:*name*, implementation-defined 18–16  
*typename* 14–3/4, 20  
*type-parameter* 14–20  
 types  
 implementation-defined exception 17–21  
 implementation-defined 17–5  
 type-specifier  
*bool* 7–8  
*wchart* 7–8  
*type-specifier* 7–6

## U

U suffix 2–7  
 u suffix 2–7  
*uflow, basic\_streambuf* 27–33  
 unary  
 expression 5–13  
 minus operator 5–13/14  
 operator 5–13  
 operator, interpretation of 13–19  
 operator, overloaded 13–19  
 plus operator 5–13/14  
*unary-expression* 5–13  
*unary\_function* 20–8  
*unary\_negate* 20–10  
*unary-operator* 5–13  
*uncaught\xception* 18–20  
*#undef* 16–6, 17–17  
*undefined* 17–2, 17/19, 18–21, 21–12, 24–26, 26–13/17, 19,  
 24, 28, 27–4, 10  
 arithmetic exception 5–1  
 behavior 1–3  
 bound pointer to member function C–12  
 change to *const* object 7–7  
 change to string literal 2–9  
*delete* 5–17  
 deleted object 3–23  
 division by zero 5–1, 19  
 escape sequence 2–8  
 floating point conversion 4–4  
 function call 5–11  
 left shift 5–21  
 member function call 9–6  
 overflow 5–1  
 pointer comparison 5–20, 22  
 pointer to function cast 5–11  
 pure virtual function call 10–10  
 string literal concatenation 2–9  
 unrepresentable integral value 4–4  
 underflow  
*basic\_filebuf* 27–68  
*basic\_streambuf* 27–33  
*basic\_stringbuf* 27–60

*strstreambuf* D–8  
 underlying  
 type, enumeration 7–11  
 type, *wchar\_t* 3–28  
 underscore  
 character 17–17/18  
 in identifier \_ 2–4  
 unexpected 18–19  
*unexpected()* 15–8  
*unexpected\_handler* 17–18, 18–19  
*unget, basic\_istream* 27–46  
 uninitialized variable, indeterminate 8–15  
*uninitialized\_copy* 20–18  
*uninitialized\_fill* 20–18  
*uninitialized\_fill\_n* 20–18  
 union 3–29, 9–10  
 access control, anonymous 9–10  
 anonymous 9–10  
 at namespace scope, anonymous 9–10  
 class versus 9–1  
 constructor 9–10  
 default member access 9–1  
 destructor 9–10  
 extension to C anonymous C–1  
 global anonymous 9–10  
 initialization 8–19, 9–10  
 member function 9–10  
 restriction 9–10, 12–2  
 restriction, anonymous 9–10  
 type specifier 7–9  
*unique* 25–16  
 list 23–22  
*unique\_copy* 25–16  
 unit, translation 17–16/17  
 unknown argument type 8–9  
 unnamed  
 bit-field 9–11  
 class 7–6  
 object 12–2  
 parameter example 8–14  
 unqualified name 3–8  
*unqualified-id* 5–3  
 unrepresentable integral value, undefined 4–4  
*unsetf, ios\_base* 27–17  
 unsigned  
 arithmetic 3–28  
 char type 3–28  
 int type 3–28  
 integer conversion, signed 4–3  
 literal 2–6/7  
 long type 3–28  
 short type 3–28  
 type 3–28  
 type specifier 7–8  
*typedef* and 7–2  
*unsigned-suffix* 2–6  
 unspecified 18–11/13, 15, 21–8, 25–20, 26–16, 27–10,  
 27–60/D–5, D–7/8  
 address of member function 17–20  
 allocation 9–5, 11–3  
 argument to constructor 5–17  
 behavior 1–3  
 constructor and *new* 5–17  
 destructor call 6–6  
 order of argument evaluation 5–5  
 order of evaluation 3–20, 5–1  
 order of evaluation *new* 5–17  
 order of function call evaluation 5–5  
 pointer comparison 5–22  
 unwinding, stack 15–3  
 up, name look 3–8

upper\_bound 25–22  
 uppercase 17–6, 17  
 uppercase 27–24  
 use of template name 14–5  
 usefacet, locale 22–9  
 user-defined  
   conversion 5–2, 12–4/5  
   conversion and name hiding 12–6  
   conversion, implicit 12–6  
   conversion, inheritance of 12–6  
   conversion, virtual 12–6  
   type, extension to C C–1  
 using-declaration 7–15  
 using-directive 7–20  
 usual arithmetic conversions 5–2  
<utility> 20–4

## V

va\_end 17–18  
<valarray> 26–8  
 valarray 26–11, 25  
   apply 26–16  
   cshift 26–16  
   fill 26–16  
   free 26–17  
   length 26–16  
   max 26–19  
   min 26–19  
   operator T\* 26–16  
   operator! 26–14  
   operator!= 26–18  
   operator% 26–17  
   operator%= 26–15  
   operator& 26–17  
   operator&& 26–17  
   operator&= 26–15  
   operator\* 26–17  
   operator\*= 26–15  
   operator+ 26–14, 17  
   operator+= 26–15  
   operator- 26–14, 17  
   operator-= 26–15  
   operator/ 26–17  
   operator/= 26–15  
   operator< 26–18  
   operator<< 26–17  
   operator<= 26–15  
   operator<= 26–18  
   operator= 26–13  
   operator== 26–18  
   operator> 26–18  
   operator>= 26–18  
   operator>> 26–17  
   operator>>= 26–15  
   operator[] 26–14  
   operator^ 26–17  
   operator^= 26–15  
   operator| 26–17  
   operator|= 26–15  
   operator|| 26–17  
   operator~ 26–14  
   shift 26–16  
   sum 26–16  
 valarray 26–12  
 valarray 26–12  
~valarray 26–13  
~valarray, valarray 26–13  
va\_list 17–18  
value

call by 5–5  
 null member pointer 4–4  
 null pointer 4–4  
 of char literal, implementation-defined 2–8  
 of enumerator 7–10  
 of multicharacter literal, implementation-defined 2–7  
 representation 3–27  
 undefined unrepresentable integral 4–4  
 value\_type 24–13  
 T\* 24–13  
 bidirectional\_iterator 24–13  
 forward\_iterator 24–13  
 input\_iterator 24–13  
 random\_access\_iterator 24–13  
 variable  
   argument list 8–9  
   indeterminate uninitialized 8–15  
   parameter list 5–5, 8–9  
   parameter list example 8–9  
   template and static 14–35  
<vector> 23–10  
 vector 23–26  
   assign 23–27  
   capacity 23–28  
   erase 23–29  
   insert 23–28  
   operator< 23–27  
   operator== 23–27  
   reserve 23–28  
   resize 23–28  
   vector 23–27  
   vector 23–27  
 vector<bool> 23–29  
   operator< 23–31  
   operator== 23–31  
 vertical tab 2–8  
 viable function 13–4  
 virtual  
   base class 10–2  
   base class DAG 10–3  
   base class dominance 10–5  
   base class initialization 12–14, 21  
   base class initialization, order of 12–14  
   destructor 12–7  
   destructor, pure 12–7  
   function 10–6  
   function access 11–8  
   function call 10–9  
   function call, constructor and 12–17  
   function call, destructor and 12–17  
   function call, undefined pure 10–10  
   function definition 10–8  
   function definition, pure 10–9  
   function example 10–7/8  
   function example, pure 10–9  
   function, pure 10–9/10  
   member function 17–18, 20  
   user-defined conversion 12–6  
 virtual  
   and friend 10–8  
   and multiple inheritance 10–8  
   specifier 7–5  
 visibility 3–8  
 void  
   parameter 8–9  
   type 3–29  
   type specifier 7–8  
 void& 8–6  
 void\*  
   conversion, pointer to member 4–5  
   pointer comparison 5–21

pointer type extension to C C-1  
 type 3-29  
**volatile** 3-30  
 constructor and 9-8, 12-1  
 destructor and 9-8, 12-7  
 extension to C C-2  
 implementation-defined 7-8  
 member function 9-7  
 operand 5-1  
 overloading and 13-2  
 type 7-6  
 type specifier 7-8

**wstring** 21-28  
**assign** 21-29/30  
**compare** 21-29  
**copy** 21-29  
**eos** 21-29  
**eq** 21-29  
**find** 21-29  
**length** 21-29  
**lt** 21-29  
**move** 21-30  
**ne** 21-29  
**wstringbuf** 27-57

## W

**wcerr** 27-6  
**<wchar.h>** D-1  
**wchart** type-specifier 7-8  
**wchar\_t** 2-7, 9, 17-6, 21-31  
 implementation-defined 3-28  
 type 3-28  
 underlying type 3-28  
**wcin** 27-6  
**wclog** 27-6  
**wcout** 27-6  
**wcschr** 21-32  
**wcslen** 21-29  
**wcspbrk** 21-32  
**wcsrchr** 21-32  
**wcsstr** 21-32  
**<wctype.h>** D-1  
 well-formed program 1-3  
**wfilebuf** 27-65  
**what**  
 bad\_alloc 18-14  
 bad\_cast 18-16  
 bad\_exception 18-19  
 bad\_typeid 18-17  
 exception 18-18  
 ios\_base::failure 27-13  
 while statement 6-3/4  
**white**  
 space 2-3  
 space 2-4  
 wide string literal 2-9  
 wide-character 2-7  
 string, null-terminated 17-6  
**widen**  
 ctype 22-13  
 ctype<char> 22-17  
**width, ios\_base** 22-11, 27-17  
**wifstream** 27-65  
**wios** 27-4, 7  
**wistream** 27-35  
**wistringstream** 27-57  
**wmemchr** 21-29, 32  
**wmemcmp** 21-29  
**wmemcpy** 21-30  
**wmemmove** 21-30  
**wmemset** 21-30  
**wofstream** 27-65  
**wostream** 27-35  
**wostream** 27-57  
**write, basic\_ostream** 27-55  
**ws** 27-41, 47  
**wstreambuf** 27-25  
**wstreamoff** 27-7  
 implementation-defined 27-7  
**wstrempos** 27-7  
 implementation-defined 27-8

## X

**xalloc, ios\_base** 27-17  
**xsgetn, basic\_streambuf** 27-32  
**xputn, basic\_streambuf** 27-34  
**X(X&)** —see copy constructor , 19

## Z

**zero**  
 pointer 4-4  
 undefined division by 5-1, 19  
 width of bit-field 9-11