

# Index

, —see comma operator  
! —see logical negation operator  
!= —see inequality operator  
# operator 16–5  
## operator 16–6  
% —see modulus operator  
%= operator 5–26  
&  
—see address-of operator  
—see bitwise AND operator  
reference declarator 8–6  
&& —see logical AND operator  
&= operator 5–26  
( )  
—see function call operator  
function declarator 8–9  
\*  
—see indirection operator  
—see multiplication operator  
pointer declarator 8–5  
\*= operator 5–26  
+  
—see addition operator  
—see unary plus operator  
++ —see increment operator  
+= operator 5–15, 26  
-  
—see subtraction operator  
—see unary minus operator  
-- —see decrement operator  
-= operator 5–26  
-> —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 5–26  
:  
field declaration 9–11  
label specifier 6–1  
::  
—see scope resolution operator  
scope resolution operator 3–13  
:::, pointer to member declarator 8–7  
<

—see less than operator  
template and 14–4  
<< —see left shift operator  
<<= operator 5–26  
<= —see less than or equal to operator  
= —see assignment operator  
== —see equality operator  
> —see greater than operator  
>= —see greater than or equal operator  
>> —see right shift operator  
>>= operator 5–26  
?: —see conditional expression operator  
[ ]  
—see subscripting operator  
array declarator 8–8  
\ —see backslash  
^ —see bitwise exclusive OR operator  
^= operator 5–26  
, underscore in identifier 2–6  
{ }  
block statement 6–1  
class declaration 9–1  
class definition 9–1  
enum declaration 7–10  
initializer list 8–18  
| —see bitwise inclusive OR operator  
|= operator 5–26  
|| —see logical OR operator  
~  
—see destructor  
—see one's complement operator  
0  
—see also zero, null  
null character 2–11  
string terminator 2–11

## A

abort 3–23, 6–5, 17–9, 18–14, 18  
abs 26–19, 30/31  
complex 26–8  
abstract  
class 10–10  
class, constructor and 10–11  
class, pointer to 10–10  
*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 10–5  
 declaration 11–4  
 example, member name 11–4  
 member name 11–1  
 overloading and 13–4  
 specifier 11–2/3  
 specifier and `friend` 11–7  
 specifier and object layout 11–3  
`struct` default member 9–1  
 union default member 9–1  
 virtual function 11–9  
`access-specifier` 10–1  
`accumulate` 26–28  
`acos` 26–19, 31  
 addition operator 5–21  
 additive operator 5–21  
`additive-expression` 5–21  
 address  
   of bit-field 9–11  
   of bit-field restriction 9–11  
   of constructor 12–2  
   of cv-qualified name 5–14  
   of member function, unspecified 17–13  
   of overloaded function 5–14, 13–18  
 address-of operator 5–13  
`adjacent_find` 25–11  
 adjusting base class member access 11–4  
 adjustment  
   array parameter 8–10  
   function parameter 8–10  
`advance` 24–10  
 aggregate 8–18  
 alert 2–9  
`<algorithm>` 25–1  
 alias 7–15  
 alignment  
   of bit-field 9–11  
   of bit-field, implementation defined 9–11  
 requirement, implementation-defined 3–30  
 allocation  
   function 3–25, 5–17, 12–9  
   implementation defined bit-field 9–11  
`new, storage` 5–15  
   unspecified 9–5, 11–3  
 Allocator requirements 20–2  
`allocator` 20–15  
 allowing an exception 15–7  
 alternate definition 17–11  
`always_noconv, codecvt` 22–17  
 ambiguity  
   base class member 10–4  
   class conversion 10–6  
   declaration type 7–2  
   declaration versus cast 8–3  
   declaration versus expression 6–7  
   detection, overloaded function 13–4  
   function declaration 8–16  
   member access 10–4  
   parentheses and 5–16  
   resolution, scoping 10–5  
 Amendment 1 17–11

anachronism C–11  
 C function definition C–12  
 assignment to `this` C–12  
 cast of pointer to member C–13  
 free store and constructor C–12  
 free store and deconstructor C–12  
 memory management C–12  
 nonnested class C–13  
 old style base class initializer C–12  
 old style function definition C–12  
`overload` keyword C–11  
 pointer to member conversion C–13  
 scope of nested class C–13  
`this` and constructor C–12  
`this` and deconstructor C–12  
 AND  
   operator, bitwise 5–24  
   operator, logical 5–25  
   operator, side effects and logical 5–25  
 and pointer to member type, multi-level mixed pointer 4–3  
 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` 23–45  
`append, basic_string` 21–16  
`apply, valarray` 26–17  
`arg, complex` 26–8  
`argc` 3–21  
 argument 1–2, 17–12/13, 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 14–36  
   evaluation of default 8–12/13  
   evaluation, order of 5–6  
   evaluation, unspecified order of 5–6  
   example of default 8–11/12  
   list, empty 8–9  
   list, variable 8–9  
   matching —see overload resolution  
   overloaded operator and default 13–20  
   passing 5–5  
   passing, reference and 8–21  
   reference 5–5  
   scope of default 8–13  
   specification, template 14–35  
   substitution 16–5  
   template 14–5  
   to constructor, unspecified 5–18  
   type checking 5–5  
   type checking of default 8–12  
   type, unknown 8–9  
 argument-dependent lookup 3–12  
 arguments, implementation-defined order of evaluation of  
   function 8–13  
`argv[ ]` 3–21  
 arithmetic  
   conversions, usual 5–2  
   exception 5–1  
   exception, undefined 5–1  
   extension to C single precision C–1  
   pointer 5–22  
   type 3–32  
   unsigned 3–32  
 array

bound 8–8  
 const 3–33  
 declaration 8–8  
 declarator [ ] 8–8  
 declarator, multidimensional 8–8  
 delete 5–18  
 example 8–8  
 initialization 8–18  
 member 9–4  
 multidimensional 8–9  
 new 5–16  
 of class objects and constructor 12–12  
 of class objects and new 5–17  
 of class objects initialization 8–20, 12–12  
 order of execution, constructor and 12–11  
 order of execution, destructor and 12–7  
 overloading and pointer versus 13–2  
 parameter adjustment 8–10  
 pointer conversion 4–2  
 size, default 8–8  
 sizeof 5–15  
 storage of 8–9  
 type 3–32, 8–10  
 array-to-pointer conversion 4–2  
 arrow operator—see class member access operator  
 as-if rule 1–5  
 asin 26–19, 31  
 asm  
     declaration 7–23  
     implementation-defined 7–23  
 assembler 7–23  
*<assert.h>* 17–9/D–1  
 assign  
     **basic\_string** 21–17  
     **deque** 23–13  
     **list** 23–17  
     **vector** 23–24  
 Assignable requirements 23–1  
 assignment  
     and initialization, overloaded 12–12  
     and lvalue 5–26  
     conversion by 5–26  
     expression 5–26  
     extension to C memberwise C–2  
     operator 5–26, 17–7  
     operator, copy 12–20  
     operator, overloaded 13–21  
     operator restriction, copy 12–21  
     reference 8–21  
     to class object 5–26  
     to reference 5–26  
     to **this** anachronism C–12  
*assignment-expression* 5–26  
*assignment-operator* 5–26  
 at, **basic\_string** 21–16  
 atan 26–19, 31  
 atan2 26–19, 31  
 atexit 3–23, 17–9, 18–9  
 auto 7–3  
     destruction of 6–5/6  
     initialization 6–7  
     object initialization 8–15  
     restriction 7–3  
     specifier 7–3  
     storage duration 3–24  
 automatic initialization 6–6/7  
 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  
     ~auto\_ptr 20–19  
     ~auto\_ptr, auto\_ptr 20–19

## B

back\_inserter 24–16  
 back\_insert\_iterator 24–15  
     back\_insert\_iterator 24–16  
     back\_insert\_iterator 24–16  
     operator\* 24–16  
     operator++ 24–16  
     operator= 24–16  
     backslash character 2–9  
     backspace 2–9  
     bad, basic\_ios 27–18  
     bad\_alloc 5–18, 18–10, 14  
         bad\_alloc 18–13  
         bad\_alloc 18–13  
         operator= 18–13  
         what 18–13  
     bad\_alloc::what, implementation-defined 18–13  
     bad\_cast 5–8, 18–15  
         bad\_cast 18–15  
         bad\_cast 18–15  
         operator= 18–15  
         what 18–15  
     bad\_cast::what, implementation-defined 18–15  
     bad\_exception 18–17  
         bad\_exception 18–17  
         bad\_exception 18–17  
         operator= 18–17  
         what 18–17  
     bad\_exception::what, implementation-defined 18–17  
     bad\_typeid 5–9, 18–15  
         bad\_typeid 18–15/16  
         bad\_typeid 18–15/16  
         operator= 18–16  
         what 18–16  
     bad\_typeid::what, implementation-defined 18–16  
 base  
     class 17–11, 14  
     class 10–1/2  
     class access 11–3  
     class cast 5–11  
     class constructor order of execution 12–2  
     class destructor order of execution 12–7  
     class, direct 10–1  
     class, indirect 10–1  
     class initialization 12–12/13  
     class initialization, order of 12–14  
     class initializer 8–15  
     class initializer anachronism, old style C–12  
     class member access 10–1  
     class member access, adjusting 11–4  
     class member ambiguity 10–4  
     class, private 11–3  
     class, public 11–3  
     class virtual—see virtual base class  
     of integer literal 2–8  
     base-specifier 10–1  
     base-specifier-list 10–1  
 basic  
     execution character set 1–4  
     source character set 2–2  
 basic\_filebuf 27–4, 56  
 basic\_filebuf 27–57  
 basic\_filebuf 27–57

close 27-58, 64  
imbue 27-61  
is\_open 27-57, 64  
open 27-57, 64  
overflow 27-59  
pbackfail 27-59  
rdbuf 27-64  
seekoff 27-60  
seekpos 27-60  
setbuf 27-60  
showmanyc 27-59  
sync 27-61  
uflow 27-59  
underflow 27-59  
~basic\_filebuf 27-57  
~basic\_filebuf, basic\_filebuf 27-57  
basic\_filebuf<char> 27-56  
basic\_filebuf<wchar\_t> 27-56  
basic\_fstream 27-4, 63  
basic\_fstream 27-64  
basic\_fstream 27-64  
basic\_ifstream 27-4, 61  
basic\_ifstream 27-61  
basic\_ifstream 27-61  
close 27-62  
is\_open 27-62  
open 27-62  
rdbuf 27-62  
basic\_ifstream<char> 27-56  
basic\_ifstream<wchar\_t> 27-56  
basic\_ios 27-4, 15  
bad 27-18  
basic\_ios 27-16  
basic\_ios 27-16  
clear 27-18  
copyfmt 27-17  
eof 27-18  
exceptions 27-18  
fail 27-18  
fill 27-17  
good 27-18  
imbue 27-17  
init 27-32, 42  
narrow 27-17  
operator bool 27-18  
operator! 27-18  
rdbuf 27-17  
rdstate 27-18  
setstate 27-18  
tie 27-17  
widen 27-17  
basic\_ios<char> 27-7  
basic\_ios::failure argument, implementation-defined  
27-18  
basic\_iostream 27-39  
basic\_iostream 27-39  
basic\_iostream 27-39  
~basic\_iostream 27-39  
~basic\_iostream, basic\_iostream 27-39  
basic\_ios<wchar\_t> 27-7  
basic\_istream 27-4, 30  
basic\_istream 27-31  
basic\_istream 27-31  
gcount 27-35  
get 27-35  
getline 27-36/37  
ignore 27-37  
operator bool() 27-33  
operator>> 27-34  
peek 27-37  
putback 27-38  
read 27-37  
readsome 27-38  
seekg 27-38  
sentry 27-32  
sync 27-38  
telli 27-38  
unget 27-38  
~sentry 27-33  
basic\_istreambuf\_iterator 27-4  
basic\_istream<char> 27-29  
basic\_istream<wchar\_t> 27-29  
basic\_istringstream 27-4, 52  
basic\_istringstream 27-52  
basic\_istringstream 27-52  
rdbuf 27-53  
str 27-53  
basic\_istringstream<char> 27-48  
basic\_istringstream<wchar\_t> 27-48  
basic\_ofstream 27-4, 62  
basic\_ofstream 27-63  
basic\_ofstream 27-63  
close 27-63  
is\_open 27-63  
open 27-63  
rdbuf 27-63  
basic\_ofstream<char> 27-56  
basic\_ofstream<wchar\_t> 27-56  
basic\_ostream 27-4  
basic\_ostream 27-41  
basic\_ostream 27-41  
flush 27-45  
operator bool() 27-42  
operator<< 27-43  
put 27-45  
seekp 27-42  
sentry 27-42  
tellp 27-42  
write 27-45  
~basic\_ostream 27-42  
~sentry 27-42  
~basic\_ostream, basic\_ostream 27-42  
basic\_ostreambuf\_iterator 27-4  
basic\_ostream<char> 27-29  
basic\_ostream<wchar\_t> 27-29  
basic\_ostringstream 27-4, 53  
basic\_ostringstream 27-53  
basic\_ostringstream 27-53  
rdbuf 27-54  
str 27-54  
basic\_ostringstream<char> 27-48  
basic\_ostringstream<wchar\_t> 27-48  
basic\_streambuf 27-4, 22  
basic\_streambuf 27-23  
basic\_streambuf 27-23  
eback 27-25  
egptr 27-25  
eptr 27-25  
gbump 27-25  
getloc 27-24  
gptr 27-25  
imbue 27-26  
in\_avail 27-24  
overflow 27-28  
pbackfail 27-28  
pbase 27-25  
pbump 27-25  
pptr 27-25  
pubimbue 27-24  
pubseekoff 27-24  
pubseekpos 27-24  
pubsetbuf 27-24

pubsync 27–24  
 sbumpc 27–24  
 seekoff 27–26  
 seekpos 27–26  
 setbuf 27–26  
 setg 27–25  
 setp 27–25  
 sgetc 27–24  
 sgetn 27–24  
 showmany 27–26, 59  
 snextc 27–24  
 sputbackc 27–25  
 sputc 27–25  
 sputn 27–25  
 sungetc 27–25  
 sync 27–26  
 uflow 27–27  
 underflow 27–27  
 xsgetn 27–26  
 xsputn 27–28  
**basic\_streambuf<char>** 27–21  
**basic\_streambuf<wchar\_t>** 27–21  
**basic\_string** 21–9, 24, 27–48  
 append 21–16  
 assign 21–17  
 at 21–16  
**basic\_string** 21–12  
**basic\_string** 21–12  
 begin 21–15  
 c\_str 21–20  
 capacity 21–15  
 clear 21–15  
 compare 21–24  
 copy 21–20  
 data 21–21  
 empty 21–16  
 end 21–15  
 erase 21–18  
 find 21–21  
 find\_first\_not\_of 21–23  
 find\_first\_of 21–22  
 find\_last\_not\_of 21–23  
 find\_last\_of 21–22  
 getline 21–27  
 insert 21–17  
 max\_size 21–15  
 operator!= 21–25  
 operator+ 21–24  
 operator+= 21–16  
 operator< 21–26  
 operator<< 21–27  
 operator<= 21–26  
 operator= 21–14  
 operator== 21–25  
 operator> 21–26  
 operator>= 21–27  
 operator>> 21–27  
 operator[] 21–16  
 rbegin 21–15  
 rend 21–15  
 replace 21–19  
 reserve 21–15  
 resize 21–15  
 rfind 21–21  
 size 21–15  
 substr 21–23  
 swap 21–20, 27  
**basic\_stringbuf** 27–4, 48  
**basic\_stringbuf** 27–49  
**basic\_stringbuf** 27–49  
 overflow 27–50  
 pbackfail 27–50  
 seekoff 27–50  
 seekpos 27–51  
 str 27–49  
 underflow 27–50  
**basic\_stringbuf<char>** 27–48  
**basic\_stringbuf<wchar\_t>** 27–48  
**basic\_stringstream** 27–4, 54  
**basic\_stringstream** 27–55  
**basic\_stringstream** 27–55  
 rdbuf 27–55  
 str 27–55  
**before, type\_info** 18–14  
**begin, basic\_string** 21–15  
 behavior  
     default 17–1, 4  
     implementation-defined 1–3  
     locale-specific 1–3  
 reentrancy, implementation-defined 17–14  
 required 17–2, 4  
 undefined 1–3  
 unspecified 1–3  
 Ben 13–3  
**bidirectional\_iterator\_tag** 24–9/10  
**binary**  
     operator, interpretation of 13–20  
     operator, overloaded 13–20  
**binary\_function** 20–9  
**binary\_negate** 20–11  
**binary\_search** 25–21  
**bind1st** 20–12  
**bind2nd** 20–12  
**binder1st** 20–11  
**binder2nd** 20–12  
**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>** 23–41  
**bitset** 23–41  
     any 23–45  
     bitset 23–43  
     bitset 23–43  
     count 23–45  
     flip 23–44  
     none 23–45  
     operator!= 23–45  
     operator& 23–45  
     operator&= 23–43  
     operator<< 23–45/46  
     operator<= 23–43  
     operator== 23–45  
     operator>> 23–45  
     operator>>= 23–44  
     operator^ 23–45

**operator^=** 23–43  
**operator|** 23–45  
**operator|=** 23–43  
**operator~** 23–44  
**reset** 23–44  
**set** 23–44  
**size** 23–45  
**test** 23–45  
**to\_string** 23–44  
**to\_ulong** 23–44  
**bitwise**  
  **AND operator** 5–24  
  **exclusive OR operator** 5–24  
  **inclusive OR operator** 5–25  
  **operator** 5–24  
**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, 15  
  **type-specifier** 7–8  
**bool()**  
  **basic\_istream operator** 27–33  
  **basic\_ostream operator** 27–42  
**boolalpha** 27–19  
**Boolean**  
  **bit-fields** 9–11  
  **conversion** 4–5  
  **literal** 2–11  
  **type** 3–31  
  **type** 3–32  
**boolean-literal** 2–11  
**bound array** 8–8  
**bound, of array** 8–8  
**bound pointer to member function, undefined** C–13  
**break statement** 6–5/6  
**built-in type**—see fundamental type  
**byte** 5–15  
  **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–12  
  **header** 17–9, 11, 17–13/D–1  
  **implementation-defined extension to** C–11  
  **inline function, extension to** C–1  
  **library, Standard** 17–1, 6, 17–8/C–13, C–15  
  **linkage to** 7–24  
  **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** 13–20  
  **pseudo destructor** 5–6  
**calloc** 20–20/C–16  
**candidate functions** 14–26  
**capacity**  
  **basic\_string** 21–15  
  **vector** 23–25  
**carriage return** 2–9  
**case label** 6–1, 3  
**<cassert>** 17–9, 19–4  
**cast**  
  **ambiguity, declaration versus** 8–3  
  **base class** 5–11  
  **const** 5–12  
  **derived class** 5–11  
  **dynamic** 5–8, 18–15  
  **integer to pointer** 5–11  
  **lvalue** 5–10/11  
  **of pointer to member anachronism** C–13  
  **operator** 5–13, 19, 8–2  
  **pointer to function** 5–11  
  **pointer to integer** 5–11  
  **pointer to member** 5–11/12  
  **reference** 5–10, 12  
  **reinterpret** 5–11  
  **reinterpret\_cast, lvalue** 5–11  
  **reinterpret\_cast, reference** 5–12  
  **static** 5–10  
  **static\_cast, lvalue** 5–10  
  **static\_cast, reference** 5–10  
  **to incomplete class** 5–20  
  **undefined pointer to function** 5–11  
**cast-expression** 5–19  
**casting** 5–6, 19  
**catch** 15–1  
**category, locale** 22–4  
**c-char** 2–8  
**c-char-sequence** 2–8  
**<cctype>** 21–28  
**ceil** 26–31  
**cerr** 27–5  
**<cerrno>** 17–10, 19–4  
**<cfloat>** 18–8  
**C++**  
  **Standard library** 17–1, 11/12, 14  
  **Standard library exception specifications** 17–14  
  **headers** 17–8  
**change**  
  **to const object, undefined** 7–7  
  **to string literal, undefined** 2–11  
**char**  
  **implementation-defined sign of** 3–31  
  **literal, implementation-defined value of** 2–10  
  **type** 3–31  
  **type, signed** 3–31  
  **type specifier** 7–8  
  **type, unsigned** 3–31/32

character  
 array initialization 8–20  
 decimal-point 17–6  
 literal 2–9  
 literal, type of 2–9  
 multibyte 1–3  
 set, basic execution 1–4  
 set, basic source 2–2  
**signed** 3–31  
 string 2–11  
 type 3–31  
 underscore 17–10/11  
*character-literal* 2–8  
**char\_traits**  
 eos 21–21  
**eq** 21–21/23  
 length 21–13/14, 16/19, 21/23, 25/26  
 checking  
 point of error 14–17  
 syntax 14–17  
**cin** 27–5  
**<ciso646>** C–15  
 class 3–33, 9–1  
 abstract 10–10  
 access and **friend** 11–6  
 anachronism, nonnested C–13  
 and type 9–1  
 base 17–11, 14  
 base —see base class  
 cast to incomplete 5–20  
 constructor and abstract 10–11  
 conversion 12–4  
 conversion ambiguity 10–6  
 declaration, forward 9–2  
 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 17–14  
 derived —see derived class  
 extension to C C–1  
**gslice** 26–22  
 linkage of 3–20  
 linkage specification 7–24  
 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 3–24  
 member storage duration 3–26  
 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 5–26  
 object, const 3–33  
 object copy 12–19  
 object copy —see also copy constructor  
 object initialization 8–18, 12–11  
 object initialization —see also constructor  
 object layout 9–5, 10–2  
 object, member 9–4  
 object, operations on 9–1  
 object, **sizeof** 5–15  
 objects and constructor, array of 12–12  
 objects and **new**, array of 5–17  
 objects initialization, array of 8–20, 12–12  
 pointer to abstract 10–10  
 polymorphic 10–6  
 scope 3–7  
 scope of enumerator 7–11  
**sizeof**, empty 9–1  
 template 23–42  
 template partial specializations 14–12  
 template specialization 14–5  
 unnamed 7–6  
**class**  
 type specifier 9–1  
 versus struct 9–1  
 versus union 9–1  
**classic, locale** 22–9  
**classic\_table, ctype<char>** 22–15  
**class-key** 9–1  
**class-name** 9–1  
**class-specifier** 9–1  
**clear**  
**basic\_ios** 27–18  
**basic\_string** 21–15  
**<climits>** 18–8, 23–43/D–5  
**<locale>** 17–6, 22–45/C–16  
**clog** 27–5  
**close**  
**basic\_filebuf** 27–58, 64  
**basic\_ifstream** 27–62  
**basic\_ofstream** 27–63  
 messages 22–41  
**<cmath>** 26–30  
**codecvt** 22–16  
 always\_noconv 22–17  
 do\_always\_noconv 22–19  
 do\_encoding 22–19  
 do\_in 22–18  
 do\_length 22–19  
 do\_max\_length 22–19  
 do\_out 22–18  
 do\_unshift 22–18  
 encoding 22–17  
 in 22–17  
 length 22–17  
 max\_length 22–17  
 out 22–17  
 unshift 22–17  
**codecvt\_byname** 22–19  
**collate** 22–30  
 compare 22–31  
 do\_compare 22–31  
 do\_hash 22–31  
 do\_transform 22–31  
 hash 22–31  
 transform 22–31  
**collate\_byname** 22–31  
**comma**  
 operator 5–27  
 operator, side effects and 5–27  
**comment** 2–3  
 /\* \*/ 2–4  
 // 2–4  
**compare**  
**basic\_string** 21–24

collate 22–31  
 comparison  
   function 17–1  
   pointer 5–23  
   pointer to function 5–23  
   undefined pointer 5–22/23  
   unspecified pointer 5–23  
   void\* pointer 5–23  
 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 9–4  
 <complex> 26–2  
 complex 26–3  
   abs 26–8  
   arg 26–8  
   complex 26–5  
   complex 26–5  
   conj 26–8  
   cos 26–8  
   cosh 26–8  
   exp 26–8  
   imag 26–8  
   log 26–8  
   log10 26–8  
   norm 26–8  
   operator!= 26–7  
   operator\* 26–7  
   operator\*= 26–6  
   operator+ 26–6  
   operator+= 26–6  
   operator- 26–6  
   operator-= 26–6  
   operator/= 26–6  
   operator<< 26–7  
   operator== 26–7  
   operator>> 26–7  
 polar 26–8  
 pow 26–8  
 real 26–8  
 sin 26–8  
 sinh 26–9  
 sqrt 26–9  
 tan 26–9  
 tanh 26–9  
 component 17–1  
 compound  
   statement 6–1  
   type 3–32  
*compound-statement* 6–1  
 concatenation  
   string 2–11  
   undefined string literal 2–11  
*condition* 6–2  
 conditional  
   expression operator 5–25  
   inclusion 16–2  
 conditional-expression, throw-expression in 5–25  
*conditions*, rules for 6–2  
 conj, complex 26–8  
 consistency  
   example, linkage 7–3  
   linkage 7–3  
   linkage specification 7–25  
   type declaration 3–21  
 const  
   cast 5–12  
   member initialization 12–14  
   \*const example 8–5  
   const 3–33  
   array 3–33  
   class object 3–33  
   constructor and 9–8, 12–1  
   destructor and 9–8, 12–7  
   example 8–5  
   extension to C C–1  
   initialization 7–7, 8–18  
   linkage of 3–19, 7–3  
   member function 9–7/8  
   object, undefined change to 7–7  
   overloading and 13–2  
   reference 8–22  
   type 7–6  
   constant 2–7, 5–2  
   enumeration 7–10  
   expression 5–27  
   expression, pointer to member 5–14  
   initializer 9–4  
   null pointer 4–4/5  
   pointer declaration 8–5  
   pointer example 8–5  
*constant-expression* 5–27  
*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 10–11  
   and array order of execution 12–11  
   and const 9–8, 12–1  
   and initialization 12–11  
   and initialization example 12–11  
   and member function 12–2  
   and new 5–17  
   and new, unspecified 5–18  
   and return 6–6  
   and static objects order of execution 12–12  
   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 8–15  
   example 12–2  
   exception handling 15–3  
   for temporary 12–3  
   inheritance of 12–2  
   non-trivial 12–2  
   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 5–18  
 container requirements 23–1  
 continue  
   in for statement 6–5  
   statement 6–5/6  
 control line —see preprocessing directive  
 convention 17–4  
 conversion  
   Boolean 4–5  
   ambiguity, class 10–6  
   anachronism, pointer to member C–13  
   and name hiding, user-defined 12–6

argument 8–9  
array pointer 4–2  
array-to-pointer 4–2  
by assignment 5–26  
by constructor 12–4  
class 12–4  
derived-to-base 13–14  
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, 12–4  
implicit user-defined 12–6  
inheritance of user-defined 12–6  
integer 4–4  
lvalue-to-rvalue 4–2  
operator 12–5  
overload resolution and 13–12  
overload resolution and pointer 13–19  
pointer 4–4  
pointer to function 4–2  
pointer to member 4–5  
pointer to member `void*` 4–5  
rank 13–14  
return type 6–6  
`reverse_iterator` 24–13  
sequence, implicit 13–13  
sequence, standard 4–1  
signed unsigned integer 4–4  
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 12–4/5  
virtual user-defined 12–6  
`conversion-function-id` 12–5  
conversions  
qualification 4–2  
usual arithmetic 5–2  
copy  
assignment operator 12–20  
assignment operator 12–19  
assignment operator, implicitly-declared 12–21  
assignment operator restriction 12–21  
class object 12–19  
constructor 12–2/3, 19, 17–7  
constructor, implicitly-declared 12–19  
constructor restriction 12–20  
copy 25–12  
`basic_string` 21–20  
`copy_backward` 25–13  
`CopyConstructible` requirements 20–2  
`copyfmt`, `basic_ios` 27–17  
cos 26–19, 31  
complex 26–8  
cosh 26–19, 31  
complex 26–8  
count 25–11  
`bitset` 23–45  
`count_if` 25–11  
cout 27–5  
`_cplusplus` 16–9  
`<csetjmp>` 17–10, 18–19  
`cshift`, `valarray` 26–17  
`<csignal>` 18–19  
`<cstdarg>` 8–10, 17–10, 18–19  
`<cstddef>` 5–15, 22, 18–1/C–16  
`<cstdio>` 27–5/6, 56, 58, 60, 27–64/C–16  
`<cstdlib>` 3–22, 24, 17–9, 18–9, 19, 20–20, 21–29,  
25–27, 26–30/C–16  
`c_str`, `basic_string` 21–20  
`<cstring>` 17–6, 20–20, 21–29/D–5, D–10/C–16  
`<ctime>` 18–19, 20–20, 22–2/C–16  
`ctor-initializer` 12–12  
`ctype` 22–10  
`do_is` 22–12  
`do_narrow` 22–13  
`do_scan_is` 22–12  
`do_scan_not` 22–12  
`do_tolower` 22–12  
`do_toupper` 22–12  
`do_widen` 22–12  
`is` 22–11  
`narrow` 22–11  
`scan_is` 22–11  
`scan_not` 22–11  
`tolower` 22–11  
`toupper` 22–11  
`widen` 22–11  
`ctype_byname` 22–13  
`ctype_byname<char>` 22–16  
`ctype<char>`  
`classic_table` 22–15  
`ctype<char>` 22–14  
`ctype<char>` 22–14  
`is` 22–14  
`narrow` 22–15  
`scan_is` 22–15  
`scan_not` 22–15  
`table` 22–15  
`tolower` 22–15  
`toupper` 22–15  
`widen` 22–15  
`~ctype<char>` 22–14  
`~ctype<char>, ctype<char>` 22–14  
`<ctype.h>` D–1  
cv-qualified name, address of 5–14  
cv-qualifier 3–33  
`cv-qualifier` 8–2  
`<cwchar>` 17–6, 11, 21–29/C–16  
`<cwctype>` 17–11, 21–28

## 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` 21–21  
`date_order, time_get` 22–33  
deallocation  
—see `delete`  
function 3–26, 5–19, 12–9  
dec 27–20, 44  
decimal literal 2–8  
`decimal-literal` 2–7  
decimal-point character 17–6  
`decimal_point`, `numpunct` 22–29  
declaration 3–1, 7–1  
`: field` 9–11  
access 11–4  
ambiguity, function 8–16

array 8–8  
 as definition 7–2  
`asm` 7–23  
 bit-field 9–11  
 class member 9–3  
 class name 3–1  
 class name, point of 9–3  
 consistency, type 3–21  
 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 8–21  
 forward 7–4  
 forward class 9–2  
 function 3–1, 8–9  
 hiding —see name hiding  
 in `for`, scope of 6–5  
 in `for` statement 6–5  
 in `switch` statement 6–3  
 matching, overloaded function 13–3  
 member 9–3  
 multiple 3–21  
 name 3–1  
 name, point of 3–5  
 overloaded 13–1  
 overloaded name and `friend` 11–6  
 parameter 8–9  
 parentheses in 8–3, 5  
 pointer 8–5  
 reference 8–6  
`register` 7–3  
 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 6–7  
`{ }`, class 9–1  
`{ }`, enum 7–10  
`declaration` 7–1  
`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 8–8  
 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, 15  
 operator, overloaded 13–22  
 deduction, template argument 14–36  
 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 13–20  
 argument, scope of 8–13  
 argument, type checking of 8–12  
 array size 8–8  
 behavior 17–1, 4  
 constructor 12–2  
 constructor and initialization 12–11  
 constructor and `new` 5–17  
 destructor 12–7  
 initialization 8–16  
 initializers, overloading and 13–3  
 member access, `struct` 9–1  
 member access, `union` 9–1  
 default label 6–1, 3  
 default-initialization 8–16  
`#define` 16–5  
 definition 3–1, 17–1  
 alternate 17–11  
 and initialization 7–2  
 class 3–2  
 class 9–1, 4  
 class name as type 9–2  
 constructor 8–15  
 declaration as 7–2  
 empty class 9–1  
 enumerator 3–2  
 enumerator point of 7–11  
 example 3–1  
 example, function 8–15  
 example, nested class 9–12, 11–10  
 function 3–2  
 function 8–14  
 local class 9–13  
 member function 9–5  
 name hiding, class 9–2  
 namespace 7–12  
 nested class 9–12  
 object 3–2  
 of template 14–1  
 pure virtual function 10–10  
 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 5–18  
 object 5–18  
`delete` 3–24, 5–18/19, 12–9  
 destructor and 5–19, 12–8  
 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 17–11, 18–11, 20–20  
 overloading and 3–26  
 type of 12–10  
 undefined 5–19  
`delete[ ]`, operator 17–11, 18–12  
 deleted object, undefined 3–26  
`delete-expression` 5–18

dependent name 14–20, 25  
 deprecated features 5–7, 15  
`<deque>` 23–9  
`deque` 23–11  
 assign 23–13  
 erase 23–14  
 insert 23–14  
 resize 23–14  
 dereferencing —see also indirection  
 derivation —see inheritance  
 derived  
 class 17–14  
 class 10–1  
 class cast 5–11  
 class example 10–1  
 class, most 1–4  
 class, overloading and 13–3  
 object, most 1–4  
 derived-to-base conversion 13–14  
 destination type 8–17  
 destruction  
 of `auto` 6–5/6  
 of `local static` 6–7  
 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` 5–19, 12–8  
 and `delete` example 12–10  
 and exception, explicit 12–9  
 and exit from scope 6–5  
 and fundamental type 12–9  
 and member function 12–8  
 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 12–8  
 call, pseudo 5–6  
 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 12–8  
 pure virtual 12–7  
 restriction 12–7/8  
`static object` 3–23  
 union 9–10  
 virtual 12–7  
 diagnostic message 1–2  
 difference from C expression evaluation C–1  
`digit` 2–6  
`digit-sequence` 2–10  
`digraph` 2–4  
 direct  
 base class 10–1  
 binding of reference 8–22  
`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` 5–16  
 distance 24–11  
 distinct string 2–11  
 div 26–30  
 divides 20–9  
 division  
 by zero, undefined 5–1, 21  
 implementation defined 5–21  
 operator 5–21  
`djacent_difference` 26–29  
`do` statement 6–3, 5  
`do_always_noconv, codecvt` 22–19  
`do_close, messages` 22–42  
`do_compare, collate` 22–31  
`do_curr_symbol, moneypunct` 22–40  
`do_date_order, time_get` 22–33  
`do_decimal_point`  
`moneypunct` 22–39  
`numpunct` 22–29  
`do_encoding, codecvt` 22–19  
`do_falsename, numpunct do_truename` 22–30  
`do_frac_digits, moneypunct` 22–40  
`do_get`  
`messages` 22–41/42  
`money_get` 22–37  
`num_get` 22–22  
`do_get_date, time_get` 22–34  
`do_get_monthname, time_get` 22–34  
`do_get_time, time_get` 22–33  
`do_get_weekday, time_get` 22–34  
`do_get_year, time_get` 22–34  
`do_grouping`  
`moneypunct` 22–40  
`numpunct` 22–29  
`do_hash, collate` 22–31  
`do_in, codecvt` 22–18  
`do_is, ctype` 22–12  
`do_length, codecvt` 22–19  
`domain_error` 19–2  
`domain_error` 19–2  
`domain_error` 19–2  
`do_max_length, codecvt` 22–19  
 dominance, virtual base class 10–5  
`do_narrow, ctype` 22–13  
`do_negative_sign, moneypunct` 22–40  
`do_neg_format, moneypunct` 22–40  
`do_open, messages` 22–41  
`do_out, codecvt` 22–18  
`do_pos_format, moneypunct` 22–40  
`do_positive_sign, moneypunct` 22–40  
`do_put`  
`money_put` 22–38  
`num_put` 22–25  
`time_put` 22–35  
`do_scan_is, ctype` 22–12  
`do_scan_not, ctype` 22–12  
 dot operator —see class member access operator  
`do_thousands_sep`  
`moneypunct` 22–39  
`numpunct` 22–29  
`do_tolower, ctype` 22–12  
`do_toupper, ctype` 22–12  
`do_transform, collate` 22–31  
`do_truename do_falsename, numpunct` 22–30  
 double quote 2–9  
 double  
 literal 2–10  
 type 3–32

type specifier 7–8  
`do_unshift, codecvt` 22–18  
`do_widen, ctype` 22–12  
 dynamic  
   binding —see virtual function  
   cast 5–8, 18–15  
   initialization 3–22  
   storage duration 3–24, 5–16  
   type 1–2

## E

`E` suffix 2–10  
`eback, basic_streambuf` 27–25  
`effect, side` 1–5  
`egptr, basic_streambuf` 27–25  
 elaborated  
   class name 7–9, 9–2/3  
   enum name 7–9  
   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 24–10  
   `basic_string` 21–16  
 encoding, multibyte 2–11  
 encoding, `codecvt` 22–17  
`end, basic_string` 21–15  
`#endif` 16–3  
`endl` 27–43, 46  
 end-of-file 23–46  
`ends` 27–46  
 entity 3–1  
 enum name, `typedef` 7–6  
`enum` 3–33  
   declaration {} 7–10  
   name, elaborated 7–9  
   overloading and 13–2  
   type of 7–10/11  
   type specifier 7–9  
 enumerated type 3–33, 17–5  
 enumeration 7–10  
   constant 7–10  
   example 7–11  
   linkage of 3–20  
   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 7–11  
   redefinition 7–11  
   restriction 7–11  
   value of 7–10  
`enumerator` 7–10  
 environment, program 3–22

`eof, basic_ios` 27–18  
`eos, char_traits` 21–21  
`eptr, basic_streambuf` 27–25  
`eq, char_traits` 21–21/23  
`equal` 25–11  
   `istreambuf_iterator` 24–24  
`equality operator` 5–24  
`EqualityComparable` requirements 20–1  
`equality-expression` 5–24  
`equal_range` 25–21  
`equal_to` 20–9  
 equivalence  
   template type 14–7  
   type 7–5, 9–2  
 equivalent  
   parameter declarations 13–2  
   parameter declarations, overloading and 13–2  
`erase`  
   `basic_string` 21–18  
   `deque` 23–14  
   `list` 23–18  
   `vector` 23–25  
`<errno.h>` D–1  
 error  
   checking, point of 14–17  
   directive 16–8  
`#error` 16–8  
 escape  
   character —see backslash  
   sequence 2–9  
   sequence, undefined 2–9  
`escape-sequence` 2–8  
 evaluation  
   difference from C expression C–1  
   new, unspecified order of 5–18  
   of default argument 8–12/13  
   of expression, order of 1–6  
   order of argument 5–6  
   unspecified order of 3–23, 5–1  
   unspecified order of argument 5–6  
   unspecified order of function call 5–6  
 example  
   `*const` 8–5  
   array 8–8  
   class definition 9–4  
   `const` 8–5  
   constant pointer 8–5  
   constructor 12–2  
   constructor and initialization 12–11  
   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 10–5  
   `friend` 9–2  
   `friend function` 11–5  
   function declaration 8–10  
   function definition 8–15  
   linkage consistency 7–3  
   local class 9–13  
   member function 9–7, 11–5  
   member name access 11–4  
   nested class 9–12  
   nested class definition 9–12, 11–10  
   nested class forward declaration 9–12  
   nested type name 9–13

of default argument 8–11/12  
 of incomplete type 3–30  
 of overloading 13–1  
 pointer to member 8–7  
 pure virtual function 10–10  
 scope of `delete` 12–10  
 scope resolution operator 10–5  
 static member 9–9  
 subscripting 8–8  
 type name 8–2  
`typedef` 7–5  
 unnamed parameter 8–15  
 variable parameter list 8–9  
 virtual function 10–8  
 exception  
     allowing an 15–7  
     and `new` 5–18  
     arithmetic 5–1  
     declaration scope 3–6  
     explicit destructor and 12–9  
     handler 15–4, 17–14  
     handler, incomplete type in 15–4  
     handling 15–1  
     handling constructor 15–3  
     handling destructor 15–3  
     specifications, C++ Standard library 17–14  
     specifications, Standard C library 17–14  
     specifications, implementation-defined 17–14  
     throwing 15–2  
     types, implementation-defined 17–14  
     undefined arithmetic 5–1  
`<exception>` 18–16  
 exception  
     exception 18–16  
     exception 18–16  
`operator=` 18–16  
     what 18–17  
`~exception` 18–17  
`~exception, exception` 18–17  
`exception-declaration` 15–1  
 exceptions, `basic_ios` 27–18  
`exception-specification` 15–5  
`exception::what` message, implementation-defined  
     18–17  
 execution character set, basic 1–4  
 exit from scope, destructor and 6–5  
 exit 3–22/23, 6–5, 17–9, 18–9, 14  
`exp` 26–19, 31  
`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 14–30  
     qualification 3–13  
     qualification example 10–5  
     specialization, template 14–31  
     type conversion —see casting  
`explicit specifier` 7–5  
`explicit-specialization` 14–31  
`exponent-part` 2–10  
 export 14–1  
 expression 5–1  
     ambiguity, declaration versus 6–7  
     assignment 5–26  
     constant 5–27  
     evaluation, difference from C C–1  
     order of evaluation of 1–6  
     parenthesized 5–3  
     pointer to member constant 5–14  
     postfix 5–4  
     primary 5–2  
     reference 5–1  
     statement 6–1  
     unary 5–13  
`expression` 5–27  
`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" 17–9, 11  
     "C++" 17–9, 11  
 declaration 3–1  
 linkage of 7–3  
 linkage specification 7–24  
 reference declaration 8–21  
 restriction 7–3  
 external linkage 3–19, 17–9/11

## F

`F` suffix 2–10  
`f` suffix 2–10  
`facet, locale` 22–6  
`fail, basic_ios` 27–18  
`failed, ostreambuf_iterator` 24–25  
`failure, ios_base::failure` 27–9  
`falsename, numpunct truename` 22–29  
`fclose` 27–58  
`field declaration :` 9–11  
`file` 2–1  
     scope 17–10  
     source 2–1, 17–9, 11  
`filebuf` 27–4, 56  
     implementation-defined 27–61  
`fill` 25–14  
     `basic_ios` 27–17  
     `gslice_array` 26–25  
     `indirect_array` 26–27  
     `mask_array` 26–26  
     `slice_array` 26–22  
`fill_n` 25–14  
`final overrider` 10–7  
`find` 25–10

**basic\_string** 21–21  
**find\_end** 25–10  
**find\_first\_not\_of, basic\_string** 21–23  
**find\_first\_of** 25–10  
  **basic\_string** 21–22  
**find\_if** 25–10  
**find\_last\_not\_of, basic\_string** 21–23  
**find\_last\_of, basic\_string** 21–22  
*floctal-digit* 2–7  
**fixed** 27–20  
**flags, ios\_base** 22–10, 27–12  
**flip, bitset** 23–44  
**float**  
  literal 2–10  
  type 3–32  
  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 2–10  
  point literal, type of 2–10  
  point promotion 4–4  
  point type 3–31  
  point type 3–32  
  point type, implementation-defined 3–32  
**floating-integral conversion** 4–4  
*floating-literal* 2–10  
*floating-suffix* 2–10  
**float\_round\_style** 18–7  
**floor** 26–31  
**flush** 27–12, 32, 42, 46  
  **basic\_ostream** 27–45  
**fmtflags**  
  **ios** 27–46  
  **ios\_base** 27–10  
**fopen** 27–58  
**for**  
  scope of declaration in 6–5  
  statement 6–3, 5  
  statement, continue in 6–5  
  statement, declaration in 6–5  
**for\_each** 25–9  
**form feed** 2–9  
**formal**  
  argument —see also parameter  
  argument —see parameter  
**forward**  
  class declaration 9–2  
  declaration 7–4  
  declaration example, nested class 9–12  
**forward\_iterator\_tag** 24–9/10  
**fpos** 27–7, 14/15  
  **fpos** 27–14  
  **fpos** 27–14  
  **state** 27–14  
*fractional-constant* 2–10  
**free**  
  store —see also **new, delete**  
  store and constructor anachronism C–12  
  store and destructor anachronism C–12  
**free** 20–20  
**freestanding implementation** 17–8  
**freeze**  
  **osrstream** D–10  
  **strstreambuf** D–6  
**frexp** 26–31  
**friend**  
  local class 11–7  
  specifier 17–14  
**friend**  
  access specifier and 11–7  
  class access and 11–6  
  declaration, overloaded name and 11–6  
  example 9–2  
  function, access and 11–5  
  function example 11–5  
  function, inline 11–7  
  function, linkage of 11–6  
  function, member function and 11–5  
  function, nested class 9–13  
  inheritance and 11–7  
  local class and 11–7  
  member function 11–6  
  specifier 7–6  
  template and 14–11  
  virtual and 10–8  
**front\_inserter** 24–17  
**front\_insert\_iterator** 24–16  
**front\_insert\_iterator** 24–17  
**front\_insert\_iterator** 24–17  
**operator\*** 24–17  
**operator++** 24–17  
**operator=** 24–17  
**fseek** 27–58  
**<fstream>** 27–55  
**fstream** 27–4  
**full-expression** 1–6  
**function**  
  —see also **friend** function, member function, inline  
    function, virtual function  
  allocation 3–25, 5–17, 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 5–6  
  call operator 5–4, 13–19  
  call operator, overloaded 13–21  
  call, recursive 5–6  
  call, undefined 5–11/12  
  cast, pointer to 5–11  
  cast, undefined pointer to 5–11  
  comparison 17–1  
  comparison, pointer to 5–23  
  conversion, pointer to 4–2  
  deallocation 3–26, 5–19, 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–12  
  definition anachronism, old style C–12  
  definition example 8–15  
  global 17–10, 13  
  handler 17–1  
  linkage specification overloaded 7–25  
  modifier 17–1  
  name hiding 13–3  
  name, overloaded 13–1  
  observer 17–2  
  operator 13–19  
  overloaded —see also overloading  
  parameter —see parameter  
  parameter adjustment 8–10  
  pointer to member 5–21

prototype scope 3–6  
 replacement 17–2  
 reserved 17–2  
 return—see *return*  
 return type—see *return type*  
 scope 3–6  
 specifier 7–4  
 template 14–34  
 template overload resolution 14–41  
 type 3–32, 8–9/10  
*typedef* 8–10  
 viable 13–5  
 virtual—see *virtual function*  
 virtual member 17–11, 13  
*<functional>* 20–7  
*function-body* 8–14  
*function-definition* 8–14  
 function-like macro 16–4  
 functions, candidate 14–26  
*function-specifier* 7–4  
 function-to-pointer conversion 4–2  
*function-try-block* 15–1  
 fundamental  
 type 3–31  
 type conversion—see *conversion, user-defined conversion*  
 type, destructor and 12–9

## G

*gbump*, *basic\_streambuf* 27–25  
*gcount*, *basic\_istream* 27–35  
*generate* 25–15  
*generated destructor*—see *default destructor*  
*generate\_n* 25–15  
*get*  
 auto\_ptr 20–19  
*basic\_istream* 27–35  
*money\_get* 22–37  
*num\_get* 22–21  
*get\_date*, *time\_get* 22–33  
*getline*  
*basic\_istream* 27–36/37  
*basic\_string* 21–27  
*getloc*  
*basic\_streambuf* 27–24  
*ios\_base* 27–13  
*get\_mounthname*, *time\_get* 22–33  
*get\_temporary\_buffer* 20–17  
*get\_time*, *time\_get* 22–33  
*get\_weekday*, *time\_get* 22–33  
*get\_year*, *time\_get* 22–33  
*global*  
 anonymous union 9–10  
 function 17–10, 13  
 name 3–7  
 namespace scope 3–7  
 scope 3–7  
*global*, *locale* 22–9  
*good*, *basic\_ios* 27–18  
*goto*  
 initialization and 6–6  
 statement 6–1, 5/6  
*gptr*, *basic\_streambuf* 27–25  
*grammar* A–1  
*greater*  
 than operator 5–23  
 than or equal to operator 5–23  
*greater* 20–10  
*greater\_equal* 20–10  
*grouping*, *numpunct* 22–29

*gslice*  
 class 26–22  
*gslice* 26–23  
*gslice* 26–23  
 size 26–23  
 start 26–23  
 stride 26–23  
*gslice\_array* 26–23/24  
 fill 26–25  
*gslice\_array* 26–24  
*gslice\_array* 26–24  
 operator% 26–24  
 operator& 26–24  
 operator\* 26–24  
 operator+= 26–24  
 operator-= 26–24  
 operator/= 26–24  
 operator<= 26–24  
 operator= 26–24  
 operator>= 26–24  
 operator^ 26–24  
 operator|= 26–24

## H

*handler*  
 exception 15–4, 17–14  
 function 17–1  
 incomplete type in exception 15–4  
*handler* 15–1  
*handler-seq* 15–1  
*hasfacet*, *locale* 22–9  
*hash*, *collate* 22–31  
*header*, C 17–9, 11, 17–13/D–1  
*header-name* 2–5  
*headers*, C++ 17–8  
 hex number 2–10  
 hex 27–20  
 hexadecimal literal 2–8  
*hexadecimal-digit* 2–7  
*hexadecimal-escape-sequence* 2–9  
*hexadecimal-literal* 2–7  
*hex-quad* 2–2  
 hiding—see *name hiding*  
 horizontal tab 2–9  
 hosted implementation 17–8

## I

*id*, qualified 5–3  
*id*, *locale* 22–7  
*identifier* 2–6, 5–3, 7–1  
 \_, underscore in 2–6  
*identifier* 2–5  
 identities and overloading, operator 13–20  
*id-expression* 5–3  
*id-expression* 5–3  
*#if* 16–2, 17–13  
*if* statement 6–2/3  
*#ifdef* 16–3  
*#ifndef* 16–3  
*ifstream* 27–4, 56  
*ignore*, *basic\_istream* 27–37  
 ill-formed program 1–3  
*imag* 26–6  
 complex 26–8  
*imbue*  
*basic\_filebuf* 27–61  
*basic\_ios* 27–17  
*basic\_streambuf* 27–26

ios\_base 27–13  
 implementation  
   defined alignment of bit-field 9–11  
   defined bit-field allocation 9–11  
   defined division 5–21  
   defined modulus 5–21  
   defined pointer integer conversion 5–11  
   defined pointer subtraction 5–22  
   defined right shift 5–23  
   defined sizeof expression 5–15  
   defined type of ptrdiff\_t 5–22  
   defined type of size\_t 5–15  
 freestanding 17–8  
 hosted 17–8  
 limits 1–3  
 implementation-defined 4–4, 8–22, 17–8, 11, 18–1, 10, 13,  
   15/17, 27–13, 52, 27–60/C–16  
 \_\_STDC\_\_ 16–9  
 alignment requirement 3–30  
 asm 7–23  
 bad\_alloc::what 18–13  
 bad\_cast::what 18–15  
 bad\_exception::what 18–17  
 bad\_typeid::what 18–16  
 basic\_ios::failure argument 27–18  
 behavior 1–3  
 behavior reentrancy 17–14  
 exception specifications 17–14  
 exception types 17–14  
   exception::what message 18–17  
 extension to C C–11  
 filebuf 27–61  
 floating point conversion 4–4  
 floating point type 3–32  
 generation of temporary 12–2  
 linkage of main() 3–22  
 linkage specification 7–24  
 object linkage 7–26  
 order of evaluation of function arguments 8–13  
 parameters to main() 3–21  
 sign of bit-field 9–11  
 sign of char 3–31  
 sizeof integral type 3–31  
 sizeof type 3–31  
 streambuf 27–2  
 streamoff 27–7/D–2  
 streampos D–2  
 string literal 2–11  
 type of integer literal 2–8  
 type\_info::name 18–15  
 value of char literal 2–10  
 value of multicharacter literal 2–9  
 volatile 7–8  
 wchar\_t 3–32  
 implementation-dependent 27–32, 42  
 implementation-generated definitions 3–2  
 implementation-specified smanip 27–46  
 implementation-defined types 17–5  
 implicit  
   conversion 4–1, 12–4  
   conversion sequence 13–13  
   conversion sequences implied object parameter 13–5  
   destructor call 12–8  
   instantiation, template 14–27  
   object argument 13–5  
   user-defined conversion 12–6  
 implicitly-declared  
   copy assignment operator 12–21  
   copy constructor 12–19  
   default constructor 12–2  
   default constructor —see default constructor  
   implied  
     object parameter 13–5  
     object parameter, implicit conversion sequences 13–5  
 in, codecvt 22–17  
 in\_avail, basic\_streambuf 27–24  
 #include 16–3, 17–9  
 includes 25–22  
 inclusion  
   conditional 16–2  
   source file 16–3  
 incomplete  
   class, cast to 5–20  
   type 3–2/3, 5, 30, 4–2, 5–4/6, 8/9, 14/15, 19, 21, 26, 10–1  
   type, example of 3–30  
   type in exception handler 15–4  
 increment  
   bool 5–7, 15  
   operator 5–7, 13, 15  
   operator, overloaded 13–22  
 indeterminate uninitialized variable 8–16  
 indirect base class 10–1  
 indirect\_array 26–26  
   fill 26–27  
   indirect\_array 26–27  
   indirect\_array 26–27  
   operator% 26–27  
   operator& 26–27  
   operator\* 26–27  
   operator+= 26–27  
   operator-= 26–27  
   operator/= 26–27  
   operator<= 26–27  
   operator= 26–27  
   operator>= 26–27  
   operator^= 26–27  
   operator|= 26–27  
 indirection 5–14  
   operator 5–13  
 inequality operator 5–24  
 inheritance 10–1  
   —see also multiple inheritance  
 and friend 11–7  
 of constructor 12–2  
 of overloaded operator 13–20  
 of user-defined conversion 12–6  
 Init, ios\_base::Init 27–12  
 init, basic\_ios 27–32, 42  
 ~Init, ios\_base::Init 27–12  
 init-declarator 8–1  
 init-declarator-list 8–1  
 initialization 8–15  
   and goto 6–6  
   and new 5–17  
   array 8–18  
   array of class objects 8–20, 12–12  
   auto 6–7  
   auto object 8–15  
   automatic 6–6/7  
   base class 12–12/13  
   character array 8–20  
   class member 8–16  
   class object 8–18, 12–11  
   class object —see also constructor  
   const 7–7, 8–18  
   const member 12–14  
   constructor and 12–11  
   default 8–16  
   default constructor and 12–11  
   definition and 7–2  
   dynamic 3–22  
   example, constructor and 12–11

extension to C memberwise C-2  
 in block 6-6  
 jump past 6-3, 6  
 local static 6-7  
 member 12-12  
 member object 12-13  
 order of 3-22, 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 8-7, 21  
 reference member 12-14  
 run-time 3-22  
 static member 9-9  
 static object 3-22, 8-15/16  
 struct 8-18  
 union 8-20, 9-10  
 virtual base class 12-14, 20  
 initializer 8-15  
 base class 8-15  
 constant 9-4  
 list {} 8-18  
 member 8-15  
 scope of member 12-15  
 temporary and declarator 12-3  
*initializer* 8-15  
*initializer-clause* 8-15  
*initializer-list* 8-15  
 inline 17-13  
   friend function 11-7  
   function 7-4  
   function, extension to C C-1  
   member function 9-5  
 inline  
   linkage of 3-19  
   specifier 7-4  
 inner\_product 26-28  
 inplace\_merge 25-21  
 input\_iterator\_tag 24-9/10  
 insert  
   basic\_string 21-17  
   deque 23-14  
   list 23-18  
   vector 23-25  
 inserter 24-18  
 insert\_iterator 24-17  
 insert\_iterator 24-18  
 insert\_iterator 24-18  
 operator\* 24-18  
 operator++ 24-18  
 operator= 24-18  
 instantiation  
   explicit 14-30  
   point of 14-25  
   template implicit 14-27  
   unit 2-2  
 int, bool promotion to 4-3  
 int  
   type 3-31  
   type specifier 7-8  
   type, unsigned 3-32  
 integer  
   cast, pointer to 5-11  
   conversion 4-4  
   conversion, implementation defined pointer 5-11  
   conversion, signed unsigned 4-4  
   literal 2-8  
   literal, base of 2-8  
   literal, implementation-defined type of 2-8  
   literal, type of 2-8  
   to pointer cast 5-11  
   type 3-32  
*integer-literal* 2-7  
*integer-suffix* 2-8  
 integral  
   promotion 4-3  
   type 3-31  
   type 3-32  
   type, implementation-defined sizeof 3-31  
   value, undefined unrepresentable 4-4  
 internal linkage 3-19  
 internal 27-20  
 interpretation  
   of binary operator 13-20  
   of unary operator 13-20  
 invalid\_argument 19-2, 23-42/43  
   invalid\_argument 19-2  
   invalid\_argument 19-2  
 invocation, macro 16-5  
 <iomanip> 27-29  
 <ios> 27-6  
 ios 27-4, 7  
   fmtflags 27-46  
 ios\_base 27-7  
   flags 22-10, 27-12  
   fmtflags 27-10  
   getloc 27-13  
   imbuf 27-13  
   ios\_base 27-14  
   ios\_base 27-14  
   iostate 27-10  
   iword 27-13  
   openmode 27-11  
   precision 22-10, 27-12  
   pword 27-13  
   register\_callback 27-14  
   seekdir 27-11  
   setf 27-12  
   sync\_with\_stdio 27-13  
   unsetf 27-12  
   width 22-10, 27-13  
 xalloc 27-13  
 ios\_base::failure 27-9  
   failure 27-9  
   what 27-9  
 ios\_base::Init 27-11  
   Init 27-12  
   ~Init 27-12  
 <iosfwd> 27-2  
 iostate, ios\_base 27-10  
 <iostream> 27-5  
 is  
   ctype 22-11  
   ctype<char> 22-14  
 isalnum 22-9  
 isalpha 22-9  
 iscntrl 22-9  
 isdigit 22-9  
 isgraph 22-9  
 islower 22-9  
 ISO C summary, compatibility with C-2  
 <iso646.h> D-1/C-15  
 is\_open  
   basic\_filebuf 27-57, 64  
   basic\_ifstream 27-62  
   basic\_ofstream 27-63  
 isprint 22-9  
 ispunct 22-9  
 isspace 22-9  
 <iostream> 27-29

istream 27–4, 29  
 operator>> 27–33  
 istreambuf\_iterator 24–21  
 equal 24–24  
 istreambuf\_iterator 24–23  
 istreambuf\_iterator 24–23  
 operator!= 24–24  
 operator\* 24–23  
 operator++ 24–23  
 operator== 24–24  
 proxy 24–22  
 istream\_iterator 24–19  
 operator== 24–20  
 istringstream 27–4, 48  
 istrstream D–9  
 istrstream D–9  
 istrstream D–9  
 rdbuf D–9  
 str D–9  
 isupper 22–9  
 isxdigit 22–9  
 iteration statement 6–3  
*iteration-statement* 6–3, 6  
 scope 6–4  
 iterator requirements 24–1  
*<iterator>* 24–6  
 iter\_swap 25–13  
 iword, ios\_base 27–13

## 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 2–6

## L

L  
 prefix 2–9, 11  
 suffix 2–8, 10  
 l suffix 2–8, 10  
 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 3–31  
 left  
 shift operator 5–22  
 shift, undefined 5–22  
 left 27–20  
 length of name 2–6  
 length  
 char\_traits 21–13/14, 16/19, 21/23, 25/26

codecvt 22–17  
 valarray 26–16  
 length\_error 19–2, 21–9  
 length\_error 19–2  
 length\_error 19–2  
 less  
 than operator 5–23  
 than or equal to operator 5–23  
 less 20–10  
 less\_equal 20–10  
 LessThanComparable requirements 20–2  
 lexical conventions 2–1  
 lexicographical\_compare 25–26  
 library  
 C++ Standard 17–1, 11/12, 14  
 Standard C 17–1, 6, 17–8/C–13, C–15  
 limits, implementation 1–3  
*<limits>* 18–2  
*<limits.h>* D–1  
#line 16–8  
linkage 3–1, 19  
consistency 7–3  
consistency example 7–3  
external 3–19, 17–9/11  
implementation-defined object 7–26  
internal 3–19  
of class 3–20  
of const 3–19, 7–3  
of enumeration 3–20  
of extern 7–3  
of friend function 11–6  
of inline 3–19  
of main(), implementation-defined 3–22  
of static 3–19, 7–3  
specification 7–24  
specification class 7–24  
specification consistency 7–25  
specification, extern 7–24  
specification, implementation-defined 7–24  
specification object 7–26  
specification overloaded function 7–25  
to C 7–24  
*linkage-specification* 7–24  
list  
keyword 2–6  
operator 2–7, 13–19  
{}, initializer 8–18  
*<list>* 23–9  
list 23–15  
assign 23–17  
erase 23–18  
insert 23–18  
merge 23–19  
remove 23–18  
resize 23–17  
reverse 23–19  
sort 23–19  
splice 23–18  
unique 23–19  
literal 2–7, 5–2  
base of integer 2–8  
character 2–9  
decimal 2–8  
double 2–10  
float 2–10  
floating point 2–10  
hexadecimal 2–8  
implementation-defined type of integer 2–8  
implementation-defined value of char 2–10  
implementation-defined value of multicharacter 2–9  
integer 2–8

long 2–8  
 long double 2–10  
 multicharacter 2–9  
 narrow-character 2–9  
 octal 2–8  
 type of character 2–9  
 type of floating point 2–10  
 type of integer 2–8  
 unsigned 2–8  
*literal* 2–7  
 local  
     class and friend 11–7  
     class definition 9–13  
     class example 9–13  
     class, friend 11–7  
     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 3–24  
     object storage duration 3–24  
     scope 3–6  
     static, destruction of 6–7  
     static initialization 6–7  
     variable, destruction of 6–5/6  
`<locale>` 22–1  
 locale  
     category 22–4  
     classic 22–9  
     facet 22–6  
     global 22–9  
     hasfacet 22–9  
     id 22–7  
     locale() 22–7  
     name 22–8  
     operator!= 22–8  
     operator() 22–8  
     operator== 22–8  
     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, 31  
     complex 26–8  
 log10 26–19, 31  
     complex 26–8  
 logical  
     AND operator 5–25  
     AND operator, side effects and 5–25  
     OR operator 5–25  
     OR operator, side effects and 5–25  
     negation operator 5–13/14  
 logical\_and 20–10  
 logical\_not 20–10  
 logical\_or 20–10  
 logic\_error 19–1  
     logic\_error 19–2  
     logic\_error 19–2  
 long  
     double literal 2–10  
     double type 3–32  
     literal 2–8  
     type 3–31  
     type specifier 7–8  
     type, unsigned 3–32  
     typedef and 7–2  
 longjmp 18–20  
*long-suffix* 2–8  
 look up, name 3–8  
 lookup  
     argument-dependent 3–12  
     member name 10–4  
     name 3–1  
     template name 14–16  
 lower\_bound 25–20  
 lowercase 17–6  
 lvalue 3–34  
     assignment and 5–26  
     cast 5–10/11  
     cast, reinterpret\_cast, 5–11  
     cast, static\_cast, 5–10  
     conversion to rvalue 4–2  
     modifiable 3–34  
     lvalue-to-rvalue conversion 4–2

## M

macro  
     definition scope 16–6  
     function-like 16–4  
     invocation 16–5  
     masking 17–13  
     name 16–5  
     object-like 16–4  
     parameters 16–5  
     preprocessor 16–1  
     replacement 16–4  
 main() 3–21  
     implementation-defined linkage of 3–22  
     implementation-defined parameters to 3–21  
     parameters to 3–22  
     return from 3–22/23  
 make\_heap 25–25  
 make\_pair 20–6  
 malloc 20–20/C–16  
 management anachronism, memory C–12  
`<map>` 23–28  
 map 23–29  
     operator< 23–32  
     operator== 23–32  
     operator[] 23–32  
 mask\_array 26–25  
     fill 26–26  
 mask\_array 26–25  
 mask\_array 26–25  
     operator% 26–26  
     operator& 26–26  
     operator\*= 26–26  
     operator+= 26–26  
     operator-= 26–26  
     operator/= 26–26  
     operator<= 26–26  
     operator= 26–25  
     operator>= 26–26  
     operator^= 26–26  
     operator|= 26–26  
     masking macro 17–13  
`<math.h>` D–1  
 max 25–25  
     valarray 26–16  
 max\_element 25–25  
 max\_length, codecvt 22–17  
 max\_size, basic\_string 21–15  
 meaning of declarator 8–4  
 member  
     —see also base class member  
 access operator, overloaded 13–22

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 5–11/12  
 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* 9–7/8  
 function, constructor and 12–2  
 function definition 9–5  
 function, destructor and 12–8  
 function example 9–7, 11–5  
 function, *friend* 11–6  
 function in local class 9–6  
 function, *inline* 9–5  
 function, local class 9–13  
 function, nested class 11–10  
 function, overload resolution and 13–5  
 function, *static* 9–8/9  
 function template 14–8  
 function, *union* 9–10  
 function, *virtual* 17–11, 13  
 function, *volatile* 9–7  
 initialization 12–12  
 initialization, *const* 12–14  
 initialization, order of 12–14  
 initialization, reference 12–14  
 initialization, *static* 9–9  
 initializer 8–15  
 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  
 pointer to —see pointer to member  
 pointer value, null 4–5  
 static 9–8  
 static class 3–24  
 storage duration, class 3–26  
 template and *static* 14–9  
 type of *static* 5–14  
 use, *static* 9–8  
*member-declaration* 9–3  
*member-declarator* 9–3  
*member-specification* 9–3  
 memberwise  
     assignment, extension to C 2–2  
     initialization, extension to C 2–2  
 memchr 21–30  
 memcpy 22–15  
 mem\_fun 20–13  
 mem\_fun1 20–13  
 mem\_fun1\_ref 20–14  
 mem\_fun1\_ref\_t 20–14  
 mem\_fun1\_t 20–13  
 mem\_fun\_ref 20–14  
 mem\_fun\_ref\_t 20–13  
 memory  
     management —see also new, delete  
     management anachronism C–12  
 model 1–4  
 <memory> 20–14  
 merge 25–21  
     list 23–19  
 message, diagnostic 1–2  
 messages 22–41  
     close 22–41  
     do\_close 22–42  
     do\_get 22–41/42  
     do\_open 22–41  
     open 22–41  
 messages\_byname 22–42  
 min 25–25  
     valarray 26–16  
 min\_element 25–25  
 minus 20–9  
 mismatch 25–11  
 missing storage class specifier 7–3  
 mixed pointer and pointer to member type, multi-level 4–3  
 mod 26–31  
 modf 26–31  
 modifiable lvalue 3–34  
 modifier function 17–1  
 modulus  
     implementation defined 5–21  
     operator 5–21  
     zero, undefined 5–1  
 modulus 20–9  
 money\_get 22–36  
     do\_get 22–37  
     get 22–37  
 moneypunct 22–38  
     do\_curr\_symbol 22–40  
     do\_decimal\_point 22–39  
     do\_frac\_digits 22–40  
     do\_grouping 22–40  
     do\_neg\_format 22–40  
     do\_negative\_sign 22–40  
     do\_pos\_format 22–40  
     do\_positive\_sign 22–40  
     do\_thousands\_sep 22–39  
 moneypunct\_byname 22–40  
 money\_put 22–37  
     do\_put 22–38  
     put 22–38  
 most  
     derived class 1–4  
     derived object 1–4  
 multibyte  
     character 1–3  
     encoding 2–11  
     string, null-terminated 17–6  
 multicharacter  
     literal 2–9  
     literal, implementation-defined value of 2–9  
 multidimensional  
     array 8–9  
     array declarator 8–8  
 multi-level  
     mixed pointer and pointer to member type 4–3  
     pointer to member type 4–3  
 multimap 23–33  
     operator< 23–35  
     operator== 23–35

multiple  
 declaration 3–21  
 inheritance 10–1/2  
 inheritance DAG 10–3  
 inheritance, extension to C C–2  
 inheritance, virtual and 10–8  
 multiplication operator 5–21  
 multiplicative operator 5–21  
*multiplicative-expression* 5–21  
**multiset** 23–38  
*operator<* 23–40  
*operator==* 23–40  
**mutable** 7–3

## N

**name** 2–6, 3–1, 5–3  
 address of cv-qualified 5–14  
 and translation unit 3–1  
 class —see class name  
 declaration 3–1  
 dependent 14–20, 25  
 elaborated enum 7–9  
 global 3–7  
 hiding 3–5, 8, 5–2/3, 6–6  
 hiding, class definition 9–2  
 hiding, function 13–3  
 hiding, overloading versus 13–3  
 hiding, user-defined conversion and 12–6  
 length of 2–6  
 look up 3–8  
 lookup 3–1  
 lookup, member 10–4  
 lookup, template 14–16  
 macro 16–5  
 overloaded function 13–1  
 overloaded member 9–4  
 point of declaration 3–5  
 qualified 3–13  
 reserved 17–10  
 resolution, template 14–16  
 scope of 3–4  
 space, label 6–1  
 unqualified 3–9  
**name**  
*locale* 22–8  
*type\_info* 18–15  
**namespace** 17–7, 17–10/D–1  
 definition 7–12  
 scope 3–6  
 scope, anonymous union at 9–10  
 scope, global 3–7  
*std* 17–10  
**namespaces** 7–12  
 narrow string literal 2–11  
**narrow**  
*basic\_ios* 27–17  
*ctype* 22–11  
*ctype<char>* 22–15  
 narrow-character literal 2–9  
**NDEBUG** 17–9  
**negate** 20–9  
 negation operator, logical 5–13/14  
**nested**  
 class anachronism, scope of C–13  
 class definition 9–12  
 class definition example 9–12, 11–10  
 class example 9–12  
 class forward declaration example 9–12  
 class *friend* function 9–13

class, local class 9–13  
 class member function 11–10  
 class, scope of 9–12  
 type name 9–13  
 type name example 9–13  
 type name, scope of 9–13  
*nested-name-specifier* 5–3  
*<new>* 17–11, 18–10  
**new** 3–24, 5–15/16, 12–9  
 array 5–16  
 array of class objects and 5–17  
 constructor and 5–17  
 default constructor and 5–17  
 exception and 5–18  
 extension to C C–1  
 extension to C overloading C–2  
 initialization and 5–17  
*operator* 17–11, 18–10/13, 20–20  
 placement syntax 5–17  
 scoping and 5–16  
 storage allocation 5–15  
 type of 12–9  
 unspecified constructor and 5–18  
 unspecified order of evaluation 5–18  
**new[ ]**, *operator* 17–11, 18–12/13  
*new-declarator* 5–16  
*new-expression* 5–15  
*new\_handler* 3–25, 17–11, 18–13  
*new-initializer* 5–16  
 new-line 2–9  
 new-placement 5–15  
*new-type-id* 5–15  
*next\_permutation* 25–26  
*noboolalpha* 27–19  
*nondigit* 2–5  
*none, bitset* 23–45  
 nonnested class anachronism C–13  
**non-trivial**  
 constructor 12–2  
 destructor 12–7  
 nonvirtual base class DAG 10–3  
*nonzero-digit* 2–7  
*norm, complex* 26–8  
*noshowbase* 27–19  
*noshowpoint* 27–19  
*noshowpos* 27–19  
*noskipws* 27–19  
*not1* 20–11  
*not2* 20–11  
 notation, syntax 1–3  
*not\_equal\_to* 20–9  
*nounitbuf* 27–20  
*nouppercase* 27–20  
*NTBS* 17–6, 27–58/D–10  
 static 17–6  
*nth\_element* 25–19  
*NTMBS* 17–6  
 static 17–6  
*NTWCS* 17–6/7  
 static 17–7  
**null**  
 character 0 2–11  
 directive 16–9  
 member pointer value 4–5  
 pointer constant 4–4/5  
 pointer value 4–4  
 reference 8–7  
 statement 6–1  
**NULL** 18–1  
 null-terminated  
 byte string 17–6

multibyte string 17–6  
 wide-character string 17–6  
 number  
 hex 2–10  
 octal 2–10  
 numeric type requirements 26–1  
`<numericc>` 26–27  
`numeric_limits` 3–32, 18–2  
`num_get` 22–20  
`do_get` 22–22  
`get` 22–21  
`num_punct` 22–28  
`decimal_point` 22–29  
`do_decimal_point` 22–29  
`do_grouping` 22–29  
`do_thousands_sep` 22–29  
`do_truename` `do_falsename` 22–30  
`grouping` 22–29  
`thousands_sep` 22–29  
`truename` `falsename` 22–29  
`num_punct_byname` 22–30  
`num_put` 22–24  
`do_put` 22–25  
`put` 22–25

## O

object 1–4, 3–1, 34  
 class —see also class object  
 complete 1–4  
 definition 3–2  
 delete 5–18  
 destructor and placement of 12–8  
 destructor `static` 3–23  
 initialization, `auto` 8–15  
 initialization, `static` 3–22, 8–15/16  
 layout, access specifier and 11–3  
 lifetime 3–26  
 linkage, implementation-defined 7–26  
 linkage specification 7–26  
 representation 3–30  
 state 17–2  
`static local` 3–24  
 storage duration, local 3–24  
 temporary —see temporary  
 type 1–4  
 type 3–31  
 type, completely defined 9–4  
 undefined deleted 3–26  
 unnamed 12–2  
 object-expression 5–1  
 object-like macro 16–4  
 observer function 17–2  
`oct` 27–20  
 octal  
 literal 2–8  
 number 2–10  
`octal-escape-sequence` 2–9  
`octal-literal` 2–7  
 of  
 overloading, example 13–1  
 reference, direct binding 8–22  
`offsetof` 18–2/C–16  
`ofstream` 27–4, 56  
 old  
 style base class initializer anachronism C–12  
 style function definition anachronism C–12  
 one-definition rule 3–2  
 one’s complement operator 5–13/14  
 open

`basic_filebuf` 27–57, 64  
`basic_ifstream` 27–62  
`basic_ofstream` 27–63  
 messages 22–41  
`openmode`, `ios_base` 27–11  
 operations on class object 9–1  
 operator  
`%=` 5–26  
`&=` 5–26  
`*=` 5–26  
`+=` 5–15, 26  
`-=` 5–26  
`/=` 5–26  
`<<=` 5–26  
`>>=` 5–26  
`^=` 5–26  
 additive 5–21  
 address-of 5–13  
 assignment 5–26, 17–7  
 bitwise 5–24  
 bitwise AND 5–24  
 bitwise exclusive OR 5–24  
 bitwise inclusive OR 5–25  
 cast 5–13, 19, 8–2  
 class member access 5–6  
 comma 5–27  
 conditional expression 5–25  
 conversion 12–5  
 copy assignment 12–19  
 decrement 5–7, 13, 15  
 division 5–21  
 equality 5–24  
 example, scope resolution 10–5  
 function call 5–4, 13–19  
 function call 13–20  
 greater than 5–23  
 greater than or equal to 5–23  
 identities and overloading 13–20  
 increment 5–7, 13, 15  
 indirection 5–13  
 inequality 5–24  
 left shift —see left shift operator  
 less than 5–23  
 less than or equal to 5–23  
 list 2–7, 13–19  
 logical AND 5–25  
 logical OR 5–25  
 logical negation 5–13/14  
 modulus 5–21  
 multiplication 5–21  
 multiplicative 5–21  
 new —see new  
 one’s complement 5–13/14  
 overloaded 5–1  
 overloading —see also overloaded operator  
 overloading restrictions 13–20  
 pointer to member 5–20  
 precedence of 1–6  
 relational 5–23  
 right shift; right shift operator 5–22  
 scope resolution 5–2/3, 9–6, 10–1, 10  
 shift —see left shift operator, right shift operator  
 side effects and comma 5–27  
 side effects and logical AND 5–25  
 side effects and logical OR 5–25  
`sizeof` 5–13, 15  
 subscripting 5–4, 13–19  
 unary 5–13/14  
 unary minus 5–13/14  
 unary plus 5–13/14  
 use, scope resolution 9–9

```

|= 5-26
operator
bool, basic_ios 27-18
bool( ), basic_istream 27-33
bool( ), basic_ostream 27-42
delete 17-11, 18-11, 20-20
delete 5-19, 12-9
delete—see delete
delete[] 17-11, 18-12
delete[] 5-19, 12-9
function 13-19
new 17-11, 18-10/13, 20-20
new 5-17, 12-9
new[ ] 17-11, 18-12/13
new[ ] 5-17, 12-9
overloaded 13-19
operator!
basic_ios 27-18
valarray 26-15
operator!= 20-5
basic_string 21-25
bitset 23-45
complex 26-7
istreambuf_iterator 24-24
locale 22-8
reverse_iterator 24-14
type_info 18-14
valarray 26-18
operator%, valarray 26-17
operator%=
gslice_array 26-24
indirect_array 26-27
mask_array 26-26
slice_array 26-21
valarray 26-15
operator&
bitset 23-45
valarray 26-17
operator&&, valarray 26-17/18
operator&=
bitset 23-43
gslice_array 26-24
indirect_array 26-27
mask_array 26-26
slice_array 26-21
valarray 26-15
operator(), locale 22-8
operator*
auto_ptr 20-19
back_insert_iterator 24-16
complex 26-7
front_insert_iterator 24-17
insert_iterator 24-18
istreambuf_iterator 24-23
ostreambuf_iterator 24-25
reverse_iterator 24-13
valarray 26-17
operator*=
complex 26-6
gslice_array 26-24
indirect_array 26-27
mask_array 26-26
slice_array 26-21
valarray 26-15
operator+
basic_string 21-24
complex 26-6
reverse_iterator 24-13, 15
valarray 26-15, 17
operator++
back_insert_iterator 24-16
front_insert_iterator 24-17
insert_iterator 24-18
istreambuf_iterator 24-23
ostreambuf_iterator 24-25
reverse_iterator 24-13
operator+=
basic_string 21-16
complex 26-6
gslice_array 26-24
indirect_array 26-27
mask_array 26-26
reverse_iterator 24-13
slice_array 26-21
valarray 26-15
operator-
complex 26-6
reverse_iterator 24-14/15
valarray 26-15, 17
operator--, reverse_iterator 24-13
operator-=
complex 26-6
gslice_array 26-24
indirect_array 26-27
mask_array 26-26
reverse_iterator 24-14
slice_array 26-21
valarray 26-15
operator->
auto_ptr 20-19
reverse_iterator 24-13
operator/, valarray 26-17
operator/=*
complex 26-6
gslice_array 26-24
indirect_array 26-27
mask_array 26-26
slice_array 26-21
valarray 26-15
operator<
basic_string 21-26
map 23-32
multimap 23-35
multiset 23-40
pair 20-6
queue 23-20
reverse_iterator 24-14
set 23-38
valarray 26-18
vector 23-24
vector<bool> 23-27
operator<< 27-20
basic_ostream 27-43
basic_string 21-27
bitset 23-45/46
complex 26-7
valarray 26-17
operator<<=
bitset 23-43
gslice_array 26-24
indirect_array 26-27
mask_array 26-26
slice_array 26-21
valarray 26-15
operator<= 20-6
basic_string 21-26
reverse_iterator 24-15
valarray 26-18
operator=
auto_ptr 20-19
back_insert_iterator 24-16
bad_alloc 18-13

```

bad\_cast 18–15  
 bad\_exception 18–17  
 bad\_typeid 18–16  
 basic\_string 21–14  
 exception 18–16  
 front\_insert\_iterator 24–17  
 gslice\_array 26–24  
 indirect\_array 26–27  
 insert\_iterator 24–18  
 mask\_array 26–25  
 ostreambuf\_iterator 24–25  
 slice\_array 26–21  
 type\_info 18–15  
 valarray 26–14  
 operator==  
   basic\_string 21–25  
   bitset 23–45  
   complex 26–7  
   istream\_iterator 24–20  
   istreambuf\_iterator 24–24  
   locale 22–8  
   map 23–32  
   multimap 23–35  
   multiset 23–40  
   pair 20–6  
   queue 23–20  
   reverse\_iterator 24–14  
   set 23–38  
   type\_info 18–14  
   valarray 26–18  
   vector 23–24  
   vector<bool> 23–27  
 operator> 20–5  
   basic\_string 21–26  
   reverse\_iterator 24–14  
   valarray 26–18  
 operator>= 20–6  
   basic\_string 21–27  
   reverse\_iterator 24–14  
   valarray 26–18  
 operator>>  
   basic\_istream 27–34  
   basic\_string 21–27  
   bitset 23–45  
   complex 26–7  
   istream 27–33  
   valarray 26–17  
 operator>>=  
   bitset 23–44  
   gslice\_array 26–24  
   indirect\_array 26–27  
   mask\_array 26–26  
   slice\_array 26–21  
   valarray 26–15  
 operator[]  
   basic\_string 21–16  
   map 23–32  
   reverse\_iterator 24–14  
   valarray 26–14/15  
 operator^  
   bitset 23–45  
   valarray 26–17  
 operator^=  
   bitset 23–43  
   gslice\_array 26–24  
   indirect\_array 26–27  
   mask\_array 26–26  
   slice\_array 26–21  
   valarray 26–15  
 operator|  
   bitset 23–45  
   valarray 26–17  
 operator|=  
   bitset 23–43  
   gslice\_array 26–24  
   indirect\_array 26–27  
   mask\_array 26–26  
   slice\_array 26–21  
   valarray 26–15  
 operator||, valarray 26–17/18  
 operator~  
   bitset 23–44  
   valarray 26–15  
 operator 13–19  
 operator-function-id 13–19  
 optimization of temporary —see elimination of temporary  
 OR  
   operator, bitwise exclusive 5–24  
   operator, bitwise inclusive 5–25  
   operator, logical 5–25  
   operator, side effects and logical 5–25  
 order  
   of argument evaluation 5–6  
   of argument evaluation, unspecified 5–6  
   of base class initialization 12–14  
   of destruction of temporary 12–3  
   of evaluation new, unspecified 5–18  
   of evaluation of expression 1–6  
   of evaluation of function arguments, implementation-defined  
     8–13  
   of evaluation, unspecified 3–23, 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 12–12  
   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 5–6  
   of initialization 3–22, 10–2  
   of member initialization 12–14  
   of virtual base class initialization 12–14  
 <ostream> 27–29  
 ostream 27–4, 29  
 ostreambuf\_iterator 24–24  
   failed 24–25  
   operator\* 24–25  
   operator++ 24–25  
   operator= 24–25  
   ostreambuf\_iterator 24–24  
   ostreambuf\_iterator 24–24  
 ostream\_iterator 24–20  
 ostringstream 27–4, 48  
 ostrstream D–10  
   :pcount D–10  
   freeze D–10  
   ostrstream D–10  
   ostrstream D–10  
   rdbuf D–10  
   str D–10  
   out, codecvt 22–17  
   out\_of\_range 19–3, 21–9, 23–42/45  
     out\_of\_range 19–3  
     out\_of\_range 19–3  
   output\_iterator\_tag 24–9/10  
   overflow 5–1  
     undefined 5–1  
   overflow  
     basic\_filebuf 27–59  
     basic\_streambuf 27–28  
     basic\_stringbuf 27–50

**strstreambuf** D-6  
**overflow\_error** 19-3/4, 23-42, 44  
**overflow\_error** 19-4  
**overflow\_error** 19-4  
**overload**  
  resolution 13-4  
  resolution and conversion 13-12  
  resolution and default argument 13-11  
  resolution and ellipsis 13-11  
  resolution and member function 13-5  
  resolution and pointer conversion 13-19  
  resolution contexts 13-4  
  resolution, function template 14-41  
  resolution, template 14-16  
**overload keyword** anachronism C-11  
**overloaded**  
  assignment and initialization 12-12  
  assignment operator 13-21  
  binary operator 13-20  
  declaration 13-1  
  decrement operator 13-22  
  function, address of 5-14, 13-18  
  function ambiguity detection 13-4  
  function call operator 13-21  
  function call resolution — see also argument matching,  
    overload resolution  
  function declaration matching 13-3  
  function, linkage specification 7-25  
  function name 13-1  
  increment operator 13-22  
  member access operator 13-22  
  member name 9-4  
  name and friend declaration 11-6  
  operator 13-19  
  operator 5-1  
  operator 13-19  
  operator and default argument 13-20  
  operator, inheritance of 13-20  
  subscripting operator 13-21  
  unary operator 13-20  
**overloading** 8-10, 9-2, 13-1, 14-15  
  and access 13-4  
  and **const** 13-2  
  and default initializers 13-3  
  and **delete** 3-26  
  and derived class 13-3  
  and **enum** 13-2  
  and equivalent parameter declarations 13-2  
  and pointer versus array 13-2  
  and return type 13-1  
  and scope 13-3  
  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 13-20  
  postfix **++** and **--** 13-22  
  prefix **++** and **--** 13-22  
  resolution and access control 10-5  
  restriction 13-20  
  subsequence rule 13-16  
  versus name hiding 13-3  
**overrider, final** 10-7

## P

**pair** 20-6  
**operator<** 20-6

**operator==** 20-6  
**parameter** 1-3, 8-15  
  adjustment, array 8-10  
  adjustment, function 8-10  
  declaration 8-9  
  example, unnamed 8-15  
  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** 8-10  
**parameter-declaration** 8-9  
**parameterized type** —see template  
**parameters**  
  macro 16-5  
  to **main()** 3-22  
  to **main()**, implementation-defined 3-21  
**parentheses**  
  and ambiguity 5-16  
  in declaration 8-3, 5  
**parenthesized expression** 5-3  
**partial specializations, class template** 14-12  
**partial\_sort** 25-19  
**partial\_sort\_copy** 25-19  
**partial\_sum** 26-29  
**partition** 25-17  
**pbackfail**  
  **basic\_filebuf** 27-59  
  **basic\_streambuf** 27-28  
  **basic\_stringbuf** 27-50  
  **strstreambuf** D-7  
**pbase, basic\_streambuf** 27-25  
**pump, basic\_streambuf** 27-25  
**:pcount, ostrstream** D-10  
**pcount**  
  **strstream** D-12  
  **strstreambuf** D-6  
**peek, basic\_istream** 27-37  
**period** 17-6  
**phases, translation** 2-1  
**placement**  
  of object, destructor and 12-8  
  syntax, new 5-17  
**plus** 20-9  
**pm-expression** 5-20  
**POD**  
  class type 5-17  
  type 3-31  
  type 5-17  
**POD-struct** 9-1  
**point**  
  of declaration class name 9-3  
  of declaration, enumerator 3-5  
  of declaration name 3-5  
  of definition, enumerator 7-11  
  of error checking 14-17  
  of instantiation 14-25  
  promotion, floating 4-4  
  type, floating 3-31  
**pointer**  
  —see also **void\***  
  and pointer to member type, multi-level mixed 4-3  
**arithmetic** 5-22  
  cast, integer to 5-11  
  comparison 5-23  
  comparison, undefined 5-22/23  
  comparison, unspecified 5-23  
  comparison, **void\*** 5-23  
  constant, null 4-4/5

conversion 4–4  
 conversion, array 4–2  
 conversion, overload resolution and 13–19  
 declaration 8–5  
 declarator \* 8–5  
 example, constant 8–5  
 integer conversion, implementation defined 5–11  
 subtraction, implementation defined 5–22  
 terminology 3–33  
 to abstract class 10–10  
 to bit-field restriction 9–11  
 to function cast 5–11  
 to function cast, undefined 5–11  
 to function comparison 5–23  
 to function conversion 4–2  
 to integer cast 5–11  
 to member 3–33, 5–20  
 to member anachronism, cast of C–13  
 to member cast 5–11/12  
 to member constant expression 5–14  
 to member conversion 4–5  
 to member conversion anachronism C–13  
 to member declarator : : \* 8–7  
 to member example 8–7  
 to member, extension to C C–2  
 to member function 5–21  
 to member function, undefined bound C–13  
 to member operator 5–20  
 to member type, multi-level 4–3  
 to member type, multi-level mixed pointer and 4–3  
 to member void\* conversion 4–5  
 type 3–33  
 type extension to C, void\* C–1  
 value, null 4–4  
 value, null member 4–5  
 versus array, overloading and 13–2  
 zero 4–4  
*pointer\_to\_binary\_function* 20–12  
*pointer\_to\_unary\_function* 20–12  
 polar, complex 26–8  
 polymorphic  
   class 10–6  
   type 10–6  
*pop\_priority\_queue* 23–21  
*pop\_heap* 25–24  
 postfix  
   ++ and -- 5–7  
   ++ and --, overloading 13–22  
   expression 5–4  
 potential scope 3–4  
*pow* 26–19, 31  
   complex 26–8  
*pp-number* 2–5  
*ptr, basic\_streambuf* 27–25  
 pragma directive 16–8  
*#pragma* 16–8  
 precedence of operator 1–6  
*precision, ios\_base* 22–10, 27–12  
 prefix  
   ++ and -- 5–15  
   ++ and --, overloading 13–22  
   L 2–9, 11  
 preprocessing 16–1  
   directive 16–1  
*processing-op-or-punc* 2–7  
*processing-token* 2–3  
 preprocessor, macro 16–1  
*prev\_permutation* 25–26  
 primary  
   expression 5–2  
   template 14–12  
*priority\_queue* 23–20  
*pop* 23–21  
*priority\_queue* 23–21  
*priority\_queue* 23–21  
*push* 23–21  
*private* 11–1  
   base class 11–3  
*program* 3–19  
   environment 3–22  
   ill-formed 1–3  
   start 3–21/22  
   startup 17–9, 11  
   termination 3–22/23  
   termination and destructor 12–8  
   well-formed 1–3  
*promotion*  
   floating point 4–4  
   integral 4–3  
   to int, bool 4–3  
*protected* 11–1  
   extension to C C–2  
*protection* 17–14  
   —see access control  
*proxy, istreambuf\_iterator* 24–22  
 pseudo destructor call 5–6  
 pseudo-destructor-name 5–6  
*pseudo-destructor-name* 5–4  
*ptrdiff\_t* 5–22  
   implementation defined type of 5–22  
*ptr\_fun* 20–12/13  
*ptr-operator* 8–1  
*pubimbue, basic\_streambuf* 27–24  
*public* 11–1  
   base class 11–3  
*pubseekoff, basic\_streambuf* 27–24  
*pubseekpos, basic\_streambuf* 27–24  
*pubsetbuf, basic\_streambuf* 27–24  
*pubsync, basic\_streambuf* 27–24  
 punctuators 2–7  
*pure*  
   specifier 9–3  
   virtual destructor 12–7  
   virtual function 10–10/11  
   virtual function call, undefined 10–11  
   virtual function definition 10–10  
   virtual function example 10–10  
*pure-specifier* 9–3  
*push, priority\_queue* 23–21  
*push\_heap* 25–24  
*put*  
   *basic\_ostream* 27–45  
   *money\_put* 22–38  
   *num\_put* 22–25  
   *time\_put* 22–35  
*putback, basic\_istream* 27–38  
*pword, ios\_base* 27–13

## Q

qualification  
   conversions 4–2  
   explicit 3–13  
 qualified  
   id 5–3  
   name 3–13  
*qualified-id* 5–3  
 question mark 2–9  
*<queue>* 23–9  
*queue* 23–19  
   operator< 23–20

`operator==` 23–20  
`quote`  
`double` 2–9  
`single` 2–9

## R

`random_access_iterator_tag` 24–9/10  
`random_shuffle` 25–17  
`range_error` 19–3  
`range_error` 19–3  
`range_error` 19–3  
`rank, conversion` 13–14  
`rbegin, basic_string` 21–15  
`rdbuf`  
`basic_filebuf` 27–64  
`basic_ifstream` 27–62  
`basic_ios` 27–17  
`basic_istringstream` 27–53  
`basic_ofstream` 27–63  
`basic_ostringstream` 27–54  
`basic_stringstream` 27–55  
`istrstream` D–9  
`ostrstream` D–10  
`strstream` D–11  
`rdstate, basic_ios` 27–18  
`read, basic_istream` 27–37  
`readsome, basic_istream` 27–38  
`real` 26–6  
`complex` 26–8  
`realloc` 20–20  
`recursive function call` 5–6  
`redefinition`  
`enumerator` 7–11  
`typedef` 7–5  
`reentrancy` 17–14  
`implementation-defined behavior` 17–14  
`reference` 3–33  
`and argument passing` 8–21  
`and return` 8–21  
`argument` 5–5  
`assignment` 8–21  
`assignment to` 5–26  
`binding` 8–21  
`call by` 5–5  
`cast` 5–10, 12  
`cast, reinterpret_cast`, 5–12  
`cast, static_cast`, 5–10  
`const` 8–22  
`declaration` 8–6  
`declaration, extern` 8–21  
`declarator &` 8–6  
`direct binding of` 8–22  
`expression` 5–1  
`initialization` 8–7, 21  
`member initialization` 12–14  
`null` 8–7  
`parameter` 8–6  
`restriction` 8–7  
`sizeof` 5–15  
`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  
`register_callback, ios_base` 27–14  
`reinterpret_cast` 5–11  
`reinterpret_cast`

`lvalue cast` 5–11  
`reference cast` 5–12  
`relational operator` 5–23  
`relational-expression` 5–23  
`release, auto_ptr` 20–19  
`remainder operator` —see modulus operator  
`remove` 25–15  
`list` 23–18  
`remove_copy` 25–15  
`remove_copy_if` 25–15  
`remove_if` 25–15  
`rend, basic_string` 21–15  
`replace` 25–14  
`basic_string` 21–19  
`replace_copy` 25–14  
`replace_copy_if` 25–14  
`replace_if` 25–14  
`replacement`  
`function` 17–2  
`macro` 16–4  
`representation`  
`object` 3–30  
`value` 3–30  
`required behavior` 17–2, 4  
`requirements` 17–3  
`Allocator` 20–2  
`Assignable` 23–1  
`CopyConstructible` 20–2  
`EqualityComparable` 20–1  
`LessThanComparable` 20–2  
`container` 23–1  
`iterator` 24–1  
`numeric type` 26–1  
`reraise` 15–3  
`rescanning and replacement` 16–6  
`reserve`  
`basic_string` 21–15  
`vector` 23–25  
`reserved`  
`function` 17–2  
`identifier` 2–6  
`name` 17–10  
`word` —see keyword  
`reset, bitset` 23–44  
`resetiosflags` 27–46  
`resize`  
`basic_string` 21–15  
`deque` 23–14  
`list` 23–17  
`valarray` 26–17  
`vector` 23–25  
`resolution`  
`and conversion, overload` 13–12  
`and default argument, overload` 13–11  
`and ellipsis, overload` 13–11  
`and member function, overload` 13–5  
`and pointer conversion, overload` 13–19  
`argument matching` —see overload  
`function template overload` 14–41  
`overload` 13–4  
`overloaded function call resolution` —see also argument  
`matching, overload`  
`overloading` —see overload resolution  
`resolution overloading` —see overload  
`scoping ambiguity` 10–5  
`template name` 14–16  
`template overload` 14–16  
`restriction` 17–12/14  
`address of bit-field` 9–11  
`anonymous union` 9–10  
`auto` 7–3

bit-field 9–11  
 constructor 12–1/2  
 copy assignment operator 12–21  
 copy constructor 12–20  
 destructor 12–7/8  
 enumerator 7–11  
 extern 7–3  
 local class 9–13  
 overloading 13–20  
 pointer to bit-field 9–11  
 reference 8–7  
 register 7–3  
 static 7–3  
 static member local class 9–10  
 union 9–10, 12–2  
 restrictions, operator overloading 13–20  
 rethrow 15–3  
 return  
     type 8–10  
     type conversion 6–6  
     type, overloading and 13–1  
 return 6–5/6  
     constructor and 6–6  
     from `main()` 3–22/23  
     reference and 8–21  
     statement—see also return  
 reverse 25–16  
     list 23–19  
 reverse\_copy 25–16  
 reverse\_iterator 24–11  
     conversion 24–13  
     operator!= 24–14  
     operator\* 24–13  
     operator+ 24–13, 15  
     operator++ 24–13  
     operator+= 24–13  
     operator- 24–14/15  
     operator-- 24–13  
     operator-= 24–14  
     operator-> 24–13  
     operator< 24–14  
     operator<= 24–15  
     operator== 24–14  
     operator> 24–14  
     operator>= 24–14  
     operator[] 24–14  
     reverse\_iterator 24–12  
     reverse\_iterator 24–12  
 rfind, `basic_string` 21–21  
 right  
     shift, implementation defined 5–23  
     shift operator 5–22  
 right 27–20  
 rotate 25–16  
 rotate\_copy 25–17  
 rounding 4–4  
 rule  
     as-if 1–5  
     one-definition 3–2  
 rules  
     for *conditions* 6–2  
     summary, scope 3–8  
 run-time initialization 3–22  
 runtime\_error 19–3  
     runtime\_error 19–3  
     runtime\_error 19–3  
 rvalue 3–34  
     lvalue conversion to 4–2

## S

sbufpc, `basic_streambuf` 27–24  
 scalar type 3–31  
 scan\_is  
     ctype 22–11  
     ctype<char> 22–15  
 scan\_not  
     ctype 22–11  
     ctype<char> 22–15  
 s-char 2–11  
 s-char-sequence 2–10  
 scientific 27–20  
 scope 3–1, 4  
     anonymous union at namespace 9–10  
 class 3–7  
     destructor and exit from 6–5  
     exception declaration 3–6  
     file 17–10  
     function 3–6  
     function prototype 3–6  
     global 3–7  
     global namespace 3–7  
     iteration-statement 6–4  
     local 3–6  
     macro definition 16–6  
     namespace 3–6  
     of class definition 9–2  
     of class name 9–2  
     of declaration in `for` 6–5  
     of default argument 8–13  
     of delete example 12–10  
     of enumerator class 7–11  
     of label 3–6, 6–1  
     of local class 9–13  
     of member initializer 12–15  
     of name 3–4  
     of nested class 9–12  
     of nested class anachronism C–13  
     of nested type name 9–13  
     of parameter 3–6  
     overloading and 13–3  
     potential 3–4  
     resolution operator 5–2/3, 9–6, 10–1, 10  
     resolution operator `::` 3–13  
     resolution operator example 10–5  
     resolution operator use 9–9  
     rules summary 3–8  
     selection-statement 6–2  
 scoping  
     ambiguity resolution 10–5  
     and new 5–16  
 search 25–12  
 seekdir, `ios_base` 27–11  
 seekg, `basic_istream` 27–38  
 seekoff  
     `basic_filebuf` 27–60  
     `basic_streambuf` 27–26  
     `basic_stringbuf` 27–50  
     `strstreambuf` D–7  
 seekp, `basic_ostream` 27–42  
 seekpos  
     `basic_filebuf` 27–60  
     `basic_streambuf` 27–26  
     `basic_stringbuf` 27–51  
     `strstreambuf` D–8  
 selection statement 6–2  
 selection-statement 6–2  
     scope 6–2  
 semantics, class member 5–6  
 sentry

**basic\_istream** 27–32  
**basic\_ostream** 27–42  
**~sentry**  
**basic\_istream** 27–33  
**basic\_ostream** 27–42  
**separate**  
 compilation 2–1  
 translation 2–1  
**sequence**  
 implicit conversion 13–13  
 point 1–5, 5–1  
 standard conversion 4–1  
 statement 6–1  
**sequencing operator** —see comma operator  
**set, basic source character** 2–2  
**<set>** 23–28  
**set** 23–36  
 bitset 23–44  
 operator< 23–38  
 operator== 23–38  
**setbase** 27–47  
**setbuf**  
 basic\_filebuf 27–60  
 basic\_streambuf 27–26  
 streambuf D–9  
 strstreambuf D–9  
**set\_difference** 25–23  
**setf, ios\_base** 27–12  
**setfill** 27–47  
**setg, basic\_streambuf** 27–25  
**set\_intersection** 25–23  
**setiosflags** 27–46  
**setjmp** 17–10  
**<setjmp.h>** D–1  
**setlocale** 17–6  
**set\_new\_handler** 17–12, 18–14  
**setp, basic\_streambuf** 27–25  
**setprecision** 27–47  
**setstate, basic\_ios** 27–18  
**set\_symmetric\_difference** 25–23  
**set\_terminate** 17–12, 18–18  
**set\_unexpected** 17–12, 18–18  
**set\_union** 25–22  
**setw** 27–47  
**sgetc, basic\_streambuf** 27–24  
**sgetn, basic\_streambuf** 27–24  
**shift operator** —see left shift operator, right shift operator  
**shift, valarray** 26–16  
**shift-expression** 5–22  
**short**  
 type 3–31  
 type specifier 7–8  
 type, unsigned 3–32  
 typedef and 7–2  
**showbase** 27–19  
**showmany**  
 basic\_filebuf 27–59  
 basic\_streambuf 27–26, 59  
**showpoint** 27–19  
**showpos** 27–19  
**side**  
 effect 1–5  
 effects 5–1  
 effects and comma operator 5–27  
 effects and logical AND operator 5–25  
 effects and logical OR operator 5–25  
**sign**  
 of bit-field, implementation-defined 9–11  
 of char, implementation-defined 3–31  
**sign** 2–10  
**<signal.h>** D–1  
**signature** 1–3  
**signed**  
 char type 3–31  
 character 3–31  
 typedef and 7–2  
 unsigned integer conversion 4–4  
**simple-escape-sequence** 2–9  
**simple-type-specifier** 7–8  
**sin** 26–19, 31  
 complex 26–8  
**single**  
 precision arithmetic, extension to C C–1  
 quote 2–9  
**sinh** 26–19, 31  
 complex 26–9  
**size**  
 basic\_string 21–15  
 bitset 23–45  
 gslice 26–23  
 slice 26–20  
**sizeof**  
 array 5–15  
 class object 5–15  
 empty class 9–1  
 expression, implementation defined 5–15  
 integral type, implementation-defined 3–31  
 operator 5–13, 15  
 reference 5–15  
 string 2–11  
 type, implementation-defined 3–31  
**size\_t** 5–15  
 implementation defined type of 5–15  
**skipws** 27–19  
**slice** 26–19  
 size 26–20  
 slice 26–20  
 slice 26–20  
 start 26–20  
 stride 26–20  
**slice\_array** 26–20  
 fill 26–22  
 operator% 26–21  
 operator&= 26–21  
 operator\*= 26–21  
 operator+= 26–21  
 operator-= 26–21  
 operator/= 26–21  
 operator<<= 26–21  
 operator= 26–21  
 operator>>= 26–21  
 operator^= 26–21  
 operator|= 26–21  
 slice\_array 26–21  
 slice\_array 26–21  
 smanip, implementation-specified 27–46  
**snextc, basic\_streambuf** 27–24  
**sort** 25–18  
 list 23–19  
**sort\_heap** 25–25  
**source**  
 character set, basic 2–2  
 file 2–1, 17–9, 11  
 file inclusion 16–3  
 space, white 2–3  
**special member function** —see also constructor, destructor,  
 inline function, user-defined conversion, virtual function  
**specialization**  
 class template 14–5  
 template 14–27  
 template explicit 14–31  
**specializations, class template partial** 14–12

specification, template argument 14–35  
 specifications  
   C++ Standard library exception 17–14  
   Standard C library exception 17–14  
   implementation-defined exception 17–14  
 specifier  
   access —see access specifier  
   auto 7–3  
   declaration 7–2  
   explicit 7–5  
   friend 7–6  
   friend 17–14  
   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 23–18  
 sputbackc, basic\_streampbuf 27–25  
 sputc, basic\_streampbuf 27–25  
 sputn, basic\_streampbuf 27–25  
 sqrt 26–19, 31  
   complex 26–9  
<sstream> 27–48  
stable\_partition 25–17  
stable\_sort 25–19  
stack unwinding 15–4  
<stack> 23–10  
stack 23–22  
Standard  
  C library 17–1, 6, 17–8/C–13, C–15  
  C library exception specifications 17–14  
  library, C++ 17–1, 11/12, 14  
standard  
  conversion 4–1  
  conversion sequence 4–1  
start, program 3–21/22  
start  
  gslice 26–23  
  slice 26–20  
startup, program 17–9, 11  
state, object 17–2  
state, fpos 27–14  
statement 6–1  
  —see also return, return  
break 6–5/6  
compound 6–1  
continue 6–5/6  
continue in for 6–5  
declaration 6–6  
declaration in for 6–5  
declaration in switch 6–3  
do 6–3, 5  
empty 6–1  
expression 6–1  
extension to C declaration C–1  
for 6–3, 5  
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, 6  
while 6–3/4  
{} , block 6–1

*statement* 6–1  
static  
  NTBS 17–6  
  NTMBS 17–6  
  NTWCS 17–7  
  cast 5–10  
  type 1–3  
static 7–3  
  class member 3–24  
  data member 9–8  
  destruction of local 6–7  
  initialization, local 6–7  
  linkage of 3–19, 7–3  
  local object 3–24  
  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 14–9  
  member, type of 5–14  
  member use 9–8  
  object, destructor 3–23  
  object initialization 3–22, 8–15/16  
  objects order of execution, constructor and 12–12  
  overloading and 13–1  
  restriction 7–3  
  specifier 7–3  
static\_cast  
  conversion to enumeration type 5–10  
  lvalue cast 5–10  
  reference cast 5–10  
std, namespace 17–10  
<stdarg.h> D–1  
\_\_STDC\_\_ 16–9  
  implementation-defined 16–9  
<stddef.h> 2–9, 2–11/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 3–24  
  duration, auto 3–24  
  duration, class member 3–26  
  duration, dynamic 3–24, 5–16  
  duration, local object 3–24  
  management —see new, delete  
  of array 8–9  
str  
  basic\_istringstream 27–53  
  basic\_ostringstream 27–54  
  basic\_streampbuf 27–49  
  basic\_stringstream 27–55  
  istrstream D–9  
  ostrstream D–10  
  strstream D–12  
  strstreambuf D–6  
strchr 21–30  
<streampbuf> 27–21  
streampbuf 27–4, 21  
  implementation-defined 27–2  
setbuf D–9  
streamoff 27–15/D–2  
  implementation-defined 27–7/D–2

**streampos**, implementation-defined D–2  
**streamsize** 27–7  
**strftime** 22–35  
**stride**  
  `gslice` 26–23  
  `slice` 26–20  
**string**  
  concatenation 2–11  
  distinct 2–11  
  literal 2–11  
  literal concatenation, undefined 2–11  
  literal, implementation-defined 2–11  
  literal, narrow 2–11  
  literal, type of 2–11  
  literal, undefined change to 2–11  
  literal, wide 2–11  
  null-terminated byte 17–6  
  null-terminated multibyte 17–6  
  null-terminated wide-character 17–6  
  `sizeof` 2–11  
  terminator 0 2–11  
  type of 2–11  
*<string>* 21–6  
**stringbuf** 27–4, 48  
*<string.h>* D–1  
*string-literal* 2–10  
**stringstream** 27–4  
**strlen** D–5, 10  
**strpbrk** 21–30  
**strrchr** 21–30  
**strstr** 21–30  
**strstream** D–11  
  `pcount` D–12  
  `rdbuf` D–11  
  `str` D–12  
  `strstream` D–11  
  `strstream` D–11  
  `~strstream` D–11  
  `~strstream, strstream` D–11  
**strstreambuf** D–3  
  freeze D–6  
  overflow D–6  
  `pbackfail` D–7  
  `pcount` D–6  
  `seekoff` D–7  
  `seekpos` D–8  
  `setbuf` D–9  
  `str` D–6  
  `strstreambuf` D–5  
  `strstreambuf` D–5  
  underflow D–7  
  `~strstreambuf` D–6  
  `~strstreambuf, strstreambuf` D–6  
**struct**  
  class versus 9–1  
  default member access 9–1  
  initialization 8–18  
  type specifier 9–1  
**structure** 9–1  
  tag —see class name  
**sub-object** 1–4  
  lattice —see DAG  
**subscripting**  
  example 8–8  
  explanation 8–8  
  operator 5–4, 13–19  
  operator, overloaded 13–21  
**subsequence rule, overloading** 13–16  
**substr, basic\_string** 21–23  
**subtraction**  
  implementation defined pointer 5–22

  operator 5–21  
  suffix  
    E 2–10  
    F 2–10  
    L 2–8, 10  
    U 2–8  
    f 2–10  
    l 2–8, 10  
    u 2–8  
**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** 27–25  
**swap** 25–13  
  `basic_string` 21–20, 27  
**swap\_ranges** 25–13  
**switch**  
  statement 6–2/3, 6  
  statement, declaration in 6–3  
**sync**  
  `basic_filebuf` 27–61  
  `basic_istream` 27–38  
  `basic_streambuf` 27–26  
**sync\_with\_stdio, ios\_base** 27–13  
**synonym** 7–15  
  type name as 7–5  
**syntax**  
  checking 14–17  
  class member 5–6  
  notation 1–3  
  summary A–1

## T

**table, ctype<char>** 22–15  
**tan** 26–19, 31  
  complex 26–9  
**tanh** 26–19, 31  
  complex 26–9  
**tellg, basic\_istream** 27–38  
**tellp, basic\_ostream** 27–42  
**template** 14–1  
  and < 14–4  
  and friend 14–11  
  and static member 14–9  
  argument 14–5  
  argument deduction 14–36  
  argument specification 14–35  
  class 23–42  
  definition of 14–1  
  explicit specialization 14–31  
  function 14–34  
  implicit instantiation 14–27  
  member function 14–8  
  name lookup 14–16  
  name resolution 14–16  
  overload resolution 14–16  
  overload resolution, function 14–41  
  partial specializations, class 14–12  
  primary 14–12  
  specialization 14–27  
  specialization, class 14–5  
  type equivalence 14–7  
**template** 14–1  
*template-argument* 14–4  
*template-argument-list* 14–4  
*template-declaration* 14–1

*template-id* 14–3  
*template-name* 14–3  
*template-parameter* 14–2  
*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* 3–23, 15–8, 18–9, 18  
*terminate()* 15–8  
*terminate\_handler* 17–11, 18–18  
*termination*  
 and destructor, program 12–8  
 program 3–22/23  
*terminator* 0, string 2–11  
*terminology*, pointer 3–33  
*test*, *bitset* 23–45  
*this* 5–2  
 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* 22–29  
*throw* 15–1  
*throw-expression* in conditional-expression 5–25  
*throw-expression* 15–1  
*throwing*, exception 15–2  
*tie*, *basic\_ios* 27–17  
*time\_get* 22–32  
*date\_order* 22–33  
*do\_date\_order* 22–33  
*do\_get\_date* 22–34  
*do\_get\_monthname* 22–34  
*do\_get\_time* 22–33  
*do\_get\_weekday* 22–34  
*do\_get\_year* 22–34  
*get\_date* 22–33  
*get\_monthname* 22–33  
*get\_time* 22–33  
*get\_weekday* 22–33  
*get\_year* 22–33  
*time\_get\_byname* 22–34  
<time.h> D–1  
*time\_put* 22–35  
*do\_put* 22–35  
*put* 22–35  
*time\_put\_byname* 22–35  
*times* 20–9  
 to  
 int, bool promotion 4–3  
 rvalue, lvalue conversion 4–2  
*token* 2–4, 7  
*token* 2–4  
*tolower* 22–10  
*ctype* 22–11  
*ctype<char>* 22–15  
*to\_string*, *bitset* 23–44  
*to\_ulong*, *bitset* 23–44  
*toupper* 22–10  
*ctype* 22–11  
*ctype<char>* 22–15  
*transform* 25–13  
*collate* 22–31  
*translation*  
 phases 2–1  
 separate 2–1  
 unit 17–9/10  
 unit 2–1, 3–19  
 unit, name and 3–1  
*trigraph* 2–1/2  
*trueename*, *falsename*, *numpunct* 22–29  
*truncation* 4–4  
*try* 15–1  
*try-block* 15–1  
*type* 3–1  
 Boolean 3–31  
 POD 3–31  
*ambiguity*, declaration 7–2  
*arithmetic* 3–32  
*array* 3–32, 8–10  
*bitmask* 17–5  
*char* 3–31  
*character* 3–31  
*checking*, argument 5–5  
*checking*, extension to C C–1  
*checking* of default argument 8–12  
*class* and 9–1  
*completely defined object* 9–4  
*compound* 3–32  
*const* 7–6  
*conversion*, explicit —see *casting*  
*declaration* 8–4  
*declaration consistency* 3–21  
*declaration*, *typedef* as 7–5  
*definition*, class name as 9–2  
*destination* 8–17  
*double* 3–32  
*dynamic* 1–2  
*enumerated* 3–33, 17–5  
*enumeration underlying* 7–11  
*equivalence* 7–5, 9–2  
*equivalence*, template 14–7  
*example of incomplete* 3–30  
*extension to C reference* C–1  
*extension to C user-defined* C–1  
*float* 3–32  
*floating point* 3–31  
*function* 3–32, 8–9/10  
*fundamental* 3–31  
*generator* —see *template*  
*implementation-defined* *sizeof* 3–31  
*incomplete* 3–2/3, 5, 30, 4–2, 5–4/6, 8/9, 14/15, 19, 21, 26,  
 10–1  
*int* 3–31  
*integral* 3–31  
*long* 3–31  
*long double* 3–32  
*multi-level mixed pointer and pointer to member* 4–3  
*multi-level pointer to member* 4–3  
*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  
*object* 1–4  
*of bit-field* 9–11  
*of character literal* 2–9  
*of constructor* 12–2  
*of conversion* 12–5  
*of delete* 12–10  
*of enum* 7–10/11  
*of floating point literal* 2–10  
*of integer literal* 2–8  
*of integer literal, implementation-defined* 2–8  
*of new* 12–9  
*of ptrdiff\_t, implementation defined* 5–22

of `size_t`, implementation defined 5–15  
 of static member 5–14  
 of string 2–11  
 of string literal 2–11  
 of `this` 9–7  
 pointer 3–33  
 polymorphic 10–6  
 pun 5–12  
 requirements, numeric 26–1  
 short 3–31  
 signed char 3–31  
 specifier, char 7–8  
 specifier, class 9–1  
 specifier, double 7–8  
 specifier, enum 7–9  
 specifier, float 7–8  
 specifier, int 7–8  
 specifier, long 7–8  
 specifier, short 7–8  
 specifier, struct 9–1  
 specifier, union 9–1  
 specifier, unsigned 7–8  
 specifier, void 7–8  
 specifier, volatile 7–8  
 static 1–3  
 unsigned 3–32  
 unsigned char 3–31/32  
 unsigned int 3–32  
 unsigned long 3–32  
 unsigned short 3–32  
 void 3–32  
 void\* 3–33  
 volatile 7–6  
`wchar_t` 3–32  
`wchar_t` underlying 3–32  
 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>` 18–14  
`type_info` 5–9, 18–14  
 before 18–14  
 name 18–15  
 operator!= 18–14  
 operator= 18–15  
 operator== 18–14  
`type_info` 18–15  
`type_info` 18–15  
`type_info`::name, implementation-defined 18–15  
`typename` 7–9  
*type-parameter* 14–2  
 types  
   implementation-defined exception 17–14  
   implementation-defined 17–5  
 type-specifier  
   `bool` 7–8  
   `wchart` 7–8

*type-specifier* 7–6

**U**

U suffix 2–8  
 u suffix 2–8  
 uflow  
   `basic_filebuf` 27–59  
   `basic_streambuf` 27–27  
 unary  
   expression 5–13  
   minus operator 5–13/14  
   operator 5–13/14  
   operator, interpretation of 13–20  
   operator, overloaded 13–20  
   plus operator 5–13/14  
   *unary-expression* 5–13  
   *unary\_function* 20–8  
   *unary\_negate* 20–10  
   *unary-operator* 5–13  
   *uncaught\xception* 18–19  
   *#undef* 16–6, 17–10  
   undefined 17–2, 10/12, 18–20, 21–16, 24–22, 26–14/18, 23, 27, 27–15  
   arithmetic exception 5–1  
   behavior 1–3  
   bound pointer to member function C–13  
   change to `const` object 7–7  
   change to string literal 2–11  
   *delete* 5–19  
   deleted object 3–26  
   division by zero 5–1, 21  
   escape sequence 2–9  
   floating point conversion 4–4  
   function call 5–11/12  
   left shift 5–22  
   member function call 9–6  
   modulus zero 5–1  
   overflow 5–1  
   pointer comparison 5–22/23  
   pointer to function cast 5–11  
   pure virtual function call 10–11  
   string literal concatenation 2–11  
   unrepresentable integral value 4–4  
 underflow  
   `basic_filebuf` 27–59  
   `basic_streambuf` 27–27  
   `basic_stringbuf` 27–50  
   `strstreambuf` D–7  
 underflow\_error  
   underflow\_error 19–4  
   underflow\_error 19–4  
 underlying  
   type, enumeration 7–11  
   type, `wchar_t` 3–32  
 underscore  
   character 17–10/11  
   in identifier\_ 2–6  
 unexpected 18–18  
 unexpected() 15–9  
 unexpected\_handler 17–11, 18–17  
 unget, `basic_istream` 27–38  
 uninitialized variable, indeterminate 8–16  
 uninitialized\_copy 20–17  
 uninitialized\_fill 20–18  
 uninitialized\_fill\_n 20–18  
 union 3–33, 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 8–20, 9–10  
 member function 9–10  
 restriction 9–10, 12–2  
 restriction, anonymous 9–10  
 type specifier 9–1  
 unique 25–15  
     list 23–19  
 unique\_copy 25–16  
 unit  
     instantiation 2–2  
     translation 17–9/10  
 unitbuf 27–20  
 universal-character-name 2–2  
*universal-character-name* 2–2  
 unknown argument type 8–9  
 unnamed  
     bit-field 9–11  
     class 7–6  
     object 12–2  
         parameter example 8–15  
     unqualified name 3–9  
*unqualified-id* 5–3  
 unrepresentable integral value, undefined 4–4  
 unsetf, ios\_base 27–12  
 unshift, codecvt 22–17  
 unsigned  
     arithmetic 3–32  
     char type 3–31/32  
     int type 3–32  
     integer conversion, signed 4–4  
     literal 2–8  
     long type 3–32  
     short type 3–32  
     type 3–32  
     type specifier 7–8  
     typedef and 7–2  
*unsigned-suffix* 2–8  
 unspecified 18–11/12, 14, 21–12, 25–19, 26–16,  
     27–50/D–7  
 address of member function 17–13  
 allocation 9–5, 11–3  
 argument to constructor 5–18  
 behavior 1–3  
 constructor and new 5–18  
 order of argument evaluation 5–6  
 order of evaluation 3–23, 5–1  
 order of evaluation new 5–18  
 order of function call evaluation 5–6  
 pointer comparison 5–23  
 unwinding, stack 15–4  
 up, name look 3–8  
 upper\_bound 25–20  
 uppercase 17–6, 10  
 uppercase 27–19  
 usefacet, locale 22–9  
 user-defined  
     conversion 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 7–16  
 using-directive 7–21  
 usual arithmetic conversions 5–2

<utility> 20–5

## V

va\_end 17–10  
 <valarray> 26–9  
 valarray 26–12, 24  
     apply 26–17  
     cshift 26–17  
     length 26–16  
     max 26–16  
     min 26–16  
     operator! 26–15  
     operator!= 26–18  
     operator% 26–17  
     operator%= 26–15  
     operator& 26–17  
     operator&& 26–17/18  
     operator&= 26–15  
     operator\* 26–17  
     operator\*= 26–15  
     operator+ 26–15, 17  
     operator+= 26–15  
     operator- 26–15, 17  
     operator-= 26–15  
     operator/ 26–17  
     operator/= 26–15  
     operator< 26–18  
     operator<< 26–17  
     operator<= 26–15  
     operator<= 26–18  
     operator= 26–14  
     operator== 26–18  
     operator> 26–18  
     operator>= 26–18  
     operator>> 26–17  
     operator>>= 26–15  
     operator[] 26–14/15  
     operator^ 26–17  
     operator^= 26–15  
     operator| 26–17  
     operator|= 26–15  
     operator|| 26–17/18  
     operator~ 26–15  
     resize 26–17  
     shift 26–16  
     sum 26–16  
     valarray 26–13  
     valarray 26–13  
     ~valarray 26–14  
     ~valarray, valarray 26–14  
 va\_list 17–10  
 value  
     call by 5–5  
     null member pointer 4–5  
     null pointer 4–4  
     of char literal, implementation-defined 2–10  
     of enumerator 7–10  
     of multicharacter literal, implementation-defined 2–9  
     representation 3–30  
     undefined unrepresentable integral 4–4  
 variable  
     argument list 8–9  
     indeterminate uninitialized 8–16  
     parameter list 5–5, 8–9  
     parameter list example 8–9  
 <vector> 23–10  
 vector 23–22  
     assign 23–24  
     capacity 23–25

**erase** 23–25  
**insert** 23–25  
**operator<** 23–24  
**operator==** 23–24  
**reserve** 23–25  
**resize** 23–25  
**vector** 23–24  
**vector** 23–24  
**vector<bool>** 23–26  
**operator<** 23–27  
**operator==** 23–27  
**vertical tab** 2–9  
**viable function** 13–5  
**virtual**  
  base class 10–2  
  base class DAG 10–3  
  base class dominance 10–5  
  base class initialization 12–14, 20  
  base class initialization, order of 12–14  
  destructor 12–7  
  destructor, pure 12–7  
  function 10–6  
  function access 11–9  
  function call 10–10  
  function call, constructor and 12–17  
  function call, destructor and 12–17  
  function call, undefined pure 10–11  
  function definition 10–8  
  function definition, pure 10–10  
  function example 10–8  
  function example, pure 10–10  
  function, pure 10–10/11  
  member function 17–11, 13  
  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 3–32  
  type specifier 7–8  
**void&** 8–6  
**void\***  
  conversion, pointer to member 4–5  
  pointer comparison 5–23  
  pointer type extension to C C–1  
  type 3–33  
**volatile** 3–33  
  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  
  overloading and 13–2  
  type 7–6  
  type specifier 7–8

**wcout** 27–6  
**wcschr** 21–30  
**wcspbrk** 21–30  
**wcsrchr** 21–31  
**wcsstr** 21–31  
**<wctype.h>** D–1  
**well-formed program** 1–3  
**wfilebuf** 27–4, 56  
**wfstream** 27–4  
**what**  
  **bad\_alloc** 18–13  
  **bad\_cast** 18–15  
  **bad\_exception** 18–17  
  **bad\_typeid** 18–16  
  **exception** 18–17  
  **ios\_base::failure** 27–9  
**while statement** 6–3/4  
**white**  
  space 2–3  
  space 2–4  
  wide string literal 2–11  
  wide-character 2–9  
  string, null-terminated 17–6  
**widen**  
  **basic\_ios** 27–17  
  **ctype** 22–11  
  **ctype<char>** 22–15  
**width, ios\_base** 22–10, 27–13  
**wifstream** 27–4, 56  
**wios** 27–7  
**wistream** 27–4, 29  
**wistringstream** 27–4, 48  
**wmemchr** 21–31  
**wofstream** 27–4, 56  
**wostream** 27–4, 29  
**wostreamstream** 27–4, 48  
**write, basic\_ostream** 27–45  
**ws** 27–34, 39  
**wstreambuf** 27–4, 21  
**wstreamoff** 27–7  
**wstringbuf** 27–4, 48  
**wstringstream** 27–4

**X**

**xalloc, ios\_base** 27–13  
**xsgetn, basic\_streambuf** 27–26  
**xsputn, basic\_streambuf** 27–28  
**X(X&)** —see copy constructor , 19

**Z**

**zero**  
  pointer 4–4  
  undefined division by 5–1, 21  
  undefined modulus 5–1  
  width of bit-field 9–11  
**zero-initialization** 8–16

**W**

**wcerr** 27–6  
**<wchar.h>** D–1  
**wchart** type-specifier 7–8  
**wchar\_t** 2–9, 11, 17–6, 21–30  
  implementation-defined 3–32  
  type 3–32  
  underlying type 3–32  
**wcin** 27–6  
**wclog** 27–6