

Index

- ! (logical negation), 57, 58
- != (not equal to), 57, 60
 - for nullable types, 114
 - for strings, 16
- \ " (double quote escape code), 16
- % (remainder), 57, 58
- %= (compound assignment), 62
- & (bitwise and), 57, 60
- & (logical strict and), 57, 58
 - nullable, 114
- && (logical and), 57, 58
- &= (compound assignment), 62
- \ ' (single quote escape code), 16
- * (multiplication), 57
- *= (compound assignment), 62
- + (addition), 57
- + (delegate combination), 57, 112
- + (enum addition), 57, 110
- + (string concatenation), 18, 57
 - example, 17
- ++ (postincrement), 57, 58
- ++ (preincrement), 57, 58
- += (compound assignment), 57, 62
- += (event assignment), 52, 57
- (delegate removal), 57, 112
- (enum subtraction), 57, 110
- (minus sign), 57
- (subtraction), 57
- (postdecrement), 57, 58
- (predecrement), 57, 58
- = (compound assignment), 62
- = (event assignment), 52, 57
- / (division), 57, 58
- /= (compound assignment), 62
- ; (semicolon), 84
 - in delegate type declaration, 112
 - misplaced (example), 91
- < (less than), 57, 60
- << (left shift), 57, 60
- <<= (compound assignment), 62
- <= (less than or equal to), 57, 60
- = (assignment), 57
- == (equal to), 57, 60
 - for nullable types, 114
 - for strings, 16
- > (greater than), 57, 60
- >= (greater than or equal to), 57, 60
- >> (right shift), 57, 60
- >>= (compound assignment), 62
- ? : (conditional expression), 57, 62
- ?? (null-coalescing), 57, 114
- @ (identifier prefix), 4
- @" . . ." (verbatim string constant), 16
- \\" (backslash escape code), 16
- ^ (bitwise exclusive-or), 57, 60
- ^ (logical strict exclusive-or), 57, 58
- ^= (compound assignment), 62
- { 0 } (format specification), 20
- | (bitwise or), 57, 60
- | (logical strict or), 57, 58
 - nullable, 114
- |= (compound assignment), 62
- || (logical or), 57, 58
- ~ (bitwise complement), 57, 60
- \0 (NUL character escape code), 16
- \a (alert escape code), 16
- abbreviation for constructed type, 154
- abrupt termination, 85
- Abs method (Math), 124
- absolute value, 124
 - example, 63, 87
- abstract
 - class, 34
 - method, 42
 - property, 48
- abstract
 - class modifier, 34
 - method modifier, 42
- abstract override (method modifier), 42
- Accept method (Socket), 142
- access modifier, 34

- accessible member, 34
- accessor
 - get, 48
 - set, 48
- Acos method (`Math`), 124
- actual parameter. *See* argument *actual-list*, 68
- add clause, 52
- Add method
 - `ICollection<T>`, 158
 - `IDictionary<K,V>`, 164
 - `IList<T>`, 164
- addition operator (+), 57
- /addmodule (compile option), 2
- AddRange method (`List<T>`), 166
- After (iterator state), 100
- ambiguous method call, 41, 72
- amortized complexity, 159
- and operator
 - bitwise (&), 57
 - logical (&&), 57
 - logical strict (&), 57
 - nullable, 114
- anonymous method expression, 82
- APoint class (example), 33, 67, 69
- Append method (`StringBuilder`), 24
- AppendFormat method (`StringBuilder`), 24
- AppendText method (`FileInfo`), 140
- applicable method, 72
- ApplicationException, 116
- arc cosine (Acos), 124
- arc sine (Asin), 124
- arc tangent (Atan or Atan2), 124
- args (command line arguments), 2
- argument
 - by-value, 70
 - of method call, 68
 - out, 70
 - ref, 70
- ArgumentException, 116, 130, 132, 134, 136, 138–140, 158, 164
- ArgumentNullException, 6, 30, 116, 122, 130, 132, 134, 136, 138–140
- ArgumentOutOfRangeException, 18, 24, 116, 130, 132, 134, 136, 138, 139, 158, 164, 166
- arithmetic
 - expressions, 58
 - operators, 58
- array, 26–31
 - access, 26, 28, 57
 - of arrays, 28
 - assignment to element, 26
 - assignment type check, 26
 - creation expression, 26, 28
 - C-style, 28
 - element, 26
 - initial value, 26
 - type, 26
 - implements `IList<T>`, 88
 - index, 26
 - initialization, 26
 - is enumerable, 88
 - iteration (example), 31
 - jagged, 28
 - Java-style multi-dimensional, 28
 - length, 26
 - member, 30
 - multi-dimensional, 28
 - product (example), 63
 - rank, 26, 30
 - rectangular, 28
 - reversal (example), 89
 - search, 30
 - segment swapping (example), 31
 - sort, 30
 - type, 26
- ArrayList class, 8, 30
 - not usable as constraint, 148
- ArrayList (example), 33, 137, 145
- ArrayTypeMismatchException, 26, 27, 116
- as (instance test and cast), 57, 64
- ASCII character encoding, 16
- Asin method (`Math`), 124
- AsReadOnly method (`List<T>`), 166
- assembly, 2
 - reference, 2
- Assert method (`Debug`), 176

assertion, 176
 assigned, definitely, 14
 assignment

- array element, 26
- compound, 57, 62
- event, 52, 57
- expression, 62
- operators (`=`, `+=`, ...), 62
- statement, 85
- value type variable, 6

 associativity, 56, 57
`Atan` method (`Math`), 124
`Atan2` method (`Math`), 124
 attribute, 178–179

- custom, 178
- predefined, 178

 Attribute class, 178
 AttributeUsage (attribute), 178

`\b` (backspace escape code), 16
 backslash escape code (`\\\`), 16
 backspace escape code (`\b`), 16
 Bank class (example), 121
 base

- class, 36
 - constructor call, 36, 44
 - constructor call (example), 75, 107
 - immediate, 36
- interface, 108

 base, 36

- base class constructor call, 36, 37
- base class field access, 37, 66
- base class indexer access, 37, 78
- base class method call, 37, 72
 - base class property access, 37, 76

 base-interfaces, 106
`BaseStream` property (`BinaryWriter`), 134
 Before (iterator state), 100
 best signature, 68
 better

- conversion, 11
- signature, 68
- type, 68

 binary

- input, 134
- operator overloading, 50
- output, 134
- stream, 126

 BinaryFormatter class, 129, 179
 BinaryReader class, 134

- example, 137

 BinarySearch method

- `Array`, 30
- `List<T>`, 166

 BinaryWriter class, 134

- example, 137

 Bind method (`Socket`), 142
 bitwise

- and operator (`&`), 57, 60
- complement operator (`~`), 57, 60
- exclusive-or operator (`^`), 57, 60
- operators, 60
- or operator (`|`), 57, 60

 block, 84

- statement, 84
 - example, 87

 block-statement, 84
 blocking method call, 128
 bool (simple type), 7
 Boolean struct type (`bool`), 7
 Box-Muller transformation (example), 125
 boxing

- conversion, 12
- of value as object, 103, 104

 breadth-first graph traversal (example), 171
 break statement, 92

- example, 85

 Buffer class (example), 123
 by-value

- argument, 70
- parameter, 40, 70

 byte (simple type), 7, 10
 byte array

- reading from, 139
- writing to, 139

 byte stream, 126

- reading from, 130
- writing to, 132

- Byte struct type (`byte`), 7
- bytecode, 2
- C++ templates versus C# generics, 156
- C-style multi-dimensional array, 28
- calendar (example), 111
- call
 - of delegate, 112
 - of method, 68–75
- call-by-value, 70
- CanRead property (`Stream`), 136
- CanSeek property (`Stream`), 136
- CanWrite property (`Stream`), 136
- Capacity property
 - `List<T>`, 166
 - `MemoryStream`, 139
- captured variable, 82
- carriage return escape code (`\r`), 16
- case clause, 86
- cast. *See* type cast
- catch clause, 96
- catching an exception, 96
- Ceiling method (`Math`), 124
- char (simple type), 7, 10
- Char struct type (`char`), 7
- character
 - counting (example), 17
 - encoding, 130
 - UTF-8, 130, 132
 - escape code, 16
 - stream, 126
 - type, 6
- check date (example), 27
- checked
 - expression, 57, 58
 - statement, 98
- checked context, 58, 98
- choice statement, 86
- choosing a collection class, 159
- class, 32–53
 - abstract, 34
 - base, 36
 - body, 32
 - declaration, 32
 - partial, 174
 - generic, 144, 146, 148
 - hierarchy, 36
 - example, 35
 - implementing interface, 108
 - inner (Java), 46
 - instance, 54
 - internal, 46
 - library, 172
 - loading, 2, 38, 44, 54
 - member, 32
 - modifier, 34
 - nested, 46
 - of an object, 54, 64
 - operator overloading, 50
 - public, 46
 - run-time representation, 54
 - sealed, 34
 - example, 175
 - static, 34
 - type parameter, 146
 - versus struct type (example), 103
- class constraint, 148
- class-base-clause*, 36, 108
- class-body*, 32
- class-declaration*, 32
- class-modifier*, 32
- Clear method
 - `ICollection<T>`, 158
- client socket, 142
- Clone method (`String`), 16
- Close method, 128
 - `BinaryWriter`, 134
 - `Socket`, 142
 - `Stream`, 136
 - `TextReader`, 130
 - `TextWriter`, 132
- closure, 112
 - for anonymous method, 82
- code
 - non-static, 32
 - static, 32
- collection, 158–171
- Color enum type (example), 111

Colored interface (example), 107

ColoredDrawable interface (example), 107
 ColoredDrawablePoint class (example), 107
 ColoredPoint class (example), 107
 ColoredRectangle class (example), 107
 ColorPoint class, generic (example), 147
 command line arguments, 2

 example, 17, 25

comment, 4

Common Language Runtime, ix

comparable, 162–163

Compare method

 long (example), 63

 IComparer, 162

 IComparer<T>, 162

 String, 18

comparer, 162–163

CompareTo method

 IComparable, 162

 IComparable<T>, 162

 simple types, 162

 String, 18

comparison

 operator, 57, 60

 of references, 8

compatible

 anonymous method and delegate type, 82

 method and delegate type, 112

 operand type, 60

compilation, 2

compile option, 2

 /addmodule, 2

 /d, 2, 176

 /debug, 2

 /define, 2

 /main, 2

 /r, 2

 /reference, 2

 /t, 2

 /target, 2

compile-time

 constant, 86

 type, 6, 56

compiler, 2

complement operator (~), 57

complete program (example), 3

complexity

 amortized, 159

 of collection class operations, 159

 time, 159

compound assignment, 57, 62

 to indexer, 78

 for nullable types, 114

operators, 62

 to property, 76

Concat method (String), 18

concatenating arguments (example), 17, 25

concatenation of strings, 24

concurrency, 118–123

Conditional (attribute), 178

conditional expression (? :), 62

Console.Error (standard error), 132

Console.In (standard input), 130

Console.Out (standard output), 132

Console.WriteLine method, 132

const

 constant field declaration, 38

 local constant declaration, 84

constant, 38

 in class, 38

 compile-time, 86

 declaration, 38, 84

 floating-point, 7

 integer, 6

 in method, 84

 simple type, 6

 string, 16

constraint on type parameter, 148

constructed type, 144

 abbreviation for, 154

constructor, 44

 body, 44

 call, 64

 base class, 44

 example, 75

 declaration, 44

 default, 36, 44

- generic (no such thing), 144
- overloading, 44
- predefined in struct, 102
- signature, 44
- static, 44
- constructor-declaration*, 44
- constructor-modifier*, 44
- Contains method
 - `ICollection<T>`, 158
- ContainsKey method (`IDictionary<K,V>`), 164
- ContainsValue method
 - `Dictionary<K,V>`, 168
- continue statement, 92
 - example, 85
- conversion, 10–13
 - between reference types, 12
 - explicit, 10, 52
 - user-defined, 52
 - implicit, 10, 52
 - user-defined, 52
 - overflow checking, 10
 - standard
 - boxing, 12
 - between simple types, 10
- unboxing, 12
- user-defined, 52
 - example, 81
- Copy method (`String`), 16
- CopyTo method
 - `ICollection<T>`, 158
 - `List<T>`, 166
- Cos method (`Math`), 124
- Count property (`ICollection<T>`), 158
- Create method (`FileInfo`), 140
- Created (thread state), 119
- CreateText method (`FileInfo`), 140
- creation
 - of array, 26, 28
 - of delegate, 112
 - of object, 64
 - of stream, 126
 - of struct value, 64
 - of thread, 118
- CryptoStream class, 126
- .cs file, 2
 - example, 175
- csc (Microsoft C# compiler), 2
 - example, 175
- culture, 23
- culture sensitive, 23
 - string formatting, 20
- CultureInfo class, 20
- currency formatting as string, 22
- current
 - object, 32, 66
 - thread, 20
- Current property (`IEnumerator<T>`), 160
- CurrentCulture property (`Thread`), 20
- CurrentEncoding property (`StreamReader`), 130
- CurrentThread method (`Thread`), 122
- custom
 - attribute, 178
 - DateTime formatting, 22
 - number formatting, 22
- /d (compile option), 2
- data member, 32
- DataAvailable property (`Socket`), 142
- database query (example), 167
- Date class (example), 111
- date formatting as string, 22
- DateTime class, 22
- DateTimeFormat property (`CultureInfo`), 20
- Day enum (example), 111
- DComparer
 - delegate type (example), 113
 - interface, generic (example), 155
- de-DE culture (example), 23
- Dead (thread state), 119
- /debug (compile option), 2
- Debug class, 176
 - decimal (simple type), 6, 7, 10
 - decimal integer constant, 6
 - Decimal struct type (decimal), 7
 - declaration
 - class, 32
 - in class body, 32
 - constant, 38, 84

constructor, 44
 custom attribute, 178
 delegate type, 112
 enum member, 110
 enum type, 110
 event, 52
 field, 38
 formal parameter, 40
 indexer, 48
 interface, 106
 local variable, 84
 method, 40
 namespace, 172
 property, 48
 statement, 84
 struct type, 102
 declared type, 6
 decrement operator (--) , 57, 58
 default
 clause in switch, 86
 constructor, 36, 44
 in struct type, 102
 namespace, 172
 value, 14
 for simple type, 7
 for struct type, 102
 for type parameter, 145, 150
 of field, 38
 default(t) (default value for type t), 14
 example, 145
`/define` (compile option), 2
 definitely assigned, 14
 delegate
 call, 112
 combination operator (+), 112
 conversion from anonymous method, 82
 creation, 112
 generic, 154
 invocation list, 112
 removal operator (-), 112
 return type, 112
 type, 112–114
 declaration, 112
 generic, 154–155

Delegate class, 8, 112
 not usable as constraint, 148
delegate-modifiers, 112
delegate-type-declaration, 112
 Delete method (FileInfo), 140
 depth-first graph traversal (example), 171
 Dequeue method (Queue<T>), 170
 derived class, 36
 Deserialize method
 BinaryFormatter, 128
 SoapFormatter, 128
 deterministic finite automaton (example), 169
 dictionary, 168–171
 Dictionary<K,V> class, 168
 die
 example, 27, 133
 loaded (example), 43
 Directory class, 140
 directory hierarchy (example), 141
 DirectoryInfo class, 140
 DirectoryNotFoundException, 116, 130, 132, 140
 Dispose method
 IDisposable<T>, 98
 IEnumerator (example), 89
 IEnumerator<T>, 160
 DivideByZeroException, 58, 105, 116
 division
 by zero, 58
 floating-point, 58
 integer, 58
 operator (/), 57
 .dll file, 2
 do-while statement, 90
 double (simple type), 7, 10, 124
 double quote ("") escape code (\"), 16
 Double struct type (double), 7
 Drawable interface (example), 107
 dynamically enclosing, 94

E constant (Math), 124
 efficiency
 array access, 28
 avoid boxing, 8
 avoid repeated string concatenation, 17

- avoid throwing exceptions, 94
- comparisons, 162
- generic collection class, 79
- generics, 156
- indexer accessors, 48
- property accessors, 48
- string builder editing, 25
- string concatenation, 24, 25
- use generic collections, 12
- eight queens problem (example), 101
- element of array, 26
- element type of array, 26
- `else` keyword, 86
- empty statement, 84
- en-US culture (example), 23
- Enabled (thread state), 118, 119
- Encoding class, 130
 - encoding of characters, 130, 132
 - Encoding property (TextWriter), 132
 - end-of-stream, 130
 - EndOfStreamException, 116, 128, 134
 - EndsWith method (String), 18
 - Enqueue method (Queue<T>), 170
 - entry point, 2
- enum
 - example, 61
 - member
 - access, 110
 - declaration, 110
 - type of, 110
 - type, 110–111
 - arithmetics, 57, 110
 - declaration, 110
- Enum class, 8
 - not usable as constraint, 148
- enum-type-declaration*, 110
- enumerable, 160–161
 - expression, 88
- enumerator, 160–161
 - example, 161
 - object, 100
- Epsilon constant (Double), 6
- equal to operator (`==`), 57, 60
 - for nullable types, 114
 - for strings, 16
 - equality of strings (example), 17
- Equals method
 - and hash code, 8
 - array, 30
 - default for struct type, 8
 - IComparable<T>, 162
 - IComparer<T>, 162
 - Object, 8
 - String, 16
 - ValueType, 8
- escape code, 16
- evaluation
 - of expression, 56
 - of method call, 70
 - order, 56
- event, 52
 - assignment, 52, 57
 - declaration, 52
 - description, 106
 - generic (no such thing), 144
 - handling, 52
- event-description*, 106
- exception, 116–117
 - catching, 96
 - throwing, 94
 - type, 116
- Exception class, 94, 116
- exchange rate array (example), 29
- exclusive-or operator (^), 57
- .exe file, 2
 - example, 3, 175
- executable, 2
- execution, 2
- Exists property (FileInfo), 140
- Exp method (Math), 124
- explicit
 - conversion, 10
 - example, 63, 81
 - user-defined, 52
 - interface member implementation, 40, 108
- explicit, 52
- exponential notation, 22
- expression, 56–83

anonymous method, 82
 arithmetic, 58
 array access, 26, 28
 array creation, 26, 28
 assignment, 62
 conditional, 62
 enumerable, 88
 evaluation, 56
 field access, 66
 indexer access, 78
 logical, 58
 method call, 68–75
 object creation, 64
 property access, 76
 statement, 84
 struct value creation, 64
 type cast, 57, 80
 Extension property (FileInfo), 140
 external module, 2

 \f (form feed escape code), 16
 factorial (example), 125
 field, 14, 38
 access, 57, 66
 declaration, 38
 default value, 38
 hiding, 38
 initialization, 38
 initializer, 38
 instance field access, 66
 modifier, 38
 read-only, 38
 example, 27, 51
 shadowed, 14
 example, 67
 static, 38
 access, 66
 example, 43
field-declaration, 38
field-modifier, 38
 file, 140
 extension, 140
 .cs, 2
 .dll, 2
 .exe, 2
 .netmodule, 2
 index (example), 165
 name, 140
 path (example), 141
 reading from, 130, 138
 example, 131
 source, 2
 writing to, 132, 138
 example, 133
 FileAccess enum type, 138
 example, 61
 FileInfo class, 140
 FileMode enum type, 138
 FileNotFoundException, 116, 130, 138
 FileShare enum, 138
 FileStream class, 138
 example, 137
 finally, 96
 finite state machine (example), 95
 fixed-point type, 6
 Flags (attribute), 178
 example, 61
 float (simple type), 7, 10, 124
 floating-point
 constant, 7
 division, 58
 overflow, 58
 remainder, 58
 type, 6
 Floor method (Math), 124
 Flush method, 128
 BinaryWriter, 134
 Stream, 136
 TextWriter, 132
 fn (Standard ML language), 82
 for statement, 88
 example, 31
 foreach statement, 88
 example, 51
 form feed escape code (\f), 16
 formal parameter, 40
formal-list, 40
 Format method (String), 20

- format specification, 20
- FormatException**, 6, 20, 116
- formatting
 - code, 22
 - data as string, 20–23
 - date as string, 22
 - number as string, 22
 - time as string, 22
- Frac** class (example), 53, 65
- frame (in stack), 54
- FullName** property (**FileInfo**), 140
- function
 - as delegate (example), 155
 - member, 32
- garbage collector, 54
- Gaussian random numbers (example), 125
- generic
 - class, 144, 146–149
 - constructor (no such thing), 144
 - delegate type, 154–155
 - event (no such thing), 144
 - indexer (no such thing), 144
 - interface, 150–151
 - method, 152–153
 - operator (no such thing), 144
 - property (no such thing), 144
 - struct type, 156–157
- generics, 144–157
 - versus C++ templates, 156
 - implementation, 156
 - versus Java language generics, 156
- get-accessor
 - of indexer, 48
 - of property, 48
- GetCurrentDirectory** property (**Directory**), 140
- GetDirectories** method (**DirectoryInfo**), 140
- GetEnumerator** method
 - Array, 30
 - IEnumerator** (example), 89
 - IEnumerator**<T>, 160
- GetHashCode** method
 - IComparer**<T>, 162
 - Object, 8
- simple type, 8
- String**, 8
- ValueType**, 8
- GetLength** method (**Array**), 30
- GetType** method (**Object**), 8
- GetValue** method (**Array**), 30
- goto statement, 94
 - example, 85
- governing type, 86
- graph traversal (example), 171
- greater than operator (>), 57, 60
- greater than or equal to operator (>=), 57, 60
- hash code, 8
 - and **Equals** method, 8
- hash table. *See* dictionary
- heap, 8, 54
- hexadecimal integer constant, 6
 - example, 61
- hiding
 - base class's indexer (example), 79
 - field, 38
 - indexer, 36
 - member, 36
 - method, 36
- horizontal tab escape code (\t), 16
- HTML output (example), 133
- ICollection**<T> interface, 158
- IComparable** interface, 162
- IComparable**<T> interface, 162
 - example, 149
- IComparer** interface, 162
- IComparer**<T> interface, 162
- IDictionary**<K,V> class, 164
- IDisposable** interface, 98
 - example, 89, 161
- IEEE754 floating-point standard, 6, 7, 124, 182
- IEERemainder** method (**Math**), 124
- IEnumerable** interface, 160
- IEnumerable**<T> interface, 160
- IEnumerator** interface, 160
- IEnumerator**<T> interface, 160
- if statement, 86

if-else statement, 86
IList<T> interface, 164
 implemented by array type `T[]`, 88
illegal type cast, 80
implementation of interface, 108
implicit, 52
implicit conversion, 10
 example, 63
 user-defined, 52
IMyList interface (example), 151
increment operator (`++`), 57, 58
index
 into array, 26
 into string, 16
indexer, 48
 access, 57
 expression, 78–79
 compound assignment, 78
 declaration, 48
 description, 106
 formal parameter, 48
 generic (no such thing), 144
 get-access, 78
 hiding, 36
 example, 79
IDictionary<K,V>, 164
IList<T>, 164
 overloading, 48
 example, 109
 set-access, 78
 String, 16
 StringBuilder, 24
 type, 48
indexer-description, 106
IndexOf method
 IList<T>, 164
 List<T>, 166
IndexOutOfRangeException, 16, 24, 26, 97, 116
inefficiency. *See efficiency*
infinity constant, 6
inheritance, 36
 example, 35, 43
initialization
 of array, 26
 of instance fields, 38, 44
 of static fields, 38
 of struct values, 102
initializer of field, 38
inner class (Java), 46
input, 126–144
 binary, 134
 byte-oriented, 136
 character-oriented, 130
 from keyboard (example), 119
 sequential, 130
input-output, 126–144
 byte stream, 136–139
 character stream, 130–133
 examples, 129
 socket, 142–144
 thread-safety, 128
Insert method
 IList<T>, 164
 StringBuilder, 24
InsertRange method (List<T>), 166
instance
 field, 38
 access, 66
 member, 32
 method, 42
 of struct type, 54
 test expression, 64
 example, 65
 int (simple type), 7, 10
 Int16 struct type (short), 7
 Int32 struct type (int), 7
 Int64 struct type (long), 7
integer
 constant, 6
 division, 58
 overflow, 58
 checking, 58
 remainder, 58
 sequences (example), 47, 51, 101, 109
 square root (example), 177
 type, 6
interface, 106–110
 base, 108

- declaration, 106
 - partial, 174
- explicit member implementation, 108
- generic, 150
- implementation, 108
 - explicit, 40
- member, 106
- interface-declaration*, 106
- interface-modifier*, 106
- intermediate code, 2
- internal
 - class, 46
 - member, 34
- InternalBufferOverflowException, 116
- Interrupt method (Thread), 122
- intersection closure (example), 171
- InvalidCastException, 10, 12, 80, 88, 116, 158
- InvalidOperationException, 114, 116, 160, 170
- InvalidProgramException, 116
- invariant, 177
- invocation list of delegate, 112
- invocation of method. *See* method call
- IOException, 116, 128, 130, 132, 134, 138
- IPEndPoint, 142
- IPrintable interface (example), 149
- is (instance test), 57, 64
 - example, 103
- ISeq interface (example), 109
- ISO 8601 date format, 22
- ISO week number (example), 111
- IsReadOnly property (ICollection<T>), 158
- iterating over array (example), 31
- iterator
 - block, 100
 - method, 100
- jagged array, 28
- Java language, 180
 - differences to C#, 180–181
 - generics, versus C# generics, 156
 - inner class, 46
 - multi-dimensional array, 28
 - protected member, 34
- Join method (Thread), 122
- Joining (thread state), 118, 119
- justification, 20
- Key field (KeyValuePair<K,V>), 168
- keyboard input (example), 119
- Keys property (IDictionary<K,V>), 164
- KeyValuePair<K,V> struct, 168
- keyword, 4
 - as identifier (example), 5
 - recognizing (example), 169
- label*, 94
- labeled statement, 94
- lambda (Scheme language), 82
- LastIndexOf method (List<T>), 166
- layout of program, 4
- leap year (example), 59
- left associative, 56
- left shift operator (<<), 57, 60
 - overloading, 50
- length of array, 26
- Length property
 - Array, 30
 - FileInfo, 140
 - Stream, 136
 - String, 16
 - StringBuilder, 24
- less than operator (<), 57, 60
- less than or equal to operator (<=), 57, 60
- lexicographic ordering
 - pairs
 - example, 149, 163
 - strings, 18
- library, 2
- line counting (example), 127
- LinkedList<T> class (example), 147
 - enumerator, 161
 - list, 164–167
- List<T> class, 166
- Listen method (Socket), 142
- loaded die (example), 43
- loading of class, 2, 38, 44, 54
- local variable declaration, 84
- lock, 120

Lock method (FileStream), 138
 lock statement, 98, 120
 Locking (thread state), 118, 119
 log

- example, 49
- generic (example), 145
- of pairs (example), 157

 Log class (example), 49
 Log method (Math), 124
 Log10 method (Math), 124
 logarithm, 124
 logical

- and operator (`&&`), 57
- negation operator (`!`), 57
- operators, 58
- or operator (`||`), 57
- strict and operator (`&`), 57
- strict exclusive-or operator (`^`), 57
- strict or operator (`||`), 57

 long (simple type), 7, 10
 LongComparer class (example), 63
 loop statement, 88–91

- nested (example), 89

 loss of precision, 10

 /m (compile option), 2
 machine model, 54–56
 /main (compile option), 2
 Main method, 2
 manifest of assembly, 2
 map. *See* dictionary
 map function (example), 153
 Math class, 124
 mathematical functions, 124–125
 Max method

- example, 41
- Math, 124

 MaxValue constant, 6

- example, 59

 mcs (Mono C# compiler), 2
 member

- access modifier, 34
- accessible, 34
- data, 32

 explicit implementation of interface, 108
 function, 32
 hiding, 36
 instance, 32
 of simple type, 6
 static, 32
 MemoryStream class, 139
 Message property (Exception), 116
 meta-data, 178
 method, 40

- abstract, 42
- anonymous, 82
- body, 40
- call, 57, 68–75
 - actual parameter, 68
 - ambiguous, 41, 72
 - argument, 68
 - blocking, 128
 - evaluation, 70
 - statement, 85
 - static, 57
 - target object, 74
- declaration, 40
- description, 106
- formal parameter, 40
- hiding, 36
 - example, 43
- invocation. *See* method call
- modifier, 42
- name, 40
- nameless, 82
- non-virtual, 42
- overloading, 40
 - example, 75
- overriding, 36
 - example, 43, 75
- return type, 40
- return value, 40
- sealed, 42
- signature, 40
- static, 42
- virtual, 42

- method-declaration*, 40
- method-description*, 106

method-modifier, 40
 Microsoft C# compiler (example), 3
 Min method (Math), 124
 MinusOne constant (Decimal), 6
 MinValue constant, 6
 misplaced semicolon (example), 91
 missing value, 114
 module, 2

- external, 2

 monitor, 120
 Monitor class, 122
 Mono

- C# compiler (example), 3
- project, 2

 Month enum (example), 111
 most derived implementation, 74
 MoveNext method (IEnumerator<T>), 160
 mscorlib assembly, 2
 MTAThread (attribute), 178
 multi-dimensional array, 28
 multiple threads (example), 119, 121
 multiplication operator (*), 57
 mutual exclusion (example), 121

 \n (new line escape code), 16
 n-queens problem (example), 101
 name, 4

- of file, 140
- of formal parameter, 40
- reserved, 4

 Name property

- DirectoryInfo, 140
- FileInfo, 140

 named parameter of attribute, 178
 nameless method, 82
 namespace, 172–173

- declaration, 172
- default, 172
- System, 9, 172

 System.Collections, 158
 System.Collections.Generic, 158, 159
 System.Data.Odbc, 167
 System.Diagnostics, 176
 System.IO, 126, 128

 System.Net, 143
 System.Net.Sockets, 142, 143
 System.Runtime.Serialization, 179
 System.Text, 24, 172
 System.Threading, 118
namespace-declaration, 172
 naming convention, 4
 NaN (not a number), 10, 124

- constant (Double), 6

 natural logarithm, 124
 negation operator (-), 57
 NegativeInfinity constant (Double), 6
 nested

- class, 46
 - example, 51
 - type, 32
- .netmodule file, 2

 network communication, 142
 new

- array creation, 26, 57
- class member hiding, 36
- class modifier, 32
- constraint, 148
- delegate creation, 57, 112
- field modifier, 38
- interface member, 106
- interface modifier, 106
- method modifier, 42
- object creation, 57, 64
- struct value creation, 64

- new abstract (method modifier), 42
- new line escape code (\n), 16
- new static (method modifier), 42
- new virtual (method modifier), 42

 non-static

- code, 32
- field. *See* instance field
- method. *See* instance method

 non-virtual method, 42
 NonSerialized (attribute), 178
 not equal to operator (!=), 57, 60

- for nullable types, 114
- for strings, 16

 NotImplementedException, 116

NotSupportedException, 116, 136, 139, 158, 164
null, 8, 14
null-coalescing operator (??), 57, 114
nullable type, 114–115
Nullable<T> struct, 114, 157
NullReferenceException, 66, 74, 76, 78, 94, 112, 116, 120
number formatting, 22
 code, 22
 example, 133
NumberFormat property (CultureInfo), 20
numeric type, 6

O notation, 159
object, 38, 54
 creation expression, 64
 current, 32, 66
 initialization, 44
 versus struct value (example), 103
object (alias for System.Object), 8
Object class, 8, 36
ObjectDisposedException, 116, 128, 130, 136, 139
Obsolete (attribute), 178
ODBC database connection (example), 167
One constant (Decimal), 6
OpenRead method (FileInfo), 140
OpenText method (FileInfo), 140
OpenWrite method (FileInfo), 140
operator, 56
 arithmetic, 58
 bitwise, 60
 comparison, 60
 overloaded, 50
 generic (no such thing), 144
 in generic type (example), 147
 shift, 60
option to compiler, 2
Option<T> struct (example), 157
or operator
 bitwise (|), 57
 logical (||), 57
 logical strict (|), 57
 nullable, 114

order of evaluation, 56
out modifier
 argument, 68, 70
 parameter, 40, 70
output, 126–144
 binary, 134
 byte-oriented, 136
 character-oriented, 132
 sequential, 132
overflow
 checking, 58
 floating-point, 58
 integer, 58
OverflowException, 6, 10, 26, 58, 98, 99, 116
overloading
 of constructors, 44
 of indexers, 48
 example, 109
 of methods, 40
 of operators, 50
 resolution, 68, 70
 compile-time, 72
override (method modifier), 42
overriding a method, 36
 example, 35, 43

Pair struct (example), 157
parameter, 14
 actual. *See argument*
 array, 40, 70
 by-value, 40, 70
 formal, 40
 name, 40
 named, of attribute, 178
 of indexer, 48
 out, 40, 70
 passing, 70
 example, 71, 73
 ref, 40

parameter-constraints, 148
parameter-modifier, 40
parametric polymorphism, 144
params (parameter array), 40, 70
Parent property (DirectoryInfo), 140

Parse method (simple types), 6
 partial
 ordering, 162
 type declaration, 174–175
 partial type declaration, 174
 path (example), 141
 PathTooLongException, 116, 140
 Peek method, 128
 Queue<T>, 170
 Stack<T>, 170
 TextReader, 130
 PeekChar method, 128
 BinaryReader, 134
 percentage formatting, 22
 phone prefix codes (example), 87
 PI constant (Math), 124
 Point class
 example, 33, 45
 generic (example), 147
 polymorphism, parametric, 144
 polynomial, generic (example), 151
 Pop method (Stack<T>), 170
 Position property (Stream), 136
 PositiveInfinity constant (Double), 6
 postdecrement operator (--) , 57, 58
 postincrement operator (++), 57, 58
 Pow method (Math), 124
 pre-processing directive, 176
 precedence, 56
 predecrement operator (--) , 57, 58
 preincrement operator (++), 57, 58
 prime number server (example), 143
 Print method (example), 93
 print non-empty strings (example), 93
 private member, 34
 program, 2
 layout, 4
 promotion type, 56
 property, 48
 abstract, 48
 access, 57
 expression, 76–77
 compound assignment, 76
 declaration, 48
 example, 77
 description, 106
 generic (no such thing), 144
 get-access, 76
 set-access, 76
 static (example), 77
 type, 48
 virtual (example), 77
property-description, 106
 protected internal member, 34
 protected member, 34
 public
 class, 46
 member, 34
 Pulse method (Monitor), 122
 PulseAll method (Monitor), 122
 Push method (Stack<T>), 170

 queens problem (example), 101
 Queue<T> class, 170
 quicksort (example), 113, 153, 155

 \r (carriage return escape code), 16
 /r (compile option), 2
 random access file (example), 137
 random numbers
 example, 21, 27, 43, 53
 Gaussian (example), 125
 rank of array, 26, 30
 Rank property (Array), 30
 RankException, 30, 116
 rational number (example), 105
 Read method, 128
 BinaryReader, 134
 Stream, 136
 TextReader, 130
 read-only
 field, 38
 example, 27, 51
 of struct type, 104
 indexer, 48
 property, 48
 read-write
 indexer, 48

property, 48
 readability index (example), 19
 ReadBlock method (TextReader), 130
 ReadBoolean method (BinaryReader), 134
 ReadByte method
 BinaryReader, 134
 Stream, 136
 ReadBytes method (BinaryReader), 134
 ReadChar method (BinaryReader), 134
 ReadChars method (BinaryReader), 134
 ReadDecimal method (BinaryReader), 134
 ReadDouble method (BinaryReader), 134
 reading from
 byte array, 139
 byte stream, 130
 file, 130, 138
 ReadInt16 method (BinaryReader), 134
 ReadInt32 method (BinaryReader), 134
 ReadInt64 method (BinaryReader), 134
 ReadLine method (TextReader), 130
 readonly field modifier, 38
 ReadsByte method (BinaryReader), 134
 ReadSingle method (BinaryReader), 134
 ReadString method (BinaryReader), 134
 ReadToEnd method (TextReader), 130
 ReadUInt16 method (BinaryReader), 134
 ReadUInt32 method (BinaryReader), 134
 ReadUInt64 method (BinaryReader), 134
 Receive method (Socket), 142
 recognizing keywords (example), 169
 rectangular array, 28
 redundant return statement, 93
 ref modifier
 argument, 68, 70
 parameter, 40
 reference
 comparison, 8
 to assembly, 2
 type, 8
 variable, 14
 /reference (compile option), 2
 ReferenceEquals method (Object), 8
 reflection, 8, 178
 remainder
 floating-point, 58, 124
 integer, 58
 operator (%), 57
 RemoteEndPoint property (Socket), 142
 remove clause, 52
 Remove method
 ICollection<T>, 158
 IDictionary<K,V>, 164
 IList<T>, 164
 String, 18
 StringBuilder, 24
 RemoveAt method (IList<T>), 164
 RemoveRange method (List<T>), 166
 renaming the states of a DFA (example), 169
 Replace method (String), 18
 replacing character by string (example), 25
 representation type of enum type, 110
 reserved name, 4
 return statement, 92
 redundant, 93
 return type
 void, 40
 of delegate, 112
 of method, 40
 of operator, 50
 return value, 40
returntype, 40
 Reverse method
 Array, 30
 example, 89
 List<T>, 166
 RFC1123 date and time format, 22
 right alignment (example), 133
 right associative, 56, 62
 right shift operator (>>), 57, 60
 overloading, 50
 Round method (Math), 124
 run-time type, 56
 Running
 iterator state, 100
 thread state, 118, 119
 running a program, 2
 sbyte (simple type), 7, 10

SByte struct type (`sbyte`), 7
 scope, 14

- of label, 94
- of member, 14, 32
- of parameter, 14, 40
- of variable, 14

 sealed

- class, 34
- example, 175
- method, 36, 42

 sealed (class modifier), 34
 sealed override (method modifier), 42
 search

- for empty string (example), 93
- for substring (example), 95
- in array, 30

 SecurityException, 132, 140
 Seek method

- BinaryWriter, 134
- Stream, 136

 SeekOrigin enum, 134, 136
 segment swapping (example), 31
 semicolon, 84

- in delegate type declaration, 112
- misplaced (example), 91

 Send method (Socket), 142
 Seq class (example), 47, 51, 101, 109
 SeqEnumerator (example), 47
 sequence

- enumerator (example), 47
- iterator (example), 101
- of integers (example), 47, 51, 101, 109

 sequential

- input, 130
- output, 132

 Serializable (attribute), 178
 serialization, 178

- example, 179

 Serialize method

- BinaryFormatter, 128
- SoapFormatter, 128

 server socket, 142
 set intersection closure (example), 171
 set-accessor

- of indexer, 48
- of property, 48

 Set<T> class (example), 165
 SetLength method

- MemoryStream, 139
- Stream, 136

 SetValue method (Array), 30
 shadowing a field, 14

- example, 67

 shared state, 118
 shift operators, 60
 short (simple type), 7, 10
 short-cut evaluation, 58
 Sign method (Math), 124
 signature, 40

- best, 68
- better, 68
- of constructor, 44

 signed integer type, 6
 significant digits of numeric type, 7
 simple type, 6

- member, 6
- variable, 14

 Sin method (Math), 124
 single quote ('') escape code (\'), 16
 Single struct type (`float`), 7
 Sleep method (Thread), 122
 Sleeping (thread state), 118, 119
 SoapFormatter class, 179
 socket, 142

- client, 142
- communication (example), 143
- server, 142

 Socket class, 142
 SocketException, 142
 Sort method

- Array, 30
- List<T>, 166

 sort of array, 30
 SortedDictionary<K,V> class, 168
 sortedness check (example), 19
 source file, 2

- example, 175

 sparse matrix (example), 49, 79

Split method (String), 18
SPoint struct type (example), 103
SQL query language, 114
Sqrt method (Math), 124
square root (example), 177
stable sort, 30
stack, 54
Stack<T> class, 170
StackOverflowException, 116
StackTrace property (Exception), 116
standard
 conversion, 10–12
 error, 132
 input, 130
 output, 132
Start method (Thread), 122
StartsWith method (String), 18
state, 56, 84
 iterator, 100
 shared, 118
 thread, 118, 119
statement, 84–101
 assignment, 85
 block, 84
 break, 92
 checked, 98
 choice, 86
 continue, 92
 declaration, 84
 do-while, 90
 empty, 84
 expression, 84
 for, 88
 foreach, 88
 goto, 94
 if, 86
 if-else, 86
 labeled, 94
 lock, 120
 loop, 88–91
 method call, 85
 return, 92
 switch, 86
 termination (example), 85
throw, 94
try-catch-finally, 96, 117
unchecked, 98
using, 98
while, 90
yield, 100
STAThread (attribute), 178
static
 class, 34
 code, 32
 constructor, 44
 example, 43
 field, 38
 access, 57, 66
 example, 43
 in generic type, 146
 member, 32
 method, 42
 method call, 57
 property
 access, 57
 example, 77
 static
 class modifier, 34
 field modifier, 38
 method modifier, 42
stream, 126, 136
 byte, 126
 character, 126
 creating, 126
Stream class, 136
StreamReader class, 130
StreamWriter class, 132, 133
string, 16–23
 alignment (example), 21
 builder, 24–25
 character escape code, 16
 comparison, 18, 60
 concatenation, 18, 24, 57
 efficient, 24
 example, 17
 constant, 16
 verbatim, 16
 equality (example), 17

formatting, 20–23
 example, 29, 133
 indexer, 16
string (alias for `System.String`), 16
string array file (example), 137
String class, 8, 16
StringBuilder class, 24
 example, 25, 51
StringList class (example), 79
StringWriter class, 132
struct
 type, 102–106
 declaration, 102
 default constructor, 102
 generic, 156–157
 implementing interface, 108
 operator overloading, 50
 partial declaration, 174
 run-time representation, 54
 this reference, 104
 value, 102
 comparison (`==`, `!=`), 60
 creation expression, 64
 parameter passing (example), 73
 run-time representation, 54
struct constraint, 148
struct-body, 102
struct-declaration, 102
struct-interface-clause, 108
struct-modifiers, 102
subclass, 36
 example, 35
subinterface, 106
Substring method (`String`), 18
subtraction operator (`-`), 57
Suspended (iterator state), 100
switch statement, 86
 example, 95, 131
synchronization, 120–123
SynchronizationLockException, 116, 120, 122
Synchronized method
 `TextReader`, 128
 `TextWriter`, 128
System namespace, 9, 172
System.Collections namespace, 158
System.Collections.Generic namespace, 158, 159
System.Data.Odbc namespace, 167
System.Diagnostics namespace, 176
System.IO namespace, 126, 128
System.Net namespace, 143
System.Net.Sockets namespace, 142, 143
System.Runtime.Serialization namespace, 179
System.Runtime.Serialization.Binary namespace,
 179
System.Runtime.Serialization.Soap namespace,
 179
System.Text namespace, 24, 172
System.Threading namespace, 118
SystemException, 116

 /t (compile option), 2
 \t (tabulator escape code), 16
 Tan method (`Math`), 124
 /target (compile option), 2
 target of attribute, 178
 temperature conversion (example), 133
 text
 file, writing to (example), 133
 stream, 126
TextReader class, 130
TextWriter class, 132, 133
Thermometer class (example), 53
this
 constructor call, 44
 current object reference, 66
 current struct reference, 104
 example, 103
 in anonymous method, 82
 indexer
 access, 78
 declaration, 48
thread, 118–123
 and stack, 54
 communication, 118
 creation, 118
 current, 20
 example, 53
 safety of input-output, 128

state, 118, 119
 transition, 118
 Thread class, 118, 122
 ThreadInterruptedException, 116, 118, 122
 ThreadStart delegate, 118
 ThreadStateException, 116
 three-valued logic, 114
 three-way comparison (example), 63
 throw statement, 94
 example, 85, 131
 throwing an exception, 94
 time
 complexity, 159
 constant, 159
 formatting as string, 22
 linear, 159
 logarithmic, 159
 quadratic, 168
 ToArray method
 List<T>, 166
 MemoryStream, 139
 Queue<T>, 170
 Stack<T>, 170
 ToCharArray method (String), 18
 tokenizer (example), 131
 ToLower method (String), 18
 top layers of the type hierarchy, 9
 ToString method
 Enum, 110
 example, 19, 33, 51
 Exception, 116
 Object, 8
 String, 16
 StringBuilder, 24
 ToUpper method (String), 18
 transition of thread state, 118
 traversing
 collection, 161
 dictionary, 161
 Trim method (String), 18
 TrimEnd method (String), 18
 TrimStart method (String), 18
 TrimToSize method
 List<T>, 166
 Queue<T>, 170
 Stack<T>, 170
 try-catch-finally statement, 96, 117
 TryGetValue method
 Dictionary<K,V>, 168
 two's complement, 60
 type, 6–13
 better, 68
 cast
 expression, 57, 80
 illegal, 80
 compile-time, 6, 56
 constructed, 144, 146
 abbreviation for, 154
 declaration
 class, 32
 delegate, 112
 interface, 106
 partial, 174–175
 struct type, 102
 governing, 86
 hierarchy, 8
 top layers, 9
 nested, 32
 nullable, 114–115
 numeric, 6
 of a struct value, 64
 of array, 26
 of enum member, 110
 of expression, 56
 of indexer, 48
 of property, 48
 parameter, 144, 152
 of class, 146
 constraint, 148
 reference, 8
 run-time, 56
 simple, 6
 Type class, 80
 TypeInitializationException, 44, 116
 TypeLoadException, 116
 typeof operator, 57, 80
 \U (Unicode character code), 16

uint (simple type), 7, 10
 UInt16 struct type (ushort), 7
 UInt32 struct type (uint), 7
 UInt64 struct type (ulong), 7
 ulong (simple type), 7, 10
 unary operator overloading, 50
 UnauthorizedAccessException, 132, 140
 unboxing
 a boxed value, 103
 conversion, 12
 object as value, 104
 unchecked
 expression, 57, 58
 statement, 98
 unchecked context, 58, 98
 Unicode character encoding, 16, 182
 Universal Character Set, 182
 Unlock method (FileStream), 138
 unsigned integer type, 6
 user-defined conversion, 52
 ushort (simple type), 7, 10
 using
 directive, 154, 172
 example, 107
 statement, 98
 UTF-8
 character encoding, 130, 132
 format, 137, 182

 \v (vertical tab escape code), 16
 value, 14
 type, 6
 struct type, 102
 Value field (KeyValuePair<K,V>), 168
 value-oriented data, 102
 Values property (IDictionary<K,V>), 164
 ValueType class, 8
 not usable as constraint, 148
 variable, 14
 captured, 82
 declaration, 84
 of reference type, 8, 14
 of simple type, 14
 of struct type, 102

 verbatim string constant, 16
 vertical tab escape code (\v), 16
 Vessel class (example), 35
 virtual
 method, 42
 property (example), 77
 virtual (method modifier), 42
 void pseudo-type
 as return type, 40
 not in constructed type, 146

 Wait method (Monitor), 122
 wait set, 120
 Waiting (thread state), 118, 119
 week number (example), 111
 weekday (example), 87, 91, 93, 95, 111
 WeekdayException (example), 117
 where (type parameter constraint), 148
 while statement, 90
 white space character, 18
 wordlist (example), 177
 worklist algorithm (example), 171
 Write method, 128
 BinaryWriter, 134
 Stream, 136
 TextWriter, 132
 write-only
 indexer, 48
 property, 48
 WriteByte method (Stream), 136
 WriteLine method, 128
 TextWriter, 132
 WriteTo method (MemoryStream), 139
 writing to
 byte array, 139
 file, 138
 text file (example), 133

 \x (character code), 16
 xor operator (^), 57

 yield statement, 100
 yield type, 100

 Zero constant (Decimal), 6