

INDEX

Symbols

200 OK status code, 179
404 error codes, 179, 192
+ (addition operator), 21
& (ampersand), 107, 138
&& (AND operator), 39, 70
= (assignment operator), 17, 22, 101, 124
\ (backslash escape character), 43
{ } (braces), 47–48, 67, 85, 112
::cases() static method, 495
: (colon), 122
+= (combined assignment and addition operator), 122, 124
/= (combined assignment and division operator), 23
**= (combined assignment and exponentiation operator), 23
%= (combined assignment and modulo operator), 23
*= (combined assignment and multiplication operator), 23
-= (combined assignment and subtraction operator), 22
.= (concatenating assignment operator), 45
-- (decrement operator), 23
/ (division operator), 21–23
\$ (dollar sign), 17–18, 20
=> (double-arrow operator), 76, 135, 144, 329
{ } (double braces in Twig), 399

« » (guillemets, UML notation), 366
== (identical operator), 36, 75, 229
++ (increment operator), 23, 117–118
?int nullable integer type, 96
% (modulo operator), 21–22, 120
/*...*/ (multiline comment), 16
* (multiplication operator), 21
<> (not-equal operator), 36, 150
!= (not-equal operator), 36, 150
!== (not-identical operator), 36, 150
! (NOT operator), 36, 70–71, 122
?? (null-coalescing operator),
 77–78, 305
|| (OR operator), 39, 70, 72–73
:: (scope-resolution operator), 372, 478
%20 (space replacement character), 197
<=> (spaceship operator), 38
... (spread operator), 137, 150–151
[] (square brackets), 126–127

A

absolute filepaths, 83
abstract classes, 367, 502, 505, 509
 abstract superclass, 498–499, 526
abstraction, 327
abstract keyword, 367, 437
abstract methods, 497, 500–509, 526
access control logic, 301
accessor methods, 341–342, 363
action controllers, 241
addition, combined assignment and
 addition operator (+=),
 122, 124

addition operator (+), 21
add() method (`DateTimeImmutable`), 639
Advanced Packaging Tool (APT), 664
AJAX (Asynchronous JavaScript and XML), 182
aliases, 387
alternative loop syntax, 122–123
 foreach loop, 214
AMP (Apache HTTP Server, MySQL, PHP) installations, 667
ampersand (&), 107, 138
AND operations, 70, 71–72
AND operator (&&), 39, 70
anonymous classes, 338
anonymous functions, 153
antipattern, 491
application programming interface (API), 42
 API key, 473
architecture, web application, 177, 438
arguments, 55, 86
 named, 102
arithmetic expressions, 33–34
arms, 76
array functions
 `array()`, 127
 `array_flip()`, 141
 `array_is_list()`, 132, 144
 `array_key_last()`, 132
 `array_map()`, 141, 153
 `array_pop()`, 130, 149
 `array_push()`, 129
 `array_rand()`, 141
 `array_slice()`, 141
 `array_sum()`, 137
 `array_walk()`, 141, 153
arrays, 28, 111, 119, 125
 accessing keys and values, 126, 134
 appending an element, 127
 array-based form validation logic, 235–237
 checkboxes as, 218–220
 combining, 150
 comparing, 150
 copies, 137–139
 data type, 137
 default mapping, 126
destructuring into variables, 152
elements of, 126
empty, 128
ID-indexed, 282
imploding, 135
integer keys, 126
 negative, 139
 nonsequential, 144
 unique, 128
key/value pairs, 144
looping through, 133
managing multiple validation
 errors with, 227
multidimensional, 147–148, 542
non-integer keys, 129
operators, 150–151
references, 137–139
simple, 125
sophisticated, 143
as stacks, 131
string keys, 146
superglobal, 204, 265
arrow functions, 154
ASCII (American Standard Code for Information Interchange), 59
 ASCII art, 90
assignment operator (=), 17, 22, 101, 124
Asynchronous JavaScript and XML (AJAX), 182
ATOM constant, 634
augmenting inherited behavior, 371–373
authentication, 301–316, 533
 tokens, 265
authorization, 301, 303, 316
auto-incrementing, 579
autoloaders, 360, 388–391
 class namespaces, 388
autoload property, 389

B

backed enums, 494
backslash escape character (\), 43
 escaped (\\"), 46
base template, Twig, 408
block (Twig keyword), 416–419

`block()` function, 419
blocks of code, 15, 416
`bool` data type, 28
Boolean values, 21, 33
 expressions, 66, 70
 flags, 114, 116
 variables, 72
Bootstrap CSS, 209, 304, 581
bootstrap script, 616–17
braces (`{}`), 47–48, 67, 85, 112
 double (Twig output), 399
`break` statement, 74, 116
browser
 developer tools, 180, 203–204, 208
 sessions, 262–263
brute-force techniques, 608
bubbling, 454–456, 467
buffers, output, 187
built-in classes, 382
built-in web server, 190

C

caching, 303, 488, 509, 616
callback functions, 153
call-stack bubbling, 454–456, 467
camel case
 lower, 19–20, 85, 216
 Pascal, 338
 upper, 338
Cannot instantiate abstract class
 error message, 368
capitalization, 19, 37
Cascading Style Sheets (CSS), 181,
 190, 209, 277, 291,
 304, 309
cases, 19–20, 37, 53–54, 74, 338
 sensitivity, 19, 57
`::cases()` static method, 495
casting, 27, 30, 39
catching exceptions, 446–447
catch statements, 442
channels, 465–466
checkboxes, 216–220
child templates, 408, 415
`chmod()` function, 163
choice statements, 66
classes, 19, 327, 329, 334, 338–339
 abstract, 367, 502, 505, 509
 anonymous, 338
 built-in, 382
 constants, 480
 custom exception, 441, 451–453
 declaring, 337–348, 374
 default behavior, 346
 entity, 535, 619
 enum, 491
 helper, 622
 hierarchy, 360, 436, 504
 interchangeability, 526
 log handler, 465, 472
 members of, 329
 model, 538, 542, 596, 601
 names, 338
 repository, 556, 570, 595, 622
 utility, 482
client/server communication, 177,
 196–204
code blocks, 15, 416
code reuse, 522
collections, 111, 351
colon (:), 122
combined assignment operators
 addition (`+=`), 122, 124
 division (`/=`), 23
 exponentiation (`**=`), 23
 modulo (`%=`), 23
 multiplication (`*=`), 23
 subtraction (`-=`), 22
command line interface (CLI),
 4, 6, 9
comma-separated values (CSV),
 126, 166
comments, 15–16
comparative expressions, 35
comparison operators, 35–37
compiled programming languages, 6
Composer, 381, 386, 398, 673
 autoloader, 389
 package-dependency features, 391
`composer.json` configuration file,
 386, 464
compound data types, 125
computational efficiency, 596
concatenating assignment
 operator (`.=`), 45
concatenation, 45, 126, 542

concatenation, string operator (.), 35, 44, 84
conditional loops, 112
conditional statements, 39, 65
confirmation dialog, 570
consoles, 5
constants, 20
 calculated, 481
 class, 480
 magic, 83, 340, 346
 undefined, 18
constant-time function, 612
`__construct()` method, 346
constructor methods, 346–348, 433
 constructor property
 promotion, 348
continue keyword, 119
contracts, 497
controllers, 240–241
 action, 241
 classes, 428
 multiple, 430–435
 front, 185, 333, 428–430
 Application class as, 409
 creating, 284
 updating, 320
model-view-controller, 177, 189, 240, 396, 535
cookies, 263–264
 time out, 270
Coordinated Universal Time
 (UTC), 641
`count_chars()` function, 56
counter variables, 117
`count()` function, 131
`createFromDateString()` method, 639
`createFromFormat()` method, 635
creating objects, 339
credentials, database, 598
 securing, 615
CRUD (create, read, update, delete)
 database operations, 569, 585, 596
curly brackets (`{}`), 47, 67, 85, 112
 double, 399
current page link, 249, 251, 305, 420, 434
custom exception classes, 441, 451–453
custom form validation logic, 226
custom methods, 353

D

data
 filtering, 205
 sorting, 39
 source name, 545–546
 structures, 299
 types, 27–28, 75, 85, 88, 125, 137, 492
 validation, 233, 255
databases, 531
 abstracting away lower-level
 work, 596
 columns, 620
 connections, 533, 581, 598
 concurrent, 534
 credentials, 596, 598
 database-driven applications, 529, 543, 569
 drivers, 533
 images, 282, 460
 integrity of, 532
 management system (DBMS), 533
 programming, 541
 queries, 535
 records in, 532
 relational, 532
 schema, 533, 607
 security, 595, 615
 tables, 532
date classes
 `DateInterval`, 639
 `DatePeriod`, 640
 `DateTimeImmutable`, 633–641
date functions
 `date_default_timezone_get()`, 643
 `date_sun_info()`, 647
 `date.timezone`, 642
dates, 631
 manipulating, 637
date-time, 632–640
 letter codes in, 635
DATETIME MySQL data
 type, 656
DateTime object, 636
daylight saving time, 631, 644

debugging, 15, 446
decimal place formatting, 100, 281, 288, 292, 434, 484, 564, 576, 589
declaring
 abstract classes, 367
 abstract methods, 501
 array keys, 144
 arrays, 126–127
 classes, 337–348
 final, 374
 enumerations, 492
 exceptions, 452
 final methods, 375
 functions, 82, 84–88
 interfaces, 505
 static methods, 522
 traits, 522
decrement operator (--), 23
decryption, 608
default
 class behavior, 346
 method implementation, 500
 routing, 185
 value, 101
 visibility, 342
default keyword, 74
define() function, 21
delimiters, 49–50
dependency management, 391
deprecation messages, 88–89
design patterns, 240
developer tools, browser, 180, 203–204, 208
die() function, 234
diff() method, 639
__DIR__ constant, 83, 340
directories, 157
 confirming existence, 161
 creating, 161
 recursive creation, 162
 deleting, 165
 paths, 83
 array of, 169
 permissions, 163
 renaming, 165
division, combined assignment and division operator (/=), 23
division operator (/), 21–23
Doctrine ORM library, 595, 615
 bootstrap script, 616–17
dollar sign (\$), 17–18, 20
don't repeat yourself (DRY)
 principle, 82
dotenv files, 598
Dotenv object, 617
dot notation, 403
double-arrow operator (=>), 76, 135, 144, 329
double keyword, 29
double-precision format, 29
double-quoted strings, 41, 46–48
 object access, 341
do...while loops, 111, 113
DriverManager::getConnection()
 method, 619
drop tables, SQL, 607
DSN (data source name), 545–546
dynamic web servers, 183

E

echo command, 5–7, 10
efficiency, computational, 596
elements, appending, 127
elseif statement, 68
else statement, 67
{% else %} statement in Twig, 407
emojis, 48
empty arrays, 128
empty() function, 93, 227
encapsulation, 331
encryption, 608
endblock statements, 416
endfor statements, 123
endif statements, 69
entity classes, 535, 619
EntityManager class, 617
entity-relationship (ER) model, 535–536, 544
enumerations (enums), 475, 491–492
 backed, 494
 classes, 491
 value, 494
.env file, 598
Environment Variables dialog, 665
EOT (end of text) delimiter, 49

epochs, 646
equality tests, 36, 74
equal operator (`==`), 35–36, 74–75
equal sign (`=`), 17
ER (entity-relationship) model, 535–536, 544
diagram, 536
`error_log()` function, 462
`error()` method, 465
errors
 codes, 178–179, 192
 fatal, 87–88, 350, 454
 handling, 441
 messages, 160, 368, 575, 587, 611
 multiple validation, 227
 pages, 243, 256
escaped backslash (`\\\`), 46
escaped character (`\`), 43
 date-time formatting, 635
escaped double quote (`"`), 43
escaped newline (`\n`), 46, 52, 59, 60, 170
escaped single quote (`\'`), 43, 59
escaped tab (`\t`), 46 60
escape sequences, 46–48, 50
 Unicode, 48
evaluation of expressions, 17
Exception object, 442, 471, 619
exceptions, 441–457, 460
 bubbling, 454–456, 467
 built-in, 449–451
 catching, 446–447
 custom, 441, 451–453
 finally statements, 447–448
 logging, 469
 multiple classes, 449–454
 subclasses, 456
 throwing, 442–446
 uncaught, 442–446
exclusive-OR (XOR) operations, 70, 73
execution, halting, 442
exponentiation, combined assignment
 and exponentiation
 operator (`**=`), 23
exponentiation operator (`**`), 21
expressions, 17, 21–24, 32–35
 Boolean, 66, 70
 comparative, 35
evaluation of, 17
string, 30, 35, 44, 52, 350
`extends` keyword, 359, 438
 Twig, 418
eXtensible Markup Language (XML), 173, 599

F

fatal errors, 87–88, 350, 454
favicons, 267
`FILE_APPEND` option, 164
file functions
 `fclose()` function, 167
 `feof()` function, 168
 `fgetc()` function, 168
 `fgetcsv()` function, 173
 `fgets()` function, 168
 `file_exists()` function, 160
 `file()` function, 166
 `file_get_contents()` function, 158, 166
 `file_put_contents()` function, 163, 166
 `filesize()` function, 159
 `fopen()` function, 167
 `fputcsv()` function, 173
 `fread()` function, 167
 `fseek()` function, 168
 `ftell()` function, 168
`FILE_IGNORE_NEW_LINES` flag, 166
filename pattern strings, 170
file not found message, 160
files, 157
 array of paths, 169
 bytestreams, 167
 closing, 168
 confirming existence, 159
 deleting, 164
 end of, 168
 extensions, 10
 permissions, 163
 reading, 158
 into an array, 166
 renaming, 165
 size, 159
 text, 158, 177, 190, 387, 599
 naming, 5
 writing to, 163–164

touching, 161
.txt, 157
file servers, 182
FILE_SKIP_EMPTY_LINES flag, 166
filesystem pointers, 167
FILTER_DEFAULT value, 220
filter_has_var() function, 210, 217
filter_input() function, 201, 203–204,
 226, 243
FILTER_REQUIRE_ARRAY argument,
 220, 223
FILTER_SANITIZE_SPECIAL_CHARS
 argument, 205
final declarations, 374–376
finally statements, 447–448
findstr command, 463
Flaticon (website), 655
float data type, 28–29
floating-point numbers, 27, 29
flow of control, 333
foreach loops, 111, 134–136, 145
foreign keys, 532
 relationships in Doctrine, 624
for loops, 111, 117–122, 133
 last iteration, handling the,
 120–122
form actions
 avoiding double form
 submissions, 590
 default, 234
 processing data, 201
 validation, 225–226, 231–233, 235
format() method, 634–635
for statements, Twig, 406
front controllers, 185, 333, 428–430
 Application class as, 409
 creating, 284
 updating, 320
fully qualified names, 548
 namespaced classes, 383
functions, 10–11, 17, 21, 81, 85. *See also* names of individual functions
 anonymous, 153
 callback, 153
 calling, 82, 86
 declaring, 82, 84–88
 helper, 297
higher-order, 153
moving website logic into, 245
parameters, 85–86
return type, 85
scope of, 107
signature, 85, 97
variable number of arguments, 136
for website logic, 245

G

generalization, 332, 358
geocoding, 652
\$_GET array, 204
GET HTTP method, 178–181
 method forms, 200–202
 requests, 197
getInstance() function, 488
«get/set» annotations, 366
getter methods, 342, 354, 363, 476
 Twig, 403
getTimestamp() function, 646
getTimezone() function, 643
gettype() function, 29
Git, 599
.gitignore files, 615
global variables, 82
global visibility, 491
glob() function, 169
Glyphicon stars, 280
greater-than operator (>), 35, 37,
 119, 188
greater-than-or-equal-to (>=)
 operator, 37
grep function, 463
guillemets, UML notation (« »), 366
GuzzleHttp namespace, 651
Guzzle library, 648

H

halting execution, 442
hardcoded
 database credentials, 596
 references, 521
 values, 90
hashing, 596, 608–609
haystack strings, 55
HEAD HTTP method, 179
“Hello, world!” script, 5–6, 15

helper
 classes, 622
 functions, 297
 methods, 591
 scripts, 606
heredocs, 49–52
 operator, 49
 strings, 41, 49, 163
 indentation in, 50
hexadecimal code, 48
hidden variables, 577
hiding information, 331
higher-order functions, 153
highlighting the current page, 249, 251,
 305, 420, 434
hit counters, 266
Homebrew package manager, 663
.htaccess files, 264
HTML (HyperText Markup Language),
 7, 49
 template text, 244
HTTP (HyperText Transfer Protocol),
 20, 178
 cookies, 263–264
 headers, 181
 method, 204
 requests, 178, 195, 197
 responses, 178
 status codes, 179
 Secure (HTTPS), 181
http_build_query() function, 652
hyperlinks
 dynamically created, 213
 encoding data, 211

|

IDE (integrated development environment), 8
identical code, 435
identical operator (==), 36, 75, 229
identifiers, 16
identity, 36, 75, 150
ID-indexed arrays, 282
id property, 603
if...else statements, 67
 if...elseif, 68
 if...elseif...else, 69
 nested, 68
if statements, 66
 alternative syntax, 69
 in Twig, 406
images
 databases, 282, 460
 logo, 306
implode() function, 122, 135, 220
include command, 83
 Twig, 414
increment operator (++), 23,
 117–118
indentation in heredoc strings, 50
indexing, zero-based, 54
index.php file, 7, 11–13
infinite loops, 123
information disclosure, minimum, 314
information hiding, 331
inheritance, 331, 357, 427, 607
 augmenting behavior,
 371–373
 multiple, 503–504
 OOP, 435
 hierarchies, 497
 Twig, 415
INI file, 664
INPUT_GET argument, 201
INPUT_POST argument, 203
input prompts, 112
INSERT statement, 660
installing PHP, 663–667
 extensions, 667
instances, 328, 339
 instantiation, 339, 479, 498
instance-level
 members, 508
 properties, 478
insteadof keyword, 525
int data type, 28
integers, 27–28
integrated development environment
 (IDE), 8
interactive mode, 28
interfaces, 497, 502
 extension of multiple, 509
 implementing, 506–507
interpreters, 6
?int nullable integer type, 96
intval() function, 229

`InvalidArgumentException`

 class, 449

`is_datatype` functions

- `is_bool()` function, 31
- `is_dir()` function, 161
- `is_float()` function, 31
- `is_int()` function, 31
- `is_null()` function, 31
- `is_numeric()` function, 32, 228

ISO 8601 standard, 632

`isset()` function, 132, 204, 305

`is_string()` function, 31

iterator (`$i`) variable, 117

J

JavaScript Object Notation (JSON),
 171, 387, 514, 655

 JSON-formatted string, 172

`json_decode()` function, 172

`json_encode()` function, 172

K

keys

 accessing, 126, 134

 API, 473

 array, 125

 databases, 532

 foreign, 532, 624

 integer, 126

 negative, 139

 nonsequential, 144

 unique, 128

 non-integer, 129

 primary, 532

 string, 146

key-value mapping, 126

L

last iteration, handling the, 120–122

`lcfirst()` function, 54

leading numeric strings, 34, 38

Lerdorf, Rasmus, 632

less-than (`<`) operator, 37, 119

less-than-or-equal-to (`<=`) operator,
 37, 119

Linux, 664

Liskov substitution principle (LSP),
 370–371

lists, 132, 144

 multiple-selection, 221

 single-selection, 220

literal values, 17, 21

load balancing, 534

localhost, 12

local variables, 87, 107

logfiles, 462–463, 467

logging, 446, 459–460, 472–473

 cloud, 472

 interface, 464–465, 509

 Logger class, 464, 466–474,
 485–491, 509

log handler classes, 465, 472

logical comparison operators, 39,
 70–73, 122

login

 authentication tokens, 265

 forms, 301

 storing data with sessions, 316

 username, displaying, 321

 verifying hashed passwords at,
 608–609

logo images, 306

logout feature, 319–321

`LOG_WARNING` constant, 463

lollipop notation, 504–505

loops, 111

 alternative syntax, 122–123

 through arrays, 133

 conditional, 112

`do...while`, 111, 113

`for`, 111, 117–122, 133

`foreach`, 111, 134–136, 145

 infinite, 123

 Twig, 433

loose coupling, 526

lower camel case, 19–20, 85, 216

lowercase letters, 37, 53–54

low-level code, 596

`ltrim()` function, 59

M

macOS, 663

magic constants, 83, 340, 346

magic methods, 346

many-to-one relationships, 626

mapping, key-value, 126

match statements, 75–76, 96–99
members of a class, 329
messages
 deprecation, 88–89
 error, 160, 368, 575, 587, 611
 between objects, 327–328
 pop-up confirmation, 577
 warning, 17
metadata, 596, 619–620
 tags, 619
methods, 329, 339
 abstract, 497, 500–509, 526
 accessor, 341–342, 363
 constructor, 346–348, 433
 custom, 353
 declaring `final`, 375
 default implementation, 500
 helper, 591
 magic, 346
 overriding, 333, 357, 368–376, 498
 signatures, 370, 497, 527
 static, 480
minimum information disclosure, 314
mixins, 522
`mkdir()` function, 161
models, 240–241
 classes, 538, 542, 596, 601
model-view-controller (MVC)
 architecture, 177, 189, 240, 396, 535
`modify()` function, 636
modulo, combined assignment and
 modulo operator (`%=`), 23
modulo operator (`%`), 21–22, 120
Monolog library, 464
multidimensional arrays, 147–148, 542
multiline comment (`/*..*/`), 16
multiple attribute, 221
multiple controller classes, 430–435
multiple exception classes, 449–454
multiple inheritance, 503–504
multiple interfaces, extension of,
 509
multiple levels of inheritance, 361
multiple return types, 95
multiple-selection lists, 221
multiple validation errors, 227
multiplication operator (`*`), 21
MVC (model-view-controller
 architecture), 177, 189, 240, 396, 535
MySQL, 533, 542, 667, 669
 dates, 655
 server, 599
`MYSQL_DATE_FORMAT_STRING`
 constant, 658

N

`\n` (newline character), 5, 10, 14–15, 42–43, 46, 158
named arguments, 102
namespaces, 381–384
 fully qualified names, 383
 referencing, 384–385
 root, 382, 444
name/value pairs, 198
naming collision, 381
navigation bars, 396
needle strings, 55
new keyword, 339, 346
Nominatim, 652
non-numeric characters, 32–34
non-numeric strings, 35
not-equal operator (`!=`), 36, 150
not-equal operator (`<>`), 36, 150
not-identical operator (`!==`), 36, 150
NOT operator (`!`), 36, 70–71, 122
nowdoc strings, 41, 52–53
nullable
 parameters, 97
 types, 95–98
null-coalescing operator (`??`), 77–78, 305
NULL type, 28, 30–31, 37, 77–78
 connection, 573
 referring to missing objects, 351–352
 returning, 91
`number_format` filter, 434, 564–565, 576, 589
`number_format()` function, 100, 281, 288, 292, 481, 484
numeric
 characters, 32–34
 comparisons, 36
 strings, 34, 38

O

object fetch mode, 542, 548
object operator (`>`), 45, 329,
 339–340
object-oriented
 PHP, 325, 427
 programming, 19–20, 327, 427
 inheritance, 435, 497
 web applications, 402, 438
object-relational mapping (ORM),
 595–596, 615
objects, 28, 31, 327, 339
 resource, 167
online coding environments, 4
open source projects, 598
OpenStreetMap, 648
operands, 21, 32
operators, 21
 arithmetic, 21–22, 33
 array, 150–151
 assignment, 17, 101, 124
 combined arithmetic assignment,
 22–23
 comparison, 35
 concatenating assignment, 45
 decrement, 23
 equal, 35–36
 identical, 36, 75
 increment, 23
 logical AND, 39, 70, 71–72
 logical NOT, 36, 70–71, 122
 logical OR, 39
 null-coalescing, 77–78, 305
 order of precedence, 22
 string concatenation, 44
 ternary, 39, 76–77
 unary, 23
optional parameters, 100
ORM (object-relational mapping),
 595–596, 615
OR operations, 70
OR operator (`||`), 39, 70, 72–73
output buffers, 187
overriding
 methods, 333, 357, 368–376, 498
 preventing, 374
 Twig, 417, 434

P

Packagist (website), 392
padding, 61
page-generation logic, 430
page header HTML templates, 287
parameters, 85–86
 nullable, 97
 optional, 100
 skipped, 104
parentheses `(())`, 22, 71
parent keyword, 371
parsed strings, 35, 46
partial templates, 287, 414
Pascal case, 338
pass-by-reference approach, 105, 130
pass-by-value approach, 105
`password_hash()` function, 608
passwords, 112, 601
 hashing, 596
 verifying at login, 608–609
 text fields, 302
`password_verify()` function, 609
PATH environment variable, 665
PATH_TO_TEMPLATES constant, 400
pdo-crud-for-free-repositories
 library, 598
permissions, files and directories, 163
PHP
 Data Objects, 541, 670, 675
 engine, 6, 11, 15
 Extension Community
 Library, 509
 extensions, 667
 Hypertext Preprocessor, xxvi
 installing, 663–667
 libraries, 392
 object-oriented, 325, 427
 Standards Recommendations, 81
 PSR-3, 464
 PSR-4, 388–389
 PSR-6, 510
 PSR-16, 510
 tags, 187
 PHP_EOL constant, 44, 47
 `phpinfo()` function, 11
 `php.ini` file, 264, 462, 533, 642
 plus sign (+), 21

- popping (stack), 131
pop-up confirmation messages, 577
ports, 12
`$_POST` array, 204
postback scripts, 230
PostgreSQL, 629
POST HTTP method, 178, 291, 571
 method forms, 202–204
 requests, 197
post-increment values, 24
post-redirect-get (PRG) pattern, 590
power operator (**), 21
precedence, 22, 70–71
pre-increment values, 24
prepared statements, 542, 545
primary keys, 532
`print_r()` function, 150
`print` statements, 10, 14
`print_timestamp()` function, 646
private constructors, 488
`private` keyword, 335, 362
private properties, 341
procedural programming, 327
process IDs, 463
processing form data, 201
project structures
 directory, 190
 file, 304
 secure, 245
properties of a class, 329, 338–339
`protected` keyword, 342, 362, 436
pseudo-variables, 343
PSR (PHP Standards
 Recommendations), 81
 PSR-3, 464
 PSR-4, 388–389
 PSR-6, 510
 PSR-16, 510
`public` keyword, 335, 338, 362
public properties, 338–339, 341
pushing (stack), 131
- Q**
- qualified names, 384
query-string variables, 197–198
 hardcoded IDs, 207
 in hyperlinks, 206
- quotation marks, 14, 21, 30, 88
 double (""), 6, 41, 50
 escaped, 43
 single (''), 41–43
- R**
- radio buttons, 215
read-evaluate-print loop (REPL), 4
`readline()` function, 113
records in databases, 532
redirects, 580, 590
reference, pass-by-reference approach, 105, 130
reference operator (&), 138
references, 31, 329, 339, 351
 to arrays, 137–139
 hardcoded, 521
referencing namespaces, 384–385
reflection, 598
relational databases, 532
 management system, 533
relationships
 databases, 532
 ER model, 536
 between objects, 330
relative paths, 83
`rename()` function, 165
`render()` function, 397
Repl.it, 673
`replit.nix` file, 674
repository classes, 556, 570, 595, 622
`REQUEST_METHOD` keyword, 232
request-response cycle, HTTP, 178
requests for comments (RFC), 89
 RFC 5424 levels, 460
`require` command, 83
`require_once` command, 82–84
resource-expensive operations, 488
resource objects, 167
`return` statements, 86, 91
`return` types, 85, 347
 multiple, 95
reusability, 82
reverse geocoding, 652
`rewind()` function, 168
`rmdir()` function, 165
root namespace, 382, 444
rounding down, 40

routing, 184–185
`rtrim()` function, 59
runtime notices, 88

S

sanitization, 205
scalable web applications, 239
scalar data types, 28, 39, 147, 150
schema, database, 533, 607
scope
 of functions, 107
 of variables, 87, 247
scope-resolution operator (`::`), 372, 478
scripts, 5–6, 15, 388
 bootstrap, 623
 helper, 606
 postback, 230
security, 301
 best practices, 608
 credentials, 189
 database, 595, 615
 of project folder structures, 245
 Twig, 399
 vulnerability, 446
`self::` prefix, 401, 478
semicolons, 6
sensitivity, case, 19, 57
sentinel values, 478
separating display and logic files, 242
`$_SERVER` array, 232
server-based database management systems (DBMS), 533
servers, 195
 client communication, 177, 196–204
 file, 182
`$_SESSION` array, 265, 275, 317, 591
`session.auto_start` configuration
 setting, 264
`session_destroy()` function, 270
`session_id()` function, 264
sessions, 261–272, 301
 destroying, 270
 IDs, 262
 shopping carts, 275
 storing login data with, 316
 time out, 263

`session_start()` function, 264, 298, 593
`setDate()` function, 638
setter methods, 335, 342, 354, 363, 476
`setTime()` function, 638
`setTimeStamp()` function, 647, 652–653
severity levels, 463, 474
 logging, 460
shared header templates, 304
sharing static resources, 485
shopping carts, 13, 16, 211, 275, 397
 subtotal calculation in, 288–290
short echo tags, 188
side effects, 82
signatures of methods, 370, 497, 527
simple arrays, 125
`SimpleXMLElement` class, 173
`simplexml_load_file()` function, 173
single-quoted strings, 41–43
 nowdoc strings, 52
single-selection lists, 220
singleton pattern, 488
`sizeof()` function, 132
skipped parameters, 104
snake case, 19–20, 85
snapshots of databases, 460
software architecture, 430
sophisticated arrays, 143
`sort()` function, 141
sorting data, 39
space replacement character (%20), 197
spaceship operator (<=>), 38
spread operator (...), 137, 150–151
SQL (Structured Query Language), 49, 534, 570
 drop tables, 607
 injection, 542
 statements, 534
SQLite, 533, 542, 667, 675
 installation, 671
square brackets ([]), 126–127
src directory, 245, 338
stacks, 131
stack trace, 446
Standard PHP Library (SPL), 449
statements, 6, 13, 24
 branch, 68
 choice, 66
 conditional, 39, 65

group, 67
prepared, 542, 545
static, 475
 content, 183
 members, 367, 476
 methods and properties, 480
status codes, 179
stereotyping, 366
sticky forms, 230
`str_contains()` function, 72
StreamHandler class, 464–465
`str_getcsv()` function, 173
string concatenation operator `(.)`, 35,
 44, 84
string data type, 90
string literal values, 21
strings, 6, 28, 41
 array of characters, 139
 comparison, 36
 functions, 612
 concatenation, 45, 126, 542
 double-quoted, 41, 46–48
 expression, 42
 functions, 41, 53
 heredoc, 41, 49, 163
 keys, 146
 negative integer, 139
 needle and haystack, 55
 non-numeric, 35
 nowdoc, 41, 52–53
 numeric, 34, 38
 parsed, 35, 46
 replacement, 58
 searching, 54
 single-quoted, 41, 43
 unparsed, 52
`stristr()` function, 57
`strlen()` function, 55, 73, 112, 228
`STR_PAD_BOTH` constant, 61–62
`str_pad()` function, 61, 90
`STR_PAD_LEFT` constant, 61–62
`strpos()` function, 55
`str_repeat()` function, 61
`str_replace()` function, 58
`str_split()` function, 140
`strtolower()` function, 53
`strtoupper()` function, 53
structures, data, 299
subclasses, 331, 357, 451
 exceptions, 456
subclassing, preventing, 374
`sub()` method (`DateTimeImmutable`), 639
submit buttons, 200, 208
`substr_count()` function, 55
`substr()` function, 56
substrings, 54–56
`substr_replace()` function, 58
subtraction, combined assignment
 and subtraction operator
 `(-=)`, 22
subtraction operator `(-)`, 21
superclasses, 331, 357, 435
 abstract, 498–499, 526
superglobal arrays, 204, 265
switch statements, 73
Symfony web framework, 386
`syslog()` function, 460, 462

T

`\t` (tab escape character), 83
tables, database, 532
tabs, 42
tags, 5, 619
 PHP, 187
 short echo, 188
 templating, 185, 395
 library, 396
 script, 281
 text, 13–14, 244
 ternary operator `(?)`, 39, 76–77
 input, 253
 text box form input, 200
 text/html content type, 181
third-party libraries, 382, 390
`$this` keyword, 20, 335, 343
throwing exceptions, 442–446
throw statements, 442
`time()` function, 646
times, 631
 daylight saving, 631, 644
 manipulating, 637
 offsets, 633
`timestamp()` function, 653
timestamps, 40, 463, 656
 logging, 473
`time_t` format, 646

time zones, 631, 641
 identifiers, 642
timing attacks, 612
 `_toString()` method, 346, 349
`touch()` function, 161
traits, 497, 521
 resolving conflicts, 525
`trim()` function, 59
`try...catch` statements, 446
Twig, 395
 Composer, 398
 control structures, 406
 inheritance, 415
 loops, 433
 security, 399
 templates, 408
 variables, 397
type casting, 27, 39
type conversions, 34
`TypeError` message, 35, 88
type juggling, 27, 30, 32–39,
 89–90
 comparative, 35–39
 logical, 39
 numeric, 33–35
 string, 35
types, data, 27–28, 75, 85, 88, 492

U

`\u{<hex>}` Unicode escape sequence, 48
Ubuntu, 665
`ucfirst()` function, 54
`ucwords()` function, 54
unary operator, 23
undefined
 constants, 18
 variables, 17
`Undefined` property warning, 364
Unicode characters, 48
Unified Modeling Language
 (UML), 339
 diagram, 365
union operator (+), 150
union types, 98
Unix time, 646
`unlink()` function, 165
unparsed strings, 52

`unset()` function, 31, 132, 149, 269
unsetting a variable, 40
upper camel case, 338
uppercase letters, 53–54
username/password login forms,
 608
 displaying logged-in username,
 321
`use` statements, 384
`usort()` function, 141
UTC (Coordinated Universal
 Time), 641
utility classes, 482

V

validation, 205, 231, 233, 255
 errors, 227
 form data, 225–226, 233
 array-based, 235–237
value-backed enums (`->value`), 494
`var_dump()` function, 30, 607
variable multiplication operator
 (`*=`), 23
variables, 16–21
 Boolean, 72
 counter, 117
 destructuring arrays into, 152
 global, 82
 hidden, 577
 local, 87, 107
 names, 47
 pseudo, 343
 query-string, 197–198
 scope of, 87, 247
 Twig, 397
 undefined, 17
 unsetting, 40
vendor folders, 390
view, 240
 model-view-controller
 architecture, 189, 396
virtual attributes, 354
virtual machines, 4
visibility
 default, 342
 global, 491
 keywords, 362
`void` return type, 90

W

`warning()` function, 465
warnings, 88, 364
 messages, 17
web applications
 architecture of, 438
 multipage, 249
 object-oriented, 402, 438
 scalable, 239
web forms, 195
 client/server communications for,
 196–203
 encoding data, 211–214
 filtering, 203–206
 input types, 214–223
 mixed variables, 207–208
 multiple submit buttons, 208–211
 noneditable data, 206–207
web servers, 4, 7–8, 11–12
 built-in, 190
 dynamic, 183
 installing a different, 192
 public directory, 676

while loops, 111–112
whitespace, 33, 42, 188
 trimming, 59
Windows, 665–667

X

XML (eXtensible Markup Language),
 173, 599
XOR (exclusive-OR) operations, 70, 73

Y

YAML (YAML Ain’t Markup
Language), 173, 599
YAML functions
 `yaml_emit()`, 173
 `yaml_emit_file()`, 173
 `yaml_parse()`, 173
 `yaml_parse_file()`, 173

Z

zero, numeric value of, 228
zero-based indexing, 54
Zulu time, 641