

Index

#

- `+=` (accumulative addition) operator, 27–28, 99–100
- `/=` (accumulative division) operator, 99–100
- `*=` (accumulative multiplication) operator, 99–100
- `-=` (accumulative subtraction) operator, 99–100
- `+` (addition) operator, 2, 38, 98, 101
- `+` (concatenation) operator, 2, 85–86
- `/` (division) operator, 2, 38, 98, 101
- `=` (equal) operator, 2, 34
- `**` (exponentiation) operator, 2, 38, 100, 101
- `>` (greater than) operator, 2
- `>=` (greater than or equal) operator, 2
- `<` (less than) operator, 2
- `<=` (less than or equal) operator, 2
- `*` (multiplication) operator, 2, 38, 98, 101
- `<>` (not equal) operator, 2
- `-` (subtraction) operator, 2, 38, 98, 101

A

- accumulation operators, 98–100
- `Actgrp` keyword, 18
- Add (Add) operation, 4, 98
- Adddur (Add duration) operation, 92
- `%Addr` (Get address of variable) function, 111
- alternate display format, 10
- application programming interfaces (APIs), 115–117. *See also* individual APIs
- assignment statements, 34–35, 75–79, 97–102
- asterisk (`*`), 10

B

- beginning-of-file condition, 48
- `%Bin` (Binary) function, 2
- `Bnddir` keyword, 18
- bound call, 109–110
- built-in functions, 2–3, 28, 79–92. *See also* individual functions
 - best practices for, 92
 - combining, 91–92

C

- C, 2, 10, 12–13, 14, 28, 43, 45, 91, 105, 112
- call and return, 107–117
- Call (Call a program) operation, 107
- CallB (Call a bound procedure) operation, 107
- CallP (Call a Prototyped Procedure or Program) operation, 39, 107–108, 111, 112, 115
- Cas (Conditionally invoke subroutine) operation, 69
 - free-format alternative to, 69, 126–127
- Cat (Concatenate two strings) operation, 85, 119
- CEEHDLR (Register a User-Written Condition Handler) API, 116, 141
- CEEHDLU (Unregister a User-Written Condition Handler) API, 116, 141
- Chain (Random Retrieval from a File) operation, 2, 27, 42, 47, 48, 49, 50, 51, 53
- `%Char` (Convert to character data) function, 80–81, 93, 106, 125
- character-to-integer conversion, 86–87
- character-to-packed decimal conversion, 81–82

- Check (Check characters) operation, 49, 89
- %Check (Check characters) function, 31, 89–90
- CheckR (Check reverse) operation, 49, 89–90
- %CheckR (Check reverse) function, 89
- CHGPRTF (Change Printer File) command, 57
- CHGVAR (Change Variable) command, 34
- Cobol, 10, 28, 43
- comments, 7, 8, 10–11, 39, 45
- Comp (Compare) operation, 36
- comparison symbols, 2
- concatenation, 2, 85–86
- conditional logic, 59–62
- Const keyword, 111, 112, 113–114
- Control Language (CL), 2, 34, 43
- control specification, 17–18
- /Copy directive, 18
- cross-foot, 102
- CRTDTAQ (Create Data Queue) command, 117
- Ctl-opt operation code, 17–18
- CVTRPGSRC (Convert RPG Source) command, 41
- D**
- data area input, 52
- data manipulation functions, 79–80
- data manipulation operations, 75–95
- data types
 - conversion, 80–82, 86–87, 105–106
 - date, 3, 22
 - floating-point, 3, 21
 - indicator, 22, 43
 - integer, 3, 21
 - numeric, 21, 105
 - object, 3, 22
 - pointer, 3, 22
 - procedure pointer, 22
 - string, 21
 - time, 3, 22
 - timestamp, 3, 22
 - used in free-format data definitions, 21–22
- database input, 47–52
- database output, 52–54
- date and time operations, 92–95
- date data type, 3, 22
- date/time arithmetic, 94–65
- date/time-to-character conversion, 93–94
- date/time-to-decimal conversion, 93–94
- %Days (Number of days) function, 94
- Dcl-f operation code, 18–19
- Dcl-pi operation code, 24
- Dcl-proc operation code, 24
- Dcl-subf operation code, 21
- %Dec (Convert to packed decimal format) function, 81–82, 93, 106
- %Dech (Convert to packed decimal format with half adjust) function, 81, 106
- decimal position, extracting, 87–88
- decimal-to-character conversion, 80–81
- %Decpos (Get number of decimal positions) function, 82, 87–88
- definition specifications, 4, 20–24, 52, 65, 87, 107
- Delete (Delete record) operation, 49, 52, 54
- Dev keyword, 55
- Dftactgrp(*No), 18
- %Diff (Difference between two date, time, or timestamp values) function, 94, 95
- Div (Divide) operation, 4, 98
- Do (Do) operation, 10, 37, 63

free-format alternative to, 128–129
 Do operations, 63–66
 Dou (Do until) operation, 37, 39, 63, 64, 66, 102
 Dow (Do while) operation, 37, 39, 63–64, 66, 102
 Dsply (Display message) operation, 55–56
 dynamic call, 108–109

E

(e) operation extender, 50, 129, 140, 141
 %Editc (Edit value using an edit code) function, 80–81
 %Elem (Get number of elements) function, 88–89
 Else (Else) operation, 35–37, 59, 60, 62, 68
 Elseif (Else if) operation, 35–37, 39, 59, 60, 62, 68, 126–127
 embedded SQL
 advantages of, 71
 fixed-format method, 71–72
 free-format method, 73
 End statements, 20. *See also* individual End statements
 End-ds operation code, 20
 /End-free compiler directive, 17, 18, 24
 end-of-file condition, 48, 67
 End-pi operation code, 20, 24
 End-pr operation code, 20, 24
 End-proc operation code, 24
 /End-SQL precompiler directive, 72
 Enddo (End a Dou or Dow group) operation, 11, 63, 64, 67, 128
 Endfor (End a For group) operation, 11, 65–66, 67
 Endif (End if) operation, 35–37, 59, 60, 62, 64

Endmon (End a monitor group) operation, 140
 Endsll (End select) operation, 68–69
 Endsrl (End subroutine) operation, 129
 %Eof (End-of-file), 2, 48
 %Equal (Return exact match condition) function, 48, 51–52
 error handling, 50, 129–141
 %Error (Return error condition) function, 48, 50–51
 Eval (Evaluate expression) operation, 2, 4, 19, 34, 34–35, 39, 75–79, 97, 98
 and blank padding, 77
 character, 77–78
 explicit vs. implicit, 76
 fixed- vs. free-format, 102–104
 vs. Move, 79
 numeric, 76–77
 and truncation, 77–78
 EvalR (Evaluate right) operation, 78
 exception handlers, 140, 141
 Exec SQL precompiler directive, 72, 73
 Except (Calculation time output) operation, 52, 53–54, 57, 58
 Exfmt (Write then read) operation, 54, 56
 exponentiation, 100–101
 Export keyword, 24, 109
 expression operators, 161–162
 expressions, 97–102
 Exsrl (Invoke subroutine) operation, 69
 Extdesc keyword, 18
 Extended Factor 2, 29, 38, 45, 91, 97, 102–104, 114
 external program, calling, 24
 externally described files, 9
 Extfile keyword, 18
 Extname keyword, 49, 108
 Extpgm keyword, 108

Extproc keyword, 109

F

field naming, 8–9

file specifications, 17–20

%Fields (Fields to update) function, 47, 53

fixed-format RPG IV, 1–4, 28

operation codes, 33–34

floating-point data type, 3

For groups, 88, 89

For (For) operation, 37, 39, 63, 65–66, 66–67, 102, 128–129

%Found (Return found condition)

function, 2, 48, 49–50, 53

four-function math, 98

/Free compiler directive, 17, 18, 24

free-format programming languages, 12–14

free-format RPG IV

advantages of, 7–15

accessing APIs in, 115–117

alternatives for fixed-format operations, 119–141, 207–211

calculations, 28

call and return, 107–117

code block, 28–30

coding formats, 39–41

control specification, 17–18, 25

controlled looping, 37–38

data manipulation operations, 75–95

database input, 47–52

database output, 52–54

definition specifications, 17, 20–24, 25

embedded SQL operations using, 71–73

expression operators, 161–162

error handling, 129–141

field naming, 8–9

file specifications, 17–20, 25

getting started with, 28

introduction of, 27

introduction to, 27–45

keyed access, 42

language comparison, 12–14

math operations, 97–106

mathematics, 38

modern programming style of, 12–14, 28

non-case sensitivity of, 28, 30

operation codes, 28, 31–33, 163–194

operations absent in, 69

and programming efficiency, 15

printer output, 57–58

procedure specification, 17, 24–25

program flow, 59–69

programming best practices, 7–12, 30, 39–44, 45

readability and maintainability of, 7–12

sample programs, 123–149, 195–206

Technology Refresh 7 (TR7)

enhancements to, 17–25

variable naming, 29–30, 103–104

workstation I/O, 54–56

functions. *See* built-in functions

G

Goto (Go To) operation, 8, 11, 37, 66, 69

free-format alternatives to, 69

H

(h) operation extender, 34

half adjust, 34, 76–77, 86–87

I

IBM i, xi, xii, 1, 2, 17, 28
 V3R1, 2
 V5R1, 27, 36, 43, 57
 V5R2, 27
 V7.1, 2, 28, 31, 84, 108

If group, 59–62

If (If) operation, 2, 10, 35–36, 39, 59–62, 63, 68, 102, 126–127

ILE RPG. *See* RPG IV

In (Retrieve a data area) operation, 52

INDARA keyword, 43

INDDS keyword, 9, 43, 64

indenting, 8, 10, 45, 61, 102

indicator data structure, 23

indicator data type, 22, 43

indicator set, on condition, 78

indicators, 4, 8, 78

inline composite argument list, 49, 53

input/output, 47–58

%Int (Convert to integer format) function, 86–87, 106

%Inth (Convert to integer format with half adjust) function, 86–87, 106

integer data type, 3

Integrated Language Environment (ILE), 2, 116, 140, 141

Intersystem Communications Facility (ICF), 55

Invite keyword, 55

Iter (Iterate) operation, 11, 66, 67–68, 69

J

Java, 3, 13, 14, 43, 45, 105

K

%Kds (Search arguments in data structure) function, 27, 47, 49, 53

Keyed keyword, 20

Kfld (Define parts of a key) operation, 27, 42, 49

Klist (Define a composite key) operation, 27, 42, 49, 53

L

Leave (Leave a Do/For group) operation, 11, 66–67, 69

LeaveSr (Leave a subroutine) operation, 11, 69

%Len (Get or set length) function, 82, 87–88

length, extracting, 87–88

*Like keyword, 87, 88

LikeRec keyword, 49

Linoma Software, 41

local variable concept, 3

Lookup (Look up a table or array element) operation, 33, 49, 120

%Lookup (Look up an array element) function, 31, 33

loop interrupt, 11, 66–68, 69

looping operations, 37–38, 63, 64, 65–68

LPEX, xii

LR indicator, 4, 44, 114

M

maintenance (program), 7–9

math operations, 97–106

math symbols, 2

modern programming style, 12–14

Monitor (Begin a monitor group) operation, 140, 141

%Months (Number of months) function, 94, 95

Move (Move) operation, 33, 79, 80
 free-format alternative to, 123–125

MoveA (Move array) operation
 free-format alternative to, 119–123

MoveL (Move left) operation, 77, 79, 80

free-format alternative to, 125–126
Mult (Multiply) operation, 4, 98
Mvr (Move remainder) operation, 33, 98

N

*N, 20, 24
named indicator, 43, 57, 78
not found condition, 48
number-to-date/time conversion, 92–93
numeric data types, 21, 105

O

object data type, 3, 22
OFLIND keyword, 44
On-error (On error) operation, 140
operation codes, 31–33, 33–34. *See*
 individual operation names
operation extenders, 34, 50, 129, 140,
 141, 163
Options(*NoPass) keyword, 111
Options(*Omit) keyword, 111
Options(*RightAdjust) keyword, 112
Options(*String) keyword, 112
Options(*Trim) keyword, 112
Options(*VarSize) keyword, 111–112
OS/400, 2. *See also* IBM i
Other (Otherwise select) operation, 68–
 69
output specifications, 53
overflow indicator, 44, 57
Overlay keyword, 43
OVRPRTF (Override with Printer File)
 command, 57

P

parameter passing, 13, 110–114
Parm (Identify parameters) operation,
 107
parentheses, 2, 35, 101

Pascal, 10, 45
PL/1, 10, 28, 45
Plist (Identify a parameter list) operation,
 107
pointer data type, 3, 22
Pos keyword, 22–23
precedence
 in free-format expressions, 101
 in If operations, 60–61
procedure interface (PI), 23, 108, 109
procedure pointer data type, 22
procedure prototype (PR), 23–24, 107
procedure specification, 17, 24–25
printer output, 57–58
program flow, 59–69
programming skills
 maintaining, 14–15
 management's perspective on, 15
 programmer's perspective on, 14
*PSSR subroutine, 129, 141

Q

QCMDEXC (Execute Command) API,
 116
QRCVDTAQ (Receive Data Queue)
 API, 116–117
QSNDDTAQ (Send Data Queue) API,
 116–117
qualified data structure, 49

R

(r) precision operation extender, 34
Rational Developer for Power (RDp), xii
Rational Developer for System i (RD*i*),
 xii, 41
read operations, 47, 48
Read (Read a record) operation, 2, 47,
 50, 51, 53, 55, 56, 67
ReadE (Read equal key) operation, 47

- ReadP (Read prior record) operation, 47
 ReadPE (Read prior equal) operation, 47
 record locking, 53
 recursion, 3
 Remote System Explorer, xii
 %Replace (Return integer remainder) function, 98
 %Replace (Replace character string) function, 83–84, 88, 121, 124, 125
 result decimal precision, 76
 resulting indicator, 48, 50, 129
 Return (Return to caller) operation, 39, 114–115
 RPG. *See also* RPG IV, RPG/400
 cycle, 4
 free format as centerpiece of, 1
 history, 1–4
 RPG II, 36
 RPG III, 36
 RPG IV. *See also* free-format RPG IV
 field, file, and record name lengths, 3
 fixed-format, 1–4
 introduction of, 1–2
 major features of, 2–3
 as modern programming language, 3–4, 5
 other changes in, 3–4
 parameter passing, 13
 preservation of old functionality in, 4
 variable names, 29–30
 RPG/400, 3, 4, 8, 41
 RPGLE member type, 71
 RT indicator, 4
- S**
- sample programs
 customer data entry program, 140–144, 192–199
 customer inquiry program, 148–149, 189–191
 investment and loan utility program, 143–147, 195–199
 sales report program, 145–149, 199–205
 Scan (Scan string) operation, 3, 49, 90, 119
 %Scan (Scan for characters) function, 3, 90, 121
 %Scanrpl (Replace character string) function, 84–85, 121
 Select (Begin a Select group) operation, 36, 39, 68–69, 126–127
 semicolon (;), 18, 29, 104
 Setgt (Set greater than) operation, 47, 49, 52
 Setll (Set lower limit) operation, 47, 49, 51–52
 Setoff (Set indicator off) operation, 33
 Seton (Set indicator on) operation, 33
 Setxx (Set *xx*) operation, 27, 42
 short-form math, 98–100
 size, extracting, 87–88
 %Size (Get size in bytes) function, 87–88
 slash (/) character, 73, 98
 slash, double (//) characters, 11, 29
 Source Entry Utility (SEU), xi–xii
 spaghetti code, 37, 69
 SQL. *See* Structured Query Language (SQL)
 SQL communications area, 72, 73
 /SQL compiler directive, 18
 SQLRPGLE member type, 71, 73
 Sqrt (Square root) operation, 100
 %Sqrt (Square root) function, 100
 %SST (Substring) CL function, 2, 82
 Stgmdl keyword, 18
 string data types, 21

string translation, 90–91
structured operations, 11
Structured Query Language (SQL), 71–73
Sub (Subtract) operation, 4, 98
%Subarr (Set/Get portion of an array) function, 122–123
%Subdt (Extract a portion of a date, time, or timestamp) function, 94, 95
Subdur (Subtract duration) operation, 92
subprocedures, 24, 109, 114–115
Subst (Substring) operation, 3, 82, 119
%Subst (Get substring) function, 3, 82–83, 88, 120, 124, 125
substringing, 82–83

T

Tag (Tag) operation, 37
Technology Refresh 7 (TR7), 17–25
time data type, 3, 22
timestamp data type, 3, 22
%Tlookup (Look up a table element) function, 34
%Trim (Trim characters at edges) function, 85–86, 122
%TrimL (Trim leading characters) function, 85
%TrimR (Trim trailing characters) function, 85
truncation, with Eval, 77–78

U

Unlock (Unlock a data area or release a record) operation, 53

%Uns (Convert to unsigned format) function, 86–87, 106
%Unsh (Convert to unsigned format with half adjust) function, 86–87, 106
Update (Modify existing record) operation, 52, 53, 54
*USA date/time format, 93
Usage keyword, 19–20

V

Value keyword, 110, 111, 113
variable names, 29–30, 103–104

W

WebSphere Development Studio, xxii, 27
When (When true then select) operation, 36, 39, 68–69, 126–127
whole-number portion, extracting, 86
work variables, 28–29
workstation I/O, 54–56
WORKSTN device, 55
Write (Create new records) operation, 52, 54, 55, 56, 57

X

%Xfoot (Sum array expression elements) function, 102
Xlate (Translate) operation, 90
%Xlate (Translate) function, 71, 90–91, 121

Y

%Years (Number of years) function, 94