



GameMaker: Studio

100 Programming Challenges

Ben Tyers

Apress®

GameMaker: Studio 100 Programming Challenges



Ben Tyers

Apress®

GameMaker: Studio 100 Programming Challenges

Ben Tyers

Worthing, West Sussex, United Kingdom

ISBN-13 (pbk): 978-1-4842-2643-8

DOI 10.1007/978-1-4842-2644-5

ISBN-13 (electronic): 978-1-4842-2644-5

Library of Congress Control Number: 2017932374

Copyright © 2017 by Ben Tyers

This work is subject to copyright. All rights are reserved by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

Trademarked names, logos, and images may appear in this book. Rather than use a trademark symbol with every occurrence of a trademarked name, logo, or image we use the names, logos, and images only in an editorial fashion and to the benefit of the trademark owner, with no intention of infringement of the trademark.

The use in this publication of trade names, trademarks, service marks, and similar terms, even if they are not identified as such, is not to be taken as an expression of opinion as to whether or not they are subject to proprietary rights.

While the advice and information in this book are believed to be true and accurate at the date of publication, neither the authors nor the editors nor the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Managing Director: Welmoed Spahr

Lead Editor: Steve Anglin

Development Editor: Matthew Moodie

Technical Reviewer: Dickson Law

Coordinating Editor: Mark Powers

Copy Editor: Karen Jameson

Compositor: SPi Global

Indexer: SPi Global

Artist: SPi Global

Cover image designed by Freepik

Distributed to the book trade worldwide by Springer Science+Business Media New York, 233 Spring Street, 6th Floor, New York, NY 10013. Phone 1-800-SPRINGER, fax (201) 348-4505, e-mail orders-ny@springer-sbm.com, or visit www.springeronline.com. Apress Media, LLC is a California LLC and the sole member (owner) is Springer Science + Business Media Finance Inc (SSBM Finance Inc). SSBM Finance Inc is a Delaware corporation.

For information on translations, please e-mail rights@apress.com, or visit www.apress.com.

Apress and friends of ED books may be purchased in bulk for academic, corporate, or promotional use. eBook versions and licenses are also available for most titles. For more information, reference our Special Bulk Sales–eBook Licensing web page at www.apress.com/bulk-sales.

Any source code or other supplementary materials referenced by the author in this text are available to readers at www.apress.com/9781484226438. For detailed information about how to locate your book's source code, go to www.apress.com/source-code/.

Printed on acid-free paper

Contents at a Glance

About the Authorxxi

About the Technical Reviewerxxiii

Acknowledgmentsxxv

Introductionxxvii

■ Challenge 1: Maths Bar Graph 1

■ Challenge 2: Draggable and Movable Object 3

■ Challenge 3: Room Fade In and Out Transition 5

■ Challenge 4: Typewriter Text Effect 7

■ Challenge 5: Audio Volume Change Based on Distance 9

■ Challenge 6: Move Object to Position Using Path 11

■ Challenge 7: Make the Screen Shake 13

■ Challenge 8: Create Snow Effect..... 15

■ Challenge 9: Password Easter Egg 17

■ Challenge 10: Follow Two Objects in View 19

■ Challenge 11: High / Low Number Game 21

■ Challenge 12: Calculate the Average Position of Two Clicks 23

■ Challenge 13: Retrieve Text File from Web and Save Locally 25

■ Challenge 14: Shuffle Pack of Playing Cards and Deal 5 27

■ Challenge 15: Reverse Sentence Order 29

■ Challenge 16: Rotate and Move Object to Mouse Position 31

■ Challenge 17: Firework Display Using Effects 33

■ **Challenge 18: Random Sentence Generator 35**

■ **Challenge 19: Pop-Up RPG Style Text Box 37**

■ **Challenge 20: Room Wrapping 39**

■ **Challenge 21: Sprite Shadow 41**

■ **Challenge 22: Make a Jukebox Player for Four Songs 43**

■ **Challenge 23: Scrolling Credits 45**

■ **Challenge 24: Random Dice Roller 47**

■ **Challenge 25: Substitution Cipher 49**

■ **Challenge 26: Save Highscore to INI..... 51**

■ **Challenge 27: Spawn Point..... 53**

■ **Challenge 28: Dictionary Check..... 55**

■ **Challenge 29: Draw Text with Shadow 57**

■ **Challenge 30: Classic Brick and Ball Game Remake 59**

■ **Challenge 31: Fire Projectile 61**

■ **Challenge 32: World Clock..... 63**

■ **Challenge 33: Text-Based Quiz 65**

■ **Challenge 34: Onscreen Keyboard..... 67**

■ **Challenge 35: Create a Drivable Tank That Leaves Tyre Tracks..... 69**

■ **Challenge 36: Parallax Background..... 71**

■ **Challenge 37: Click the Ghost..... 73**

■ **Challenge 38: Particle Fire Effect 75**

■ **Challenge 39: Bubble Sort 77**

■ **Challenge 40: Unlockable Levels Select Screen 79**

■ **Challenge 41: Moon Lander AI..... 81**

■ **Challenge 42: Dodge the Barrels 83**

■ **Challenge 43: Convert Celsius to Fahrenheit..... 85**

■ Challenge 44: Dart Board Game.....	87
■ Challenge 45: Calculate BMI.....	89
■ Challenge 46: Colour Picker	91
■ Challenge 47: 10 Green Bottles	93
■ Challenge 48: English to Morse Code	95
■ Challenge 49: Blitz Game Remake.....	97
■ Challenge 50: Mini Golf Game Remake.....	99
■ Challenge 51: Rock, Paper, Scissors Game Remake.....	101
■ Challenge 52: Health Based on Distance	103
■ Challenge 53: Tank Trax Game Remake.....	105
■ Challenge 54: Two Separate Views.....	107
■ Challenge 55: Word Typing Game	109
■ Challenge 56: Destructible Terrain	111
■ Challenge 57: Duck Hunt Game Remake	113
■ Challenge 58: Keep Player in View	115
■ Challenge 59: Fizz Buzz.....	117
■ Challenge 60: Calculate Numbers.....	119
■ Challenge 61: Particle Trail Effect.....	121
■ Challenge 62: Draw a Rectangle and Calculate Area and Perimeter	123
■ Challenge 63: Tower Defense Game.....	125
■ Challenge 64: Drop the Coin AKA Plinko (Arcade Style)	129
■ Challenge 65: Calculate the Nth Result of Fibonacci Sequence	131
■ Challenge 66: Distance from Object to Mouse.....	133
■ Challenge 67: Convert Decimal to Binary, Oct, Hex, and Roman	135
■ Challenge 68: Text in X Box	137
■ Challenge 69: Frogger Game Remake.....	139

■ Challenge 70: Take a Screenshot.....	141
■ Challenge 71: Slowly Change Direction.....	143
■ Challenge 72: Pong Style Game Remake	145
■ Challenge 73: Shooting Gallery	147
■ Challenge 74: How Many of Each Letter	149
■ Challenge 75: Torpedo Game Remake	151
■ Challenge 76: One Hundred Random Numbers.....	153
■ Challenge 77: Coin Flip	155
■ Challenge 78: Predict the Path of an Object	157
■ Challenge 79: Dynamic Button	159
■ Challenge 80: Sokoban Game Remake	161
■ Challenge 81: Top Down Football	163
■ Challenge 82: Top Down Racing	165
■ Challenge 83: Convert Numbers (in Digits) to Words	167
■ Challenge 84: Zelda Style Views.....	169
■ Challenge 85: Convert Text File to eBook	171
■ Challenge 86: Planets Database (INI)	173
■ Challenge 87: How Much Flour.....	175
■ Challenge 88: Rotating Mini Map	177
■ Challenge 89: Selectable Troops.....	179
■ Challenge 90: Pipes	181
■ Challenge 91: Arcade Style Horse Race Game.....	183
■ Challenge 92: Road Builder	185
■ Challenge 93: Chess Board Representation.....	187
■ Challenge 94: 1945 Game Remake	189
■ Challenge 95: Create a Virtual ATM (Bank Teller).....	191

■ Challenge 96: Moon Lander Game Remake	193
■ Challenge 97: Pixelate an Image	195
■ Challenge 98: Miner.....	197
■ Challenge 99: Follow Player (Ghost).....	199
■ Challenge 100: Multiplication Table	201
■ Appendix A: Points Chart.....	203
Index.....	209

Contents

About the Authorxxi

About the Technical Reviewerxxiii

Acknowledgmentsxxv

Introductionxxvii

■ **Challenge 1: Maths Bar Graph 1**

 Notes on Approaching This Challenge 1

 Guide 2

■ **Challenge 2: Draggable and Movable Object 3**

 Notes on Approaching This Challenge 3

 Guide 4

■ **Challenge 3: Room Fade In and Out Transition 5**

 Notes on Approaching This Challenge 5

 Guide 6

■ **Challenge 4: Typewriter Text Effect 7**

 Notes on Approaching This Challenge 7

 Guide 8

■ **Challenge 5: Audio Volume Change Based on Distance 9**

 Notes on Approaching This Challenge 9

 Guide 10

■ **Challenge 6: Move Object to Position Using Path 11**

 Notes on Approaching This Challenge 11

 Guide 12

- **Challenge 7: Make the Screen Shake** 13
 - Notes on Approaching This Challenge 13
 - Guide 14
- **Challenge 8: Create Snow Effect**..... 15
 - Notes on Approaching This Challenge 15
 - Guide 16
- **Challenge 9: Password Easter Egg** 17
 - Notes on Approaching This Challenge 17
 - Guide 18
- **Challenge 10: Follow Two Objects in View** 19
 - Notes on Approaching This Challenge 19
 - Guide 20
- **Challenge 11: High / Low Number Game** 21
 - Notes on Approaching This Challenge 21
 - Guide 22
- **Challenge 12: Calculate the Average Position of Two Clicks** 23
 - Notes on Approaching This Challenge 23
 - Guide 24
- **Challenge 13: Retrieve Text File from Web and Save Locally** 25
 - Notes on Approaching This Challenge 25
 - Guide 26
- **Challenge 14: Shuffle Pack of Playing Cards and Deal 5**..... 27
 - Notes on Approaching This Challenge 27
 - Guide 28
- **Challenge 15: Reverse Sentence Order** 29
 - Notes on Approaching This Challenge 29
 - Guide 29

■ Challenge 16: Rotate and Move Object to Mouse Position	31
Notes on Approaching This Challenge	31
Guide	32
■ Challenge 17: Firework Display Using Effects	33
Notes on Approaching This Challenge	33
Guide	33
■ Challenge 18: Random Sentence Generator	35
Notes on Approaching This Challenge	35
Guide	36
■ Challenge 19: Pop-Up RPG Style Text Box	37
Notes on Approaching This Challenge	37
Guide	38
■ Challenge 20: Room Wrapping	39
Notes on Approaching This Challenge	39
Guide	40
■ Challenge 21: Sprite Shadow	41
Notes on Approaching This Challenge	41
Guide	41
■ Challenge 22: Make a Jukebox Player for Four Songs	43
Notes on Approaching This Challenge	43
Guide	44
■ Challenge 23: Scrolling Credits	45
Notes on Approaching This Challenge	45
Guide	46
■ Challenge 24: Random Dice Roller	47
Notes on Approaching This Challenge	47
Guide	48

■ **Challenge 25: Substitution Cipher** 49

 Notes on Approaching This Challenge 49

 Guide 50

■ **Challenge 26: Save Highscore to INI**..... 51

 Notes on Approaching This Challenge 51

 Guide 52

■ **Challenge 27: Spawn Point**..... 53

 Notes on Approaching This Challenge 53

 Guide 54

■ **Challenge 28: Dictionary Check**..... 55

 Notes on Approaching This Challenge 55

 Guide 56

■ **Challenge 29: Draw Text with Shadow** 57

 Notes on Approaching This Challenge 57

 Guide 58

■ **Challenge 30: Classic Brick and Ball Game Remake** 59

 Notes on Approaching This Challenge 59

 Guide 60

■ **Challenge 31: Fire Projectile** 61

 Notes on Approaching This Challenge 61

 Guide 62

■ **Challenge 32: World Clock**..... 63

 Notes on Approaching This Challenge 63

 Guide 64

■ **Challenge 33: Text-Based Quiz** 65

 Notes on Approaching This Challenge 65

 Guide 66

■ Challenge 34: Onscreen Keyboard	67
Notes on Approaching This Challenge.....	67
Guide	68
■ Challenge 35: Create a Drivable Tank That Leaves Tyre Tracks	69
Notes on Approaching This Challenge.....	69
Guide	70
■ Challenge 36: Parallax Background	71
Notes on Approaching This Challenge.....	71
Guide	72
■ Challenge 37: Click the Ghost	73
Notes on Approaching This Challenge.....	73
Guide	74
■ Challenge 38: Particle Fire Effect	75
Notes on Approaching This Challenge.....	75
Guide	76
■ Challenge 39: Bubble Sort	77
Notes on Approaching This Challenge.....	77
Guide	78
■ Challenge 40: Unlockable Levels Select Screen	79
Notes on Approaching This Challenge.....	79
Guide	80
■ Challenge 41: Moon Lander AI	81
Notes on Approaching This Challenge.....	81
Guide	82
■ Challenge 42: Dodge the Barrels	83
Notes on Approaching This Challenge.....	83
Guide	84

■ **Challenge 43: Convert Celsius to Fahrenheit..... 85**
Notes on Approaching This Challenge..... 85
Guide 86

■ **Challenge 44: Dart Board Game..... 87**
Notes on Approaching This Challenge..... 87
Guide 88

■ **Challenge 45: Calculate BMI..... 89**
Notes on Approaching This Challenge..... 89
Guide 90

■ **Challenge 46: Colour Picker 91**
Notes on Approaching This Challenge..... 91
Guide 92

■ **Challenge 47: 10 Green Bottles 93**
Notes on Approaching This Challenge..... 93
Guide 94

■ **Challenge 48: English to Morse Code 95**
Notes on Approaching This Challenge..... 95
Guide 96

■ **Challenge 49: Blitz Game Remake..... 97**
Notes on Approaching This Challenge..... 97
Guide 98

■ **Challenge 50: Mini Golf Game Remake..... 99**
Notes on Approaching This Challenge..... 99
Guide 100

■ **Challenge 51: Rock, Paper, Scissors Game Remake..... 101**
Notes on Approaching This Challenge..... 101
Guide 102

■ Challenge 52: Health Based on Distance	103
Notes on Approaching This Challenge	103
Guide	104
■ Challenge 53: Tank Trax Game Remake.....	105
Notes on Approaching This Challenge	105
Guide	106
■ Challenge 54: Two Separate Views.....	107
Notes on Approaching This Challenge	107
Guide	108
■ Challenge 55: Word Typing Game	109
Notes on Approaching This Challenge	109
Guide	110
■ Challenge 56: Destructible Terrain	111
Notes on Approaching This Challenge	111
Guide	112
■ Challenge 57: Duck Hunt Game Remake	113
Notes on Approaching This Challenge	113
Guide	114
■ Challenge 58: Keep Player in View	115
Notes on Approaching This Challenge	115
Guide	116
■ Challenge 59: Fizz Buzz.....	117
Notes on Approaching This Challenge	117
Guide	118
■ Challenge 60: Calculate Numbers.....	119
Notes on Approaching This Challenge	119
Guide	120

■ **Challenge 61: Particle Trail Effect..... 121**
Notes on Approaching This Challenge 121
Guide 122

■ **Challenge 62: Draw a Rectangle and Calculate Area and Perimeter 123**
Notes on Approaching This Challenge 123
Guide 124

■ **Challenge 63: Tower Defense Game..... 125**
Notes on Approaching This Challenge 125
Guide 126

■ **Challenge 64: Drop the Coin AKA Plinko (Arcade Style) 129**
Notes on Approaching This Challenge 129
Guide 130

■ **Challenge 65: Calculate the Nth Result of Fibonacci Sequence 131**
Notes on Approaching This Challenge 131
Guide 132

■ **Challenge 66: Distance from Object to Mouse..... 133**
Notes on Approaching This Challenge 133
Guide 134

■ **Challenge 67: Convert Decimal to Binary, Oct, Hex, and Roman 135**
Notes on Approaching This Challenge 135
Guide 136

■ **Challenge 68: Text in X Box 137**
Notes on Approaching This Challenge 137
Guide 138

■ **Challenge 69: Frogger Game Remake..... 139**
Notes on Approaching This Challenge 139
Guide 140

■ Challenge 70: Take a Screenshot.....	141
Notes on Approaching This Challenge.....	141
Guide	142
■ Challenge 71: Slowly Change Direction.....	143
Notes on Approaching This Challenge.....	143
Guide	144
■ Challenge 72: Pong Style Game Remake	145
Notes on Approaching This Challenge.....	145
Guide	146
■ Challenge 73: Shooting Gallery	147
Notes on Approaching This Challenge.....	147
Guide	148
■ Challenge 74: How Many of Each Letter	149
Notes on Approaching This Challenge.....	149
Guide	150
■ Challenge 75: Torpedo Game Remake	151
Notes on Approaching This Challenge.....	151
Guide	152
■ Challenge 76: One Hundred Random Numbers.....	153
Notes on Approaching This Challenge.....	153
Guide	154
■ Challenge 77: Coin Flip.....	155
Notes on Approaching This Challenge.....	155
Guide	156
■ Challenge 78: Predict the Path of an Object	157
Notes on Approaching This Challenge.....	157
Guide	158

■ **Challenge 79: Dynamic Button** 159

 Notes on Approaching This Challenge 159

 Guide 160

■ **Challenge 80: Sokoban Game Remake** 161

 Notes on Approaching This Challenge 161

 Guide 162

■ **Challenge 81: Top Down Football** 163

 Notes on Approaching This Challenge 163

 Guide 164

■ **Challenge 82: Top Down Racing** 165

 Notes on Approaching This Challenge 165

 Guide 166

■ **Challenge 83: Convert Numbers (in Digits) to Words** 167

 Notes on Approaching This Challenge 167

 Guide 168

■ **Challenge 84: Zelda Style Views**..... 169

 Notes on Approaching This Challenge 169

 Guide 170

■ **Challenge 85: Convert Text File to eBook** 171

 Notes on Approaching This Challenge 171

 Guide 172

■ **Challenge 86: Planets Database (INI)** 173

 Notes on Approaching This Challenge 173

 Guide 174

■ **Challenge 87: How Much Flour** 175

 Notes on Approaching This Challenge 175

 Guide 176

■ Challenge 88: Rotating Mini Map	177
Notes on Approaching This Challenge	177
Guide	178
■ Challenge 89: Selectable Troops.....	179
Notes on Approaching This Challenge	179
Guide	180
■ Challenge 90: Pipes	181
Notes on Approaching This Challenge	181
Guide	182
■ Challenge 91: Arcade Style Horse Race Game.....	183
Notes on Approaching This Challenge	183
Guide	184
■ Challenge 92: Road Builder	185
Notes on Approaching This Challenge	185
Guide	186
■ Challenge 93: Chess Board Representation.....	187
Notes on Approaching This Challenge	187
Guide	188
■ Challenge 94: 1945 Game Remake	189
Notes on Approaching This Challenge	189
Guide	190
■ Challenge 95: Create a Virtual ATM (Bank Teller).....	191
Notes on Approaching This Challenge	191
Guide	192
■ Challenge 96: Moon Lander Game Remake	193
Notes on Approaching This Challenge	193
Guide	194

■ **Challenge 97: Pixelate an Image** **195**
 Notes on Approaching This Challenge 195
 Guide 196

■ **Challenge 98: Miner**..... **197**
 Notes on Approaching This Challenge 197
 Guide 198

■ **Challenge 99: Follow Player (Ghost)**..... **199**
 Notes on Approaching This Challenge 199
 Guide 200

■ **Challenge 100: Multiplication Table** **201**
 Notes on Approaching This Challenge 201
 Guide 202

■ **Appendix A: Points Chart**..... **203**

Index..... **209**

About the Author

Ben Tyers is a freelance programmer and technical writer by day and a sci-fi horror novel writer by night. He made his first computer game way back in 1984, on a ZX Spectrum 48K computer, when he was eight years old. His passion for creation has continued since then. He holds a number of computer-related qualifications. When relaxing, Ben has an infatuation for old-school horror and sci-fi films, particularly 1960s B-Movies.

About the Technical Reviewer



Dickson Law is a GameMaker hobbyist, commentator, and extension developer with six years of community experience. In his spare time, he enjoys writing general-purpose libraries, tools, and articles covering basic techniques for GameMaker Studio. As a web programmer by day, his main areas of interest include integration with server-side scripting and API design. He lives in Toronto, Canada.

Acknowledgments

Many Thanks to the Following:

Music:

David Szesztay Cheese
Scott Holmes Happy Go Lucky
Broke For Free Night Owl
Urbano A. Zafra Danza Filipina

ghost sprite: @XenosNS

Shadow Script: Peter Christian Jørgensen

Board Game Sprites: Kenney.nl

Fire Particle Effect & Sprites: Martin Crownover - <http://martincrownover.com>

Destructible Terrain: roychanmeliaz

Croc Image: iconarchive.com

Random Terrain: Reed Hector

Dartboard: VectorPortal.com

Dart: <http://www.gifmania.co.uk/>

Blood Splatter: PWL - OpenGameArt.org

Bullet Sprites: Master484 - <http://m484games.ucoz.com/>

Zombie Sprites: Riley Gombart / ChessMasterRile - OpenGameArt.org

Tower Defence Sprites: nido

Colour Palette<a href='

Designed by Freepik

GMLscripts.com - see: GMLscripts.com/license. For the Following Scripts:

dec_to_bin dec_to_hex dec_to_oct dec_to_roman

draw_get_button motion_predict

Chess Sprites: mr0.0nerd : <https://2dartforgames.wordpress.com/>

Parallax backgrounds: Pasilan

Big Thanks to:

Vadim

“YellowAfterlife”

Dyachenko

—Doug Morrison

Introduction

This book contains 100 programming challenges to test your prowess as a programmer in GameMaker: Studio's GML.

You do not have to start this book at the beginning; just delve in and select a challenge for the time you have available.

The task that needs to be completed is stated for each challenge. Each challenge has a difficulty rating, and is worth a set number of points. A level 1 challenge is worth 10 points; a level 2 is worth 20 points; up to level 5, which is worth 50 points. An estimated time to complete the challenge is stated, whether you gauge yourself as a beginner of GML, have a medium skill level, or consider yourself advanced. You only get points if you complete it within the allotted time.

In addition to the task page, each has a guide that provides some of the more important GML required for solving the task. You may use GameMaker: Studio's Help File (by pressing F1), which will not lose you any points. You may not search on the Internet.

Each task has an additional challenge, each of which carries 20 points. There is no time limit for this additional challenge.

There is a marking table at the back of the book that allows you to take note of your progress.

Each main challenge has a downloadable GMZ project file showing an example solution. There may be more than one way to solve a challenge.

All resources can be accessed by clicking the Download Source Code button at www.apress.com/9781484226438.