

# INDEX

## Symbols

- + (addition) block, 176–177
- / (division) block, 177
- = (equal to) block, 79, 159
- > (greater than) block, 64, 142
- < (less than) block, 64, 75–76, 104, 162
- \* (multiplication) block, 160
- (subtraction) block, 92

## A

- account, Scratch website, 3–4, 11
- addition (+) block, 176–177
- AI (artificial intelligence), 186
- Alien Creak2 sound, 138–139
- all around rotation style, 89
- and** block, 76, 175
- Android, 3
- animating sprites, 16, 22, 105–108, 112–115
- Apple sprite, 45, 184
- Apples Collected variable, 184
- arrows keys, 38–40, 42, 51, 53, 65, 67
- artificial intelligence (AI), 186
- Asteroid Breaker* program
  - aiming and firing, 127–130
  - designing, 120–121
  - exploding animation, 139–140
  - keeping score, 136–137
  - limiting ammo, 141–142
  - making asteroids, 133–135
  - making spaceship, 122–124

- splitting hit asteroids, 133–135
- starburst bomb, 143
- timer, 136
- wrapping spaceship
  - around Stage, 124–126
- asteroidbreaker.sb3*, 140
- asteroidbreaker-skeleton.sb3*, 121
- asteroid.png*, 131
- Asteroids* (game), 119
- Asteroid sprite, 131
- Atari, 119

## B

- backdrops
  - choosing from library, 18–19
  - Light backdrop, 41
  - Neon Tunnel backdrop, 103
  - Stars backdrop, 18, 122
  - Wall 1 backdrop, 59
  - xy-grid backdrop, 37
  - drawing, 103
  - uploading, 179
- Backdrops tab, 103
- background music, 104
- Ball sprite, 127
- Basketball* program, 57
  - complete program, 80–81
  - designing, 58
  - freezing hoop, 82
  - jumping and falling, 59–63
  - making basketball hoop, 67–68
  - moving left and right, 66–67
  - shooting hoops, 72–79
- basketball-skeleton.sb3*, 59
- Basketball sprite, 72
- blocks, 5. *See also* names
  - of individual blocks and block types
  - adding, 8–9
  - deleting, 10
  - dragging to Code Area, 8, 22
  - reporter, 9
  - stack, 5, 8
- Block Palette, 5, 6, 8
- Booleans, 164–166
- Brick Breaker* program
  - bouncing ball off bricks, 97
  - bouncing ball off paddle, 91–93
  - bouncing ball off walls, 90–91
  - cloning brick, 94–97
  - complete program, 101–102
  - designing, 86–87
  - GAME OVER* message, 98–99
  - moving paddle, 87–89
  - polishing, 102–115
  - You win!* message, 100–101
- brickbreaker-skeleton.sb3*, 87
- brightness effect, 115
- broadcast** block, 46
- broadcasting messages, 47, 69, 76, 91–93, 97, 111–113, 133–135, 139
- Brush tool, Paint Editor, 7, 20–21
- bug, 77, 164
- Button 2 sprite, 94

## C

Canvas, Paint Editor, 7  
ceiling detection, 163–167  
**change effect by** block, 108  
**change pen color by** block, 26, 27  
**change size by** block, 108, 113  
**change x by** block, 38  
**change y by** block, 38  
Cheer sound, 45–46, 68  
Chomp sound, 133  
Choose a Backdrop button.  
  *See* backdrops  
Choose a Costume button, 168, 172, 179  
Choose a Sound button. *See* sounds, choosing from library  
Circle tool, Paint Editor, 7  
cloning sprites, 93  
Code Area, 5, 6  
Color selectors, Paint Editor, 7  
conditions  
  **and** block, 76, 175  
  **if then** block, 39  
  **if then else** block, 110  
  **not** block, 175  
  **repeat until** block, 75, 77  
  **wait until** block, 101  
*Control* blocks, 21  
  **create clone of myself**, 93  
  **delete this clone**, 134  
  **forever**, 11  
  **if then**, 39  
  **if then else**, 110  
  **not**, 175  
  **repeat**, 96  
  **repeat until**, 75, 77  
  **stop all**, 99  
  **wait seconds**, 9  
  **wait until**, 101

## when I start as a

**clone**, 94  
coordinates, 36  
copying. *See* duplicating  
costumes  
  choosing from library, 186  
  crab-a costume, 186  
  crab-b costume, 186  
  Costume center, 7  
  drawing, 168  
  hitbox costume, 168–169  
  exporting, 8  
  griffpatch, 168  
  uploading, 138, 172, 179, 181  
Costumes tab, 6  
crab-a costume, 186  
crab-b costume, 186  
**create clone of myself** block, 93  
Creative Commons license, 13  
custom blocks  
  creating, 155–156  
  editing, 165

## D

Dance Celebrate sound, 104  
degrees, 22  
**delete this clone** block, 134  
deleting  
  blocks, 10  
  clones, 134  
  sprites, 18  
demos, 16  
demoscene, 16  
designing programs, 16–17, 34–35, 58, 86–87, 120–121, 148–149  
direction, 22  
**direction** block, 92  
discussion forum, Scratch website, 13  
division (*/*) block, 177

don't rotate rotation style, 89  
dragging blocks to Code Area, 10

drawing  
  backdrops, 103  
  costumes, 168  
  sprites, 20–21, 67, 150–151  
duplicating  
  blocks, 39  
  scripts, 25  
  sprites, 25

## E

editor, Scratch, 4–6  
Energy variable, 141  
equal to (=) block, 79, 159  
Eraser tool, Paint Editor, 7  
*Events* blocks  
  **broadcast**, 46  
  **when green flag clicked**, 10  
  **when I receive**, 46, 69, 111  
  **when key pressed**, 188  
explosion animation, 138–140  
exporting costumes, 8

## F

falling, sprites, 59–63  
*Fall.svg*, 171  
Fill tool, Paint Editor, 7, 49–50  
*Flappy Bird* (game), 193  
flashing colors, sprites, 104  
**floor** block, 177  
For all sprites option, for variable, 61  
For this sprite only option, for variable, 61  
**forever** block, 11, 22, 39–40, 63, 126, 142, 152, 156, 161–162  
frames, animation, 138, 140

## G

ghost effect  
  animating sprites, 106,  
  112–113, 182, 185  
  hiding hitboxes, 71–72  
Gong sound, 113–114  
**go to** block, 27  
**go to front layer** block, 44  
**go to x y** block, 27, 51  
gravity, 59, 150–151  
greater than (>) block,  
  64, 142  
green flag, 5, 6  
griffpatch, 171  
Ground sprite, 150–152

## H

**hide** block, 72  
hiding sprites. *See* ghost  
  effect, hiding  
  hitboxes  
hitbox costume, 168–169, 172  
hitboxes, 70  
  hits variable, 131  
  Hoop sprite, 67–68

## I

I am a clone variable, 127  
**if on edge, bounce** block, 90  
**if then** block, 39  
**if then else** block, 110  
importing. *See* uploading  
inertia, 120  
input, defining, 157  
iOS, 3  
iteration, 162  
iterative development, 17

## J

Jonasson, Martin, 103  
juice, 103  
jumping, sprites, 65,  
  161–162  
*Jump.svg*, 171

## K

key, determining when  
  pressed, 38  
**key pressed?** block, 54  
keys  
  arrow, 38–40, 42, 51, 53,  
  65, 67  
  WASD, 51

## L

Laser1 sound, 108–109, 127  
Laser2 sound, 108–109  
left-right rotation style, 89  
less than (<) block, 64,  
  75–76, 104, 162  
Lifelong Kindergarten  
  Group (MIT Media  
  Lab), 2  
Light backdrop, 41  
Line tool, Paint Editor,  
  7, 151  
Linux, 3  
*Looks* blocks

**change effect by**, 108  
  **change size by**, 108, 113  
  **go to front layer**, 44  
  **hide**, 72  
  **next costume**, 67  
  **say**, 6  
  **set ghost effect to**,  
  71–72, 185  
  **set size to**, 44  
  **show**, 95  
  **switch costume to**, 42  
loops  
  **forever**, 11, 22, 39–40,  
  63, 126, 142, 152,  
  156, 161–162  
  **repeat**, 95–96, 107–108,  
  129–130  
  **repeat until**, 75, 77,  
  152, 155–156, 159,  
  184–185

## M

macOS, 3  
  made basket variable, 77  
Make a Block button, 155,  
  157, 175  
Make a Variable button, 60  
*maze-part-a.sb3*, 40  
*maze-part-b.sb3*, 42  
*maze-part-c.sb3*, 44  
*maze-skeleton.sb3*, 35  
*Maze Runner* program  
  complete program,  
  47–48  
  designing, 34–35  
  keeping cat from  
  walking through  
  walls, 42  
  maze goal, 44–47  
  maze levels, 41  
  moving Cat sprite,  
  36–40  
  two-player mode, 49–53  
  walking through  
  walls, 54  
Maze sprite, 41  
messages, broadcasting, 47,  
  69, 76, 91–93, 97,  
  111–113, 133–135,  
  139  
MIT Media Lab, 2  
**mod** block, 177  
modulo operation, 177  
*My Blocks* category, 155  
*Motion* blocks  
  **change x by**, 38  
  **change y by**, 38  
  **direction**, 92  
  **go to**, 27  
  **go to x y**, 27, 51  
  **if on edge, bounce**, 90  
  **move steps**, 10  
  **point in direction**, 23  
  **point towards**, 23  
  **set rotation style**, 89

*Motion blocks (continued)*

**set x to**, 95, 125, 129

**set y to**, 39, 125, 129

**turn clockwise degrees**,  
108, 115

**x position**, 125, 129, 132

**y position**, 64, 125,  
129, 132

mouse

aiming with, 128

pointing toward, 23

movement variable, 186

**move steps** block, 10

multiplication (\*) block, 160

music, adding, 104

## N

naming

programs, 18

sprites, 21

variables, 60

navigation bar, 5, 6

Neon Tunnel backdrop, 103

new message option, 46, 69

**next costume** block, 67

Nintendo, 147

**not** block, 175

## O

offline editor, 4

*Operator* blocks

**+** (addition), 176–177

**/** (division), 177

**=** (equal to), 79, 159

**>** (greater than), 64, 142

**<** (less than), 64, 75–76,  
104, 162

**\*** (multiplication), 160

**and**, 76, 175

**floor**, 177

**mod**, 177

**not**, 175

**pick random**, 9, 22,  
23, 82

origin (point on Stage), 36

## P

*Pac-Man* (game), 193

Paddle sprite, 88

Paint Editor, 7

Brush tool, 7, 20–21

Circle tool, 7

Eraser tool, 7

Fill tool, 7, 49–50

Line tool, 7, 151

Rectangle tool, 7, 70

Select tool, 7, 180

Text tool, 7, 98–99, 100

Pen blocks

**change pen color by**, 26

**erase all**, 26

**pen down**, 26

**pen up**, 26

**set pen color to**, 26

**pick random** block, 9, 22,  
23, 82

platformer games, 57, 147

*Platformer* program

adding crab enemies and  
apples, 184–192

ceiling detection,  
163–167

creating gravity,  
151–152

creating level, 179–183

designing, 148–149

handling slopes,  
157–160

using a hitbox, 167–170  
walking animation,  
170–178

*platformer1.sb3*, 154

*platformer2.sb3*, 156

*platformer3.sb3*, 160

*platformer4.sb3*, 163

*platformer5.sb3*, 167

*platformer6.sb3*, 170

*platformer7.sb3*, 179

*platformer8.sb3*, 183

*PlatformerBackdrop.png*, 179

*PlatformerBackdropHitbox*  
.png, 181

*platformer-skeleton.sb2*, 149

Player 1 Score variable, 73

**play sound until done** block,  
46, 104

**point in direction** block, 23

**point towards** block, 23

Pop sound, 72, 74

programs. *See also* names of  
individual programs

*Asteroid Breaker*, 119–146

*Basketball*, 57–84

*Brick Breaker*, 85–118

*Maze Runner*, 33–56

naming, 18

*Platformer*, 147–194

*Rainbow Lines*, 15–32

remixing, 13

running, 10–11

saving, 6

uploading, 35

Purho, Petri, 103

## R

*Rainbow Lines* program

bouncing dots, 20–24

complete program, 28

creating backdrop, 18–19  
designing, 16–17

drawing rainbow lines,  
25–27

Turbo Mode, 29

random numbers,

generating, 23

Raspberry Pi, 3

receiving broadcasts, 46

Rectangle tool, Paint Editor,  
7, 70

Redo button, 7

red stop sign, 5, 6, 11

remainder, when  
dividing, 177

**repeat** block, 95–96, 107–  
108, 129–130

**repeat until** block, 75, 77,  
152, 155–156, 159,  
184–185

reporter blocks, 9  
Restore option, 10  
rotation styles, 89  
rounding down, 177  
Run without screen refresh  
    option, 155–156, 157,  
    169, 175

## S

saving programs, 6  
**say** block, 6, 24, 62  
sb3 files  
    *asteroidbreaker.sb3*, 140  
    *asteroidbreaker–  
    skeleton.sb3*, 121  
    *basketball–skeleton  
    .sb3*, 59  
    *brickbreaker–skeleton  
    .sb3*, 87  
    *maze–part–a.sb3*, 40  
    *maze–part–b.sb3*, 42  
    *maze–part–c.sb3*, 44  
    *maze–skeleton.sb3*, 35  
    *platformer1.sb3*, 154  
    *platformer2.sb3*, 156  
    *platformer3.sb3*, 160  
    *platformer4.sb3*, 163  
    *platformer5.sb3*, 167  
    *platformer6.sb3*, 170  
    *platformer7.sb3*, 179  
    *platformer8.sb3*, 183  
Score variable, 94  
Scratch  
    account, creating, 3–4  
    discussion forum, 13  
    editor, 4–6  
    help, 12–13  
    offline editor, 4  
    website, 3–4  
Scratchers, 2  
scripts, 5  
    duplicating, 25  
    running, 5, 10–11  
    stopping, 5  
See Inside button, Scratch  
    website, 12

Select tool, Paint Editor,  
    7, 180  
*Sensing* blocks  
    **key pressed?**, 54  
    **touching?**, 43  
    **touching color?**, 43  
**set ghost effect to** block,  
    71–72, 185  
**set pen size to** block, 26  
**set rotation style** block, 89  
**set size to** block, 44  
**set x to** block, 95, 125, 129  
**set y to** block, 39, 125, 129  
Share button, 11  
**show** block, 95  
size, of sprite, 44, 95  
slopes, walking sprites up,  
    157–160  
*Sonic the Hedgehog*  
    (game), 57  
*Sound* blocks  
    **play sound until done**  
    block, 46, 104  
    **start sound** block, 68,  
    74, 109–110, 114,  
    139  
sounds, choosing from  
    library, 45  
    Alien Creak2 sound,  
    138–139  
    Cheer sound, 45–46, 68  
    Chomp sound, 133  
    Dance Celebrate  
    sound, 104  
    Gong sound, 113–114  
    Laser1 sound, 108–109,  
    127  
    Laser2 sound, 108–109  
    Pop sound, 72, 74  
*Spaceship.png*, 122  
Spaceship sprite, 122  
speech bubble, 11  
Sprite1 sprite, 20–21  
Sprite List, 5, 6, 37, 41, 60  
Sprite Pane, 5, 6

sprites, 5  
    choosing from library  
        Apple sprite, 45, 184  
        Ball sprite, 127  
        Basketball sprite, 72  
        Button 2 sprite, 94  
        Tennis Ball sprite, 90  
        Tennis Ball2  
        sprite, 111  
    deleting, 18  
    drawing  
        Ground sprite,  
        150–152  
        Hoop sprite, 67–68  
        Sprite1 sprite, 20–21  
    duplicating, 25  
    falling, 59–63  
    flashing colors, 104  
    hiding. *See* ghost effect,  
        hiding hitboxes  
    jumping, 65, 161–162  
    naming, 21  
    size, 44, 95  
    slopes, walking up,  
        157–160  
    uploading  
        Asteroid sprite, 131  
        Maze sprite, 41  
        Spaceship sprite, 122  
    walking animation,  
        170–178  
    wrapping around Stage,  
        124–126  
stack blocks, 5, 8  
Stage, 5  
*Stand.svg*, 171, 172  
starburst bomb, 143  
Stars backdrop, 11, 122  
**start sound** block, 68, 74,  
    109–110, 114, 139  
**stop all** block, 99  
studio, 11–12, 195  
*Super Mario Bros.* (game),  
    57, 145, 147  
*Super Meat Boy* (game), 145  
**switch costume to** block, 42

## T

Tennis Ball sprite, 90  
Tennis Ball2 sprite, 111  
Text tool, Paint Editor, 7,  
98–99, 100  
timer, 136  
**touching?** block, 43  
transparency, for sprites,  
108, 111. *See also*  
ghost effect  
Turbo Mode, 29  
**turn clockwise degrees**  
block, 108, 115  
**turn counterclockwise**  
**degrees** block, 10  
Tutorials Window, 12  
two-player mode in *Maze*  
*Runner*, 49

## U

Undo button, 7, 8  
uploading  
backdrops, 179  
costumes, 138, 172,  
179, 181  
programs, 35  
sprites, 41, 122, 131

## V

*Variable* blocks,  
**change by**, 62  
**set to**, 62

## variables

Apples Collected, 184  
changing, 62  
creating, 60  
Energy, 141  
For all sprites vs. For  
this sprite only  
options, 61–62  
hits, 131  
I am a clone, 127  
made basket, 77  
movement, 186  
naming, 60  
Player 1 Score, 73  
Score, 94  
visibility of, 61, 65  
x velocity, 122, 131  
y velocity, 60, 122,  
131, 151  
velocity, 60

## W

**wait seconds** block, 9  
**wait until** block, 100  
*Walk1.svg*, 171  
walking animation, sprites,  
170–178  
Wall 1 backdrop, 59  
walls, 42  
WASD keys, 51  
**when green flag clicked**  
block, 10

**when I receive** block, 46,  
69, 111

**when I start as a clone**  
block, 94

**when key pressed** block, 188  
Windows, 3  
wrapping around Stage,  
sprites, 124–126

## X

x-coordinate, 36–38  
**x position** block, 125,  
129, 132  
x velocity variable,  
122, 131  
xy-grid backdrop, 36

## Y

y-coordinate, 36–38  
**y position** block, 64, 75,  
98, 183  
y velocity variable, 60, 122,  
131, 151

## Z

Zoom buttons, Paint  
Editor, 7