Games in Computer Science

## Cargo-Bot

Who it's for: 5+ to adults

Platforms: iOS

The expert view: "Great iPad app to teach coding. Used it with my two kiddos." — Educational entrepreneur and Google Teacher Academy co-founder Mike Lawrence

Cargo-Bot was the first game programmed entirely on an iPad. It's accessible for kids as young as five on its easiest levels, but it offers a real challenge as it progresses.

Players use a moving crane to shift boxes around a factory. In doing so, they use coding concepts like loops and procedures and do a ton of debugging.

"I wanted it to be a game about moving blocks around with a claw and make you forget that you are in fact programming," developer Rui Viana told Fast Company.
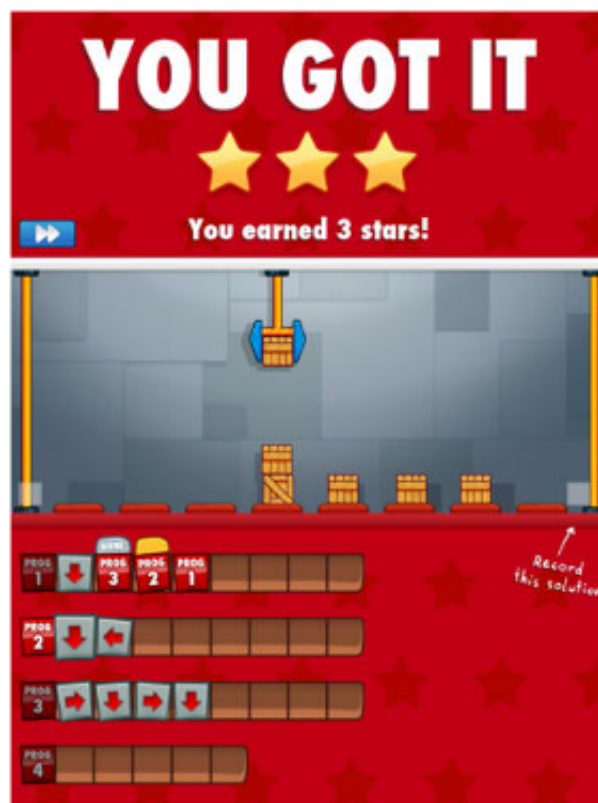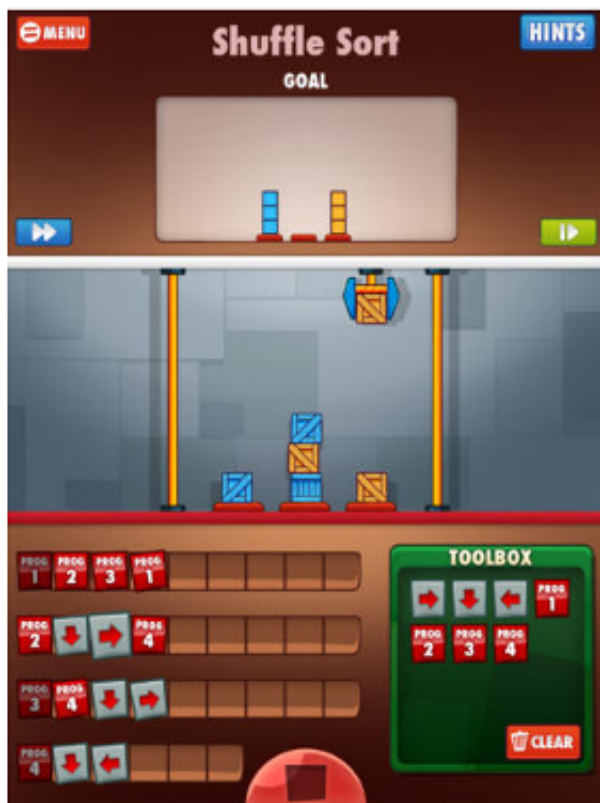
Cato's Hike

Essentially, 'Cato's Hike' is a universal game for the iPhone/iPad/iPod Touch to teach kids and young children basic programming skills. The younger ones will obviously enjoy solving levels using simpler coding techniques but the hope is the

older ones will pick up more advanced concepts like loops and branching as well as even more advanced concepts like a basic stack or memory.

Code Combat

Common reviews: Lessons aren't as applicable to real-world scenarios as traditional coding educational software. Generic aesthetic.

Multiplayer programming game; one of the twoo on the list that uses actual code on the screen. You can play Code Combat in multiple programming languages like JavaScript and Python.

Codemancer

Who it's for: Ages 9-14

Platforms: PC, Mac, iOS, Android

The expert view: "A fantasy game [with] a female protagonist that teaches kids (& adults!) how to code? I adore every single part of this! " — Lauren Scott, web developer and junior instructor, Dev Bootcamp
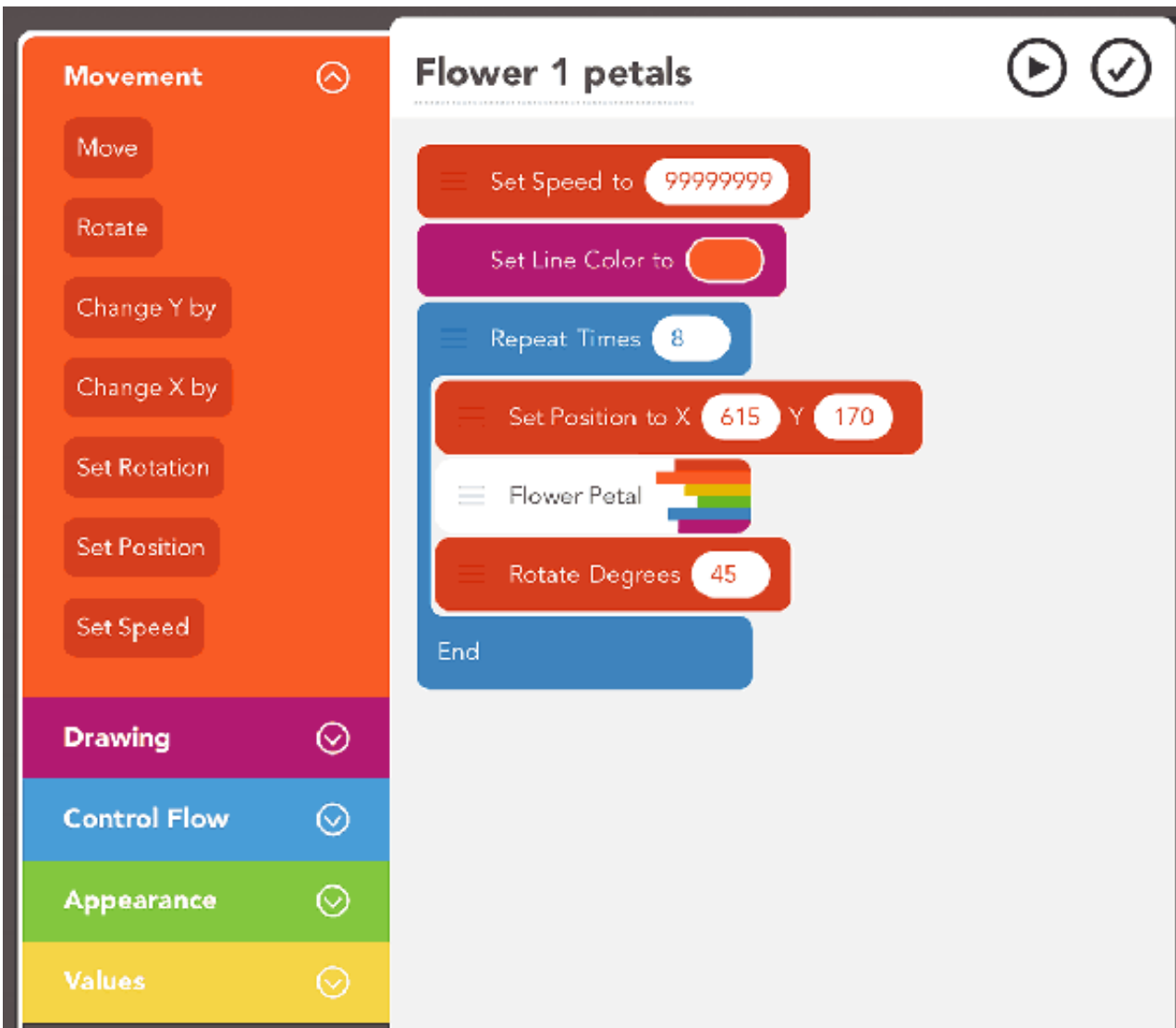
Codemancer is hoping its fantasy story and female protagonist will help it stand out when it releases next summer.

Players will use magical runes to direct the action when this successfully Kickstarted project goes live, helping the hero Aurora to save her father's life. Creator Robert Lockhart hopes the game's accessibility will help break down barriers that prevent some kids from coding.

"Codemancer's language is designed to be accessible," Lockhart says on his Kickstarter page, "but also translates easily to a variety of popular real-world programming languages. More complex programs are made when we introduce programming concepts like variables, conditionals, and functions."

Hopscotch

Movement

Move
Rotate
Change Y by
Change X by
Set Rotation
Set Position
Set Speed

Drawing
Control Flow
Appearance
Values

Flower 1 petals

Set Speed to 99999999
Set Line Color to
Repeat Times 8
  Set Position to X 615 Y 170
  Flower Petal
  Rotate Degrees 45
End

Human Resource Machine*

Your office is a simple computer. You have an inbox and an outbox (inputs and outputs), and a few slots on the floor to store stuff for later (memory). Your little office worker can hold exactly one box in his or her hands at a time (like an accumulator). Boxes (data) display letters or numbers.

In each level, your boss gives you a task, like "Take everything from the INBOX, and put it in the OUTBOX!" Automate it by programming your little office worker with simple drag n' drop commands. You start the game with just 2 commands, and gradually earn more as you're promoted. The entire language contains only 11 total commands - but they're enough to simulate almost any computer algorithm in the world!

Lightbot

Who it's for: Ages 4-8 (Lightbot Jr.), 9+ (Lightbot)

Platforms: Web browsers, iOS, Android

The expert view: "Although it seems simple, Lightbot foreshadows some interesting aspects of more sophisticated computer programming" — *Fritz Ruehr, Associate Professor of Computer Science, Willamette University, Ore.*

Lightbot is a programming puzzle game from Danny Yaroslavski, a Canadian university student. The goal is to make your robot light up all of the blue tiles on a 3D grid. The twist is that you have to do this in one run by programming your robot with a series of instructions.

Yaroslavski says that Lightbot teaches concepts like planning, testing, debugging, procedures, and loops. Your kids will just enjoy getting the endearing robot to light up everything in one turn.

You can play a free version, suitable for an hour of gameplay, on your mobile device or through your browser. Two full versions of Lightbot, for different age groups, are on sale on iTunes and Google Play.

Machineers

Who it's for: Ages 8-14

Platforms: PC, Mac (iPad to follow)

The expert view: "Machineers looks to be the best example of an education game I've ever seen." – Programmer and game developer Paul Hayes

Machineers is an adventure title that lets players interact with broken machines, using coding principles and a drag-and-drop interface to fix them up.

Henrike Lode, a member of the Danish Lohika Games team behind Machineers, decided to market it as a puzzle-adventure after one child tester complained that educational games are like "chocolate covered broccoli."

"This is preparation for future learning," Lode told Indie Statik. "We don't have math or code in there, so [kids] won't be able to start programming, but [it trains] logical thinking and something called procedural literacy, which is the ability to read and write processes."
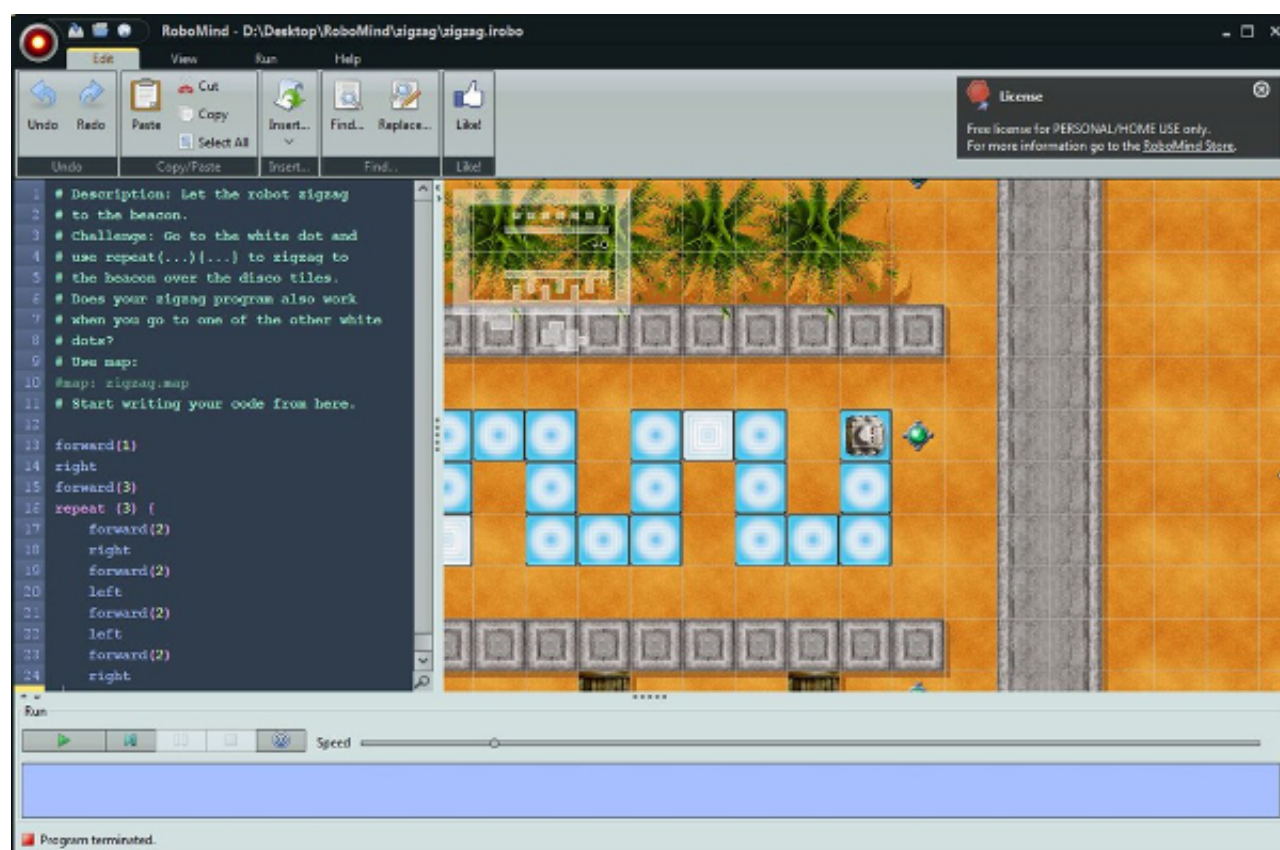
Currently still in development, the PC and Mac demo of Machineers is free to download and play. Lohika Games is targeting an iPad release for the full game.

My Robot Friend

Robomind

Robozzle

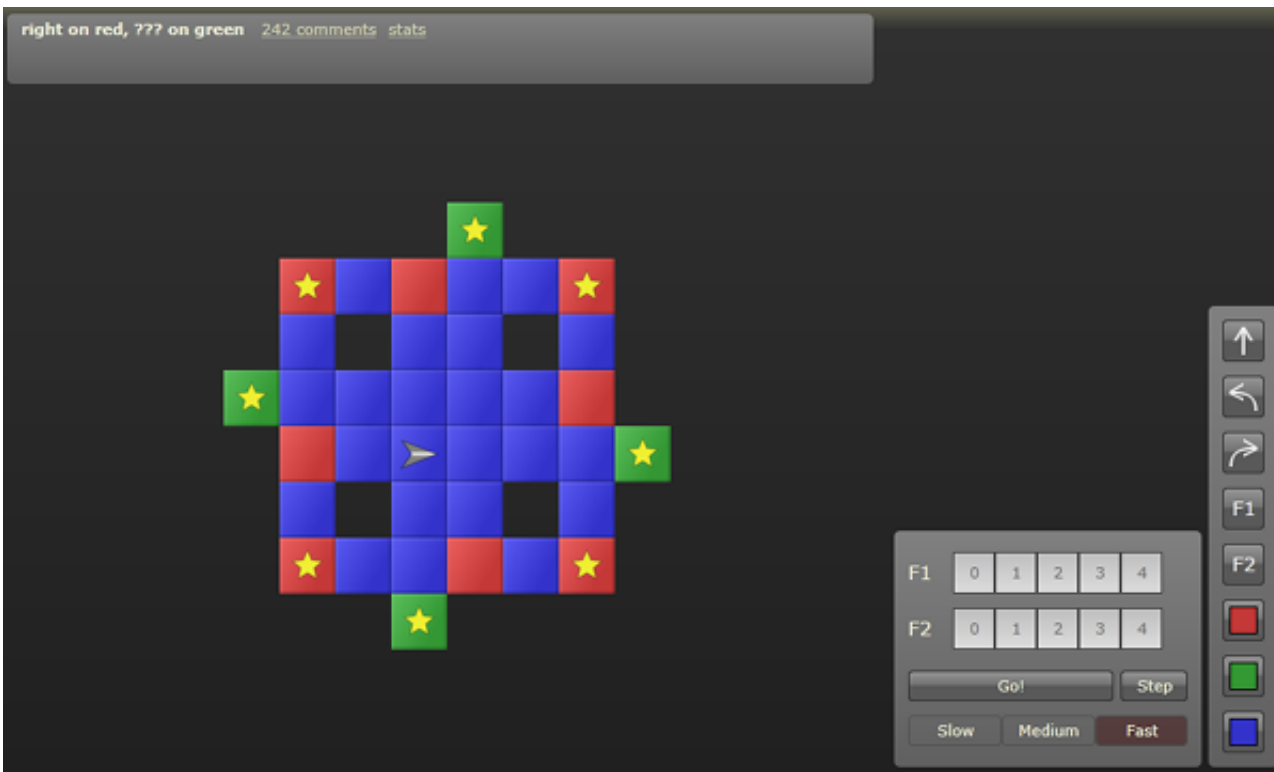**Who it's for**: Ages 6+ (and adults)

Platforms: Web browsers, iOS, Android, Windows phone

The expert view: "Robozzle bills itself as a social puzzle game, but to me it's a fun and interesting way to introduce programming concepts. And perhaps it is a game to get young people interested in programming." — *High school computer-science teacher Alfred Thompson*.

If you're looking for challenge for older kids (or yourself), try Robozzle. It's a puzzle game that Microsoft programmer Igor Ostrovsky created in his free time.

Robozzle tasks you with guiding a robot through a series of mazes using limited commands. The levels range from those suitable for younger children right up to puzzles that will make seasoned coders scratch their heads.

It's free to play through browsers (using Silverlight), and community support enables players to create, vote, and comment on new levels.

SpaceChem*

**Who it's for**: Ages 10+ (and adults)

Platforms: PC, Mac, Linux, iOS, Android

Find out more: SpaceChem website, Steam, iTunes, Google Play The expert view: "I believe SpaceChem [is] the best programming game yet made." — Neil Brown, Computing education researcher, University of Kent, U.K.

SpaceChem's fusion of programming and pseudo-chemistry in a science-fiction setting earned great reviews on its 2011 release.

Tough enough to challenge high-school students and beyond, SpaceChem tasks players with building machines to fight monsters, using programming concepts like in-order execution, loops, branching, and subroutines. Developer Zachtronic Industries details exactly what the game can help teach in its educators guide.

"SpaceChem is the game I wish I could give to my 12-year-old self and let him go crazy," according to educational blog Gaming to Learn. "When you hear people talking about how important it is to learn to write code, this is what they are talking about. Games like this teach the gamer how to think."
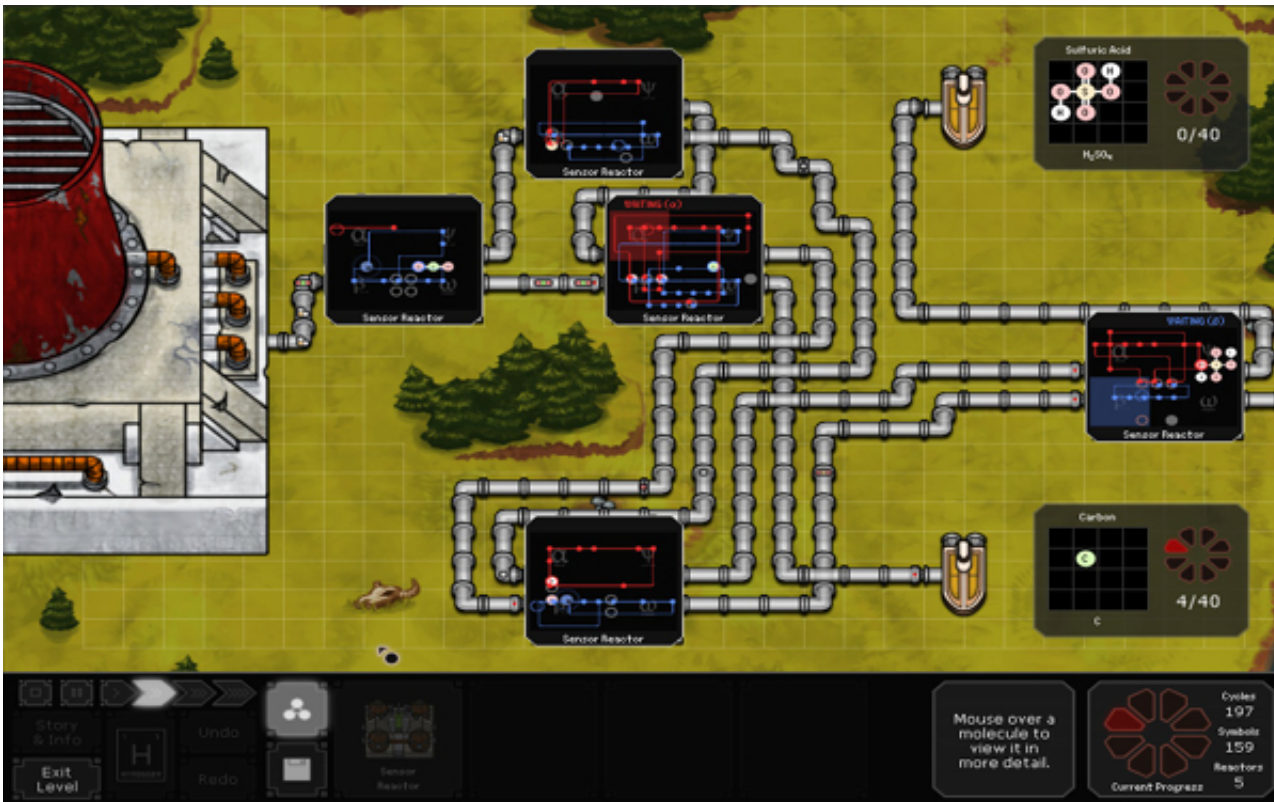
Scratch

With Scratch, you can program your own interactive stories, games, and animations — and share your creations with others in the online community.

Scratch helps young people learn to think creatively, reason systematically, and work collaboratively — essential skills for life in the 21st century.

Scratch is a project of the Lifelong Kindergarten Group at the MIT Media Lab. It is provided free of charge.

SCRATCH   File Edit Share Help

Motion   Control
Looks   Sensing
Sound   Operators
Pen   Variables

Sprite1
x: -135 y: -76 direction: 105

Scripts | Costumes | Sounds

Blocks palette (left):

when clicked

when space key pressed

when Sprite1 clicked

wait 1 secs

forever

repeat 10

broadcast

broadcast and wait

when I receive

forever if

if

if

Scripts area:

when clicked
switch to costume costume1
go to x: -96 y: -64
point in direction 90
forever
 move 2 steps
 if touching color ?
  repeat 8
   turn 45 degrees
   wait 0.1 secs
  go to x: -96 y: -64
  point in direction 90
 if touching color ?
  switch to costume costume2
  wait 1 secs
  stop all

when z key pressed
turn 15 degrees

when x key pressed
turn 15 degrees

race track

RED car wins !!!

New sprite:

Sprite1   Sprite2

Stage

x: -356 y: -3