SCIENCE CAMPS

CODEMAKERS Love 2D Project Manual

2018

Table of Contents

README

Make sure the campers have the folder Files_For_Campers on their computer by the afternoon of the first day. There are many code templates that the campers will build code from in this folder. There is one file called Give_at_ending/Game_tricks.pdf that should not be given until after the Game_tricks/Game_design workshop.

Have fun!

Camp Schedule

5 day

Codemaker - Love 2D (2017)					
Time	Monday	Tuesday	Wednesday	Thursday	Friday
9:00 AM	Welcome/ Tours	First Game	Pinball	Line rider	Finishing Touches
9:30 AM					
10:00 AM		Digital Citizenship			
10:30 AM					
11:00 AM	Basic Coding	Quidditch	Pinball	Line rider	Games to USBs / Line Rider Comp
11:30 AM					
12:00 PM	Lunch				
12:30 PM					
1:00 PM	Basic Coding	Quidditch	Game Design Tricks	Line Rider	water fight
1:30 PM					
2:00 PM					
2:30 PM	Snack				
3:00 PM	First Game	Love Hertz	Line Rider	Science Show 2:30	
3:30 PM					
4:00 PM	Home Time				

4 day

Codemakers - Love 2D Short Week (2017)				
Time	Tuesday	Wednesday	Thursday	Friday
9:00 AM	Welcome/ Tours	First Game	Line rider	Finishing Touches
9:30 AM				
10:00 AM		Digital Citizenship		
10:30 AM				
11:00 AM	Basic Coding	Pinball	Line rider	Games to USBs / Line rider Comp
11:30 AM				
12:00 PM	Lunch			
12:30 PM				
1:00 PM	Basic Coding	Pinball	Line rider	SUPER FUN TIMES
1:30 PM				
2:00 PM				
2:30 PM	Snack			
3:00 PM	First Game	Game Design Tricks	Science Show 2:30	
3:30 PM				
4:00 PM	Home Time			

ACTIVITY: Intro Programming

BY: Sam Germain adapted from Carter Hill

GRADE and CAMP: Grade 7-9, Codemakers (Love 2D)
TOPIC(s): Game Design, binary

TIME: 120 mins

OBJECTIVE: Learning the basics of programming in Lua

MATERIALS:

- ヽ(ຈل͜ຈ)ﾉ︵ ┻━┻

SCIENTIFIC BASIS (learning outcomes - teach this):

What is syntax? All coding languages are unique in how they operate, and the word syntax is used to describe them. For example the "syntax" for writing something to the console in Python or Lua is "print("something")" whereas with c++ it's more like: cout << "something" << endl; In the same way, one could say the "syntax" for saying hello in French is bonjour.

Variables: Variables, put simply, are placeholders for data. They have an assigned name and a value that can be changed at almost any time. Variables in coding are not very different from variables in math. If we say that x – 3 = 1, we know that x = 4, x would be its name, and 4 would be its value. In Lua, variables can be assigned really easy, just by typing name = value. If there is already a variable called name, its value would be changed, and if not, it would simple create a value for it.

Variables can hold the values of all kinds of different data types. The most obvious answer would be numbers. What other types of data can be used in computer code? If you want a string (a string of characters, like a sentence) you would say myString = "Your sentence in quotes". The quotations make the computer know that it's a string variable type. Another important data type is Boolean, which can only have two values, can you guess what they are? (It's True and False). myBoolean = True

Conditionals: Are bits of code that are only executed if a given condition is true. This is where computer and human language are most comparable. Let's say you're about to go get groceries you check your fridge and see that you're out of milk, so you add it to your list. The next time you go to get groceries you still have some left, so you decide not to get milk. Next, somebody else in your house is going shopping, so you tell them "If we're out of milk buy some!" which is very close to how conditionals are written in computer science. Let’s say we have a variable that is true if the milk jug is empty, so “outOfMilk = True”. Then, our if statement would look like: “if outOfMilk then // end” or “if outOfMilk == True”. Or we could have a variable that is true if we have milk, so: “if milkNotEmpty == False then   //   end”.

You can also use numbers in conditionals. For example, if 4 == 4 would always turn true, and thus the code in that block will always execute. Or you could have a variable that shows how much milk is left, like milkAmount = 10. You could say that if the milk is almost gone, you should buy more. You can do that by using < and > which mean less than or greater than. So “if milkAmount < 3 then” would execute if your “milkAmount” is two or less.

Functions: Functions, or procedures, are kind of like variables but for code. Let’s say we want a function that adds four to a given number. It would look like:

```
function add(x, y)
        z = x + y
        return z
end
```

And then if I wanted to add two numbers together and assign it to a variable I would simply type myVariable = add(4, 3). Functions can have as many arguments as you want them to, or they could have 0 arguments at all. If they have no arguments, you have to remember to use the brackets anyway, there just won’t be anything between them.

Objects

Objects behave like a container that can have variables(called attributes) and functions(called methods) attached to them. Lets use the analogy of a bike as our object. If we refer to samsbike.height we are referring to the height of sams bike, and if we refer to samsbike.speed we are referring to the speed of sams bike. If we say mattsbike.speed we are referring to the speed of matts bike.

Loops

Our for loops are only going to loop through objects, because of this, they don’t have to really learn what for loops are, just how to loop through an object. In looping through an object we repeat the same series of instructions for each attribute of the objects. We LOOP through each of the attributes of the object and perform some code using each attribute

PROCEDURE:

Get the kids to watch this video https://www.youtube.com/watch?v=l26oaHV7D40&index=13&list=PL8dPuuaLjXtNlUrzyH5r6jN9ulIgZBpdo on crash course programming.

The following exercises will take place on https://repl.it/repls/GloomyGummyGenericsoftware. Get the kids to visit this site

Write each of the following examples on the board and get the kids to try to code their own example

Write this example of variable's on the board and get them to try to code their own example

Variables

```
x = 3
print(x)        -- should print 3
y = 4 + x
print(y)        --should print 7
```

Conditional

```
x = 3
if (x<5) then
    print("less than 5")
elseif (x<10) then
    print("less than 10")
else
    print("greater than 10")
end
```

Functions

```
function add(x, y)
    z = x + y
    return z
end

x = 2
y = 3
w = add(x,y)
print(w)        --Should print 5
```

Objects

```
    mattsbike = {}
    samsbike = {}
    samsbike.height = 172
    mattsbike.height = 184
```

```
print(samsbike.height)          --Should print 172
print(mattsbike.height)         --Should print 184
```

--If the kids are too confused, you can skip this next part on methods

```
function samsbike.setheight(x)
  samsbike.height = x
end

samsbike.setheight(150)
print(samsbike.height)          --Should print 150
```

For Loop

We are going to create an object that has 3 string variables. We are then going to loop through each variable and print the string.

Pseudocode

```
bike = {}
bike.height = "1.2 m"
bike.speed = "20 km/hr"
bike.terrain = "Mountain"

for each variable in objects
  print the variable
end for loop
```

Lua Code

```
strings = {}
bike.height = "1.2 m"
bike.speed = "20 km/hr"
bike.terrain = "Mountain"

for _, item in pairs(objects) do
  print(item)
end

--Should print
--1.2 m
--20 km/hr
--bike.terrain
```

ACTIVITY: First Game

BY: Sam Germain

GRADE and CAMP: Grade 7-9, Codemakers (Love 2D)
TOPIC(s): Game Developement

TIME: 120 mins

OBJECTIVE: To create our first game

MATERIALS:

- ୧(░ಥ╭͜ʖ╮ಥ░)━☆ﾟ.*･｡ﾟ

SCIENTIFIC BASIS (learning outcomes - teach this):

Games in love2d have 3 main functions. Love.load, love.update, and love.draw. Love.load is the function that operates when the game starts, it puts everything into the game that is there at the beginning. Love.update records input from the user and determines what changes are to be made to the game. Love.draw gives the output of the game to the user, it shows the display.

Love.physics: Love.physics is used to create objects that can interact with eachother. Objects can be static(fixated on the screen), or dynamic(move around). When a dynamic object hits a static object, it deflects off of it, in this way, collision detection is taken care of for us.

We will give the kids a template for the world that the game exists in. The template sets the
Each object has a minimum of 3 attributes

- Body: Determines where the object exists within the frame and whether the object is static or dynamic.
  - Ex: objects.ball.body = love.physics.newBody(world, 1700/2, 1000/2, "dynamic")
- Shape: Determines the shape of the object
  - Ex: objects.ball.shape = love.physics.newCircleShape(20)
- Fixture: Puts the object in the game world
  - objects.ball.fixture = love.physics.newFixture(objects.ball.body, objects.ball.shape, 1)

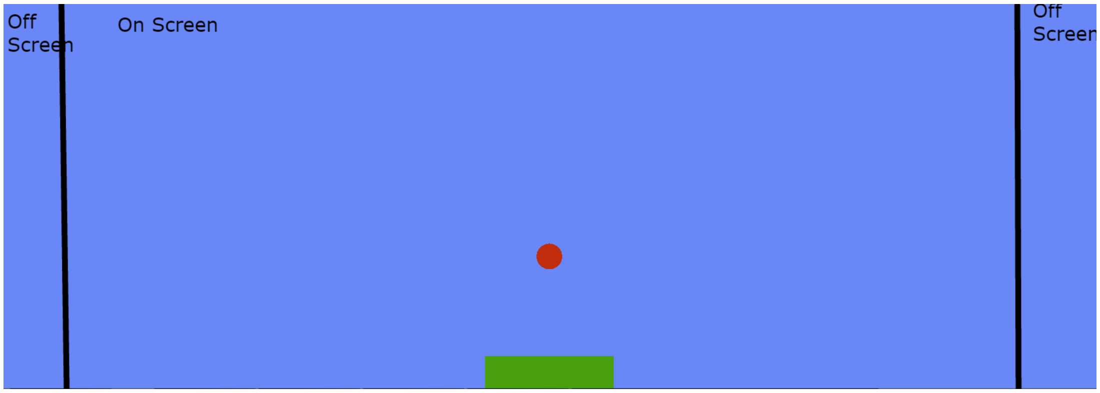
Objects: Objects are nothing more than a simple way of organising information. We are going to create 3 objects. 1 object is already created.

PROCEDURE:

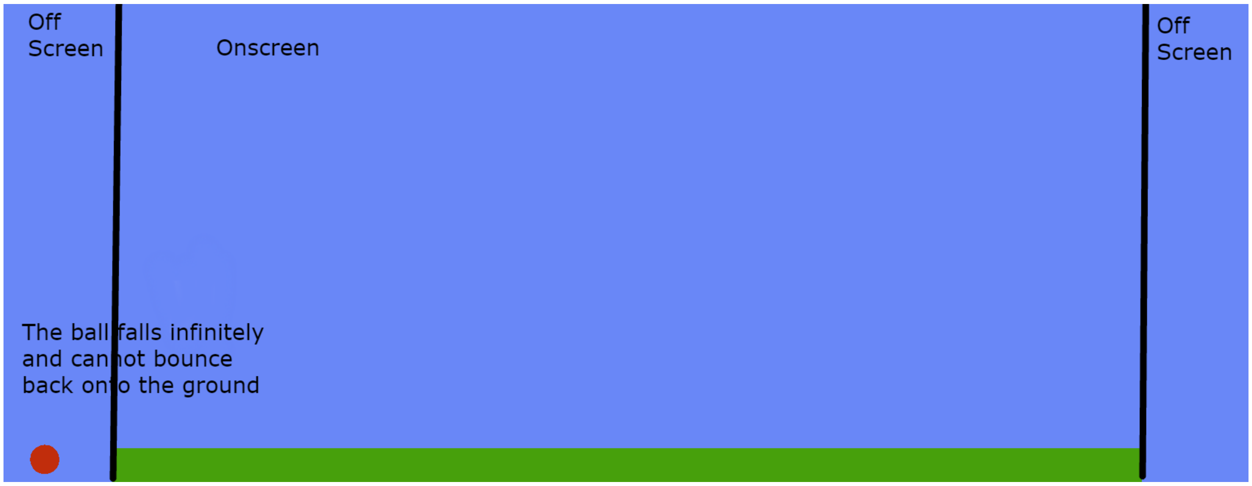
Love.load

1. Get the kids to open their template for the first game. If they drag it over love.exe as is it should display a blue screen.
2. The first thing you'll do is change the width of the ground from 200 to 1700.
   objects.ground.shape = love.physics.newRectangleShape(1700, 50)
   At 1700 if the ball falls off the screen then it falls infinitely, because there is no ground that exists outside the screen. If you change it to 25000, the ball still has something to fall on if it rolls off the screen, even though you can't see it. They can open **tutorials/Ground_width.pdf** to view the photo's below.

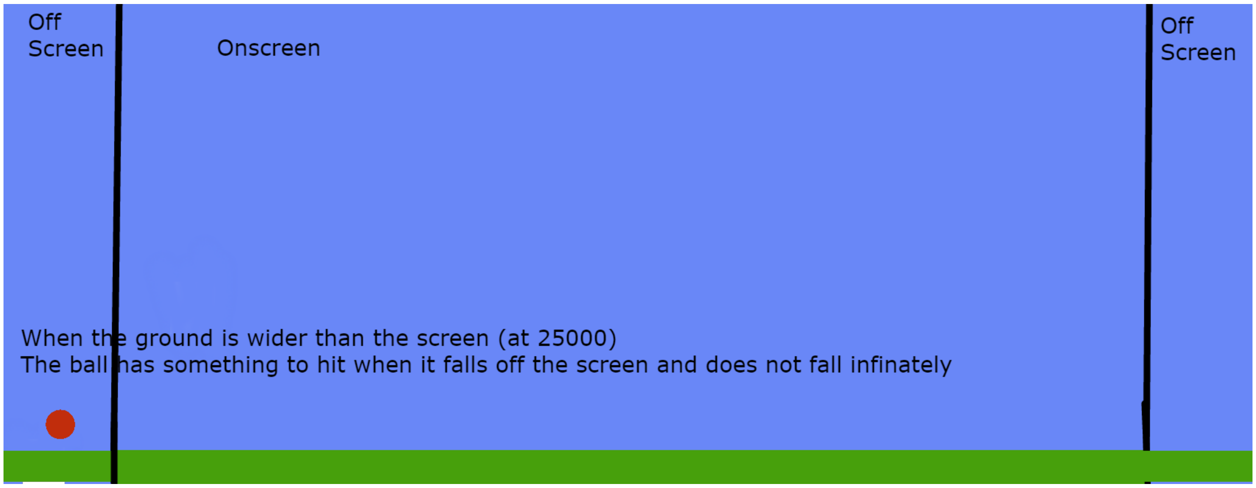
Ground Width: 200



Ground Width: 1700



Ground Width: 25000



When the ground is wider than the screen (at 25000)
The ball has something to hit when it falls off the screen and does not fall infinately

3. Fill in the right hand values for the ball object. The template should match the complete version by the end. The comments specify what the values should be for the ball. They should be able to use the code for how the ground was made as a reference for how to code the ball.
4. Code the left and right hand sides for the blocks that the ball will bounce against. The code is almost identical to the two objects created before and the comments specify what to do.

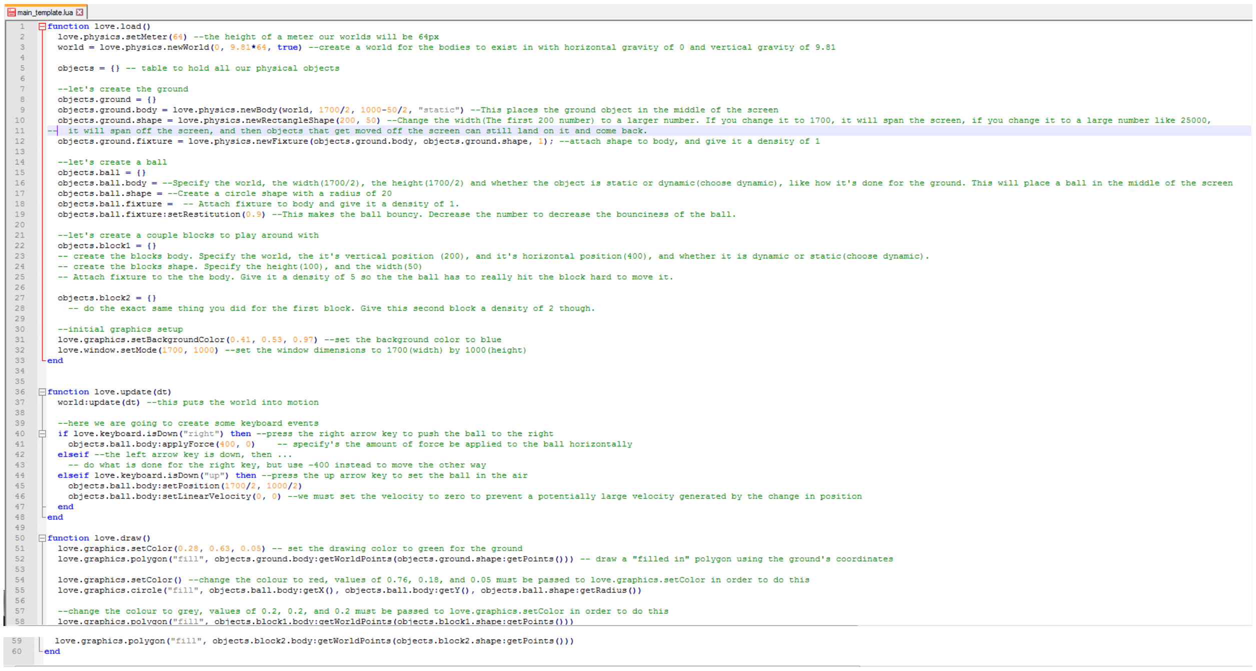
Love.update

5. Code instructions for the ball to move when the left arrow key is hit, the right arrow key is already coded

Love.draw

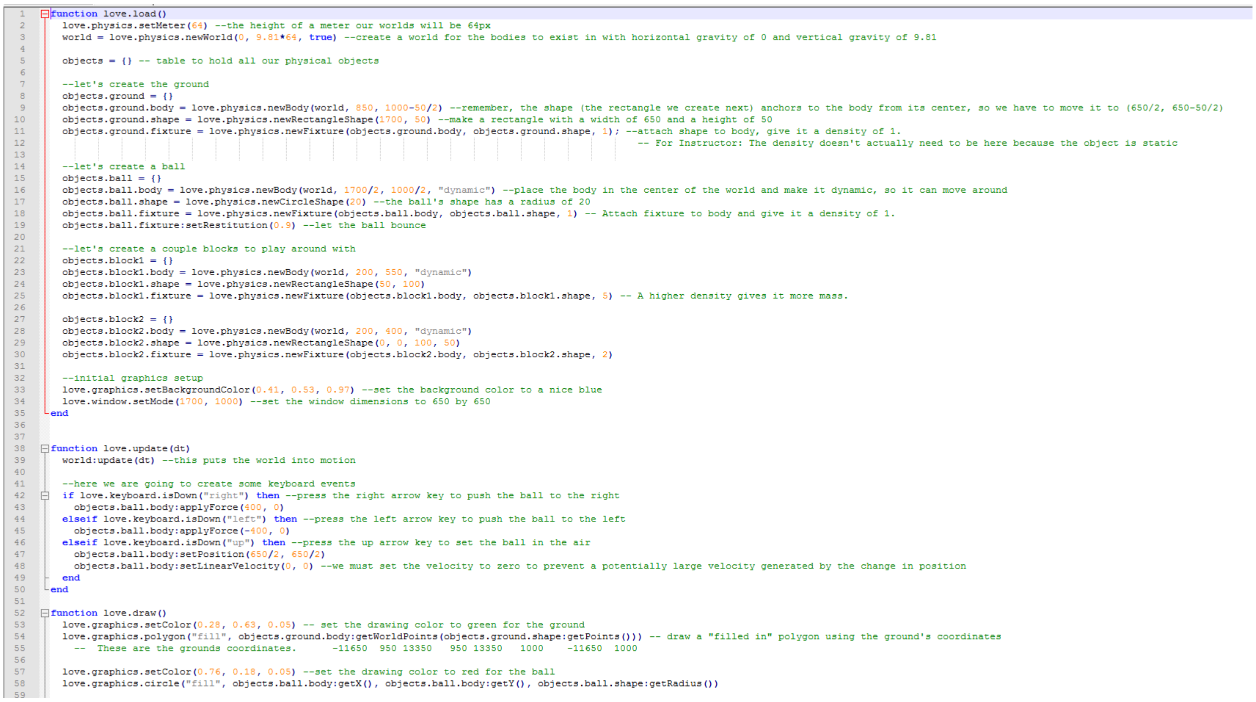
6. Uncomment the lines in love.draw that draw the shapes on the screen
7. Change the color of the ball to red. There is a commented out line for love.graphics.setcolor. They will have to uncomment this line and fill in the values specified in the comments. A few lines above they can see the code that was used to do this earlier.

Template



```lua
function love.load()
  love.physics.setMeter(64) --the height of a meter our worlds will be 64px
  world = love.physics.newWorld(0, 9.81*64, true) --create a world for the bodies to exist in with horizontal gravity of 0 and vertical gravity of 9.81

  objects = {} -- table to hold all our physical objects

  --let's create the ground
  objects.ground = {}
  objects.ground.body = love.physics.newBody(world, 1700/2, 1000-50/2, "static") --This places the ground object in the middle of the screen
  objects.ground.shape = love.physics.newRectangleShape(200, 50) --Change the width(The first 200 number) to a larger number. If you change it to 1700, it will span the screen, if you change it to a large number like 25000,
--  it will span off the screen, and then objects that get moved off the screen can still land on it and come back.
  objects.ground.fixture = love.physics.newFixture(objects.ground.body, objects.ground.shape, 1); --attach shape to body, and give it a density of 1

  --let's create a ball
  objects.ball = {}
  objects.ball.body = --Specify the world, the width(1700/2), the height(1700/2) and whether the object is static or dynamic(choose dynamic), like how it's done for the ground. This will place a ball in the middle of the screen
  objects.ball.shape = --Create a circle shape with a radius of 20
  objects.ball.fixture =  -- Attach fixture to body and give it a density of 1.
  objects.ball.fixture:setRestitution(0.9) --This makes the ball bouncy. Decrease the number to decrease the bounciness of the ball.

  --let's create a couple blocks to play around with
  objects.block1 = {}
  -- create the blocks body. Specify the world, the it's vertical position (200), and it's horizontal position(400), and whether it is dynamic or static(choose dynamic).
  -- create the blocks shape. Specify the height(100), and the width(50)
  -- Attach fixture to the the body. Give it a density of 5 so the the ball has to really hit the block hard to move it.

  objects.block2 = {}
    -- do the exact same thing you did for the first block. Give this second block a density of 2 though.

  --initial graphics setup
  love.graphics.setBackgroundColor(0.41, 0.53, 0.97) --set the background color to blue
  love.window.setMode(1700, 1000) --set the window dimensions to 1700(width) by 1000(height)
end


function love.update(dt)
  world:update(dt) --this puts the world into motion

  --here we are going to create some keyboard events
  if love.keyboard.isDown("right") then --press the right arrow key to push the ball to the right
    objects.ball.body:applyForce(400, 0)    -- specify's the amount of force be applied to the ball horizontally
  elseif --the left arrow key is down, then ...
    -- do what is done for the right key, but use -400 instead to move the other way
  elseif love.keyboard.isDown("up") then --press the up arrow key to set the ball in the air
    objects.ball.body:setPosition(1700/2, 1000/2)
    objects.ball.body:setLinearVelocity(0, 0) --we must set the velocity to zero to prevent a potentially large velocity generated by the change in position
  end
end

function love.draw()
  love.graphics.setColor(0.28, 0.63, 0.05) -- set the drawing color to green for the ground
  love.graphics.polygon("fill", objects.ground.body:getWorldPoints(objects.ground.shape:getPoints())) -- draw a "filled in" polygon using the ground's coordinates

  love.graphics.setColor() --change the colour to red, values of 0.76, 0.18, and 0.05 must be passed to love.graphics.setColor in order to do this
  love.graphics.circle("fill", objects.ball.body:getX(), objects.ball.body:getY(), objects.ball.shape:getRadius())

  --change the colour to grey, values of 0.2, 0.2, and 0.2 must be passed to love.graphics.setColor in order to do this
  love.graphics.polygon("fill", objects.block1.body:getWorldPoints(objects.block1.shape:getPoints()))
  love.graphics.polygon("fill", objects.block2.body:getWorldPoints(objects.block2.shape:getPoints()))
end
```

Complete Code



```lua
function love.load()
  love.physics.setMeter(64) --the height of a meter our worlds will be 64px
  world = love.physics.newWorld(0, 9.81*64, true) --create a world for the bodies to exist in with horizontal gravity of 0 and vertical gravity of 9.81

  objects = {} -- table to hold all our physical objects

  --let's create the ground
  objects.ground = {}
  objects.ground.body = love.physics.newBody(world, 850, 1000-50/2) --remember, the shape (the rectangle we create next) anchors to the body from its center, so we have to move it to (650/2, 650-50/2)
  objects.ground.shape = love.physics.newRectangleShape(1700, 50) --make a rectangle with a width of 650 and a height of 50
  objects.ground.fixture = love.physics.newFixture(objects.ground.body, objects.ground.shape, 1); --attach shape to body, give it a density of 1.
                                                                                                     -- For Instructor: The density doesn't actually need to be here because the object is static

  --let's create a ball
  objects.ball = {}
  objects.ball.body = love.physics.newBody(world, 1700/2, 1000/2, "dynamic") --place the body in the center of the world and make it dynamic, so it can move around
  objects.ball.shape = love.physics.newCircleShape(20) --the ball's shape has a radius of 20
  objects.ball.fixture = love.physics.newFixture(objects.ball.body, objects.ball.shape, 1) -- Attach fixture to body and give it a density of 1.
  objects.ball.fixture:setRestitution(0.9) --let the ball bounce

  --let's create a couple blocks to play around with
  objects.block1 = {}
  objects.block1.body = love.physics.newBody(world, 200, 550, "dynamic")
  objects.block1.shape = love.physics.newRectangleShape(50, 100)
  objects.block1.fixture = love.physics.newFixture(objects.block1.body, objects.block1.shape, 5) -- A higher density gives it more mass.

  objects.block2 = {}
  objects.block2.body = love.physics.newBody(world, 200, 400, "dynamic")
  objects.block2.shape = love.physics.newRectangleShape(0, 0, 100, 50)
  objects.block2.fixture = love.physics.newFixture(objects.block2.body, objects.block2.shape, 2)

  --initial graphics setup
  love.graphics.setBackgroundColor(0.41, 0.53, 0.97) --set the background color to a nice blue
  love.window.setMode(1700, 1000) --set the window dimensions to 650 by 650
end


function love.update(dt)
  world:update(dt) --this puts the world into motion

  --here we are going to create some keyboard events
  if love.keyboard.isDown("right") then --press the right arrow key to push the ball to the right
    objects.ball.body:applyForce(400, 0)
  elseif love.keyboard.isDown("left") then --press the left arrow key to push the ball to the left
    objects.ball.body:applyForce(-400, 0)
  elseif love.keyboard.isDown("up") then --press the up arrow key to set the ball in the air
    objects.ball.body:setPosition(650/2, 650/2)
    objects.ball.body:setLinearVelocity(0, 0) --we must set the velocity to zero to prevent a potentially large velocity generated by the change in position
  end
end

function love.draw()
  love.graphics.setColor(0.28, 0.63, 0.05) -- set the drawing color to green for the ground
  love.graphics.polygon("fill", objects.ground.body:getWorldPoints(objects.ground.shape:getPoints())) -- draw a "filled in" polygon using the ground's coordinates
    --  These are the grounds coordinates.      -11650  950 13350   950 13350   1000    -11650  1000

  love.graphics.setColor(0.76, 0.18, 0.05) --set the drawing color to red for the ball
  love.graphics.circle("fill", objects.ball.body:getX(), objects.ball.body:getY(), objects.ball.shape:getRadius())

```

Digital Citizenship: Searching and Security

BY: Dominik Pytlak, Stephen and Jamie

GRADE and CAMP: 7+
TOPIC(s):

TIME: 30 mins
Set Up & Intro = Show some video's on a screen

MATERIALS (what you'll need for one week of camp):

- **The internet and a screen to show videos on**

What is Digital Citizenship?

Digital citizenship refers to the norms of appropriate, responsible, and healthy behaviour in technology use. This includes ethics, etiquette, digital literacy, safety and security. Your behaviour online is sourced back to you in real life so it is important to always represent yourself on the internet as you would in real life. Your words and actions on the internet will have an impact on you just as they would in the real world.

Content online never goes away

There are websites that save old versions of websites
Video on why you should care about privacy
https://www.youtube.com/watch?v=85mu9PLWCuI

If you post something online, and then delete it, someone might have saved a copy, or the site you posted it on didn't delete it

How to tell if information is legit

https://www.youtube.com/watch?v=FxyKHp47EnQ

Website evaluation methods

Author

- Who wrote this?
- What is their background?
- Is the author an individual or group?

- Is the author an expert on the topic
- Sharing opinions or facts?
- How does all of this shape what the author wrote?
- Click on Info/About if you can't find the authors name
-

Motivation

- Is the webpage considered by a group organization or company
- What does the group stand to gain by convincing others of its points
- Was the information reviewed by others before it was published
- Is the information from a personal site (blog, etc.)
- .edu and .gov are more likely to be objective

Evidence

- Are there citations and links to other sources?
    - Are the citations accurate
- Can you verify the evidence from the site
- Are there many sources or just a couple

Timeliness

- When was the information published or last updated

BE SKEPTICAL

Security

Don't just use things you've gotten online without checking them

* If an "antivirus" that you didn't install is telling you that you have a virus… chances are, it's a virus.

* Check the website at https://safeweb.norton.com/

Or google yourwebsite.com scam and if you get search results of people reporting it's a scam, that's a red flag

SECURITY

- Key loggers can record your key's entered in

  Fake Wap
    - Software that shows a fake wireless access point
    - Who owns it
    - Who's using your data
    - Beware if free wifi doesn't require a password or terms of use page
- Phishing
    - Replicates a legit looking site
    - A legit message that is actually fake
    - Anybody who's asking for your password over email is a red flag
- Malware
    - Something that gets into your computer and messes things up

    - Comes in from a sketchy source
    - Don't download programs and files from websites you don't trust

Hacking techniques

- Bait and Switch
    - Buys ad space on a website and lures people to clicking on it
- Virus's and Trojans
    - Send data from your computer continuously back to the hacker
- Keyloggers
    - Record your key strokes
    - Banks let you use their virtual keyboards to avoid this

Efficient Use of Google

https://www.youtube.com/watch?v=LTJygQwYV84

Boolean operators

- AND – results with both criteria
- OR – results with one or more of the criteria met
- NOT – results that don't contain something
    - Can also use the minus sign

Asterisk at the end of a word give different endings

- Ex: Canad* returns results for Canada, Canadian, and Canadians

https://www.youtube.com/watch?v=R0DQfwc72PM

Quotation marks

- Assures the words show up in the order they are within the quotation marks

Can upload an image to google images and search for similar images that way

- Finds the origin of a specific image

Related:url

- Finds similar websites

Filetype:pdf

- Finds specific file types

Intitle: your search term

- Displays sites that have the search term in their title

Startpage.com

- Google search results without your ip address

Procedure

Watch this video on why you should care about privacy
https://www.youtube.com/watch?v=85mu9PLWCuI

Watch This video on privacy
\\rhubarb\admin\Outreach\SF-Instructors\Staff 2018\Camps\Codemakers-Gamedev\Videos_For_Digital_CitizenShip\privacy

Watch this video on how to tell how reliable information is.
https://www.youtube.com/watch?v=FxyKHp47EnQ

Go over the types of Scam's people try to pull as described under security
Watch this video on Scam Baiting: \\rhubarb\admin\Outreach\SF-Instructors\Staff 2018\Camps\Codemakers- Gamedev\Videos_For_Digital_CitizenShip\Ted_Talk_On_Scambaiting.mp4

Watch this video on googling better
https://www.youtube.com/watch?v=LTJygQwYV84

Give each kid a copy of Google_tips.pdf

Bonus: Watch this video on lunch, a break, or if there's extra time if people are interested:
(A Ted Talk on why online privacy is important)
\\rhubarb\admin\Outreach\SF-Instructors\Staff 2018\Camps\Codemakers-Gamedev\Videos_For_Digital_CitizenShip\Glen_Greenwald_Why_Privacy_Matters.mp4

ACTIVITY: Quidditch

BY: Sam Germain

GRADE and CAMP: Grade 7-9, Codemakers (Love 2D)
TOPIC(s): Game Developement

TIME: 150 mins

OBJECTIVE: To learn how to manipulate the camera

MATERIALS:

- 😐

SCIENTIFIC BASIS (learning outcomes - teach this):

Love.physics: We perform camera movment in love2d by creating a camera object that has 2 attributes, an x and a y coordinate

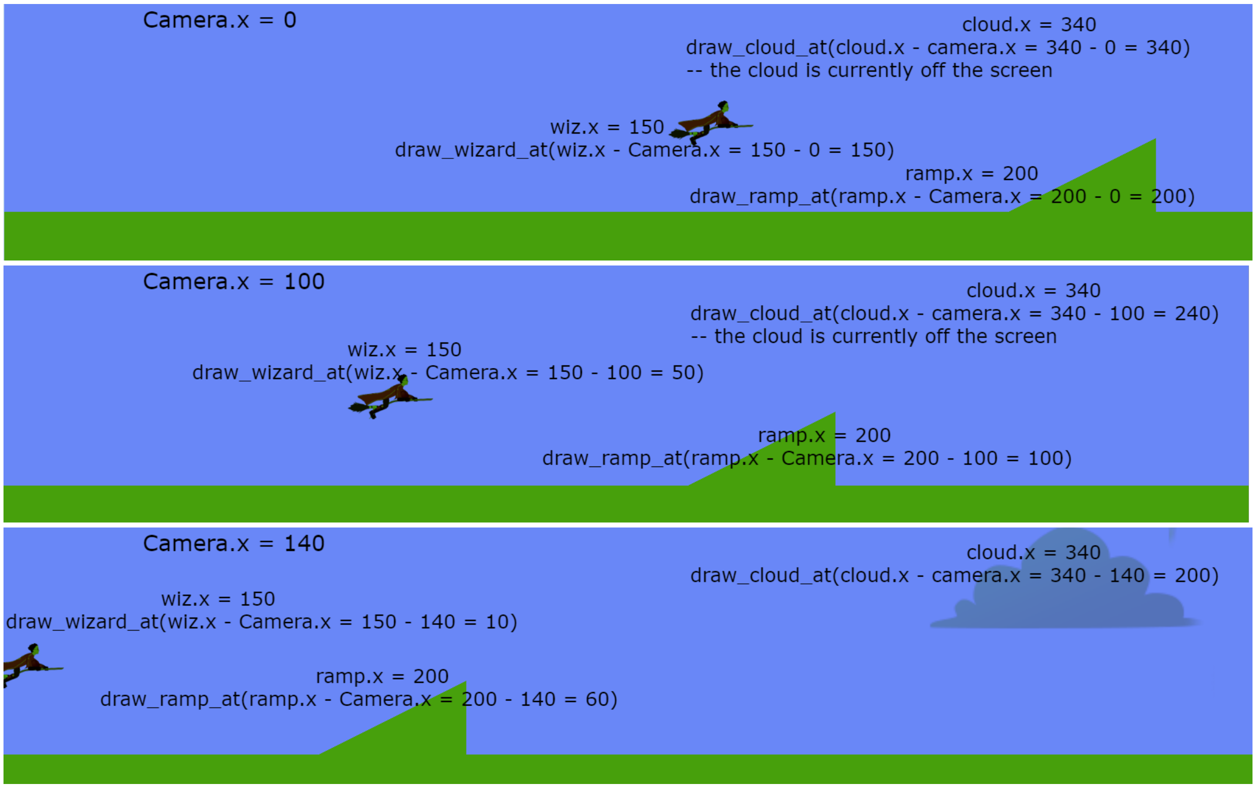
```
Camera = {
        x = 0,
        y = 0
}
```

We can set these values to change when we press an arrow key

```
if love.keyboard.isDown("right") then --RIGHT ARROW BUTTON IS DOWN then
        Camera.x = Camera.x + 5
end
```

We then subtract these x and y coordinates from each of the objects within the game to look like things are moving.

```
    love.graphics.polygon('fill', ramp.x - Camera.x, ramp.y - Camera.y, ramp.x2 - Camera.x, ramp.y - Camera.y, ramp.x2 - Camera.x, ramp.y2 - Camera.y)
```

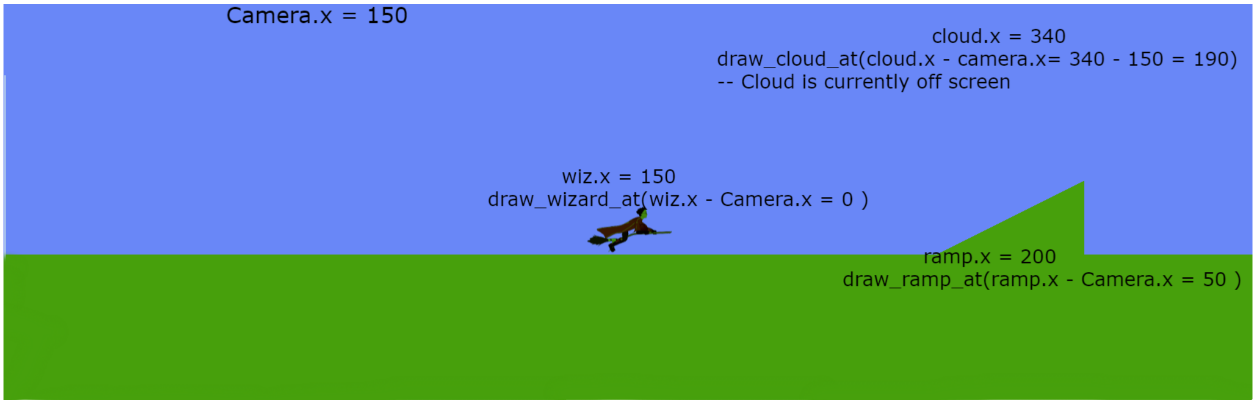


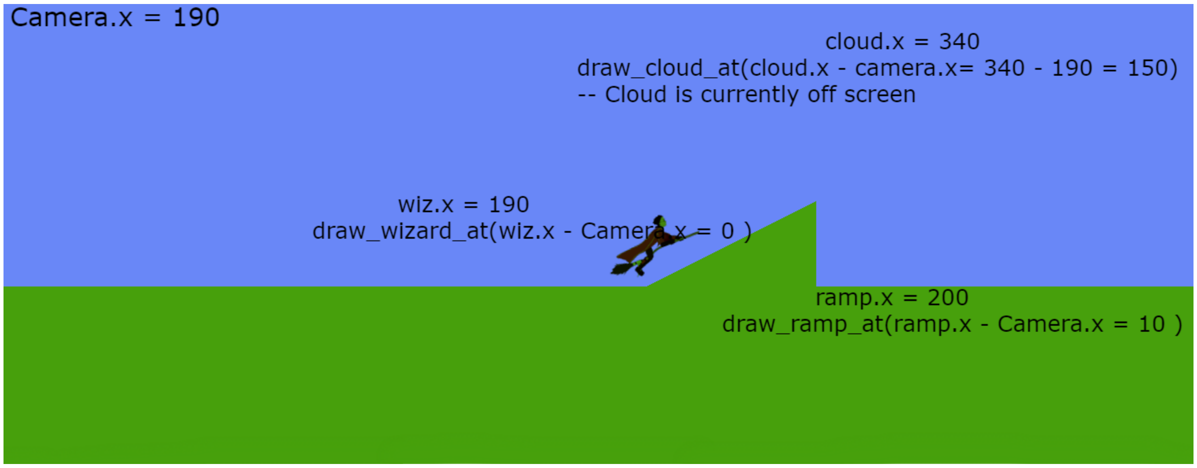
```
Camera.x = 0
cloud.x = 340
draw_cloud_at(cloud.x - camera.x = 340 - 0 = 340)
-- the cloud is currently off the screen
wiz.x = 150
draw_wizard_at(wiz.x - Camera.x = 150 - 0 = 150)
ramp.x = 200
draw_ramp_at(ramp.x - Camera.x = 200 - 0 = 200)

Camera.x = 100
cloud.x = 340
draw_cloud_at(cloud.x - camera.x = 340 - 100 = 240)
-- the cloud is currently off the screen
wiz.x = 150
draw_wizard_at(wiz.x - Camera.x = 150 - 100 = 50)
ramp.x = 200
draw_ramp_at(ramp.x - Camera.x = 200 - 100 = 100)

Camera.x = 140
cloud.x = 340
draw_cloud_at(cloud.x - camera.x = 340 - 140 = 200)
wiz.x = 150
draw_wizard_at(wiz.x - Camera.x = 150 - 140 = 10)
ramp.x = 200
draw_ramp_at(ramp.x - Camera.x = 200 - 140 = 60)
```

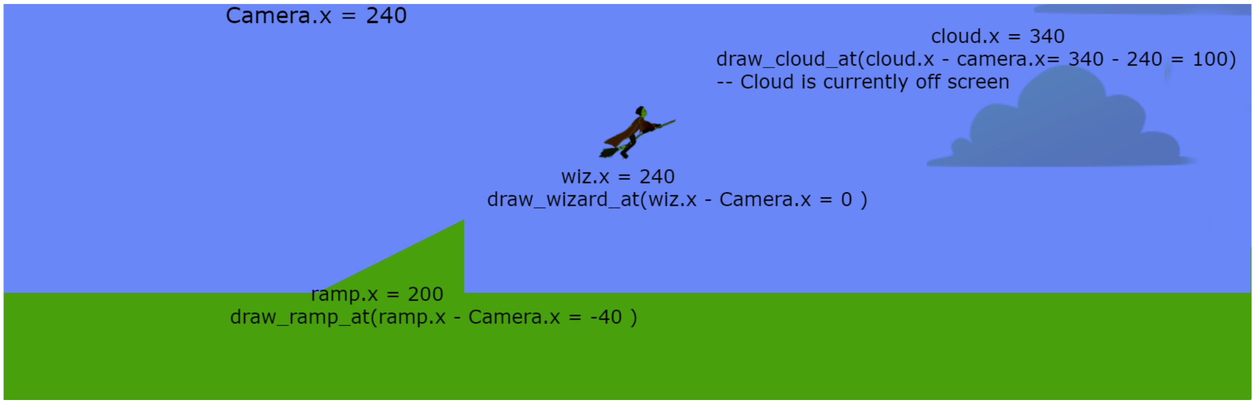
Here we change the position that we draw each of the objects at, the screen does not actually move, all the objects on the screen are just continually redrawn at a position that is further to the left.

Or we can set them to be locked on to a particular object

Camera.x = wizard.body:getX() - love.graphics.getWidth()/2 --The subtraction is done so that the camera is centered on the wizard, instead of the wizard being at the side of the screen


Camera.x = 150
cloud.x = 340
draw_cloud_at(cloud.x - camera.x= 340 - 150 = 190)
-- Cloud is currently off screen
wiz.x = 150
draw_wizard_at(wiz.x - Camera.x = 0)
ramp.x = 200
draw_ramp_at(ramp.x - Camera.x = 50)


Camera.x = 190
cloud.x = 340
draw_cloud_at(cloud.x - camera.x= 340 - 190 = 150)
-- Cloud is currently off screen
wiz.x = 190
draw_wizard_at(wiz.x - Camera.x = 0)
ramp.x = 200
draw_ramp_at(ramp.x - Camera.x = 10)


Camera.x = 240
cloud.x = 340
draw_cloud_at(cloud.x - camera.x= 340 - 240 = 100)
-- Cloud is currently off screen
wiz.x = 240
draw_wizard_at(wiz.x - Camera.x = 0)
ramp.x = 200
draw_ramp_at(ramp.x - Camera.x = -40)

The game is set up to show the first type of movement when the game is paused, and the second type of movement when the game is not paused.

PROCEDURE:

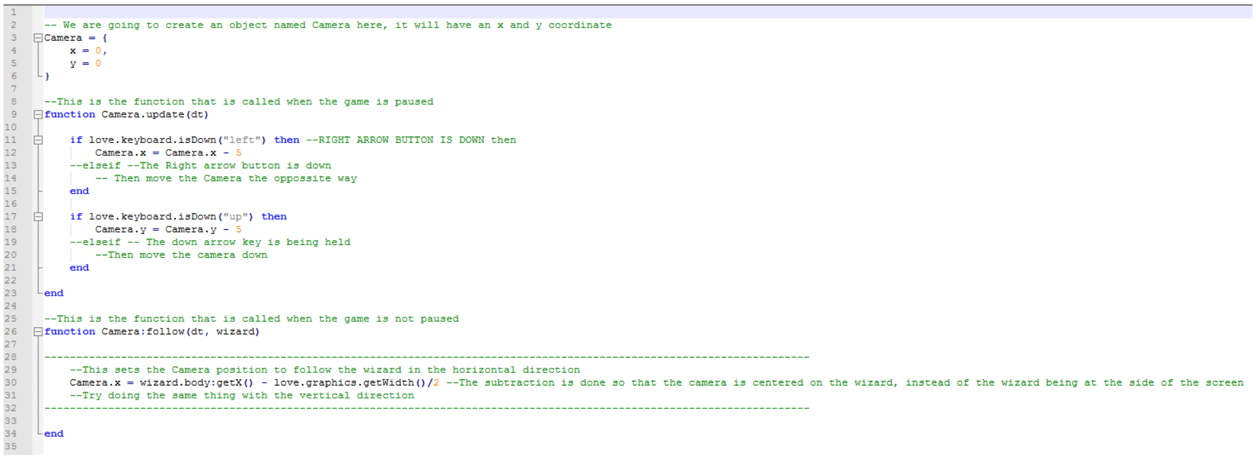
Get the kids to open the tutorials/Camera_movement.pdf file and explain camera movment to them.

Get the kids to open the main.lua and Camer.lua files within their Quidditch folder.

Camera Template

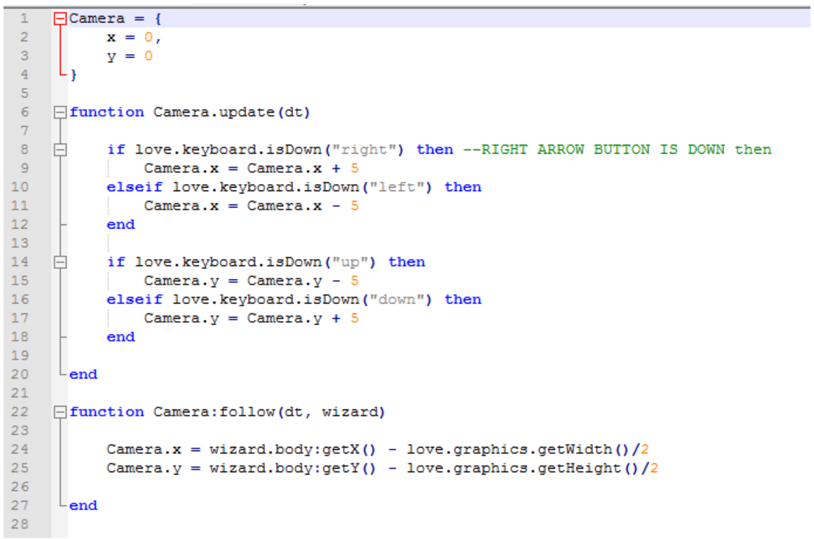
The kids must edit the template so that the Camera.update function includes functionality for moving to the Camera right and down, the adjustments are specified in the comments.

They must also update the Camera:follow function so that the camera also follows the wizard vertically, the adjustments are specified in the comments.



```

-- We are going to create an object named Camera here, it will have an x and y coordinate
Camera = {
    x = 0,
    y = 0
}

--This is the function that is called when the game is paused
function Camera.update(dt)

    if love.keyboard.isDown("left") then --RIGHT ARROW BUTTON IS DOWN then
        Camera.x = Camera.x - 5
    --elseif --The Right arrow button is down
        -- Then move the Camera the oppossite way
    end

    if love.keyboard.isDown("up") then
        Camera.y = Camera.y - 5
    --elseif -- The down arrow key is being held
        --Then move the camera down
    end

end

--This is the function that is called when the game is not paused
function Camera:follow(dt, wizard)

-----------------------------------------------------------------------------------------------------------------------
    --This sets the Camera position to follow the wizard in the horizontal direction
    Camera.x = wizard.body:getX() - love.graphics.getWidth()/2 --The subtraction is done so that the camera is centered on the wizard, instead of the wizard being at the side of the screen
    --Try doing the same thing with the vertical direction
-----------------------------------------------------------------------------------------------------------------------

end

```

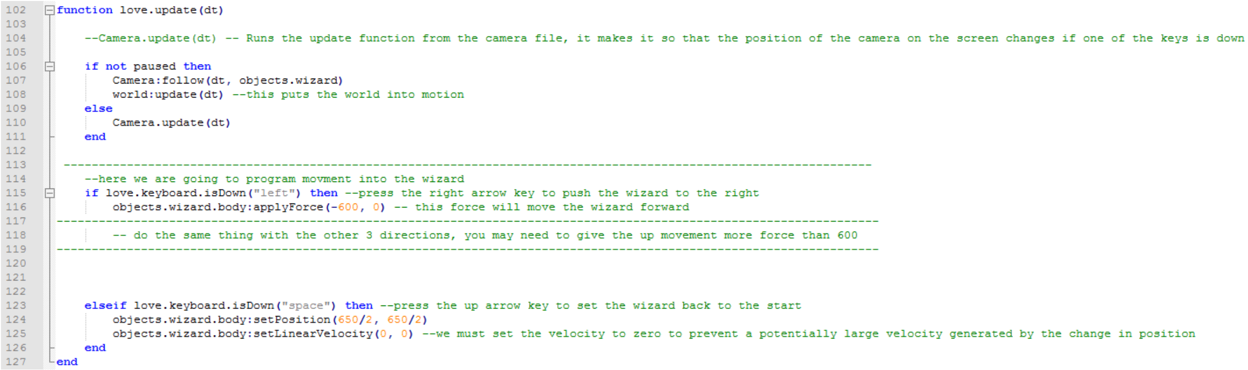
Complete Camera Code



```
Camera = {
    x = 0,
    y = 0
}

function Camera.update(dt)

    if love.keyboard.isDown("right") then --RIGHT ARROW BUTTON IS DOWN then
        Camera.x = Camera.x + 5
    elseif love.keyboard.isDown("left") then
        Camera.x = Camera.x - 5
    end

    if love.keyboard.isDown("up") then
        Camera.y = Camera.y - 5
    elseif love.keyboard.isDown("down") then
        Camera.y = Camera.y + 5
    end

end

function Camera:follow(dt, wizard)

    Camera.x = wizard.body:getX() - love.graphics.getWidth()/2
    Camera.y = wizard.body:getY() - love.graphics.getHeight()/2

end

```

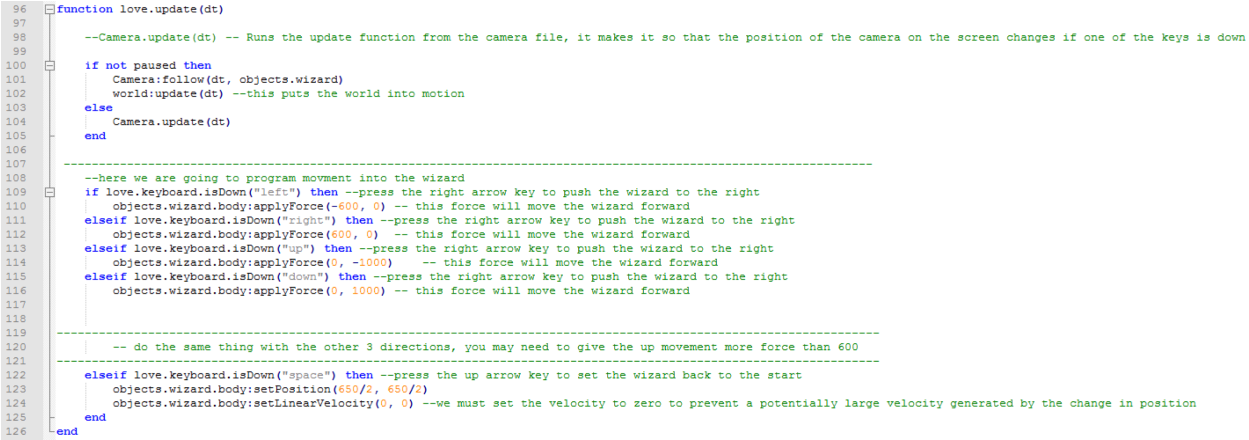
Love.update Template

The kids must edit the code so that a force is applied on the wizard to move right, up and down with the right, up and down arrow keys. The wizard will only move when the game is not paused.



```
function love.update(dt)

    --Camera.update(dt) -- Runs the update function from the camera file, it makes it so that the position of the camera on the screen changes if one of the keys is down

    if not paused then
        Camera:follow(dt, objects.wizard)
        world:update(dt) --this puts the world into motion
    else
        Camera.update(dt)
    end

  ------------------------------------------------------------------------------------------------------------
    --here we are going to program movment into the wizard
    if love.keyboard.isDown("left") then --press the right arrow key to push the wizard to the right
        objects.wizard.body:applyForce(-600, 0) -- this force will move the wizard forward
-------------------------------------------------------------------------------------------------------------
        -- do the same thing with the other 3 directions, you may need to give the up movement more force than 600
-------------------------------------------------------------------------------------------------------------



    elseif love.keyboard.isDown("space") then --press the up arrow key to set the wizard back to the start
        objects.wizard.body:setPosition(650/2, 650/2)
        objects.wizard.body:setLinearVelocity(0, 0) --we must set the velocity to zero to prevent a potentially large velocity generated by the change in position
    end
end
```

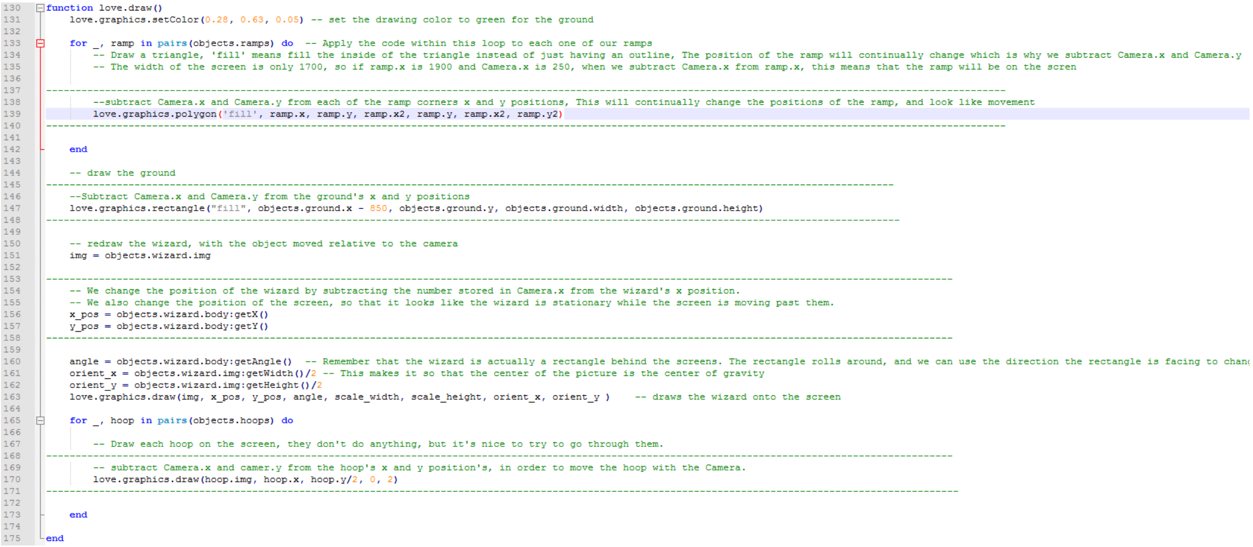
Love.update completed code



```
function love.update(dt)

    --Camera.update(dt) -- Runs the update function from the camera file, it makes it so that the position of the camera on the screen changes if one of the keys is down

    if not paused then
        Camera:follow(dt, objects.wizard)
        world:update(dt) --this puts the world into motion
    else
        Camera.update(dt)
    end

  ------------------------------------------------------------------------------------------------------------
    --here we are going to program movment into the wizard
    if love.keyboard.isDown("left") then --press the right arrow key to push the wizard to the right
        objects.wizard.body:applyForce(-600, 0) -- this force will move the wizard forward
    elseif love.keyboard.isDown("right") then --press the right arrow key to push the wizard to the right
        objects.wizard.body:applyForce(600, 0)  -- this force will move the wizard forward
    elseif love.keyboard.isDown("up") then --press the right arrow key to push the wizard to the right
        objects.wizard.body:applyForce(0, -1000)    -- this force will move the wizard forward
    elseif love.keyboard.isDown("down") then --press the right arrow key to push the wizard to the right
        objects.wizard.body:applyForce(0, 1000) -- this force will move the wizard forward


-------------------------------------------------------------------------------------------------------------
        -- do the same thing with the other 3 directions, you may need to give the up movement more force than 600
-------------------------------------------------------------------------------------------------------------
    elseif love.keyboard.isDown("space") then --press the up arrow key to set the wizard back to the start
        objects.wizard.body:setPosition(650/2, 650/2)
        objects.wizard.body:setLinearVelocity(0, 0) --we must set the velocity to zero to prevent a potentially large velocity generated by the change in position
    end
end
```

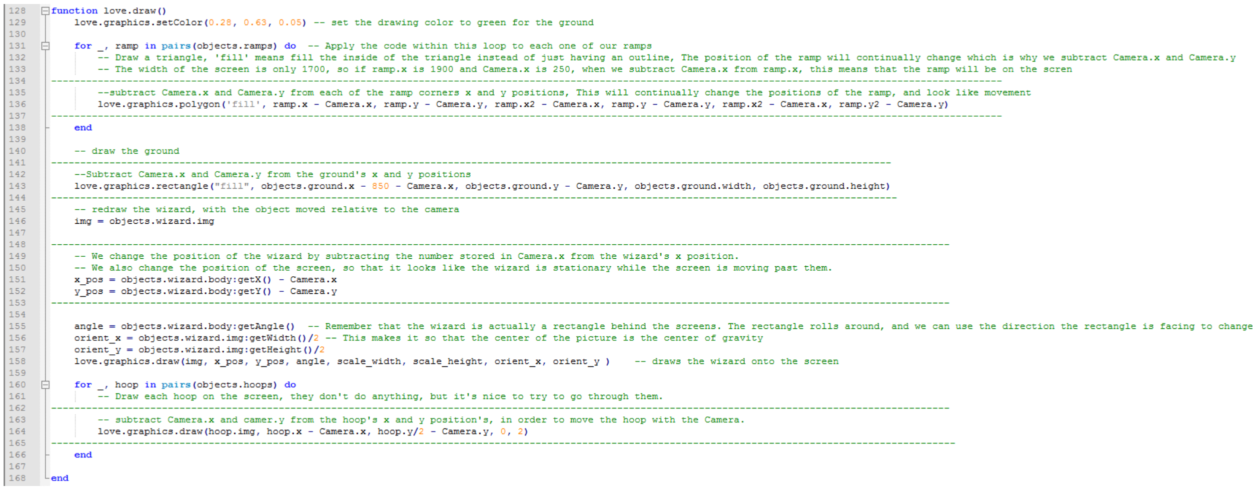
Love.draw template

The kids must subtract Camera.x from all the objects x coordinates, and subtract Camera.y from all the objects y coordinates. The objects include the ramps, the ground, the wizard, and the hoops. Have them test out the code after each subtraction and let them see what happens.



```
function love.draw()
    love.graphics.setColor(0.28, 0.63, 0.05) -- set the drawing color to green for the ground

    for _, ramp in pairs(objects.ramps) do  -- Apply the code within this loop to each one of our ramps
        -- Draw a triangle, 'fill' means fill the inside of the triangle instead of just having an outline, The position of the ramp will continually change which is why we subtract Camera.x and Camera.y
        -- The width of the screen is only 1700, so if ramp.x is 1900 and Camera.x is 250, when we subtract Camera.x from ramp.x, this means that the ramp will be on the scren

---------------------------------------------------------------------------------------------------------------------------------------------
        --subtract Camera.x and Camera.y from each of the ramp corners x and y positions, This will continually change the positions of the ramp, and look like movement
        love.graphics.polygon('fill', ramp.x, ramp.y, ramp.x2, ramp.y, ramp.x2, ramp.y2)
---------------------------------------------------------------------------------------------------------------------------------------------

    end

    -- draw the ground
------------------------------------------------------------------------------------------------------------------------
    --Subtract Camera.x and Camera.y from the ground's x and y positions
    love.graphics.rectangle("fill", objects.ground.x - 850, objects.ground.y, objects.ground.width, objects.ground.height)
------------------------------------------------------------------------------------------------------------------------

    -- redraw the wizard, with the object moved relative to the camera
    img = objects.wizard.img

--------------------------------------------------------------------------------------------------------------------------------
    -- We change the position of the wizard by subtracting the number stored in Camera.x from the wizard's x position.
    -- We also change the position of the screen, so that it looks like the wizard is stationary while the screen is moving past them.
    x_pos = objects.wizard.body:getX()
    y_pos = objects.wizard.body:getY()
--------------------------------------------------------------------------------------------------------------------------------

    angle = objects.wizard.body:getAngle()  -- Remember that the wizard is actually a rectangle behind the screens. The rectangle rolls around, and we can use the direction the rectangle is facing to chanք
    orient_x = objects.wizard.img:getWidth()/2 -- This makes it so that the center of the picture is the center of gravity
    orient_y = objects.wizard.img:getHeight()/2
    love.graphics.draw(img, x_pos, y_pos, angle, scale_width, scale_height, orient_x, orient_y )    -- draws the wizard onto the screen

    for _, hoop in pairs(objects.hoops) do

        -- Draw each hoop on the screen, they don't do anything, but it's nice to try to go through them.
--------------------------------------------------------------------------------------------------------------------------------
        -- subtract Camera.x and camer.y from the hoop's x and y position's, in order to move the hoop with the Camera.
        love.graphics.draw(hoop.img, hoop.x, hoop.y/2, 0, 2)
---------------------------------------------------------------------------------------------------------------------------------

    end

end
```

Love.draw completed code



```lua
function love.draw()
    love.graphics.setColor(0.28, 0.63, 0.05) -- set the drawing color to green for the ground

    for _, ramp in pairs(objects.ramps) do  -- Apply the code within this loop to each one of our ramps
        -- Draw a triangle, 'fill' means fill the inside of the triangle instead of just having an outline, The position of the ramp will continually change which is why we subtract Camera.x and Camera.y
        -- The width of the screen is only 1700, so if ramp.x is 1900 and Camera.x is 250, when we subtract Camera.x from ramp.x, this means that the ramp will be on the scren
----------------------------------------------------------------------------------------------------------------------------------------------------------------------
        --subtract Camera.x and Camera.y from each of the ramp corners x and y positions, This will continually change the positions of the ramp, and look like movement
        love.graphics.polygon('fill', ramp.x - Camera.x, ramp.y - Camera.y, ramp.x2 - Camera.x, ramp.y - Camera.y, ramp.x2 - Camera.x, ramp.y2 - Camera.y)
----------------------------------------------------------------------------------------------------------------------------------------------------------------------
    end

    -- draw the ground
---------------------------------------------------------------------------------------------------------------------------------------------------
    --Subtract Camera.x and Camera.y from the ground's x and y positions
    love.graphics.rectangle("fill", objects.ground.x - 850 - Camera.x, objects.ground.y - Camera.y, objects.ground.width, objects.ground.height)
----------------------------------------------------------------------------------------------------------------------------------------------------
    -- redraw the wizard, with the object moved relative to the camera
    img = objects.wizard.img

-------------------------------------------------------------------------------------------------------------------------------------------------------------
    -- We change the position of the wizard by subtracting the number stored in Camera.x from the wizard's x position.
    -- We also change the position of the screen, so that it looks like the wizard is stationary while the screen is moving past them.
    x_pos = objects.wizard.body:getX() - Camera.x
    y_pos = objects.wizard.body:getY() - Camera.y
-------------------------------------------------------------------------------------------------------------------------------------------------------------

    angle = objects.wizard.body:getAngle()  -- Remember that the wizard is actually a rectangle behind the screens. The rectangle rolls around, and we can use the direction the rectangle is facing to change
    orient_x = objects.wizard.img:getWidth()/2 -- This makes it so that the center of the picture is the center of gravity
    orient_y = objects.wizard.img:getHeight()/2
    love.graphics.draw(img, x_pos, y_pos, angle, scale_width, scale_height, orient_x, orient_y )    -- draws the wizard onto the screen

    for _, hoop in pairs(objects.hoops) do
        -- Draw each hoop on the screen, they don't do anything, but it's nice to try to go through them.
-------------------------------------------------------------------------------------------------------------------------------------------------------------
        -- subtract Camera.x and camer.y from the hoop's x and y position's, in order to move the hoop with the Camera.
        love.graphics.draw(hoop.img, hoop.x - Camera.x, hoop.y/2 - Camera.y, 0, 2)
--------------------------------------------------------------------------------------------------------------------------------------------------------------
    end

end
```

How to use the “Love Hertz 2.0” Game Engine

BY: Carter Hill

GRADE and CAMP: 7+

TOPIC(s):

TIME: 1 hour
Set Up & Intro =
Testing Substances =
Identify Mystery Substance =

MATERIALS (what you’ll need for one week of camp):

- One Golden Coelacanth

SCIENTIFIC BASIS (learning outcomes - teach this):

Love Hertz 2.0 is a new version of the Love Hertz game engine used in last year’s Codemaker’s. It has been recoded from the ground up to dynamically use its own in-game level editor. How it works is, when the game starts up, it loops through certain image folders, and automatically creates a placeable object within the game based off its image. The image will then follow the mouse, and other placeable objects can be selected by using the scroll wheel. They can then be set into the level by clicking the primary (left) mouse button, or deleted after being placed with the secondary (right) mouse button.

This means that the kids will be able to create their own tiles and objects for the game. Once they’re shown how it works, all children will be able to easily create and play their own games. Editing the code for this game engine is not recommended, as it’s already in a working and robust state. However, they will be given two copies, so if they want to fiddle with the code, they can still have an untouched (and working) copy. We will, however, be coding our own (more basic) version over the week, and so make sure they know that more coding will be coming if they are really wanting to do that.

PROCEDURE:

1. On their USB stick, there will be a folder titled “LoveHertz2.0-FINAL”. Open this folder and take a look inside.

2. Within the game folder, there will be another folder called “images”. Open this folder as well. Inside, you will see, yet again, more folders. Each of these folders with create an object in the game with certain properties. Images in the “tiles” folder will need to be 64x64 pixels in size and will be placed in a grid pattern. Images place in the “static” folder will have no special properties, but can also be placed on the screen. We will worry about enemies later.

ACTIVITY: Pinball

BY: Sam Germain

GRADE and CAMP: Grade 7-9, Codemakers (Love 2D)

TOPIC(s): Game Developement

TIME: 120 mins

OBJECTIVE: To learn how to program a pencil tool on the screen

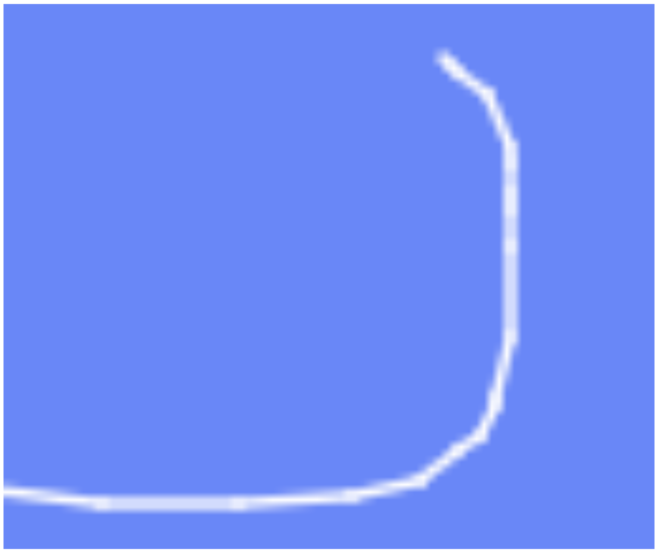
MATERIALS:

- 😐

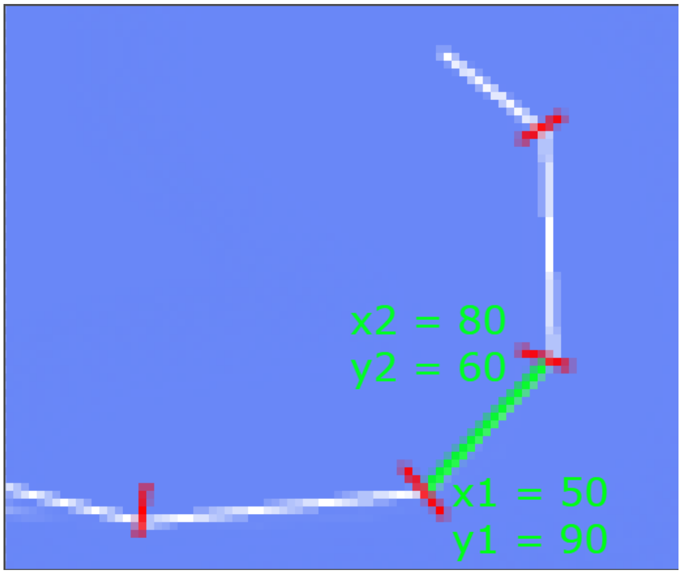
SCIENTIFIC BASIS (learning outcomes - teach this):

Drawing is done on the screen by connecting many lines together.

When a shape is drawn like this



It is done so by putting multiple straight lines onto the screen. Each line has 2 x coordinates and 2 y coordinates.



There is an example of how to draw a line within main.lua in the pinball folder. It draws a line by default within the game.

```
line = {}
line.x1 = 1675
line.x2 = 1625
line.y1 = 100
line.y2 = 100
line.body = love.physics.newBody(world, 0, 0, "static")
line.shape = love.physics.newEdgeShape(line.x2, line.y2, line.x1, line.y1)
line.fixture = love.physics.newFixture(line.body, line.shape, 5)
table.insert(objects.lines,line)
```

We want to draw lines only when the mouse is down. We do this with an if statement

```
if love.mouse.isDown(1) then
```

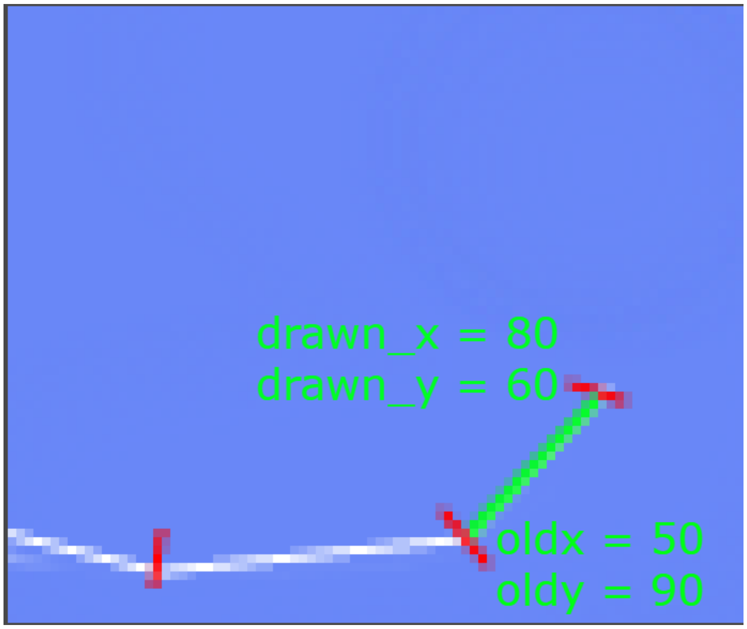
And obtain the x and y coordinates with functions like the following

```
drawn_x = love.mouse.getX()
```

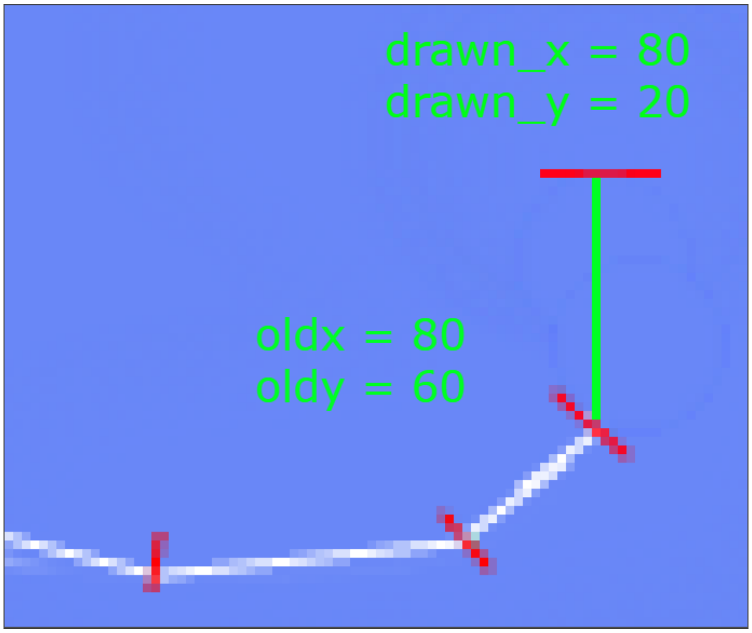
But we need to have 2 x and y coordinates in order to draw a line. Because of this we have the variables *oldx* and *oldy* originally set to nil.
After calling *love.mouse.getX()* check if oldx is set to nil

```
if oldx then
```

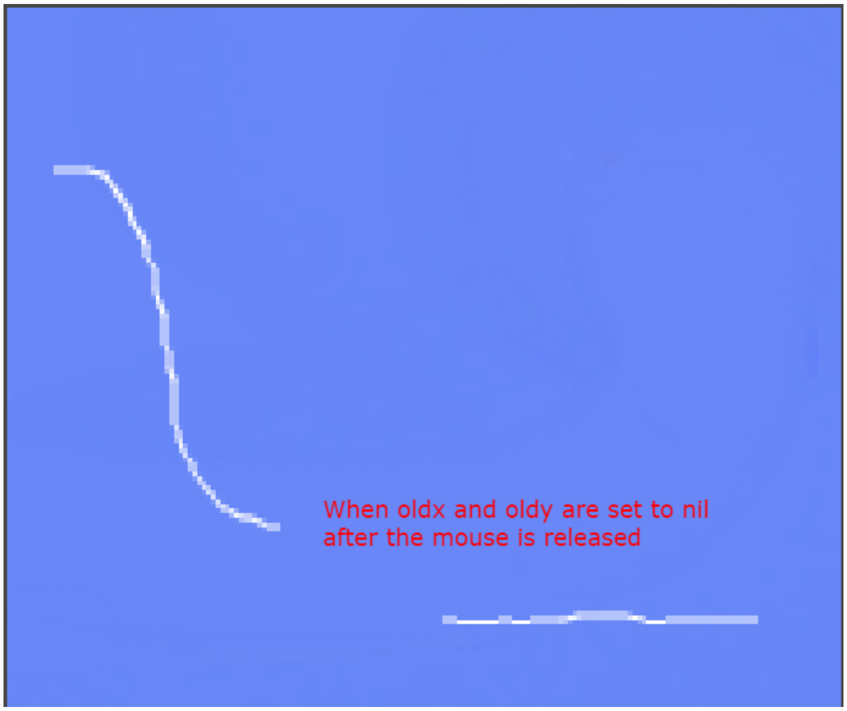
If oldx is not nil then draw a new line with drawn_x and drawn_y as the x1 and y1 coordinates, and oldx and oldy as the y1 and y2 coordinates. After the if statement set oldx and oldy to be equal to drawn_x and drawn_y, this is so you will have continuous lines.



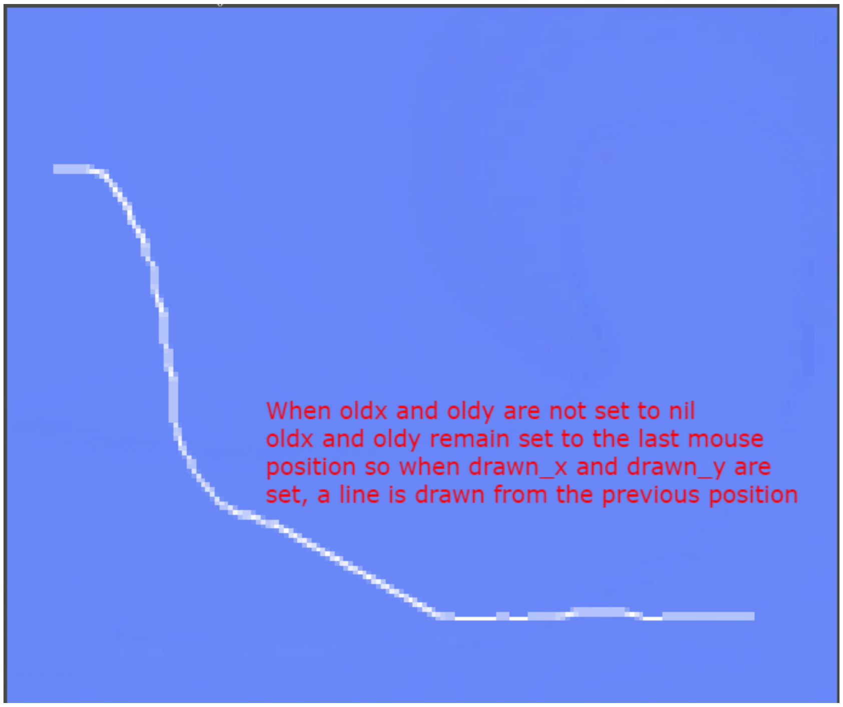
Notice how drawn_x and drawn_y in the picture above become old_x and old



Setting oldx and oldy to nil



When oldx and oldy are set to nil
after the mouse is released



When oldx and oldy are not set to nil
oldx and oldy remain set to the last mouse
position so when drawn_x and drawn_y are
set, a line is drawn from the previous position

Procedure

Get the kids to open their tutorial/Drawing_Line_Objects.pdf file and explain drawing lines to them

Get the kids to open the main.lua file stored within their folder.

Love.draw

The kids must code a for loop that draws all the lines from objects.lines onto the screen. They can refer to the quidditch game for reference on how to draw things in a loop. There is already one line programmed in objects.lines so a line should show when you draw this.

Love.update

The if statement '*if love.mouse.isDown(1) then*' is already in the template that will be given to the kids. All of the code within the update function will be within this if statment

The variable *drawn_x* is already set to the mouses x coordinate. The kids must **set the variable drawn_y to be the y coordinate to be the mouses y coordinate.**

There is a nested if statement checking if oldx is not nil. Within this if statement there is a line object with its x coordinates set. The kids must **set the y coordinates of the line.** They must also **create a body, a shape, and a fixture** for the line, and **add the line to the list objects.lines.** They can refer to the first ball game for reference on how to do this.

Outside the nested if statement the variables oldx and oldy are set to 0. The kids must set these variable to drawn_x and drawn_y.

ACTIVITY: Tricks that will make your game better

BY: Sam Germain

GRADE and CAMP: Grade 7-9, Codemakers (Love 2D)

TOPIC(s): Game Developement

TIME: 60 mins
Intro = 20 mins
Challenges = 60 mins
Conclusion = 5 mins

OBJECTIVE: To teach tricks that will make your game better

MATERIALS:

- An ethic that permits Tom Foolery

SCIENTIFIC BASIS (learning outcomes - teach this):

4 **Crucial Components of Game Design.**

1. A clear goal, or incentive to carry on.
    - In Mario we know that we have to reach the flag pole at the end of the level. In open world exploration games, we're given a big world and a means to explore it.

2. Every game has rules, it's literally what makes games what they are
    - A sport like hockey would be a game with tons of rules, such as getting a penalty for tripping. Another rule could even be that a team gets a point if the puck enters the opponents net. Ask the group what kind of rules Mario, or any other video game, has (things like "it is game over when you run out of lives", or "you get hurt if you get hit by an enemy or a trap").

3. Conveyance: how well information is communicated. What could a designer of a video game do to explain rules. Tutorials? Sometimes, but In most cases, a player should be able to understand the rules without being explicitly told much at all
    - In Mario, you know that the blocks with question marks on them have prizes. If you were the first person to play Mario ever, you would figure this out very quickly because the stand out and look very unique from the other blocks.

4. A balance in challenge. If a game is too difficult to play or understand, players will get frustrated and not enjoy it. If a game is too easy, players may get bored of it quickly, unless there is a sort of creative component to it. (The Sims would be

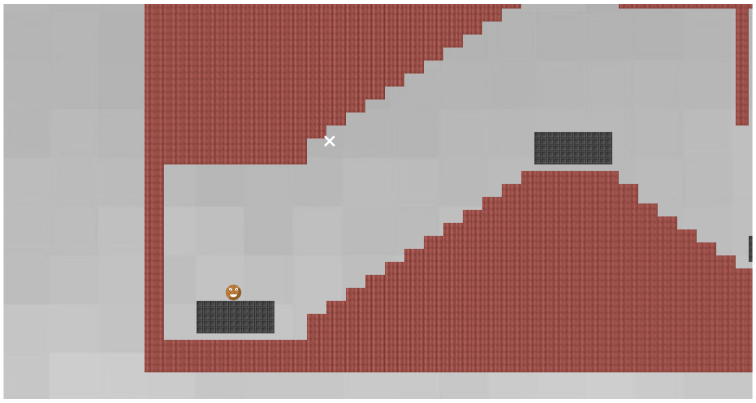
horribly boring with only one type of floor tile or wallpaper, also Assassin's Creed 3). Once you find that perfect balance of challenge, it's also important to give players a sort of "break" once in a while. Having no change of pace will often begin to bore or tire players as well, so a section of easier play every half an hour or so will keep the players engaged and wondering what will come next.

- Games will often do this by adding quick story heavy sections, or action games will often give you a puzzle to solve. That may not apply to us because we won't be making very long games, but it's a good knowledge to have.

PROCEDURE:

The folder \\rhubarb\admin\Outreach\SF-Instructors\Staff 2018\Camps\Codemakers-Gamedev\Destroyer_Executables contains 14 versions of the same game, each with a slight modification to it. Get the kids to open up destroyer_1 and tell them they should place their mouse behind their keyboard and that they will need the extra desk space(They actually can't play the game without the mouse). After a minute ask "Who's having fun!" and they'll most likely say they don't know what to do. Explain the first 3 principles of game design and that this game wasn't fun because the rules and goal weren't conveyed to you. Now tell them they actually need to use the mouse to blast the emoji. The goal of the game should be pretty clearly conveyed once they start playing with the mouse.

The first level of the game is pretty hard, and I almost gave up on it because it was so hard. I'm assuming the kids will have equal frustration but I could be wrong. Explain the 4th crucial component of Game Design and that if a game is too difficult people will get frustrated and not want to play it. Labelled on the next picture is a location of where the first shot needs to be to win the level, the game is regular difficulty after that.



After playing with the first game for a bit, get them to open the second game, then the third, the fourth…. All of these games are the same with a small adjustment added to each one that is intended to make the game more fun. Let them play around with each game for a little bit until they understand the concept of each change. Below is an explanation of each of the changes

Destroyer_1: Basic

- The most simplified version of the destroyer game

Destroyer_2:Simple sounds effects

- When the player jumps or hits a wall you hear small sounds

Destroyer_3: Object Particles

- Shows permanence, things happen to the world when you do something to them
  - Other examples of Permanence
    1. When bullets miss you can see bullet holes in the wall
    2. Bullet Shells
    3. Smoke

Destroyer_4:Player Particles

- Shows the effect that impact has on the player with some hit animation

Destroyer_5: Explosions

- Blocks go flying and the game feels more exciting

Destroyer_6: Bigger Explosions

- There's even more blocks and they go flying further! Why did we even have those small explosions to begin with?

Destroyer_7: Background Lag/Camera Lerp

- The Background is animated to lag slightly behind the animation of the player.

Destroyer_8: Screen shake

- The screen shakes when the player blasts. This makes the blast feel much more powerful

Destroyer_9: Motion blur

Destroyer_10: Color

- When the platforms explode the blocks from the platforms are a range of colors

Destroyer_11: More Bass

- The sound effect from the player blasting is much more bassy and the blast feels more powerful.
  - This sound effect is actually the result of 5 different blast sounds playing simultaneously.

Destroyer_12: Slow Motion

- There is a slower framerate when you lose the game.
  - Feels more epic.
  - Gives some meaning to the game.

Destroyer_13: Huge explosions

- Let's just make the platform blocks fly all over the place!

Destroyer_14: Music

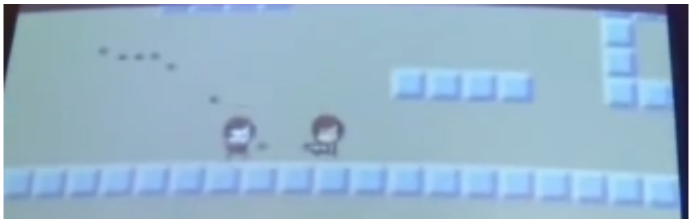
Bonus (Some extra info if it's wanted, but you don't have to teach this)

Based off this video (https://www.youtube.com/watch?v=AJdEqssNZ-U&feature=youtu.be)

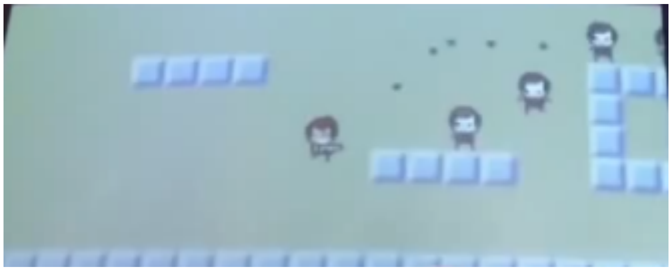
- Contains swears, don't show to campers

Some other tricks that will make your game better

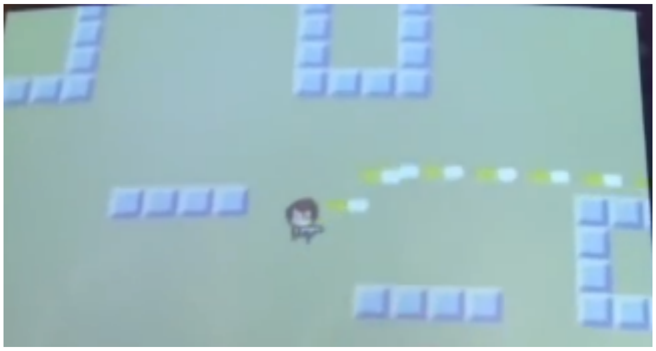
2. Basic animations
3. Low enemy Hp
4. High rate of fire



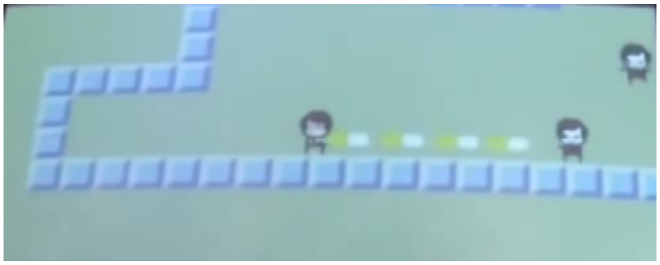
5. More enemies



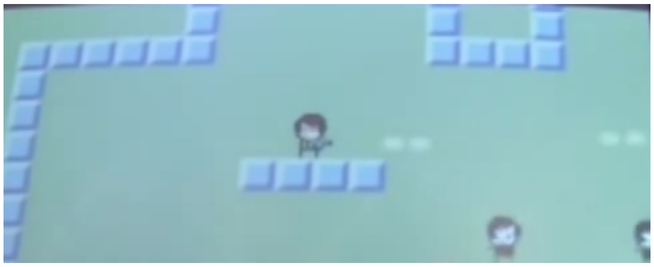
6. Bigger bullets



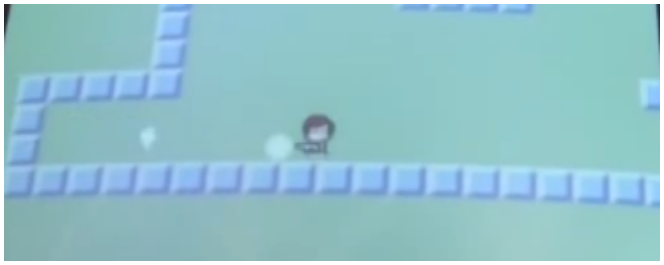
7. Muzzle Flash
   a. There is a small yellow circle around the gun when the player shoots



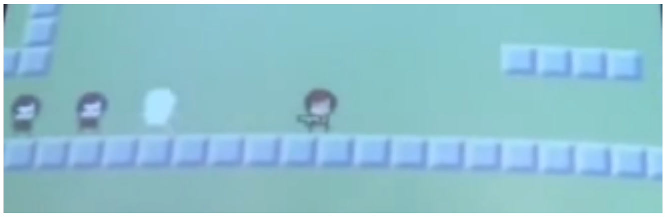
8. Faster Bullets
9. Less accuracy



10. Impact effects
    a. That cloud is from an enemy being hit



11. Hit animation
    a. That white part is the same shape as an enemy and shows them being hit.



12. Enemy knockback
    a. Enemies move back when you hit them
13. Camera Position
14. Player Knockback
    a. Player moves back when shooting
15. Sleep
    a. Slight delay on impact
        i. Brain has more time to process the game when something important happens
16. Gun delay
    a. Gun lags behind character and looks like the character is carrying it
    b. Gun kicks back
17. Strafing

   a. the technique of moving the player's character from side to side, rather than forward or backward

18. Shoot multiple bullets at a time

ACTIVITY: Line Rider

BY: Sam Germain

GRADE and CAMP: Grade 7-9, Codemakers (Love 2D)

TOPIC(s): Game Developement

TIME: 60 mins
Intro = 20 mins
Challenges = 60 mins
Conclusion = 5 mins

OBJECTIVE: To combine the skills learned into a final project

MATERIALS:

- 😐

SCIENTIFIC BASIS (learning outcomes - teach this):

All the necessary skills have already been taught to the kids, they must use their previous code to figure out how to make this project

PROCEDURE

Get them to visit www.linerider.com and play line rider for 5 minutes or so, so they have an idea of the game that they are trying to make.

Get the kids to open the main.lua, and camera.lua files within the line_rider folder, they DO NOT need to open the eraser file(that comes later).

Love.load()

The 4 variables drawn_x, drawn_y, oldx and oldy must be created and initialized to 0 or nil

```
drawn_x = 0     --position to be drawn on when the mouse is pressed
drawn_y = 0     --position to be drawn on when the mouse is pressed
oldx = 0
oldy = 0
```

The Rider must be created and put into the world. The rider is actually just a rectangle, with the toboggan rider drawn overtop of the rectangle, this was coded for the kids in the quidditch game, although the kids did not code it themselves. Friction should be set to 0, so that the rider can do loops and stuff. The kids have not learned how to do this, but it's in the comments.

```
objects.rider = {}
objects.rider.body = love.physics.newBody(world, 650/2, 0, "dynamic")
```

```
    objects.rider.width = 40
    objects.rider.height = 30
    objects.rider.shape = love.physics.newRectangleShape(objects.rider.width, objects.rider.height)
    objects.rider.fixture = love.physics.newFixture(objects.rider.body, objects.rider.shape)
    objects.rider.fixture:setFriction(0.0)
    objects.rider.img = love.graphics.newImage("images/tobboggan.png")
```

love.update()

The if not pause if statement must be modified to include both of the Camera functions

```
    if not pause then
        world:update(dt) --this puts the world into motion
        Camera:follow(dt,objects.rider)
    else
        Camera.update(dt)
    End
```

Code must be put in to draw a line if the mouse is down. This can basically just be copied from the pinball game, but Camera.x and Camera.y must be subtracted from drawn_x and drawn_y

```
    if love.mouse.isDown(1) then
        drawn_x = love.mouse.getX() + Camera.x          --x coordinate of the mouse
        drawn_y = love.mouse.getY() + Camera.y          --y coordinate of the mouse

        if oldx ~= nil then
            line = {}
            line.x1 = oldx
            line.x2 = drawn_x
            line.y1 = oldy
            line.y2 = drawn_y
            line.body = love.physics.newBody(world, 0, 0, "static")
            line.shape = love.physics.newEdgeShape(drawn_x, drawn_y, oldx, oldy)
            line.fixture = love.physics.newFixture(line.body, line.shape, 5)
            table.insert(objects.lines, line)
        end

        oldx = drawn_x
        oldy = drawn_y
    else
        oldx = nil
        oldy = nil
    end
```

love.draw()

The rider must be drawn. The angle variable makes it so that the rider image turns in accordance with the way the rectangle is facing, so when the top of the rectangle is facing down, the top of the rider image is facing down. Orient_x and Orient_y set the center of rotation for the image. When Orient_x and Orient_y are set to the top left corner, the image does not touch the surface it's resting on when upside down.

```
rider_img = objects.rider.img
rider_x = objects.rider.body:getX() - Camera.x
rider_y = objects.rider.body:getY() - Camera.y
rider_angle = objects.rider.body:getAngle()
orient_x = objects.rider.img:getWidth()/2
orient_y = objects.rider.img:getHeight()/2
love.graphics.draw(rider_img, rider_x, rider_y, rider_angle, 1, 1, orient_x, orient_y )
```

They must draw the lines that are drawn on the screen. This is done exactly like the pinball game but Camera.x and Camera.y must be subtracted from the lines x and y coordinates

```
for _, line in pairs(objects.lines) do
        love.graphics.line( line.x1 - Camera.x, line.y1 - Camera.y, line.x2 - Camera.x, line.y2 - Camera.y)
end
```

Camera.lua

**For the four day camp, they did not do the quidditch exercise, so the camera is coded for them mostly. They will have to subtract Camera.x and Camera.y from their other objects however, so explain a little bit about the camera, just so they kind of understand why they have to subtract it.

The Camera object exists as an empty object

```
Camera = {}
```

X and y coordinates for camera must be created and set to 0

```
Camera = {
        x = 0,
        y = 0
}
```

Camera.update

The actions for the arrow keys must be coded into camera.update. This includes adding and subtracting from Camera.x and Camera.y if an arrow is being pressed. This function only operates when the game is paused.

```
if love.keyboard.isDown("right") then --RIGHT ARROW BUTTON IS DOWN then
        Camera.x = Camera.x + 5
elseif love.keyboard.isDown("left") then
        Camera.x = Camera.x - 5
end

if love.keyboard.isDown("up") then
        Camera.y = Camera.y - 5
elseif love.keyboard.isDown("down") then
        Camera.y = Camera.y + 5
end
```

Camera.follow

When the game is not paused, the camera.follow function is used to set Camera.x and Camera.y to the coordinates of the rider.

```
Camera.x = rider.body:getX() - love.graphics.getWidth()/2
Camera.y = rider.body:getY() - love.graphics.getHeight()/2
```

The eraser can be coded after this, or just given to the kids if there is no more time. There is a separate write up for the eraser, with what to do if there is more time or if there is no more time.

ACTIVITY: Line Rider Eraser

BY: Sam Germain

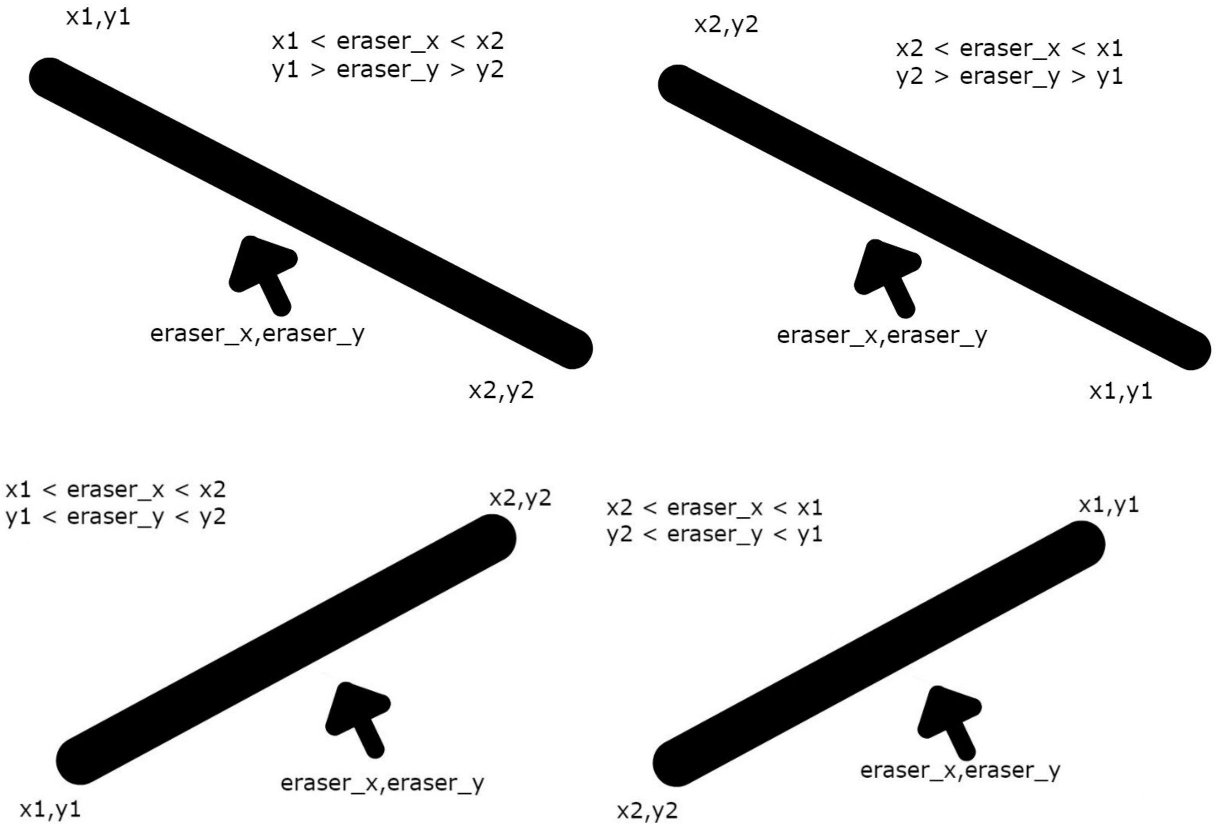
GRADE and CAMP: Grade 7-9, Codemakers (Love 2D)
TOPIC(s): Game Developement
TIME: 60 mins
OBJECTIVE: To put the eraser into line rider

MATERIALS:

- 😐

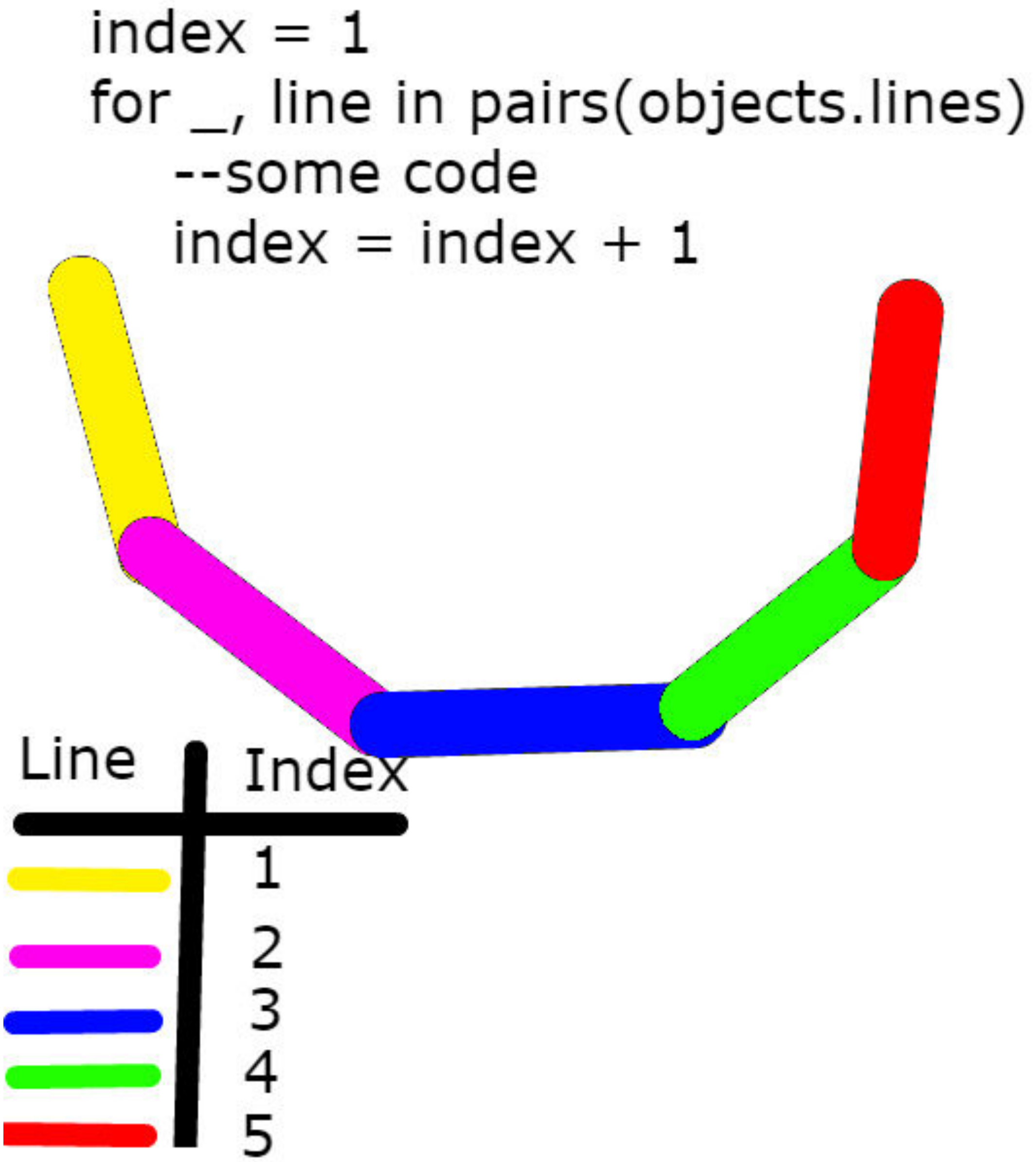
SCIENTIFIC BASIS (learning outcomes - teach this):

The eraser will be coded in the work on the right click of the mouse. A variable, which we will call erase_x and erase_y will be assigned to the x and y coordinates of the mouse we the mouse is held down. We need to loop through each of our lines and check if the line spans over the spot we are trying to erase. The pictures below explain the four scenario's where a line would span over the spot we are trying to erase.



Indices

The code is in there for them, but here's an explanation of whats going on.
Each line also has an index in a table. The first line segment is the first one in the table, and the second line segement is the second line in the table. If we set a line_counter to 0, loop through objects.lines, and increase line_counter by 1 every time we execute the loop, then line_counter is always the index of the line we're looking at.



```
index = 1
for _, line in pairs(objects.lines)
    --some code
    index = index + 1
```

Line	Index
🟨	1
🟪	2
🟦	3
🟩	4
🟥	5

From this image, we can see that when looping through all our lines, when we are on our first line, the index is equal to 1, when we are on our second line, the index is equal to 2, so if we delete the line with index 2, we are deleting the purple line.

PROCEDURE

If there is no more time

- give the kids the eraser.lua file
- put require(“eraser”) at the top of main.lua
- put erase() into draw.update()

Otherwise

- they must edit their eraser.lua file so that it works as an actual eraser
- if the eraser is within the range of the line, I use line.body:setType("dynamic") to make the line fall, this doesn’t actual delete the line, but the line won’t interfere with the game anymore
- Using table.remove(objects.lines, Line_index) is a comment in the file. If they uncomment this and place it in the correct nest, then the line should no longer be drawn.
- put require(“eraser”) at the top of main.lua
- put erase() into draw.update()

ACTIVITY: Game’s To Usb’s/Line Rider Comparison

BY: Sam Germain

GRADE and CAMP: Grade 7-9, Codemakers (Love 2D)

TOPIC(s): Game Developement

TIME: 60 mins

OBJECTIVE: To get games onto usb. Also to compare the line rider they built to the official line rider and try to get the kids thinking about how they would put the extra features in.

MATERIALS:

- | (• ◡•)| (❍ᴥ❍ʋ)

SCIENTIFIC BASIS (learning outcomes - teach this):

-

PROCEDURE:

- Get the kids to open their How_to_put_games_onto_usb_sticks.pdf file. They can follow the instructions within this pdf to get their games onto usbs.
- If there is time get them to visit www.linerider.com and see the differences in this line rider. Try to get them to figure out what kind of programming they could do to achieve these distances.
    - For the red lines some code could be written that would be something like, if the rider is on the line, applyForce to the rider
    - For the green lines, you could have an if statement checking if green is true, and if it is, exclude creating a fixture for those line objects
    - When the line rider falls off the sled, you could have an if that checks the angle and position of the rider and if the angle is a certain value when the rider hits the line, then you create 2 objects(one rider and one sled) to replace the previous object and sled.
    - For the arms and legs, you can create multiple rectangles that must stay attached to eachother, but each will have their own center of gravity…