



Scratch Programming

Lesson 12

Operators & Variable II

Presented by Advaspire Team



Review – Operator (Calculation)

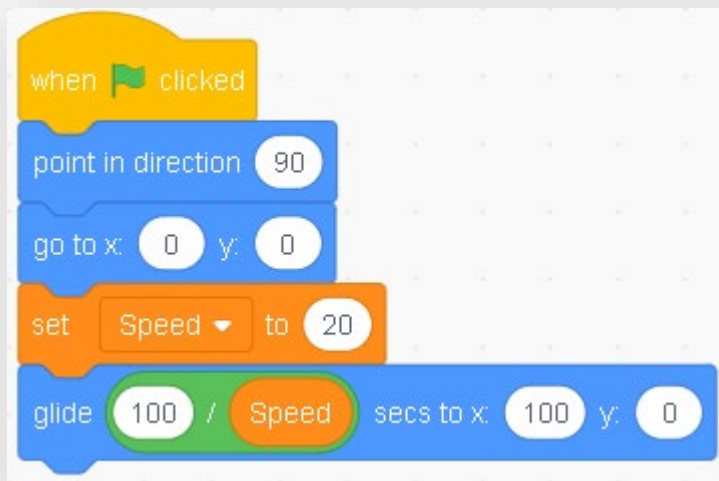


If you lazy to do calculation by yourself, you can let the computer do it, but you must let it know how to calculation first.

But in normal application, we don't do this, because we can calculate this simple equation faster than putting operator for computer.



Review – Variable in Operator



***Formula of speed calculation is:**

$Speed = Distance \div Time$

$Time = Distance \div Speed$

$Distance = Speed \times Time$

Now we know that it is going to travel 100 steps from (0,0) to (100,0) (which is the distance to be travelled), and we set that the speed (variable) to 20 steps per second.

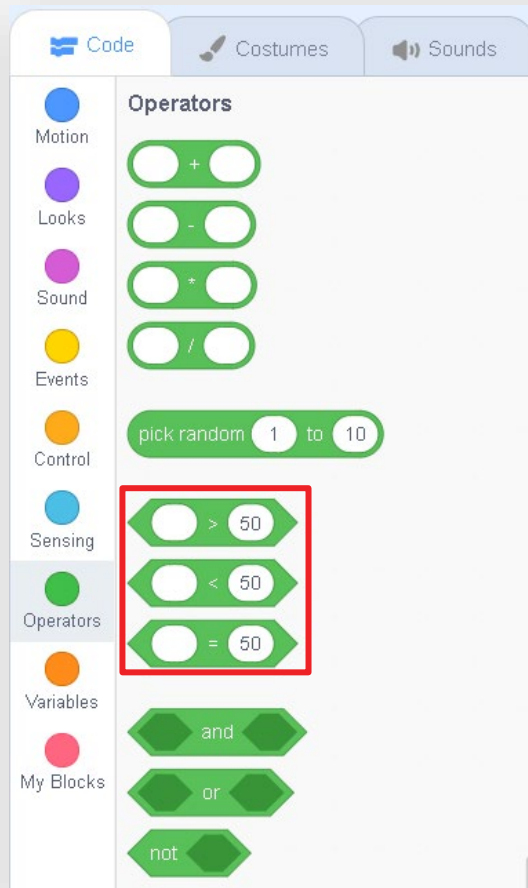
Then we can drag out the operator to make Distance (100) \div Speed (20) = time (5).

Then it will result with 5 seconds to travel to the position.

You can try to change the speed and run the program again and observe the change.



Review – Boolean (True & False)

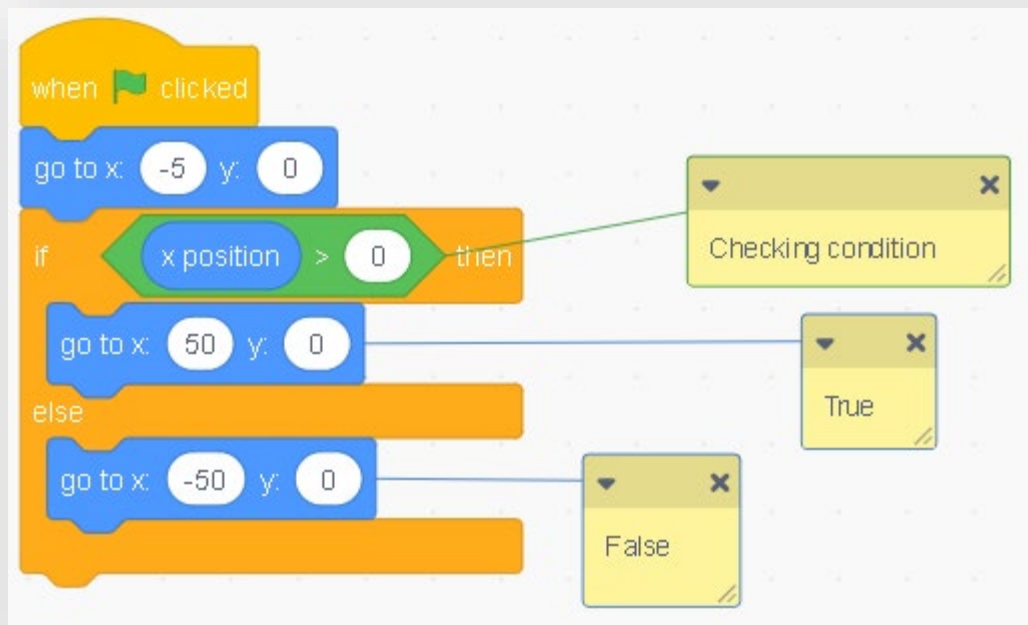


In Scratch programming, you will see some blocks in operators category are in hexagon shape.

These blocks are used for Boolean, it will analyze the true & false statement and result in either true or false input to the blocks.



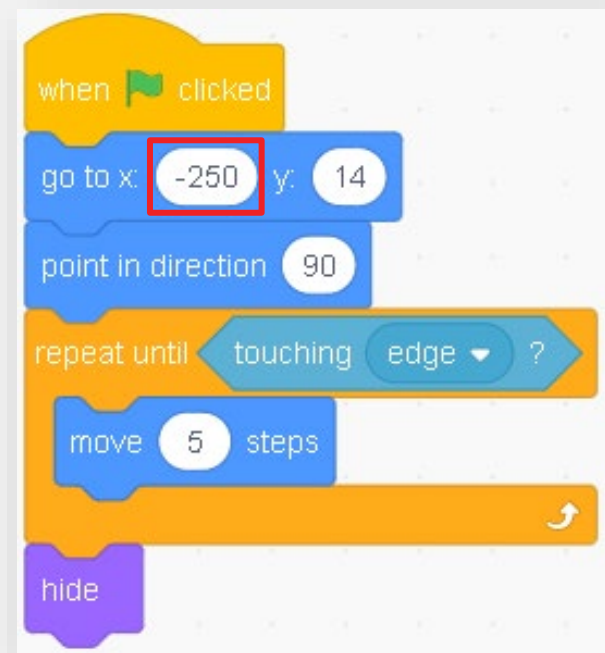
Review – Boolean with If-else statement



If the logic can be constructed in this way, then the computer will know how to make decision based on the conditions.



Review – Repeat Until Block



What happened exactly after you changed the starting position to (-250,14)?

In slow motion, your computer will set the starting position for the bat at (-250,14) and point in direction to be 90°. Then check if the bat is touching the edge now.

At point (-250,14) the bat is touching the edge, therefore it won't execute the blocks inside (move 5 steps), it will straight jump to "hide".

That's why you won't see your bat after clicking the "flag".



Review – Apply it in the game

Script:



```
when clicked
hide
forever
  go to x: -242 y: pick random -160 to 160
  create clone of myself
  wait 1 seconds

when I start as a clone
show
point in direction 90
repeat until x position > 242
  move 5 * Speed steps
change Score by 5
delete this clone

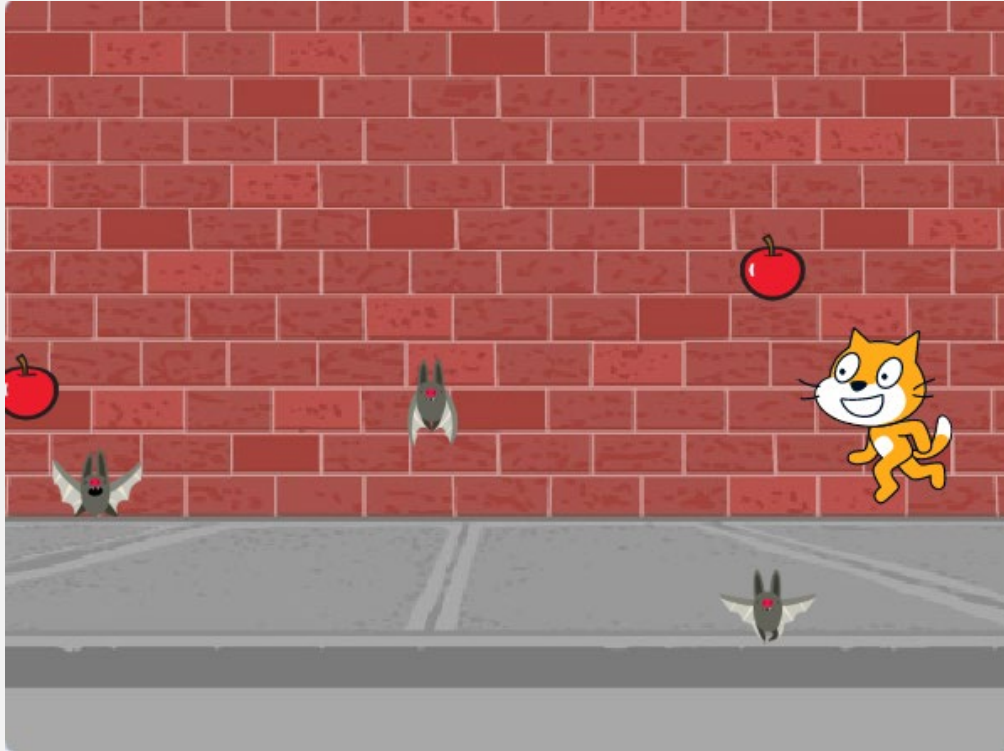
when I start as a clone
repeat until x position > 242
  next costume
  wait 0.1 seconds
delete this clone
```

The speed will affect the movement speed of the bat.

In this case, the movement speed of the bat is 5 multiplied by “speed” variable.

Which means the longer you play, the faster it goes.

Lesson 11 - Mission



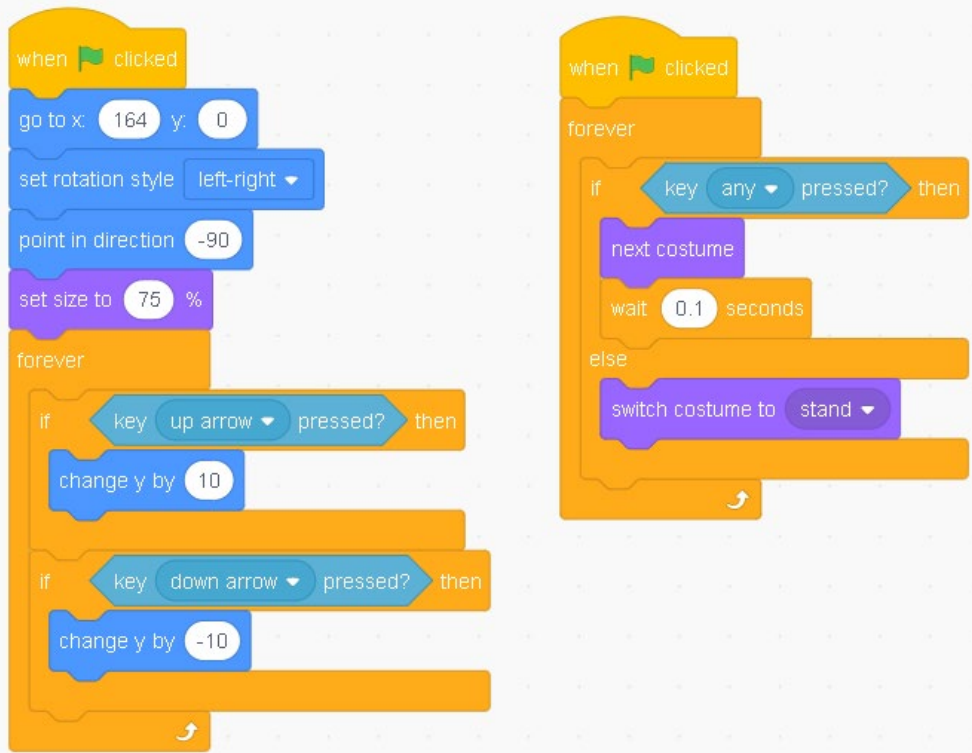
Code a game that you cat needs to collect apple to score points and to avoid bat (make it to 3 lives).

Set a target for the game to win, it can be when your score reaches how many then win.

And your cat only able to move up and down, remember to make animation for cat (change costume).

Lesson 11 – Mission Solution

Script:



After uploading the sprites and backdrop, we can start our coding part.

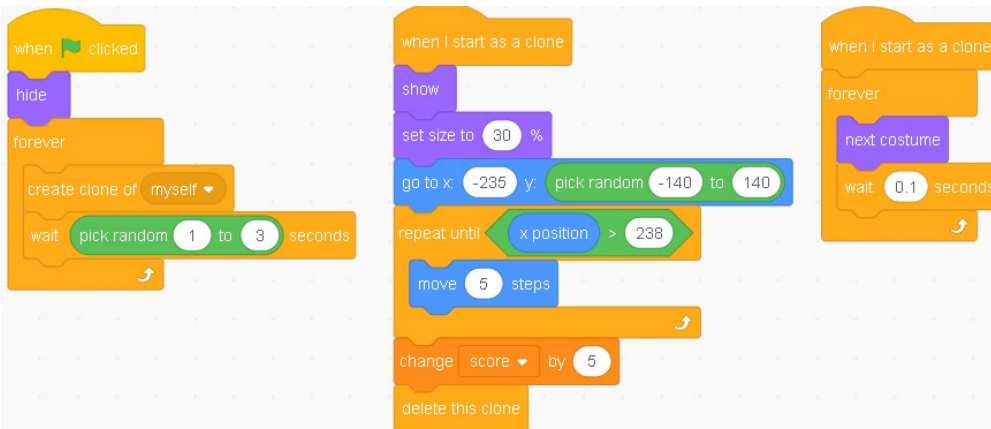
First thing is to set up the cat's starting position and direction, rotation style and the size (I set it to 75% in this game).

Followed by the control (we only need up and down movement in this game) with animation (if the cat is moving, I will keep switching the costume).



Set up scripts for Bat

Script:



There's not much different of the bat than what we coded in previous lesson.

We make it to clone function, and it will start at random position on the edge of left side, and keep moving forward for 5 steps until it reaches the edge of the right side. Then it will add 5 points to the score (as cat avoided it).

Then we also set animation for it when it's moving.



Bat – Score & Live

Script:

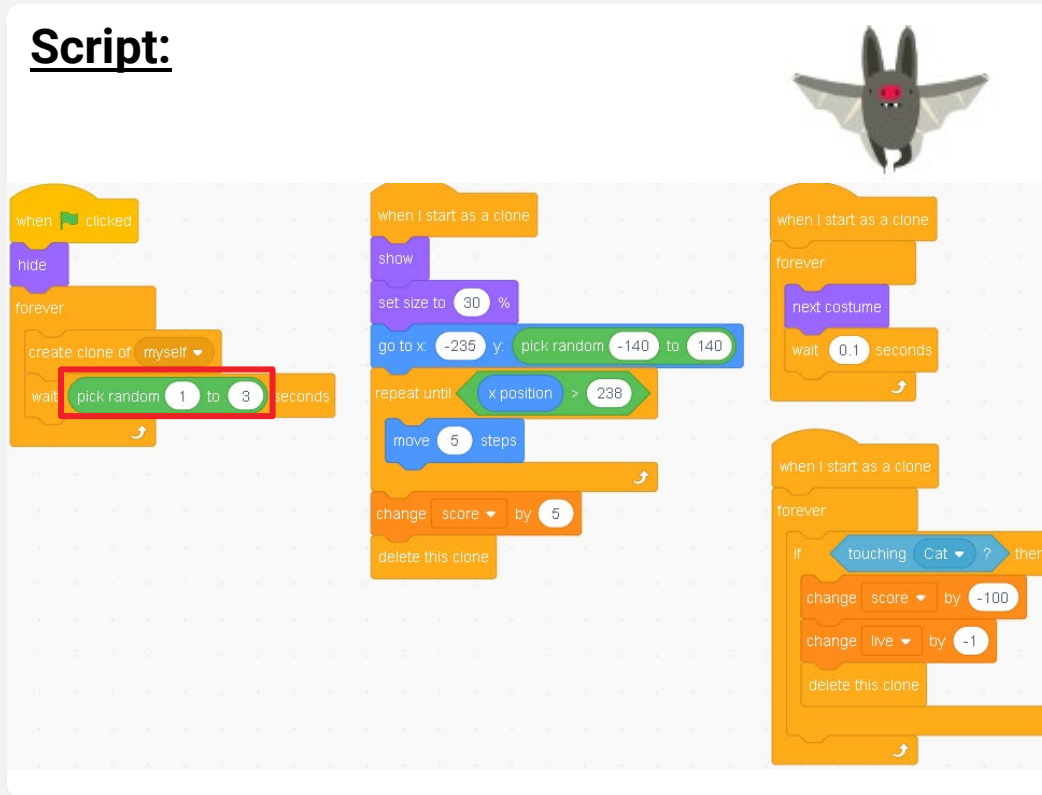
The image shows a Scratch script for a bat character, consisting of three clones. The first clone is triggered by a 'when clicked' event and contains a 'hide' block followed by a 'forever' loop with 'create clone of myself' and 'wait pick random 1 to 3 seconds'. The second clone is triggered by 'when I start as a clone' and contains 'show', 'set size to 30 %', 'go to x: -235 y: pick random -140 to 140', a 'repeat until' loop with 'x position > 238' containing a 'move 5 steps' block, 'change score by 5', and 'delete this clone'. The third clone is also triggered by 'when I start as a clone' and contains a 'forever' loop with 'next costume' and 'wait 0.1 seconds'. A red box highlights a second 'when I start as a clone' script for the third clone, which contains a 'forever' loop with an 'if touching Cat?' condition. If true, it executes 'change score by -100', 'change live by -1', and 'delete this clone'.

And we will also set a thing for the bat that if it touches the cat, it will reduce the score by 100 and deduct a live, then delete the clone.



Bat – Random interval

Script:

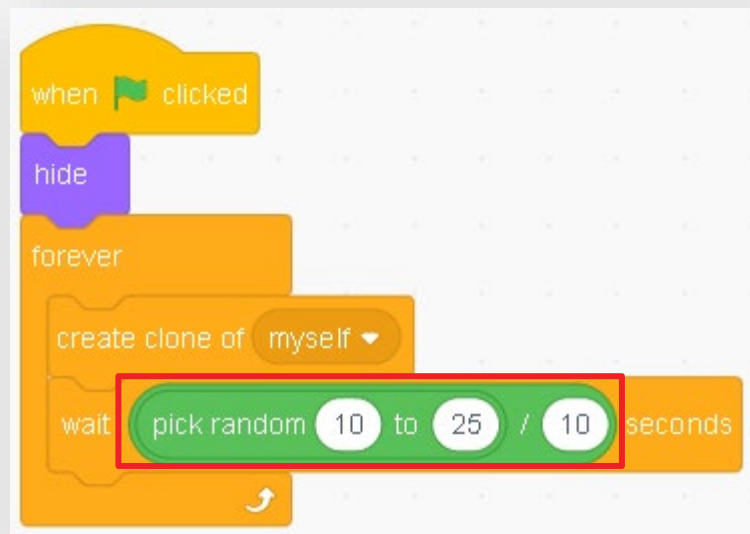


If you run the game, you will see that the clone of the bat will be created for every 1 or 2 or 3 seconds. Therefore you will see there's no much difference in gap between the bat's clone.

I would prefer to make the duration between each clone created from 1.0 to 2.5 seconds (which we will set a formula to pick random number from 10 to 25 then divide by 10), this will add the decimal number into the possibility (which means it can be 1.7, 2.3, 1.9 seconds or etc).



Bat – Decimal Random Number



So my solution is to put the operator and pick random number from 10 to 25, then divide it to 10.

The possible number will be: 1, 1.1, 1.2, 1.3, 1.4, ..., 2, 2.1, 2.2, 2.3, 2.4, 2.5.

Once you run again you will see the gap of the bat is more uneven (unpredictable).



Apple – Duplicate from Bat

Script:



Now we need apple which can increase points to scores when collected by the cat.

And if you think carefully again, you will find that apple is also very similar to bat, the main difference is just when it gets hit by the cat, it will increase the point instead of decreasing it.

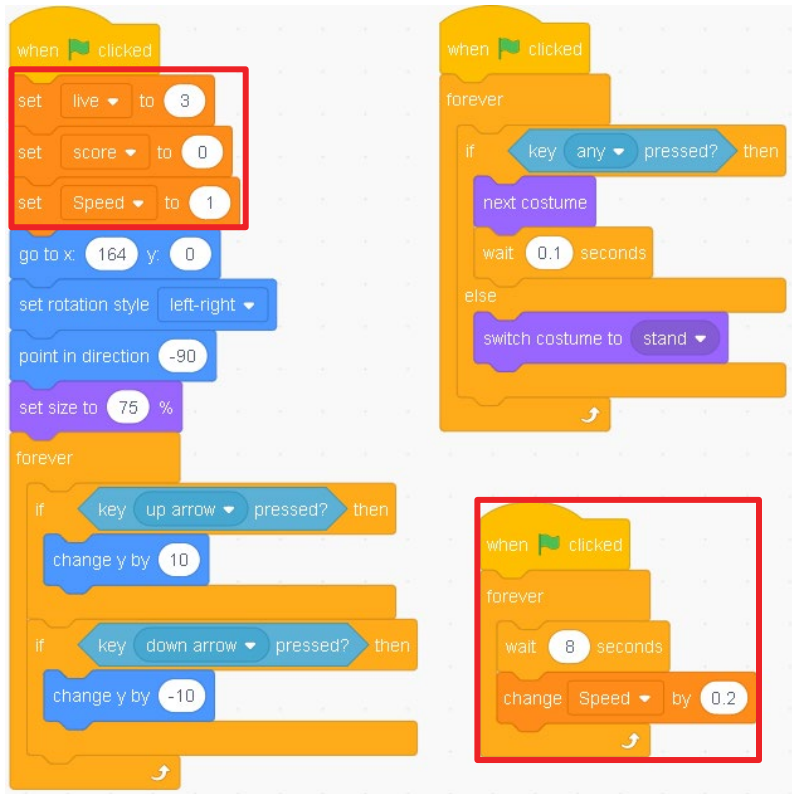
I have modify some numbers in here:

1. More duration to appear an apple
2. Size is different, so starting and ending position also different
3. The speed of apple is faster than bat
4. It won't score when it bypass the cat, it will only score 50 points when the cat successfully hit it.



Level of Difficulty

Script:



As I would like to increase the level of difficulty throughout time played, I will set a speed variable to increase the movement speed of apple and bat.

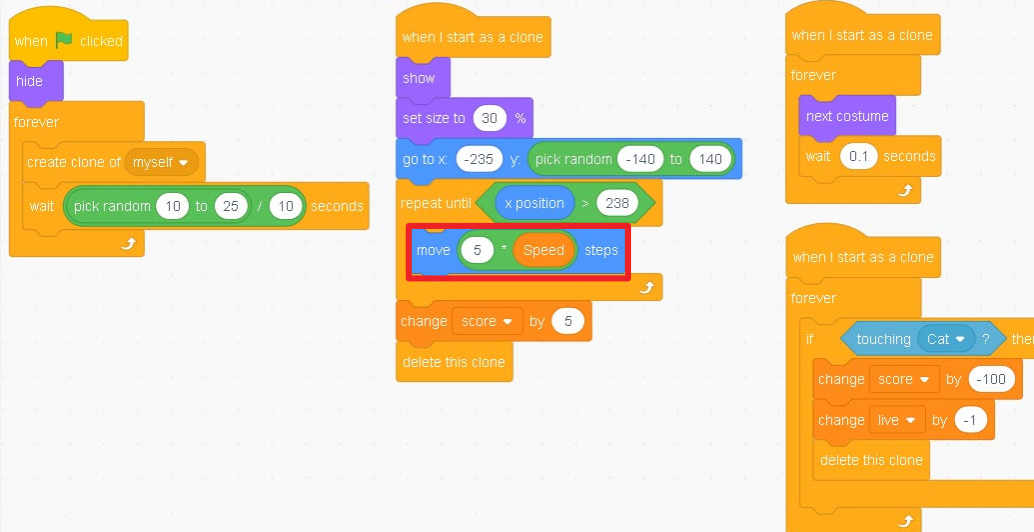
Let's set the starting live to 3; starting score to 0; starting speed to 1.

And throughout the gameplay, for every 8 seconds played, the speed will increase by 0.2.



Bat – Changing of Movement Speed

Script:

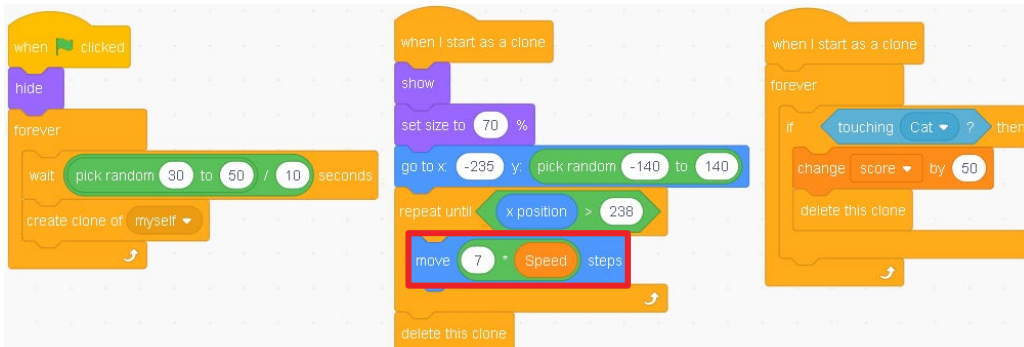


Then we use the Speed variable to multiply by the movement speed of the Bat (this has to be done by using the operator block).



Apple – Changing of Movement Speed

Script:

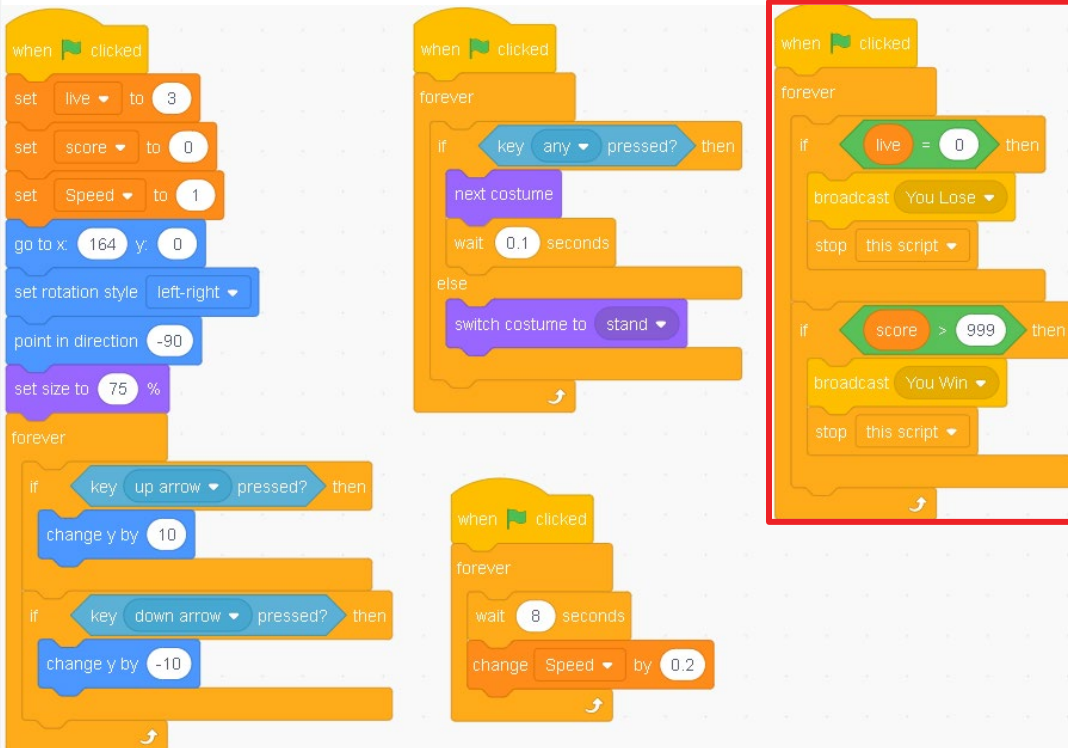


Same to the apple, we multiply the move steps with Speed so that it will increase the speed once the speed is changed.



Set Winning and Losing Condition

Script:



Let's set the winning and losing conditions:

If Score > 999 (if you score more than 999 points):

You Win

If live = 0 (if you have no more live):

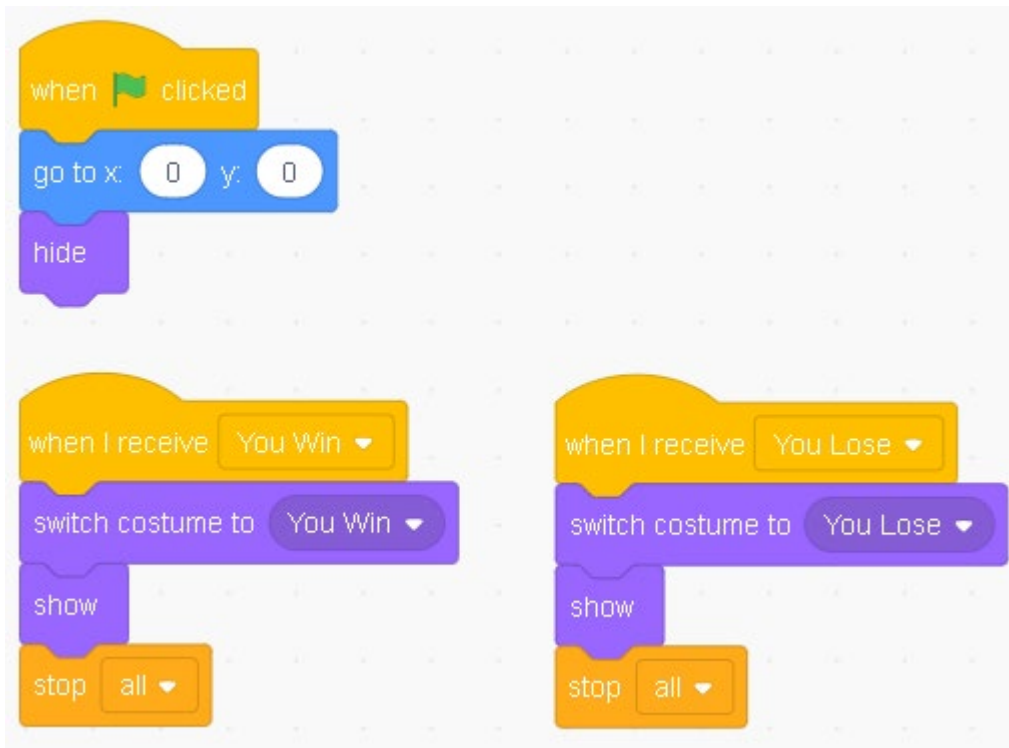
You Lose.



Broadcast You Win & You Lose

Script:

You Lose **You Win**

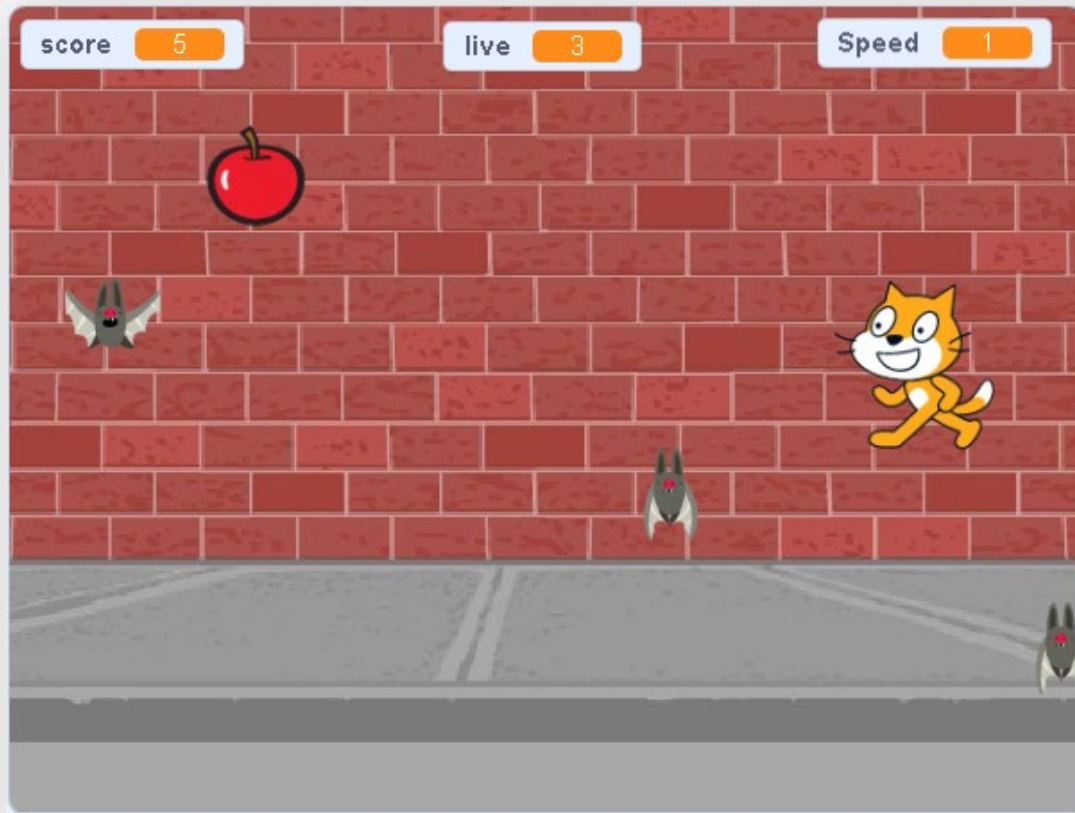


Then we create another 2 sprites to show the words of “You Win” or “You Lose” based on the condition.

This script will be same like what we did in lesson 10, the maze game.



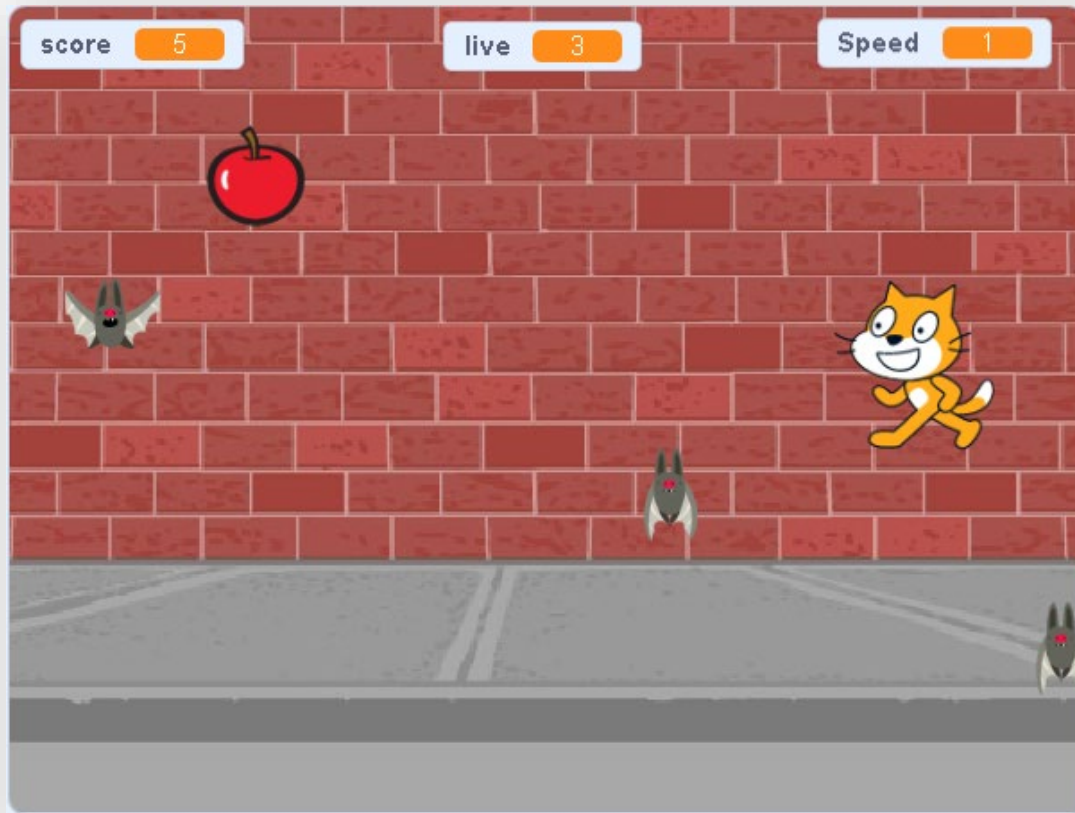
Run Your Game



Now you can try to run and play your game.



Up level your game – Additional Elements



Let's add different kind of objects for different rewards.



Apple: +50 points



Crystal-a: +75 points



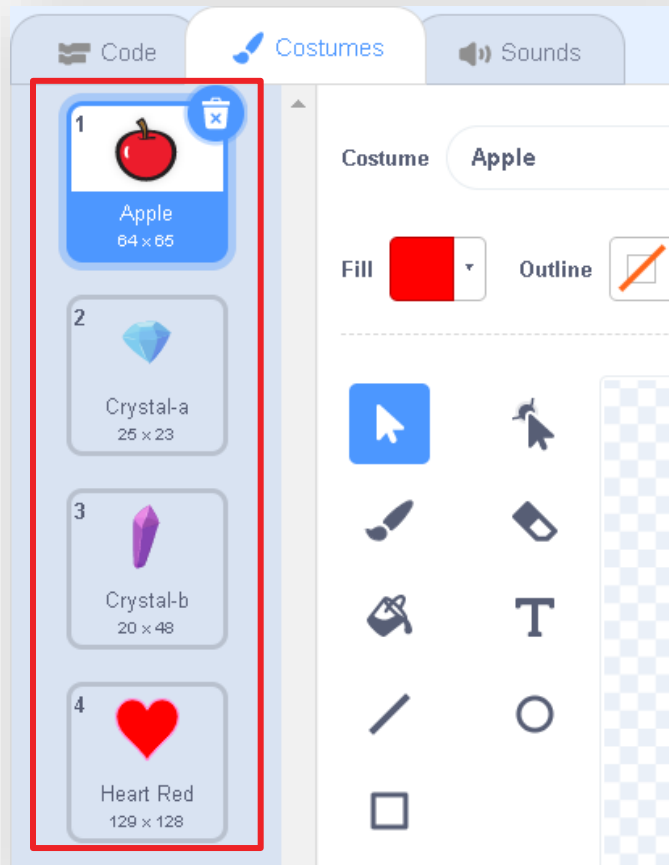
Crystal-b: +100 points



Heart Red: +1 live



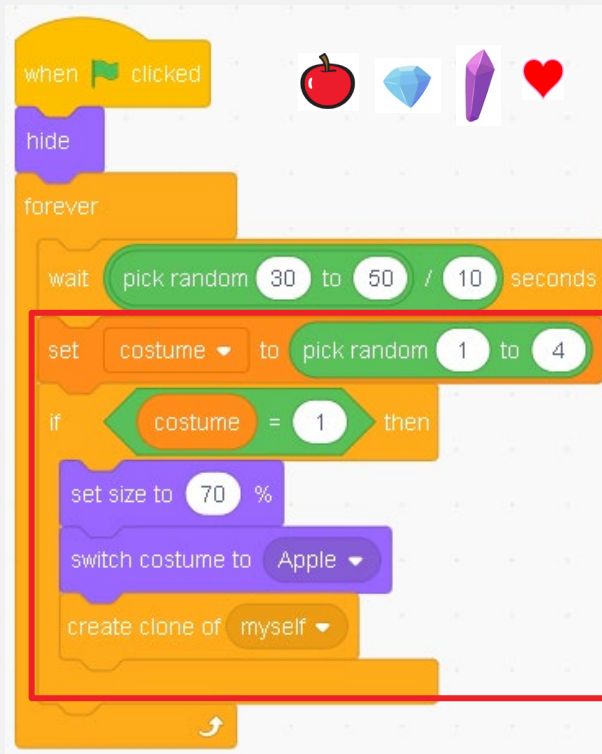
Add costumes to Apple



Let's add costumes of crystal-a, crystal-b, and Heart Red to Apple Sprite first.



Random Elements to be created



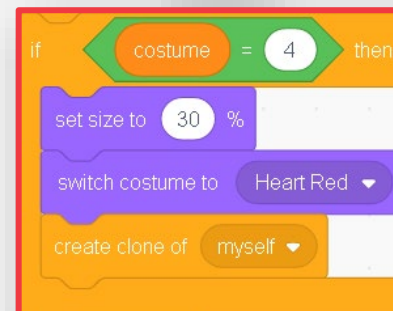
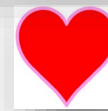
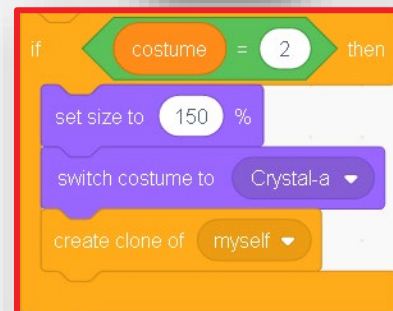
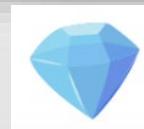
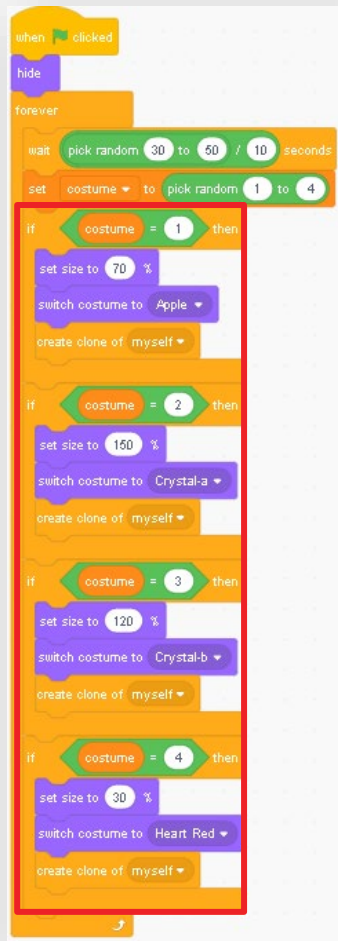
First, we need to set a variable to store the random number we pick, and we make the random number to be from 1 to 4.

Then we make the if statement to define which number relates to which costume, and switch to that costume to create clone for that element.

Here is an example that if the random number picked is 1, then it will set size to 70%, then switch to "Apple" and create the clone for Apple.



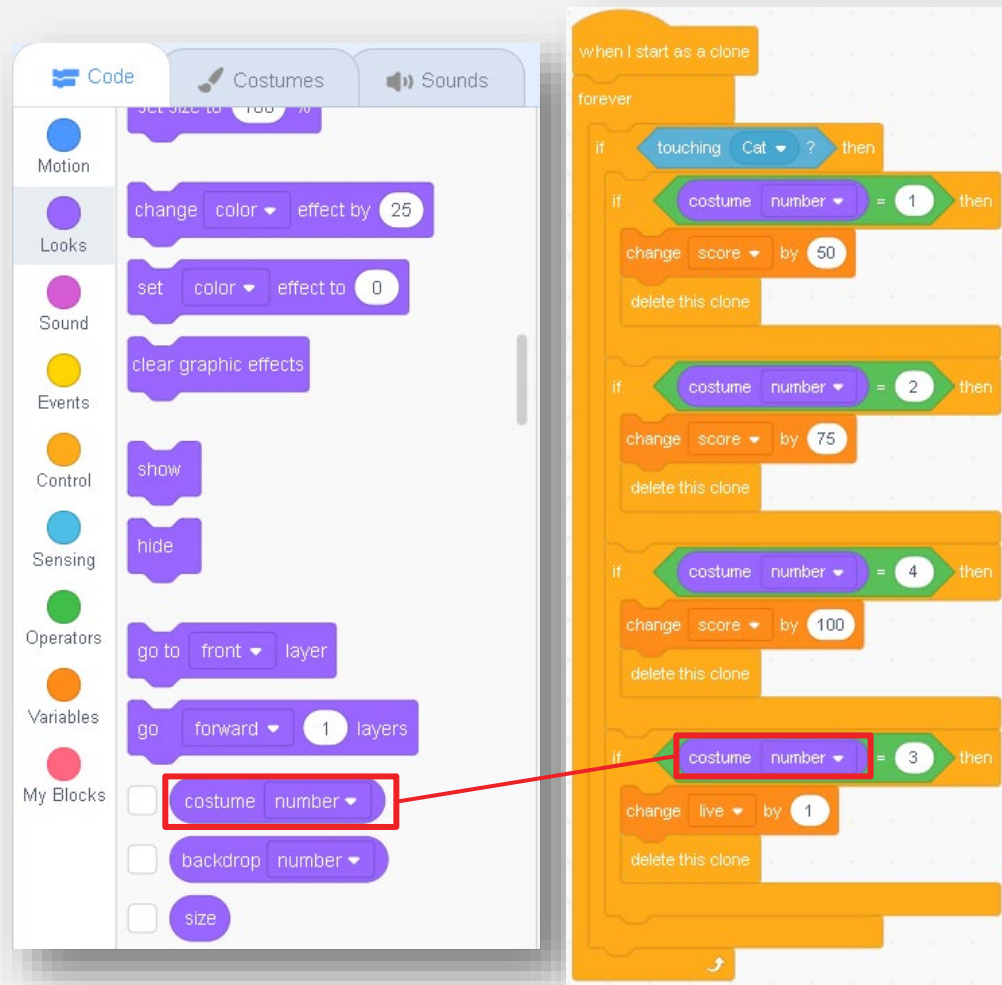
Random Elements to be created



Then add if statement for other elements as well.



Effects when touching Cat



When touching cat, it's not just adding 50 points to the score only, it will depend on different element touched to give out different effects accordingly.



Apple: +50 points



Crystal-a: +75 points



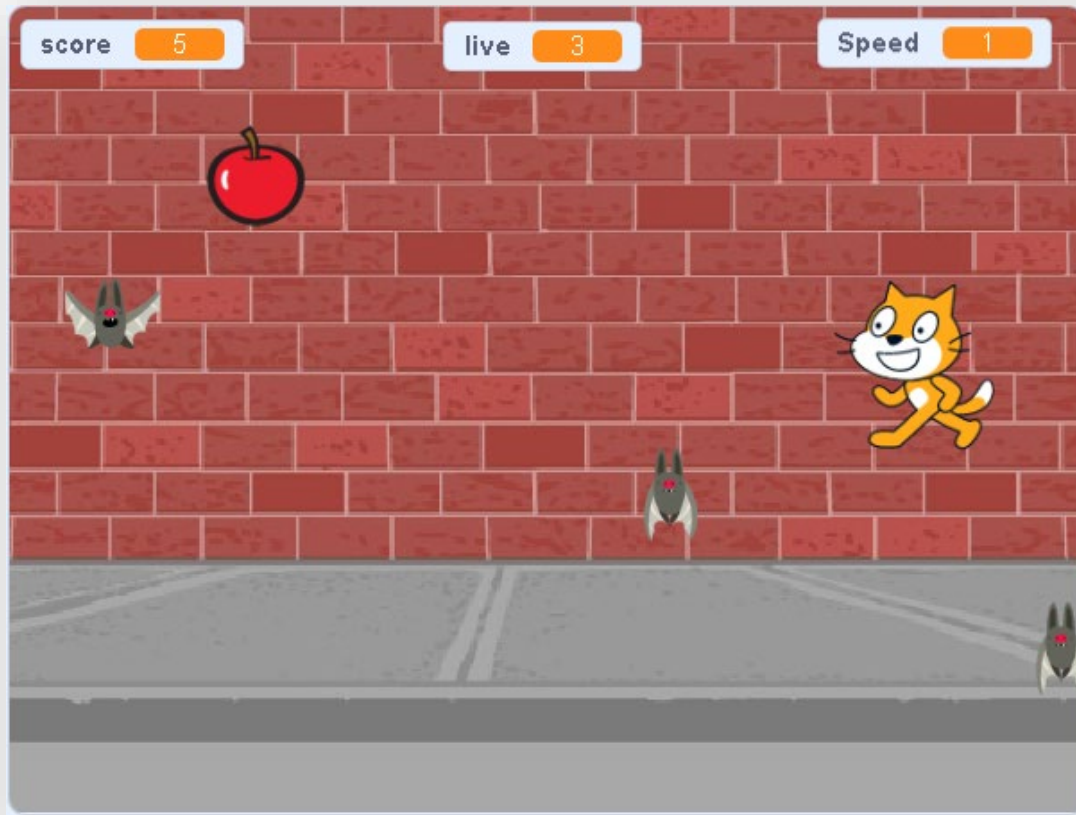
Crystal-b: +100 points



Heart Red: +1 live



Run and try your game again

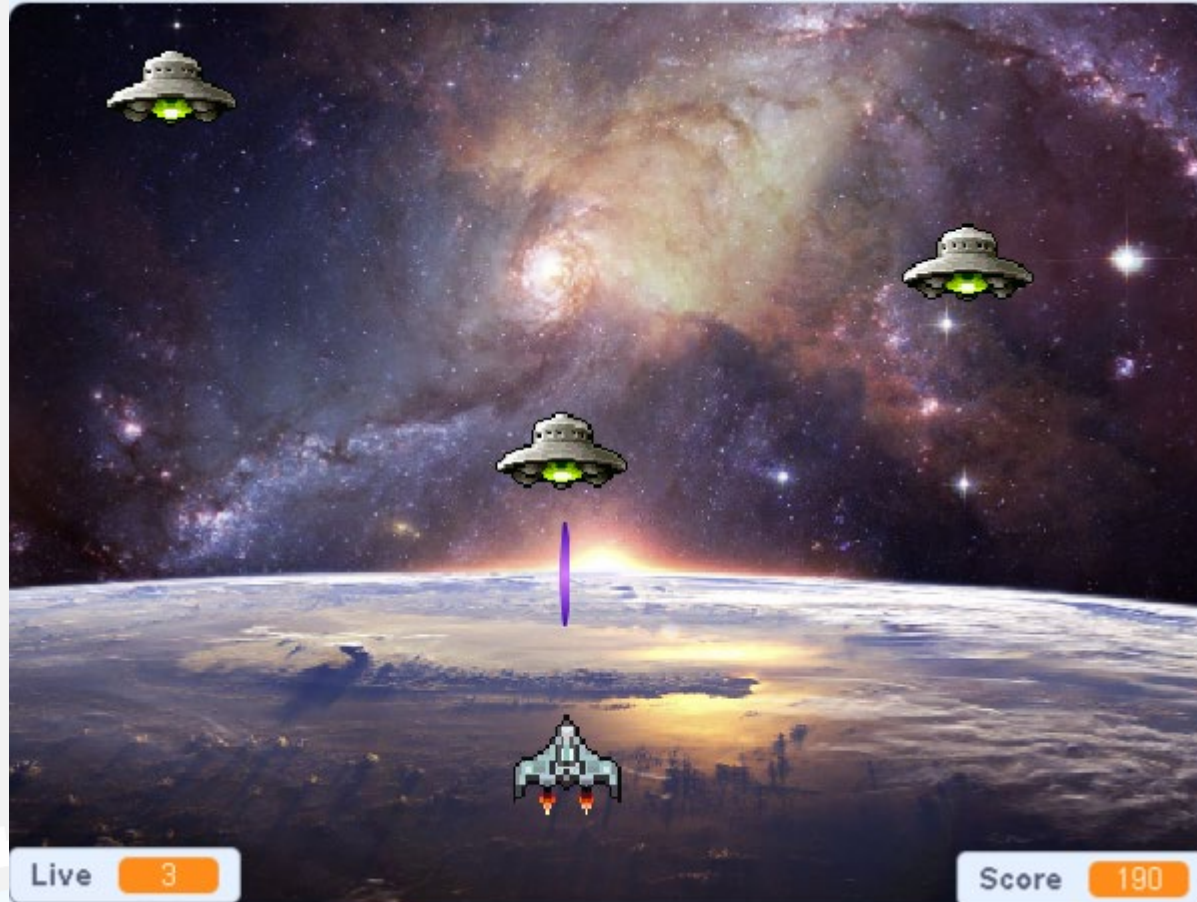


Now re-run your game and see how it is different now.



ASSIGNMENT *for*

Lesson 12



L12 – Mission

Create a space game that you have a spaceship that can shoot to defend the attack from alien.

You are able to shoot a bullet, and the only way to defend your earth is to clear all the UFO. You will have 3 lives at start and each UFO that goes through you will take 1 live from you.

The sprites can be downloaded.



You can direct message your teacher and ask your question through [Slack Robotene Community](#) or arrange a [One-to-One Consultation](#) with your teacher.



Any Questions?



Thank you :)