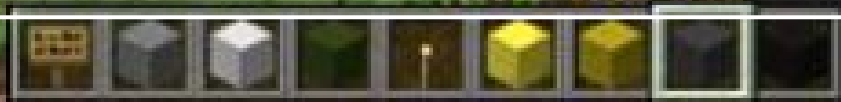
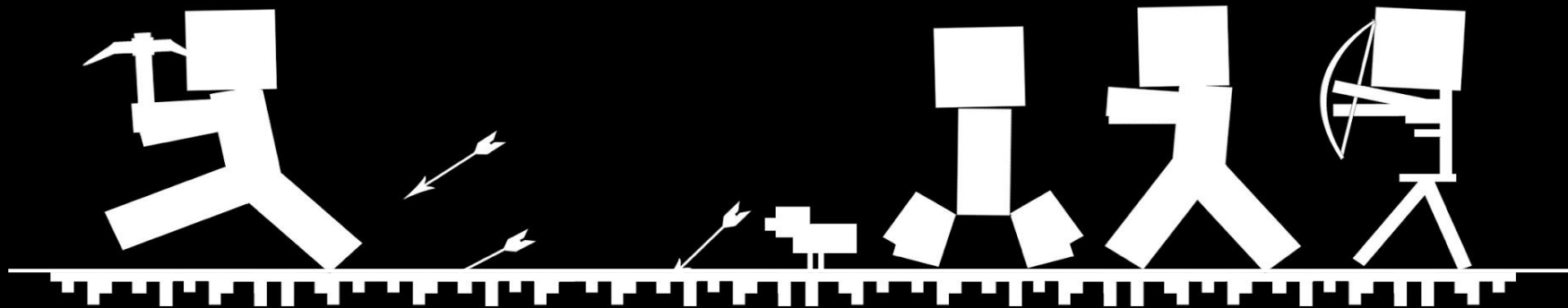

Writing Plugins in Minecraft with JavaScript

Getting Started



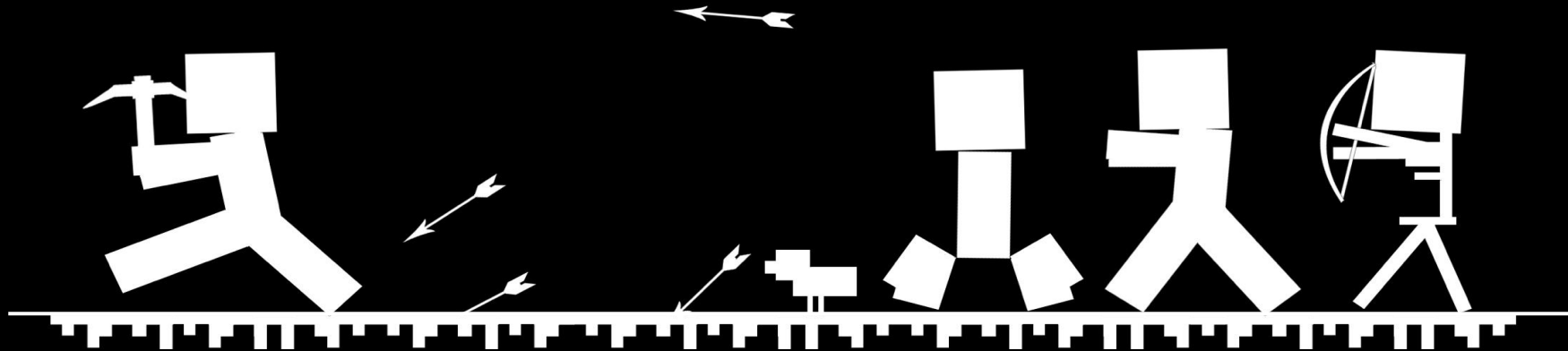
Getting Started



What You'll Need

1. Minecraft (*installed and running*)
 2. Java (*if you have Minecraft running, then java is already installed*)
 3. Class source code: <https://github.com/LetsCodeBlacksburg/ScriptCraft> (*download this to your desktop and unzip it*)
 4. Text editor (*Sublime Text is recommended*)
-

Installing CanaryMod



Find your OS's launcher script

In **ScriptCraft-master/**:

- Windows: **Windows/run.bat**
- Mac: **Mac/start_server.command**
- Linux: **Linux/canarymod.sh**

Copy this file into your **server/** directory

Making the script executable (Mac/Linux only)

Open the terminal and type the following:

```
cd ~/Desktop/ScriptCraft-master/server
```

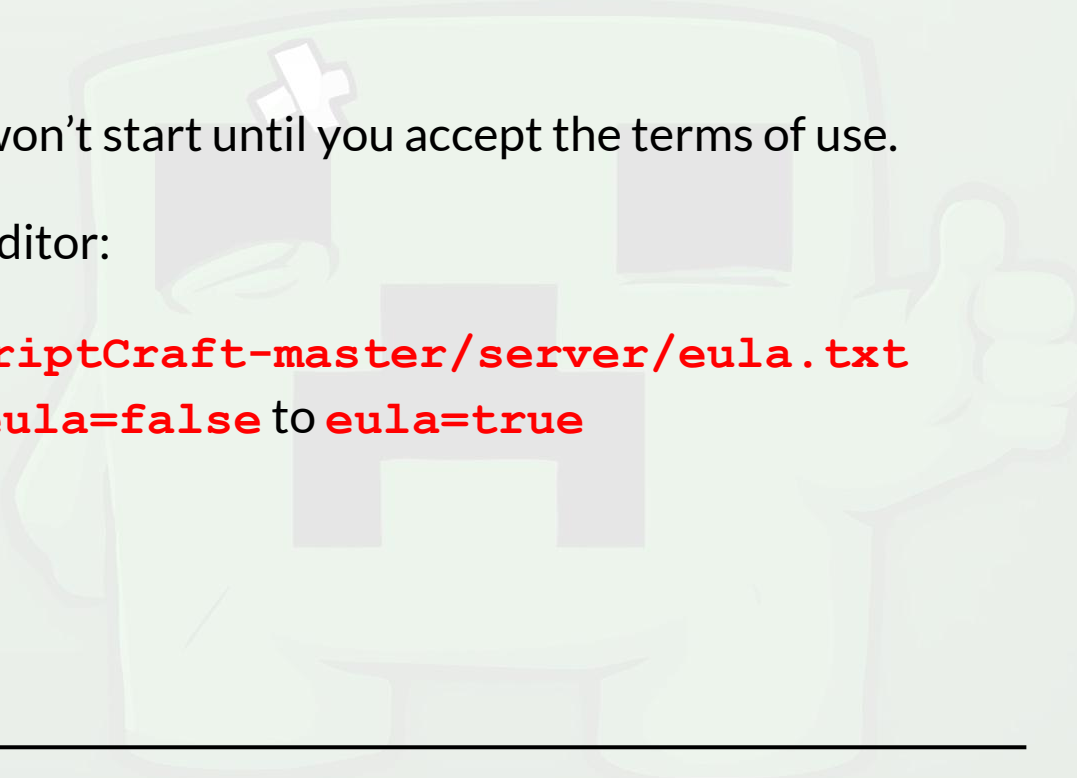
Mac: `chmod a+x ./start_server.command`

Linux: `chmod a+x ./canarymod.sh`

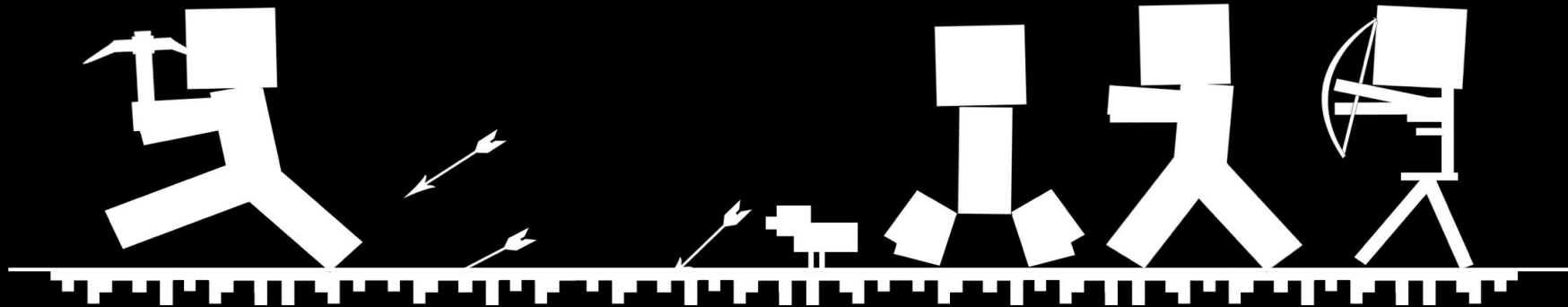
Accepting the EULA

Your server won't start until you accept the terms of use.

In your text editor:

- open **ScriptCraft-master/server/eula.txt**
 - change **eula=false** to **eula=true**
- 

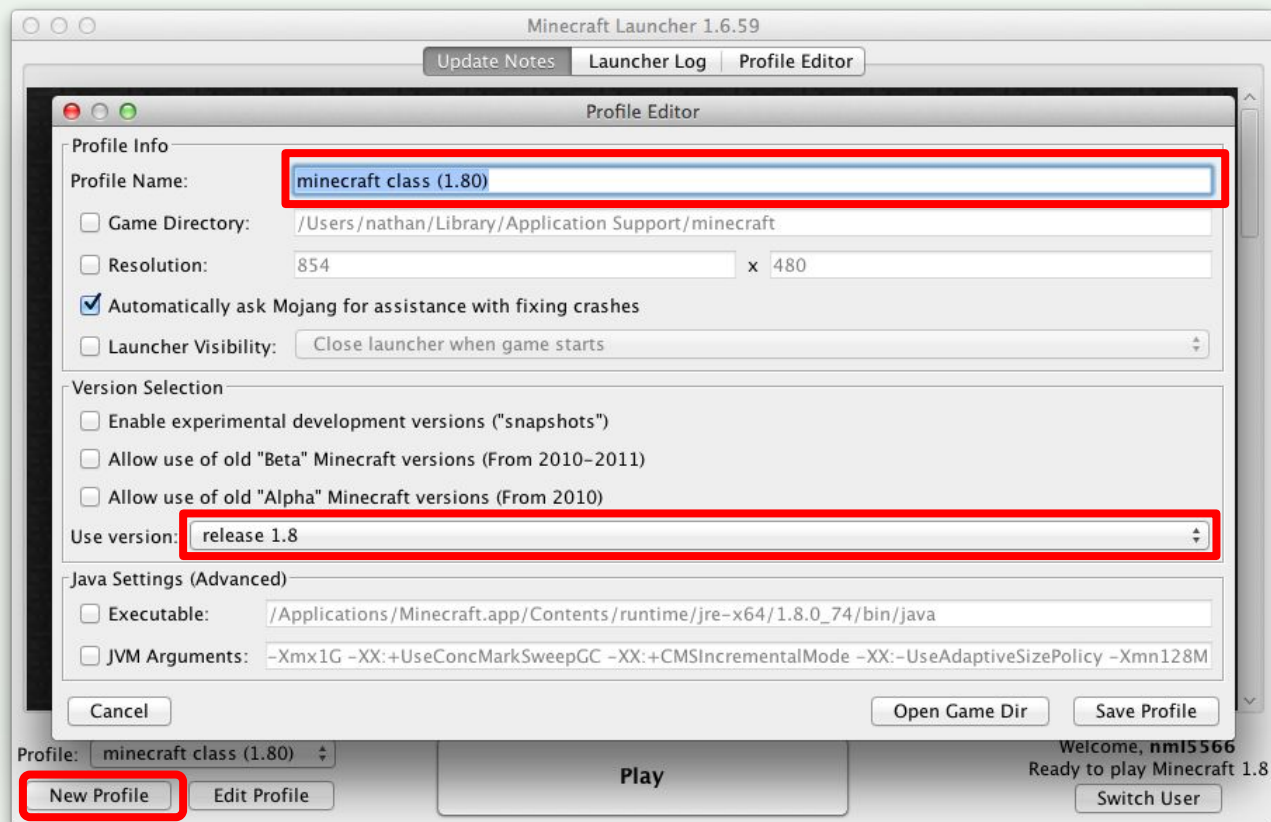
Connecting to your Server



Minecraft Profile Editor

Click on the New Profile button

Create a profile that uses release version 1.8.0



Connecting Client to Server

Launch the game and click on *Multiplayer*.

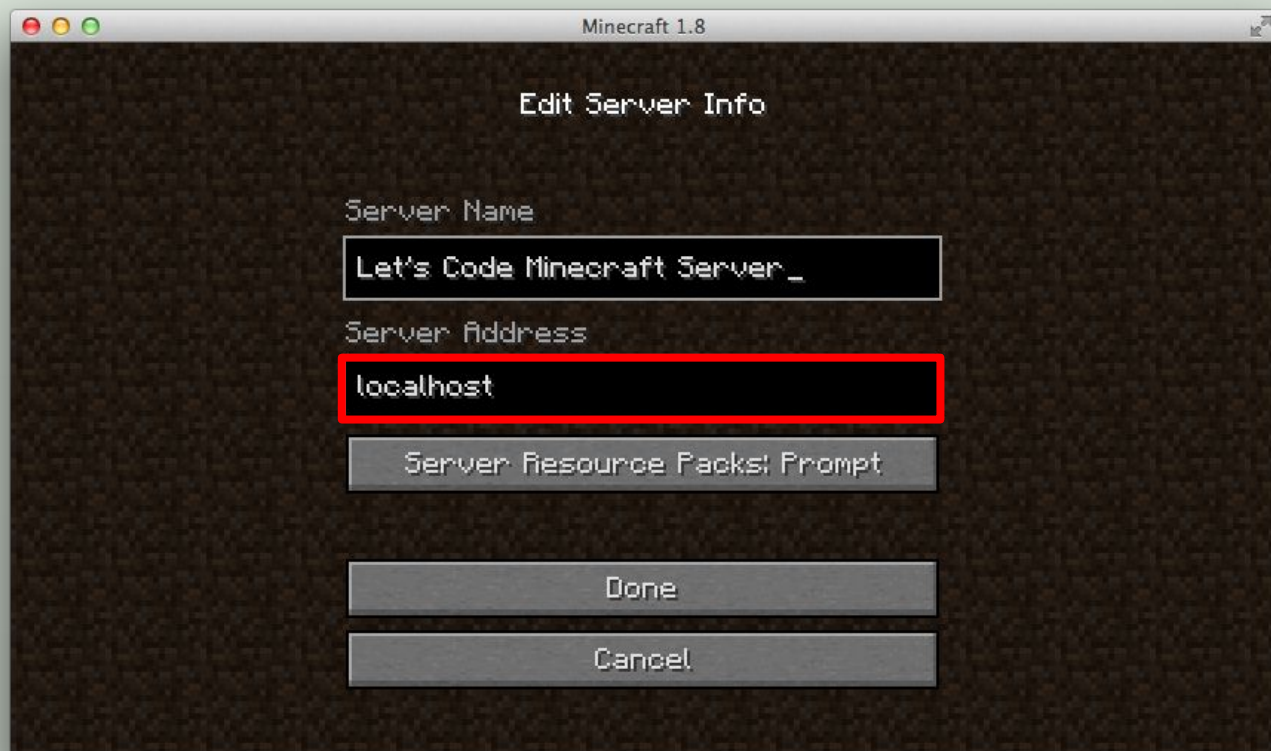
Next, click *Add Server* and type your server's name



Adding Your Server

Give your server a distinct name.

Type **localhost** in the *Server Address* field.

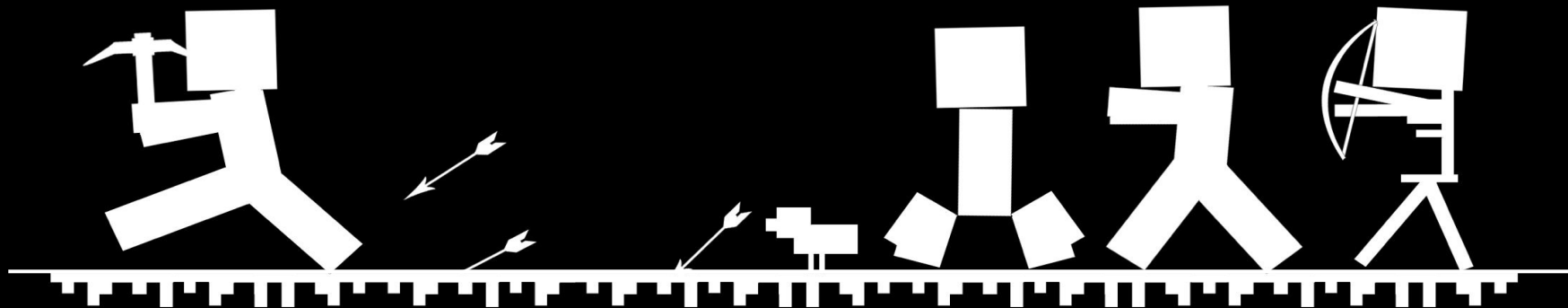


Joining Your Server

Try clicking *Refresh* if nothing shows up.



Installing ScriptCraft



Adding ScriptCraft to Plugins

In **ScriptCraft-master/plugins/**:

1. Find **scriptcraft.jar**
2. Copy this file into your **server/plugins/** directory
3. Restart the server

*(type the **stop** command into the server console, then relaunch it by double-clicking on your startup script)*

```
>stop
[10:50:10] [CanaryMod] [INFO] [NOTICE]: Console issued a manual shutdown
[10:50:10] [net.minecraft.server.MinecraftServer] [INFO]: Stopping server
...
[10:50:10] [CanaryMod] [INFO]: Disabling Plugins ...
$
```

Verifying ScriptCraft is Installed

Type the following command exactly into the server console:

```
js "Hello world"
```

The server console will also print the following:

```
[19:22:21] [CanaryMod] [INFO]: Enabling plugin ScriptCraft
```

Giving yourself OP

This is necessary to run JavaScript commands in-game and break blocks. You can only do this *after* you've logged into your server.

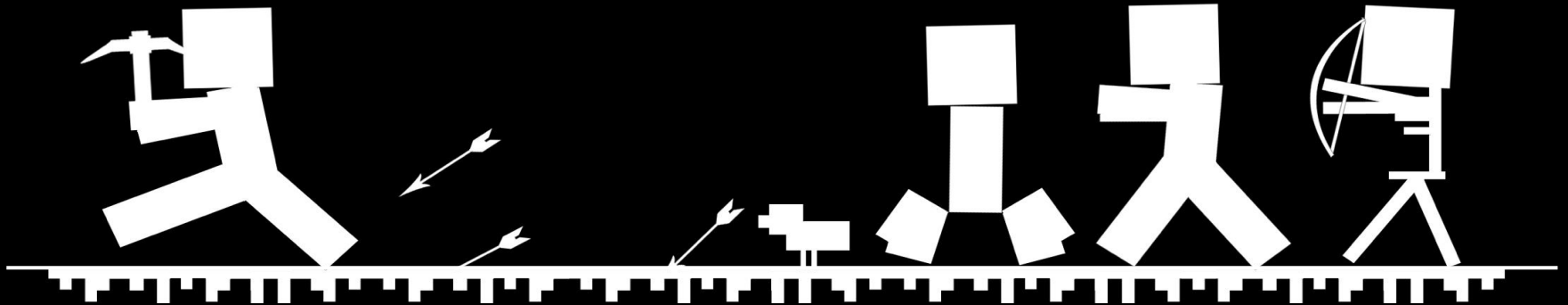
Type the following command exactly into the server console:

op <username>

The server console will print the following:

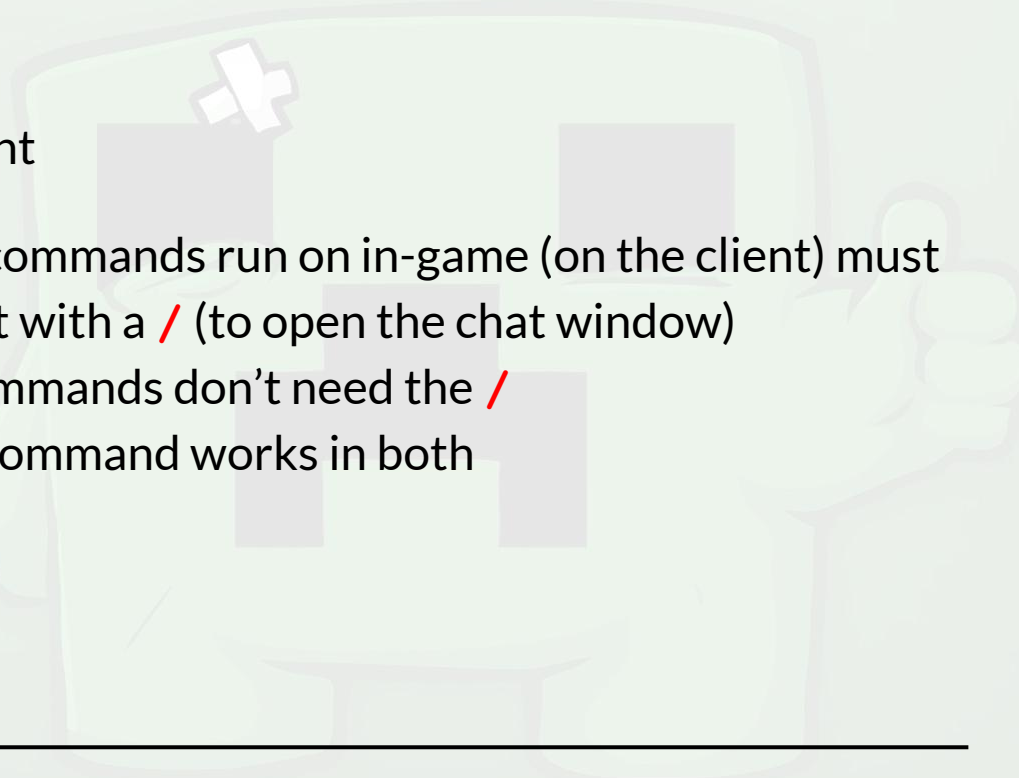
```
[11:31:09] [CanaryMod] [INFO]: [SERVER] Opped <username>
```

Exploring JavaScript in Minecraft



Running Commands

Console VS Client

- Javascript commands run on in-game (on the client) must always start with a **/** (to open the chat window)
 - Console commands don't need the **/**
 - Not every command works in both
- 

Basic Math

Javascript can act as a calculator:

```
js 2 + 3
```

```
js 2 * 3
```

```
js 2 - 3
```

It can also compare numbers:

```
js 3 > 5
```

```
js 3 < 5
```

```
js 3 == 5
```



Storing Data in Variables

Start with a variable:

```
js var hearts
```

Set it to a value:

```
js hearts = 8
```

Check the current value:

```
js hearts
```

Change the value:

```
js hearts = 9
```

Do math with it:

```
js hearts + 5
```

```
js hearts - 2
```

```
js hearts * 1
```

```
js hearts / 3
```

NOTE: variables can't begin with numbers

Strings

```
js "double string"
```

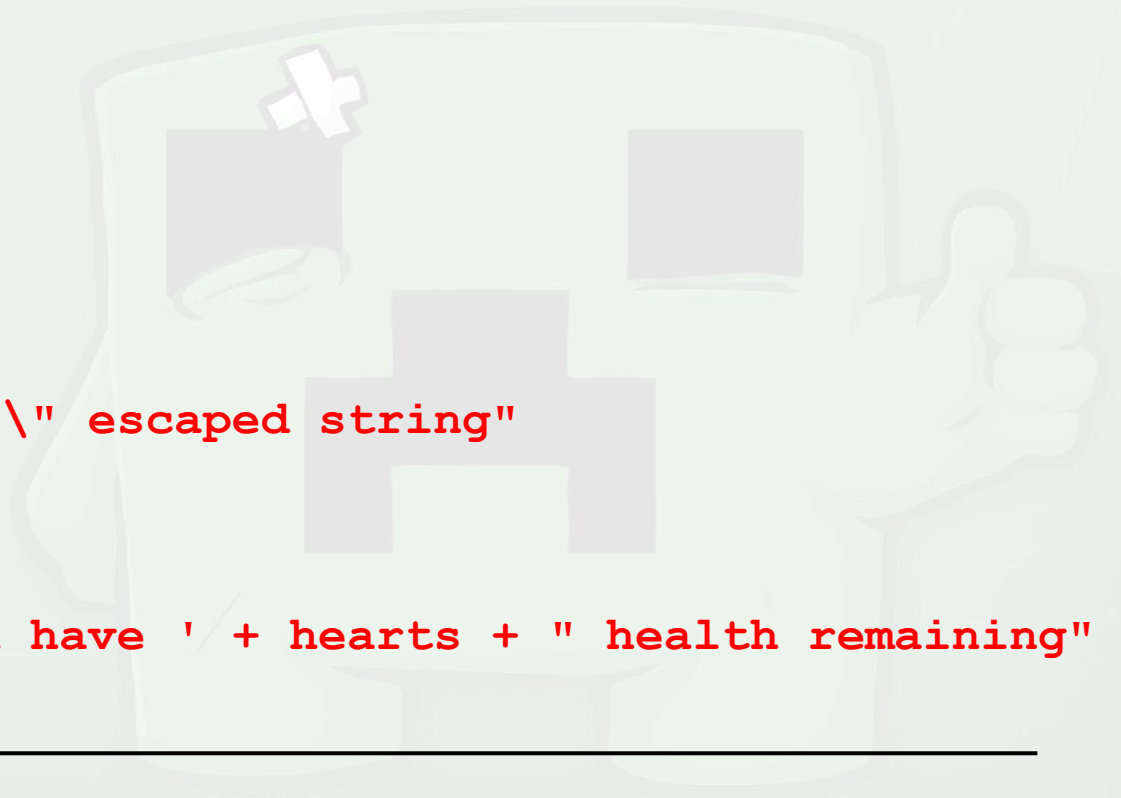
```
js 'single string'
```

```
js 'I\'m an escaped string'
```

```
js "Here's a \"double-quote\" escaped string"
```

```
js "I'm un-escaped"
```

```
js var healthMessage = 'You have ' + hearts + " health remaining"
```



The null Keyword

```
js var hearts = null
```

null means “no value”. It’s useful for marking that a variable is empty.

This is different from *undefined*, which is the default initial setting for any declared variable.

Adding and Subtracting

```
js hungerBar = 0
```

```
js hungerBar = hungerBar + 1
```

```
js hungerBar += 1
```

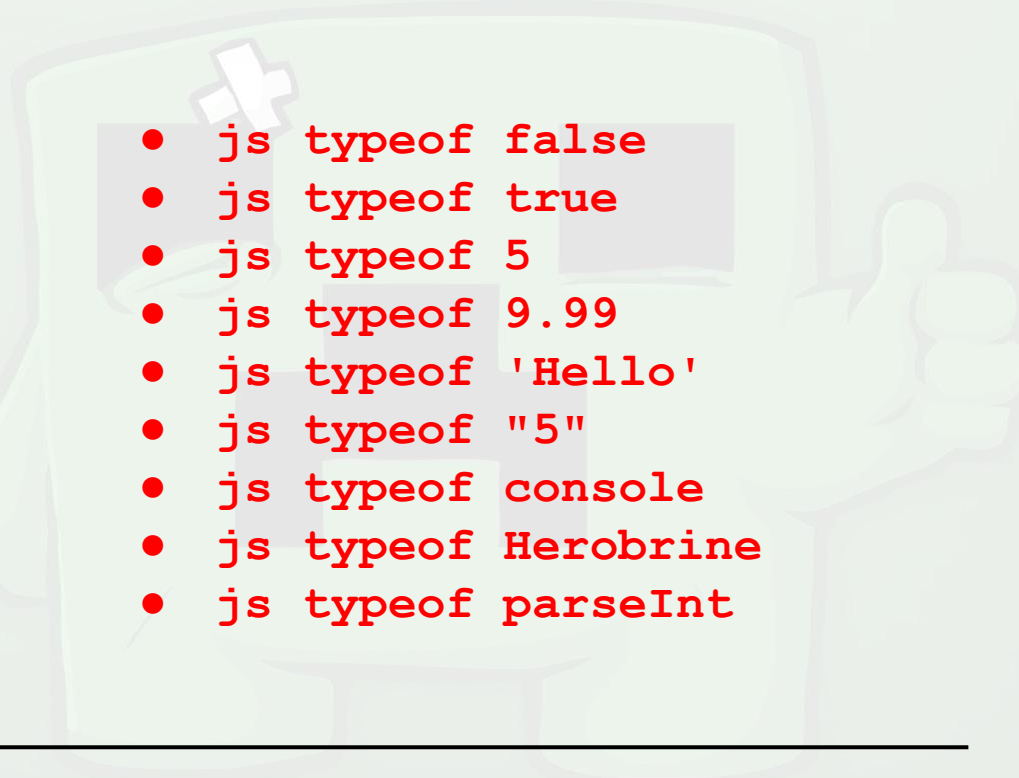
```
js hungerBar = hungerBar + 1
```

```
js ++hungerBar
```

```
js hungerBar--
```

Data Types

- Number
- String
- Boolean
- Object
- Undefined
- Function



- `js typeof false`
- `js typeof true`
- `js typeof 5`
- `js typeof 9.99`
- `js typeof 'Hello'`
- `js typeof "5"`
- `js typeof console`
- `js typeof Herobrine`
- `js typeof parseInt`

Functions

Collections of code that can be easily called and reused.

Values passed in between the (and) called *parameters*.

```
js parseInt('4 hours until sunset')
```

```
js parseInt('This is not a number')
```

```
js parseInt('3 blind mice')
```

Writing Your Own Functions

Type the following on one line *:

```
js function add(first, second) { return first + second; }
```

*NOTE: If you get the error below, just ignore it

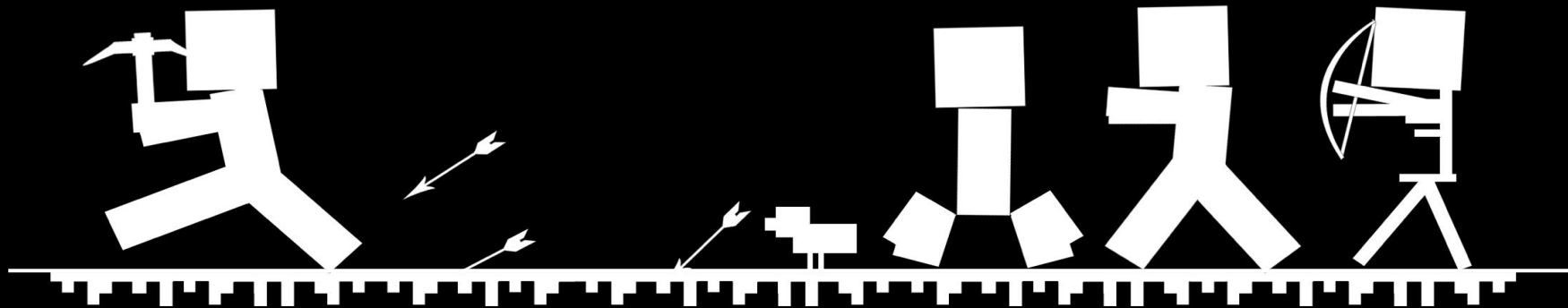
Call your new function:

```
js add(5, 6)
```

```
js add(9, 1)
```

Error: InternalError: Cannot convert NaN to
java.util.Iterator (<Unknown source>#415)

Creating Plugins



Your First Minecraft Plugin

In `ScriptCraft-master/server/scriptcraft/plugins/`:

- create a new folder called `learning/`
- use your text editor to create a file inside `learning/` called `helloWorld.js`

Add the following inside your file:

```
console.log('Hello World');
```

Save your file, then type the following in the server console:

```
js refresh()
```

Making Your Code Reusable

Let's put our helloWorld.js code into a function:

```
function helloWorld() {  
    console.log('Hello World');  
}
```

And refresh our server:

```
js refresh()
```

What Happened to Our Message?

Add the new code and refresh:

```
function helloWorld() {  
    console.log('Hello World');  
}  
  
helloWorld();
```

Making helloWorld() public

To call functions directly, we must first export them:

```
function helloWorld() {  
    console.log('Hello World');  
}  
  
helloWorld();  
  
exports.helloWorld = helloWorld;
```

Objects

Can hold other variables and functions (called *properties*) accessible via dot notation. **exports** is an example of this. **self** is another example that refers to you, the player.

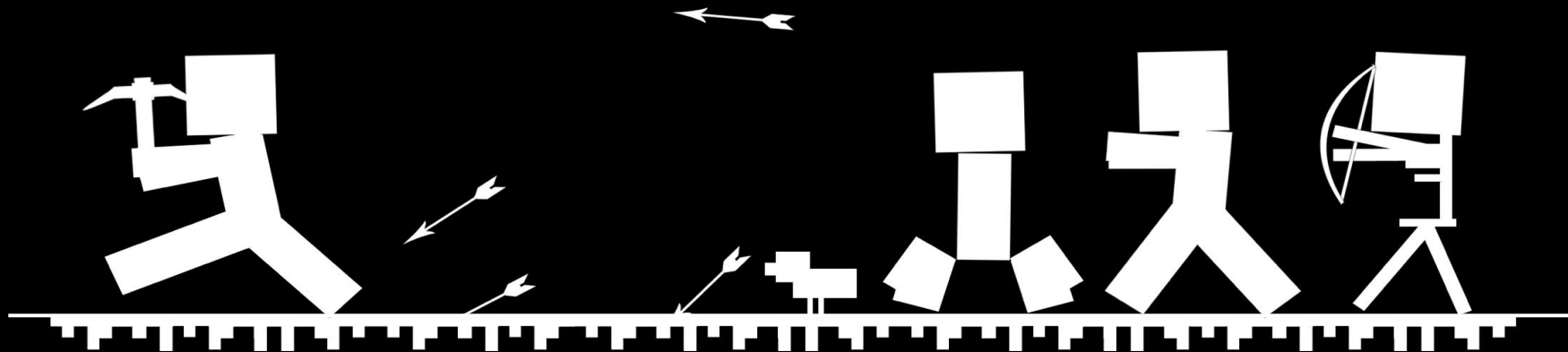
Try this in-game (note the slash in front of the command):

```
/js self.health = 10
```

```
/js self.invisible = true
```

```
/js self.hunger = 10
```

Making A Dice Plugin

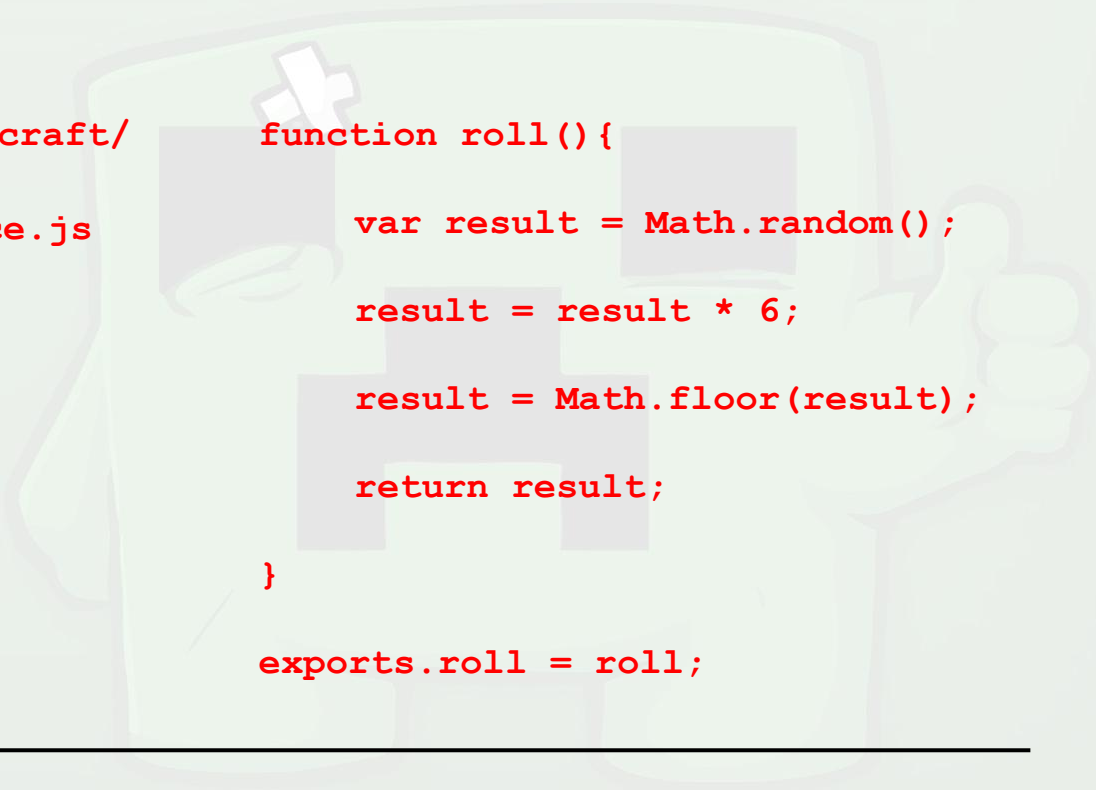


Rolling Dice

In `ScriptCraft-master/server/scriptcraft/`

- create a new file in `plugins/` called `dice.js`
- add the code on the right
- save and refresh

```
function roll(){  
  
    var result = Math.random();  
  
    result = result * 6;  
  
    result = Math.floor(result);  
  
    return result;  
  
}  
  
exports.roll = roll;
```



Multi-sided Die

You *could* define multiple functions for different dice sides (e.g. `rollSixSides()`, `rollFourSides()`, etc...), but that gets tiring.

It's easier to pass the number of sides as a **parameter**.

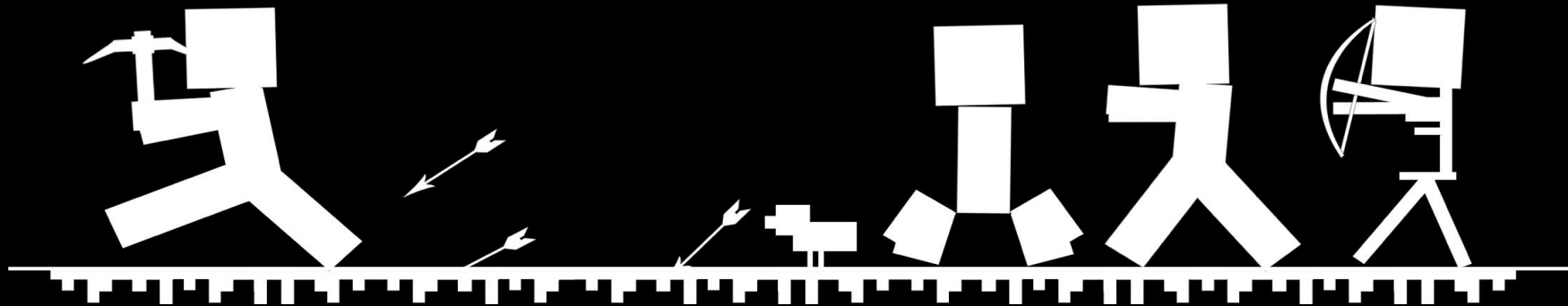
Edit `dice.js` to add the changes on the *right*, refresh, and try it out using the code *below*:

```
js roll(6)
```

```
js roll(20)
```

```
function roll( sides ){  
  
    var result = Math.random();  
  
    result = result * sides;  
  
    result = Math.floor(result);  
  
    return result;  
  
}  
  
exports.roll = roll;
```

Conditionals



If/Else/Else If

Useful for changing code based on different events:

```
var time = "noon";  
  
if ( time == "morning" ) { echo("Time for breakfast!"); }  
  
else if (time == "noon") { echo("Time for lunch!"); }  
  
else if (time == "night") { echo("Time for dinner!"); }  
  
else { echo("Time for snacks!"); }
```

Combining Conditionals

&& represents and. **||** represents or.

Below is a more accurate time check script. Minecraft counts time in ticks (up to 24,000).

```
/js var world = self.world;
```

```
/js var now = world.relativeTime;
```

```
/js if (now > 13000 && now < 23000 ) { echo("Night!"); }
```

```
/js if (now < 13000 || now > 23000 ) { echo("Not night!"); }
```

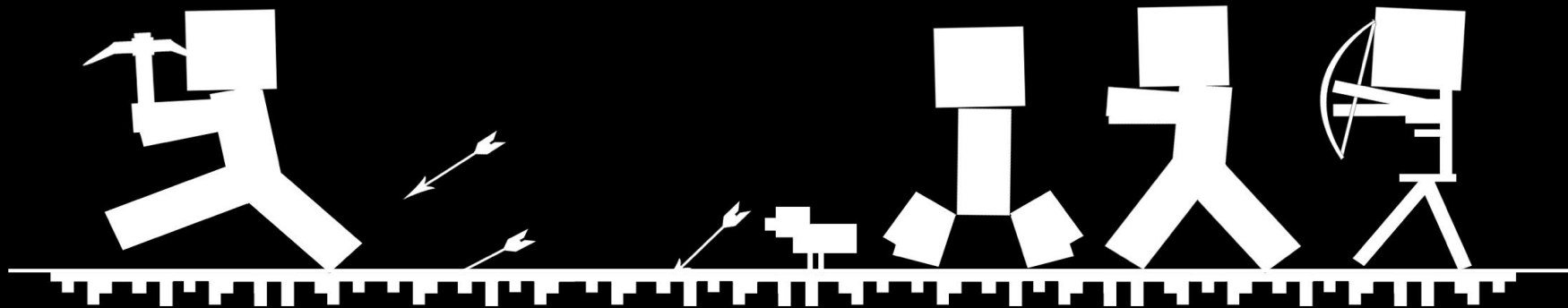
```
function roll( sides ){
    if ( isFinite(sides) && sides < 0 ) {
        echo("Negative numbers not valid");
    } else if (isFinite(sides) && sides > 0) {
        return rollValidNumber(sides);
    } else {
        echo("Not a number");
    }
}

function rollValidNumber( sides ){
    var result = Math.random();
    result = result * sides;
    result = Math.floor(result);
    return result;
}

exports.roll = roll;
```

Example of Using Conditionals to Make the Dice Roll Better

Arrays



Using Arrays

Arrays are objects than hold lists of items.

```
js var farmAnimals = [ 'Sheep', 'Cow', 'Pig', 'Chicken' ];
```

How do we access the list?

```
js echo(farmAnimals[0]); echo(farmAnimals[1]); echo(farmAnimals[2]);
```

```
js for (var count in farmAnimals) { echo(farmAnimals[count]); }
```

What if we print something outside the list?

```
js echo(farmAnimals[5]);
```

Using Modules

Modules let you build reusable code. They can be imported into plugins and combined with other modules/functions.

Module exports aren't auto-loaded, *unlike* plugin exports.

Let's move `dice.js` to `ScriptCraft-master/server/scriptcraft/modules`

But how do we use it now?

```
js var dice = require("dice")
```

```
js dice.roll()
```

Random Spawner Plugin

Create a file called `randomSpawner.js` in your `plugins/` folder:

```
var dice = require('dice');
var spawn = require('spawn');
var farmAnimals = ["cow", "chicken", "pig", "sheep"];
var total = farmAnimals.length; // .length gets # of elements

function randomSpawn() {
    var result = dice.roll(total);
    spawn(farmAnimals[result], self.location);
}

/* This command will only work in-game */
exports.randomSpawn = randomSpawn;
```

A Quick Note About Comments

Comments are notes in code that help explain what is happening. They are not read by the computer.

Single-Line comments

```
// anything after the // is a comment
```

```
var a = 1; // end of line comment
```

```
// multiple lines ...
```

```
// ... need multiple slashes
```

Multi-Line comments

```
/*
```

```
Anything inside here a  
comment
```

```
*/
```

Single-line comments can have `//` inside them. Multi-line can't have `/*` or `*/` inside them

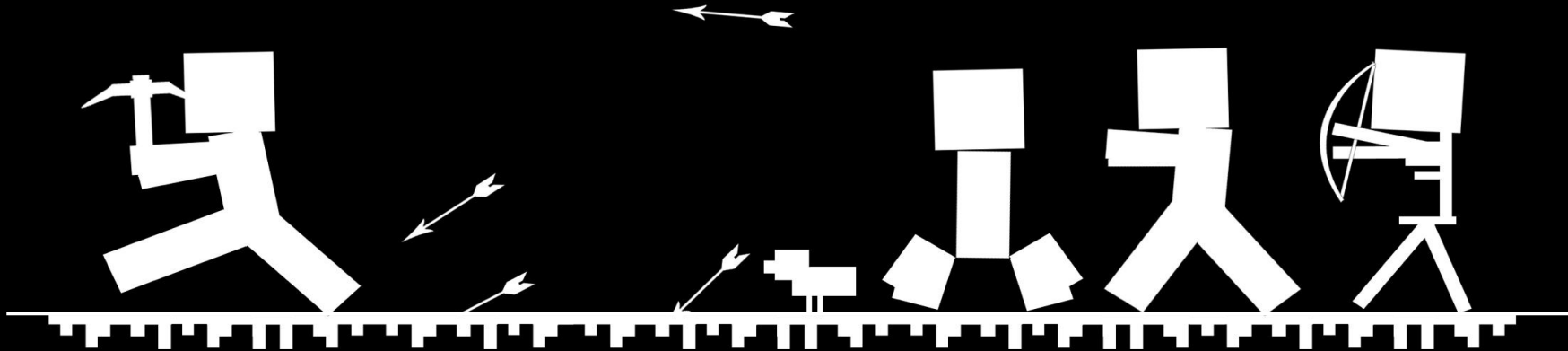
Even More Randomness

```
var dice = require('dice');
var spawn = require('spawn');
var entities = require('entities');
var entityNames = []; // empty array
/* push object properties into array to get total */
for (var name in entities){ entityNames.push(name); }
var total = entityNames.length;

function randomSpawn() {
    var result = dice.roll(total);
    echo("Spawning "+entityNames[result]); //show what spawned
    spawn(entityNames[result], self.location);
}

exports.randomSpawn = randomSpawn;
```

Event-Driven Programming



Why Events?

You know how to write code for commands that you type while in-game.

You can also monitor what's happening inside Minecraft so you can respond to it automatically.

There are roughly 200 events that can be responded to.

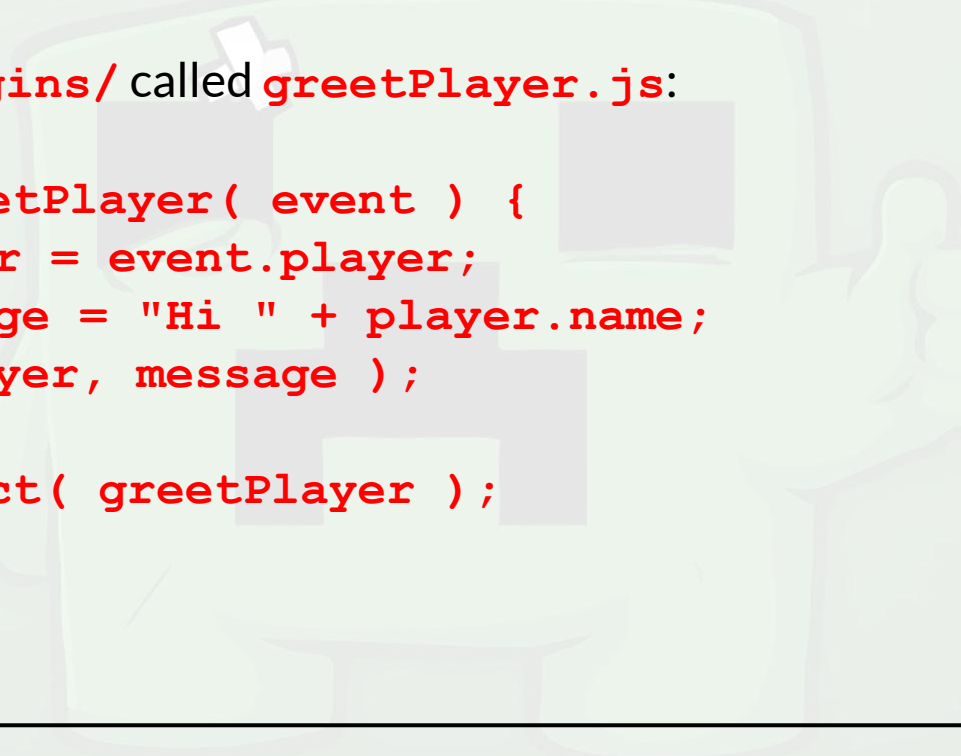
Examples:

- `playerMove()`
 - `playerDeath()`
 - `playerArmSwing()`
 - `blockPlace()`
 - `blockBreak()`
 - `portalCreate()`
 - `portalUse()`
 - `entityDeath()`
 - `entityShootBow()`
 - `itemUse()`
 - `itemDrop()`
 - `villagerTrade()`
 - `craft()`
-

Greet Players On Server Join

Add a file in `plugins/` called `greetPlayer.js`:

```
function greetPlayer( event ) {  
    var player = event.player;  
    var message = "Hi " + player.name;  
    echo( player, message );  
};  
events.connect( greetPlayer );
```



Stay Tuned for Part 2!

To be continued...

