**Part 1: Make A Face**

The first step is to create a new project. Open up Unity and select *new*. After that you’ll be taken to a screen where you can name the project and select it’s type. Select 2D and when everything looks good, click on *Create Project*

**INSERT PIC HERE**

Now you’ll be in the project window. It may look scary at first, but don’t worry, I’ll go easy on you. To start we need to create the folders to hold our files. We can start with three easy ones, *Sprites*, *Script*, and *Prefabs*. To create these, right click the area within the red rectangle in the picture below and select Create > Folder and then input the name. After doing this three times, you should see the three folders at the bottom of the screen.

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Now we need to fill these folders. Double click inside the *Scripts* folder to enter it, and then create a new C# script inside of it. To do this, perform the same process you used to create the folders, except click *C# Script* instead of *Folder*. Name this script *MouseManager*. This script will be used to manage data related to our mouse pointer. If you have ever used Java before, it may be easier to understand if you imagine this script as a *Mouse* class.

Before we edit the script, we are going to create an object in Unity that represents our mouse. To do this, right click inside the *Hierarchy* window on the left side of the screen and select Create Empty. The new object should appear with the name *GameObject*. That name is not very descriptive (or fun) so right click it and rename it to something fun like *Jerry*.

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Next we have to attach our script to this object so the script can actually do something instead of just looking pretty. To do this, drag and drop the *MouseManager* script at the bottom of the screen onto the *Jerry* object on the left side of the screen. If done correct, the *Inspector* window on the right side of the screen should look something like the picture below. Our object will contain two different components, *Transform* and *MouseManager*. We have already established what *MouseManager* is, but what is *Transform*? *Transform* is a component that comes default with all Unity objects, and it is what controls where on the 3D plane our object is. We will be manipulating it very soon, but for now double click the script at the bottom of the screen to open it in a text editor.

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You can use whatever text editor you want. I am using Microsoft *Visual Studio*, but I believe the default editor for Unity is MonoDevelop. You’re screen may look a little different than mine, but that’s ok, it’s about what’s on the inside, not what’s on the outside.

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You’ll see the class name we entered earlier, *MouseManager*, at the top of the screen followed by a colon and the name *Monobehaviour*. This means our class inherits *Monobehavior*, which allows our script to be attached to objects in Unity. You’ll see how this works later. Our class comes default with two incredibly useful methods, *Start* and *Update*.

*Start* is used to initialize the object’s fields, similar to class constructors in languages like Java and C#. It’s not the exact same thing, but it’s a good way to simplify it. This method will be automatically called when the scene initially starts playing in Unity as long as it is attached to an active object.

*Update* is used to…. Update. Every frame, this method is called in every single script that implements it. This means that if we have an object in Unity that attaches a script that has *Update* method, the object will be constantly updating every frame (and there are A LOT of frames).

First order of business is to get the position of the mouse so we can make our in game mouse object follow it. Declare a new *Vector3* object above *Start* and name it *mousePosition*. This will hold the value of our computer cursor. Then in *Start* method, initialize this by setting it equal to **new Vector3(0, 0, 0)**. Vector3 is a Unity object that is used to represent positions on a 3D plane. It has 3 coordinates, X, Y, and Z. Since we are making a 2D game, we will only be focusing on X and Y at the moment.

Now that we have initialized our *mousePosition* value, we can try setting it. We will start by creating a new method, *SetPosition*. Make this method have a return type of void since it will not need to return any values and make it private so it can only be accessed by our main man *Jerry*. Your method should look something like **private void SetPosition()**. First thing this method will do is get the position of our cursor. We will be using some included Unity scripts to do this. In the method, set *mousePosition* equal to **Camera.main.ScreenToWorldPoint(Input.mousePosition)**. Now every single frame, *mousePosition* will be set to the position of our cursor.

Now that we have the position of the mouse, we have to set *Jerry*’s position equal to that so they can always be together. To do this, we have to set the position of *Jerry*’s *Transform* component. To do that, enter **transform.position = mousePosition**. *transform.position* is the *Transform* component’s position value and *mousePosition*  is the mouse cursor position. Next, the line **Debug.Log("Mouse Position: " + transform.position.ToString());** to the bottom of the method. This will print Jerry’s position so we can make sure everything is working. Lastly, add a call to *SetPosition* inside the *Update* function so that it will be called every frame.

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Now save that script by selecting File > Script in the tool bar and then head back into Unity. Click the play button at the top of the screen (pictured below) to run the scene so we can test our script. As you move your cursor on the screen, you should see the values in the console at the bottom of the screen change to reflect the position of the cursor. Neat!

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This is cool and all, but it doesn’t really do much on it’s own. Let’s makes things a little more fun and give our old pal *Jerry* a face. To do this, you will use the “Player.PNG” you downloaded earlier and Unity’s built in Sprite Renderer component. To start, download the file below and then drag and drop it into the *Sprites* folder you created earlier. You should see the picture appear in your Unity project files on the bottom of the screen when you select the *Sprites* folder. You have now successful imported your first **Asset** into Unity, congrats!

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Let’s add this new image to our Unity object. Select *Jerry* in the *Hierarchy* panel on the left. After it is selected, you’ll see its two components from earlier appear on the right side of the screen. Select *Add Component* and then type in and select Sprite Renderer. Now your object will have a blank sprite renderer. You can see a variety of options in the Sprite Renderer. The fun ones we’ll be focusing on are *Sprite*, *Color*, and *Flip*. Drag and drop the .PNG file from the *Sprites* folder onto the *Sprite* section of the Sprite Renderer. You should now see the .PNG file appear in the Unity scene. If you don’t, try zooming in, he may be hidden behind the camera icon.

**INSERT PIC HERE**

Sure he’s there, but he looks a little tiny and blurry right? Let’s fix that. To do this, we will have to alter the import settings on the .PNG image. Select the image inside of the *Sprites* Folder. After selecting it, you should see a variety of options appear on the right side of the screen under the *Inspection* tab. Let’s change a few of those. To start, change *Pixels Per Unit* from 100 to 32. The imported .PNG is 32x32, so this should make it approximately one Unity unit (very nice alliteration) large. Next change *Filter Mode* from Bilinear to Point (no filter). This will make our image appear in Unity exactly as we designed it outside of Unity. Then, click *Apply* at the bottom of the settings. You should now see a larger blockier smiley face.

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Alright, now let’s hit play and see how things are looking… hmm…. Things aren’t looking too good. You really won’t see anything even though you can see *Jerry*’s coordinates changing. What gives? Well it’s pretty simple. While we are handling the cursors position in 2D, Unity actually handles movement in 3D. *So* while Jerry may be in the correct X and Y positions, his Z position is not correct. Since we find the position using the camera, our Z position will actually be set to the Z position of the camera. This is no good, because the camera doesn’t render things if they are too close, and being in the exact same position is DEFINITELY what I would call too close.

To fix this we need to go back and edit our code a little. We are still going to find the position of our mouse in every *Update*, but instead of just setting the position of *Jerry* to be that position, we are going to create a new more correct instance of Vector3 using the mouse position. We can use Unity’s imported Vector3 constructor to do this. It takes three variables, an X, a Y, and a Z. Just pass in the mousePosition’s X (mousePosition.x), the mousePosition’s Y (mousePosition.y), and a new Z (try 0) and then set transform.position equal to that. Don’t forget to save the script!

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Now let’s head back into Unity and see if that’s any better. Click Play and you can see that our little man will now follow our mouse cursor! Our very first game!!! (just kidding… unless you’re bored I guess… then this really is your very first game…)

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For bonus fun, try selecting *Jerry* and editing the *Sprite Renderer* component by changing the *Color* value. We can use this value to change the color of the white pixels in our sprite. Not enough fun? Try selecting the boxes next to *Flip* to flip the sprite. The *X* won’t do anything visible since the sprite is already mirrored along the X-axis, but selecting *Y* should provide some interesting results…

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**Part 2: Make A Fist**

A face is fun, but what’s more fun is a face that can hit things. If *Jerry* wants to be able to hit things in the environment, he is gonna need a couple new components.

The first of these components is called a Collider. A collider is sort of like a solid body. Sure *Jerry* has a sprite already attached that LOOKS solid, but it’s really just a picture that follows him. For him to actually be able to hit stuff and act like a block, he needs this collider. A collider can also act as a zone that activates an event when entered, but that’s not how we will be using it here. The collider component we will be using is called **Circle Collider 2D**. There are many different kinds of colliders, but since *Jerry* is a 2D circle, we will be using the 2D circle collider (very innovative naming).

The second component we need to add is a Rigidbody. When a Rigidbody is attached to an object, then the object will be able to be impacted by forces. Rigidbody is how we use the physics system that is built into Unity, so unless we are writing our planning to write our own physics, then we should just stick to Rigidbody. The specific component to add is **Rigidbody2D**.

So select *Jerry* from the object list on the left side of Unity and add in these two component the same way we added in the *SpriteRenderer* earlier. Remember, it’s **Circle Collider 2D** and **Rigidbody 2D**. After adding in them both we need to make a slight adjustment to the *Rigidbody 2D*. Change the body type setting from Dynamic to Kinematic. This stops our object from being affected by Gravity, which isn’t needed because our game is from a top down perspective.

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These changes are important, but they don’t actually do too much to gameplay at the moment. For us to see an impact, we need to make some enemies for *Jerry* to fight! To do this, we will use something called Prefabs. Prefabs are Unity objects that you build or import that can be added to your game through scripting or the Unity editor. Let’s start by making *Jerry* into a prefab. To do this, select the prefabs folder in the *Projects* section at the bottom of the screen. This will open the folder but you shouldn’t see anything since it is still empty. Next, just drag and drop the *Jerry* object in the *Hierarchy* tab on the left side of the screen to the empty folder area at the bottom of the screen. The *Jerry* object in the *Hierarchy* list on the left should turn blue to indicate that it is linked to the Prefab. Now any changes you make to the Prefab will affect the in game object.

**INSERT PIC HERE**

Now drag and drop the *Jerry* prefab onto that same *Hierarchy* list to create a brand new *Jerry*! You should now see a new object in the list titled *Jerry (1)*, which is just a copy of *Jerry*. Now let’s change him up a little to make him a good enemy. To start, it’s probably best to rename him so we don’t get confused. Think of a fun new name (I’m going with Tom) then right click the object in the list, click rename, and then type the name. Now we need to make sure that *Tom* doesn’t follow our cursor like *Jerry*, so let’s remove his *MouseManager* script. To do that, select *Tom* from the *Hierarchy* list, navigate your cursor to *Tom*’s *Inspector* on the right side of the screen, right click on the *MouseManager* component, and click Remove Component. We also need to change *Tom*’s *Rigidbody 2D* so he can be affected by outside forces. Change the Body Type setting to Dynamic and then set the Gravity Scale value to 0. Now *Tom* can be moved by other colliders but he cannot be moved by Gravity.

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Next we need to move *Tom* so he is actually visible. There are multiple ways to do this. One way is to simply click and drag *Tom* inside the Scene view. If *Tom* is currently selected, then he should appear in the Scene view surrounded by a box. Just move the box to move him. You can also do it by edition the X and Y value in the Position section of *Tom*’s *Transform* component. Just set both X and Y equal to 2 and he should be to the top left of *Jerry*.

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Lastly we are going to make him look different. Download “Enemy.PNG” and place it in your *Sprites* folder. Don’t forget to update the render settings like we did before (Pixels Per Unity to 32 and Filter Mode to Point (no filter)). Now click and drag the sprite onto the Sprite value of *Tom’s SpriteRenderer*. Tom should look a little meaner now. Go ahead and change *Tom*’s color to distinguish him a little more using the same method as earlier. I’m going to set him red and flip him upside down, while I make *Jerry* blue by editing his prefab.

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Go ahead and turn *Tom* into a prefab the same way we turned *Jerry* into one. Now we can easily make more *Tom*s to fight. Notice my Jerry prefab is still appears white even though I made *Jerry* blue. This is because I only made my game object blue, not the actual prefab itself.

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Now that we have one basic enemy, let’s add more. Go to the *Prefabs* folder and drag and drop as many *Tom*s as you want into the scene. Go ahead and change their names and colors too. Now you can have a whole rainbow of enemies to fight!

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**INSERT GIF**

**Part 3: Make A Friend**

Now we are going to raise the stakes a little. Manually placing things into the scene is fun, but making our scripts do the work for us is even better. Let’s make an enemy spawner. Start by creating a new empty game object and renaming it *SpawnPoint*. Next, create a new C# script, name it *EnemySpawner*, and add it to the *SpawnPoint* object.

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Now open the new script so we can add in the functionality we need. At the top declare a public variable of the *GameObject* class and name it enemy. **Save your script** and then head back into the Unity editor. After clicking on the screen and waiting a second, you should see a new variable appear in *Enemy Spawner* component in your *SpawnPoint* game object. When variables are declared to be public, they can be edited within the Unity editor. Now drag and drop our *Tom* prefab to assign him the the *Enemy* variable.

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Since our our script now knows what an enemy looks like, we can start spawning them. We need to start with a few new variables and a new Coroutine. Before you ask, a coroutine is a method that will can be paused and returned to later. If you’re familiar with threading, it’s similar in execution, but all of it is run on the main thread. Go ahead and copy paste the code below and I’ll try to explain to make things a little easier.

**INSERT CODE SNIPPET**

You’ll see at the top all our new variables. The public ones are ones we will manually set in the editor, so don’t forget to set them before you play the scene! In the screenshot below I put some values that I liked that made the spawner move back and forth 3 units decently fast while spawning an enemy every 0.1 seconds until there are 100 enemies.

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**INSERT GIF**

Alright, we’re about ready to wrap it up, but first let’s add one last splash of color. We’re going to make the enemies spawn as a rainbow of whatever colors your want! Start by declaring a new array of type Color in your *EnemySpawner* class by adding *public Color[] color to the ;*.Save this and head back into the Unity editor to select some new colors. Your *SpawnPoint* object should look something like the picture below.

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Click the triangle next to *Colors* to reveal its details and change the size value to be whatever amount of colors you want. I’m going to use 7 and select a few regular colors along the spectrum. After changing the value, black boxes should appear. Click the boxes to select the color. Make sure to also set the Alpha value of the color to max (255) so that our sprite won’t appear transparent. DO THIS WITH EVERY COLOR!!! I just spent 5 minutes trying to figure out why the sprites wouldn’t appear and I don’t want you to make the same mistake.

**INSERT PIC HERE**

Now head back into the *EnemySpawner* script to finish up. Make the following changes to the *Spawn* method. We will use an int named *colorSelect* to traverse out array. Notice that our *Instantiate* has been type casted so that it now returns a new object of type *GameObject*. Save this object so we can edit the *SpriteRenderer* component on it. Your code should be similar to what I have below. Now you can return and hit play!

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