v0.2

VARIABLES

What: Named box that stores a value
When: You need to remember something (speed, health, name, score)

```
int score = 0;           // whole numbers
float speed = 5.5f;      // decimals
bool hasKey = false;     // true / false
string title = "Hello"; // text
var hasKey = false;      // compiler infered type*
```

Note: *Use explicit types when learning or when the type isn't obvious. Use var when the type is obvious or very long

Common Mistakes:
- Forgetting *f* on float literals (ie. 5.5*f*)
- using vague names (x, thing, etc.)

Compound Operators

```
+= add and assign
-= subtract and assign
*= multiply and assign
/= divide and assign
++ add 1    // Pre or Post increment
-- minus 1  // Pre or Post increment

score += 5;   // score = score + 5
health -= 10; // health = health - 10
```

IF STATEMENTS & CONDITIONS

What: "If this is is true -> do this"
When: Game logic decisions (Health low, button pressed, dead/alive)

```
if (health <= 0)
{
    Die();
}
else if (health < 20)
{
    Debug.Log("Low Health!");
}
else
{
    Debug.Log("All Good.");
}
```

```
> < >= <= // math comparisons
== // equals
!= // not equal
&& // And
|| // Or
!  // Not
```

```
// Combining conditions

if (hasKey && doorLocked) {}    // AND
if (isDead || health <= 0)  {}  // OR
if (!isGrounded) {}             // NOT
```

Note: "Ask a yes / no question. if yes -> run this code block {} "

SWITCH

What: Checks one value against many possible options
When: Cleaner than many ' if ' statements when checking the same variable.

```
switch (weaponType)
{
    case "Sword":
        damage = 10;
        break;

    case "Bow":
        damage = 6;
        break;

    default:
        damage = 1;
        break;
}
```

Note: "Depending on what this variable is, run the matching case"

- A 'case fall through' is when more than one case points to the same block of code instead of duplicating logic. ie.

```
switch (food) {
    case Foods.Cake:
    case Foods.IceCream:
        Debug.log("Junk Food");
        break;

    case Foods.Carrots:
        Debug.log("Healthy");
        break;
}
```

Common Mistakes:
- `break;` stops the switch and must follow every case.

FUNCTIONS (Methods)

What: A reusable block of code you can call by name
When: You repeat actions (damage, heal, spawn, play sound)

```
// Not returning data
void Jump()
{
    Debug.Log("Jump!");
}

// Returning Data
int CalculateDamage(int baseDamage, int bonus)
{
    return baseDamage + bonus;
}

//Calling them
// No data
Jump();

// Data
int damage = CalculateDamage(10,5);
enemyHealth -= damage;
```

Rules:
- *void* returns nothing (runs a function but does not return a value)
- Any other type must `return` something.

LOOPS

What: Repeat something multiple times

for

- Is a counter with controlled repetition (until a rule says stop)

```
for (START ; CONDITION ; STEP)
    START → CHECK → RUN → STEP
            ↑           ↓
            └─── repeat ─┘

// Create a counter from 0, if less than 5, add 1
// ' i ' is just a counter it could be anything.
for (int i = 0; i < 5; i++)
{
    Debug.Log(i);
}
```

foreach

- Run for every item in a collection (Automatic looping for all items)

```
foreach (Type item in collection)
{
    // runs once per item
}

//example - for each number, print it in console
List<int> numbers = new List<int>() { 1, 2, 3 };

foreach (int number in numbers)
{
    Debug.Log(number);
}
```

while

- Condition-based looping, loop while 'true' (unknown count)

```
while (ammo >0)
{
    Shoot();
    ammo--;
}
```

do while

- Code executes once and then checks condition at the end

```
do
{
    Debug.Log("Runs once no matter what");
}
while (false);
```

Common Mistakes:
- Creating an infinite loop will crash the game, an example is a condition that is always true. ie.

```
for (int i = 0; true; i++)
{
    Debug.Log("Infinte Loop!")
}
```

DATA STRUCTURES

What: Containers holding multiple values.
When: Inventory, enemies, spawn points, scores, waypoints

Array

- Size is decided once and cannot change.
- indexing starts at postion [0]
- unassigned value use default values (int = 0) or (string = null)
- Arrays can have empty slots

```
type[] name = new type[size]
```

Example.

```
int[] scores = new int [3];

scores[0] = 10;
scores[1] = 20;
```

- Instead of specifying the size of an array, a shortcut is:

```
int[] scores = {10, 20, 30};
```

- Get the size of an array using .Length

```
for (int i = 0; i < scores.Length; i++)
{
    Debug.Log(scores[i]);
}
```

Note: Arrays are fast, but inflexible

Lists

- Can grow and shrink in size
- indexing also starts at position [0]
- Lists only store what you add (no empty slots)

```
List<string> items = new List<string>();
items.Add("Apple");
items.Add("Bread");

//Acces by index
Debug.Log(items[0]); // Apple
```

List Operations:

```
items.Count              // How many items
items.Add("Milk");       // Add item 'Milk'
items.Remove("Apple");   // Remove item 'Apple'
items.RemoveAt(0):       // Remove item @ index [0]
items.Clear();           // Clear ALL items
items.Contains("Bread");// Check if item 'Bread' exists
```

COMMENTS

What: Sometimes it is handy to annotate within your code. Comments are ignored by the compiler and do not affect the code.
When:
- Explain intent or reasoning
- Clarify complex logic
- Temporarily disable code

```
// this is a comment

/* this
    is a multi
    line comment
*/
```

Common Mistakes:
- Do not clarify obvious code, it unessesarily bloats the code
- Do not leave outdated comments

CODE BLOCKS

What: Code blocks are the building blocks of scripts, they are sections of code wrapped in { } that run as a unit.
Why: They:
- Control when code runs
- Defines scope for variables
- Group related logic

```
for(int i = 0; i < 5; i++)
{
    //code block
}

public class Player
{
    //code block
}
```

SCOPE

What: Defines where a variable can be accessed and how long it exists.
Rules:
- A variable exists only inside the { } where it is declared
- Inner (child) blocks CAN access variables from outer (parent) blocks (FIG.1)
- Outer blocks CANNOT access variables declared in inner (child) blocks (FIG.2)

FIG.1

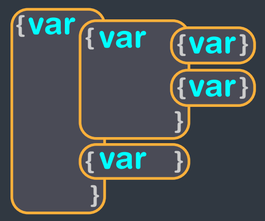
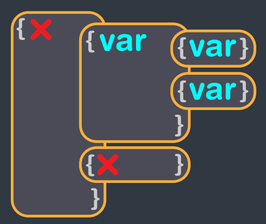


FIG.2




```
void CheckHealth()
{
    int playerHealth = 100;

    if(playerHealth < 150)
    {
        int damage = 25;
        Debug.Log(playerHealth); // ✅ Works
        Debug.Log(damage);       // ✅ Works
    }

    Debug.Log(playerHealth);     // ✅ Works
    Debug.Log(damage);           // ❌ ERROR
}
```

Note: Varriables live and die with their code block { }

CLASSES

What: A 'blueprint' that groups data (variables) and behavior (functions) together. Almost every script in Unity is a class.
When: Players, enemies, items, weapons, managers, controllers etc.

```
public class Player
{
    public int health = 100;

    public void TakeDamage(int damage)
    {
        health -= damage;
    }
}
```

Breakdown of the above:
Player → the type
health → data the player has
TakeDamage() → things the player can do

Unity Script Class

In unity if we want to attach a script to an scene object we need to add the MonoBehaviour to the class declaration which;
- Allows unity to attach the script to GameObjects
- Call start(), and Update()

```
public class PlayerController : Monobehaviour
{
    void Start()
    {
        Debug.Log("Game Started");
    }

    void Update()
    {
        //Code runs every frame
    }
}
```

Note: .cs script name must match the class name

CONSTRUCTORS

What: A special method that runs automatically when a class is created
Why: to set up initial values when an object is made.
- Has the same name as the class
- Has no return type (not even void)
- Runs once, automatically on creation

```
public class Player
{
    public int health;

    public Player()
    {
        health = 100;
    }
}
```

Breakdown of the above:
Player() is the constructor
When a Player is created → health is set to 100

CONSTRUCTORS [CONTINUED]

Constructors with parameters

By adding external parameters to our constructors we can decide values when the object is create.

Note: Think different health values for different enemy types

```
public class Enemy
{
    public int health;
    public Enemy(int startHealth)
    {
        health = startHealth;
    }
}

// Creating the object
Enemy weakEnemy = new Enemy(50);
Enemy strongEnemy = new Enemy(200);


public class Item
{
    public string name;
    public int damage;

    public item(string name, int damage)
    {
        this.name = name;
        this.damage = damage;
    }
}

// creates the item in C# memory
item sword = new Item("Sword",100);
```

⚠ No Constructors for : MonoBehaviour ⚠

Unity's MonoBehaviour class does NOT use constructors, instead it uses the following;

```
// Scene Loads
↓
// GameObjects are created
↓
Awake() // Before first frame is run
↓
Start() // Game Starts - first frame
↓
Update() // run each frame of the game
```

Note: Awake() purpose is 'internal setup' anything that is needed during Start() is already instantiated and ready.

Note: Constructors DO matter in Unity for plain C# classes (non-MonoBehaviour) [ie.] Data Classes, Inventory Items, Stats

ACCESS MODIFIERS

What: Access modifiers control access between classes, not within a class.
Why:
- Protect data from unintended changes
- Define clear boundaries between scripts
- Make code safer and easier to maintain

public

- Accesible from anywhere
- Visible in the Inspector
- Most permissive

Use When: You want other scripts, functions, or the inspector to access it

```
public int health;
```

private

- Accesible only inside this class
- NOT visible in the inspector
- Default if no modifier is specified

Use When: The variable is internal logic and shouldn't be touched externally

```
private int damage;
int damage;          // this is already private(default)
```

protected

- Accesible in this class AND child classes
- NOT accesible from unrelated scripts

Use When: You expect other classes to inherit from this one.

```
protected int mana;
```

internal

- Accesible only within this project (essentially similar to public)

Use When: not entirely sure? maybe mod support?

```
internal int score;
```

[SerializeField]

In unity if we want a private variable to be saved by unity and visible & editiable in the inspector we need to add [serializeField] before the access modifier.

Note: Editable in Unity, protected in code

```
[SerializeField] private float speed;

private          // hidden from other scripts
[SerializeField] // visible in Inspector
```