VARIABLES AND COMPONENTS

Topics

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- Variables in C#

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- **Variables in C#**
  - Declaring and defining variables

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- Important C# Variable Types

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    - float literals are followed by an f: `3.14f`

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  - Color

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  - SystemInfo
  - GameObject

Important Unity Variable Types

Important Unity Variable Types

- Vector3 – A collection of 3 floats

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- **Vector3 – A collection of 3 floats**
  - **Used for position of objects in 3D**

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Vector3 vec = new Vector3( 3, 4, 0 );
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  - **Instance variables and functions**

`vec.x` – The x component of the vector

`vec.y` – The y component of the vector

`vec.z` – The z component of the vector

`vec.magnitude` – The length of the vector

`vec.Normalize()` – New Vector3 in the same direction at unit length

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`Vector3.zero` – Shorthand for `new Vector3( 0, 0, 0 );`

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    `Vector3.Dot( vA, vB );` – Dot product of vA and vB

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Color col = new Color( 0.5f, 0.5f, 0, 1f );
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Color col = new Color( 0.5f, 0.5f, 0, 1f );
Color col = new Color( 1f, 0f, 0f ); // Alpha is optional
```

  - **In the Unity color picker, the RGBA values are in the range 0–255. These are then mapped to 0–1f.**
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`col.r` – The red component of the vector

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Important Unity Variable Types

- **Color – A color with transparency information**
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```
// Primary Colors: Red, Green, and Blue
Color.red     = new Color(1, 0, 0, 1); // Solid red
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Important Unity Variable Types

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// Secondary Colors: Cyan, Magenta, and Yellow
```

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Color.gray    = new Color(0.5f, 0.5f, 0.5f, 1) // Gray
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Color.gray    = new Color(0.5f, 0.5f, 0.5f, 1) // Gray
Color.grey    = new Color(0.5f, 0.5f, 0.5f, 1) // British spelling of gray
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Color.gray    = new Color(0.5f, 0.5f, 0.5f, 1) // Gray
Color.grey    = new Color(0.5f, 0.5f, 0.5f, 1) // British spelling of gray
Color.clear   = new Color(0, 0, 0, 0); // Completely transparent
```

Important Unity Variable Types

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- Quaternion – Rotation information

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- **Quaternion – Rotation information**
  - Based on three imaginary numbers and a scalar

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  - **So, everyone uses Euler angles (e.g., x, y, z) to input rotation**

```
Quaternion up45Deg = Quaternion.Euler( -45, 0, 0 );
```

  - **In Euler (pronounced "oiler") angles, x, y, & z are rotations about those respective axes**
  - **Quaternions are much better for interpolation and calculations than Euler angles**
    - They also avoid Gimbal Lock (where two Euler axes align)
  - **Instance variables and functions**

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`up45Deg.eulerAngles` – A Vector3 of the Euler rotations

Important Unity Variable Types

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- Mathf – A collection of static math functions

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```
Mathf.Sin(x);          // Computes the sine of x
```

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```
Mathf.Sin(x);          // Computes the sine of x

Mathf.Cos(x);          // .Tan(), .Asin(), .Acos(), & .Atan() also available
```

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```
Mathf.Sin(x);          // Computes the sine of x

Mathf.Cos(x);          // .Tan(), .Asin(), .Acos(), & .Atan() also available

Mathf.Atan2( y, x ); // Gives you the angle to rotate around the z-axis to
                       //  change something facing along the x-axis to face
                       //  instead toward the point x, y.
```

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```
Mathf.Sin(x);          // Computes the sine of x

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Mathf.Atan2( y, x ); // Gives you the angle to rotate around the z-axis to
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print(Mathf.PI);       // 3.141593; the ratio of circumference to diameter
```

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print(Mathf.PI);       // 3.141593; the ratio of circumference to diameter

Mathf.Min( 2, 3, 1 );// 1, the smallest of the numbers (float or int)
```

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```

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Mathf.Round( 1.75f );// 2, rounds up or down to the nearest number
```

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Mathf.Ceil( 1.75f ); // 2, rounds up to the next highest integer number
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Mathf.Floor( 1.75f );// 1, rounds down to the next lowest integer number
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Mathf.Abs( -25 );      // 25, the absolute value of -25
```

Important Unity Variable Types

Important Unity Variable Types

- Screen – Information about the display

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- Screen – Information about the display
  - Static class variables and functions

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- **Screen – Information about the display**
  - **Static class variables and functions**

```
Screen.width            // The width of the screen in pixels
```

Important Unity Variable Types

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  - **Static class variables and functions**

```
Screen.width          // The width of the screen in pixels
Screen.height         // The height of the screen in pixels
```

Important Unity Variable Types

- **Screen – Information about the display**
  - **Static class variables and functions**

```
Screen.width                    // The width of the screen in pixels
Screen.height                   // The height of the screen in pixels
Screen.showCursor = false;      // Hide the cursor
```

Important Unity Variable Types

Important Unity Variable Types

- SystemInfo – Information about the device/computer

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Important Unity Variable Types

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  - **Always has a Transform component**
  - **Instance variables and functions**

```
go.name                    // The name of the GameObject ("MyGO")
go.GetComponent<Transform>()    // The Transform component
go.transform               // A shortcut to the Transform component
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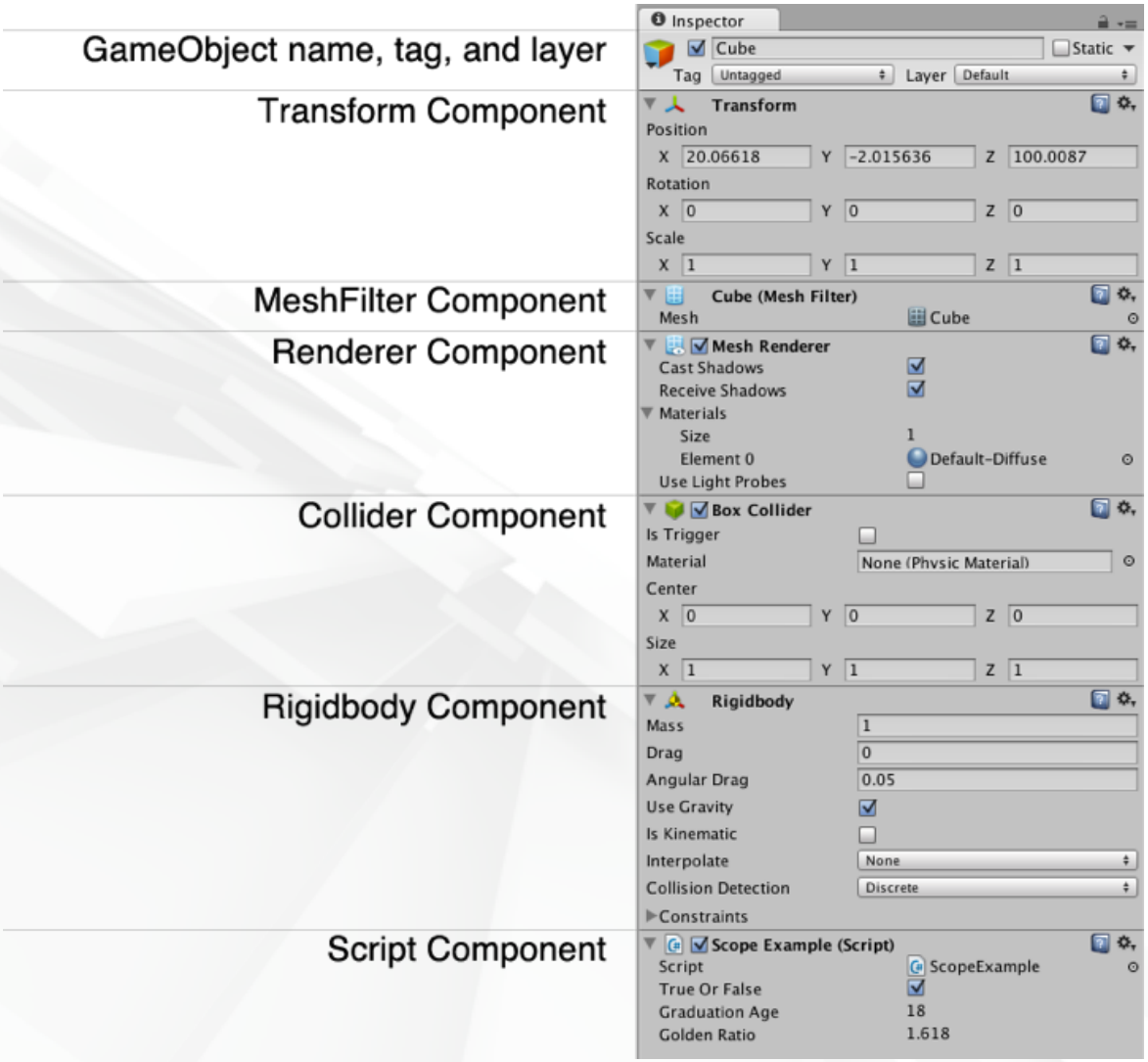
  - **GetComponent<>() is a generic method that can be used to access *any* component attached to a GameObject**

Unity GameObject Components



GameObjects are composed of Components

Unity GameObject Components

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  - **Also controls hierarchy of objects in the scene**

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tr.parent      // The parent of this transform in the hierarchy
```

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foreach (Transform tChild in tr) {…}
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tr.position            // The position in world coordinates
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  - **Attaches a 3D model to a GameObject**
  - **Is actually a 3D shell of the object (3D objects in games are hollow inside**
  - **This MeshFilter is rendered on screen by a MeshRenderer component**

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  - **Combines the MeshFilter with a Material (which contains various Textures and a Shader)**

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- Next chapter will introduce you to Boolean operations and the conditionals used to control C# code