# Window OpenGL Exercises

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## 1 Easy Difficulty

These only require the change of a few numbers or strings!

**Exercise 1.** Change the color of the window to a shade of Orange
Hint: colors have 4 numbers RGBA(Red, Green, Blue, Alpha) each between 0.0f and 1.0f

**Exercise 2.** Change the size of the window to $width = 400$, $height = 225$
Hint: you need to change both the window itself, and the OpenGL viewport

**Exercise 3.** Change the name of the window to "I made this!"
Hint: check the window creation function

## 2 Medium Difficulty

This requires the use of a function!

**Exercise 1.** !!!EPILEPSY WARNING!!!
Make the window flicker between two colors
Hint: use `glfwSwapBuffers(window)` in the right place

## 3 Hard Difficulty

This requires the use of multiple variables and functions!

**Exercise 1.** Make the window nicely fluctuate between a variety of colors using `glfwGetTime()` (this function returns the number of seconds that have passed since the beginning of the program as a double)

Hint: make an if statement that becomes True periodically, and inside of it change the value of the variable that controls the colors; do not forget to transform the doubles into floats

# Solutions

Each image first shows the original code, and then the solution code

Ex1.1

```
// Before Exercise 1.1
    glClearColor(0.07f, 0.13f, 0.17f, 1.0f);

// After Exercise 1.1
    glClearColor(1.0f, 0.37f, 0.07f, 1.0f);
```

Ex1.2

```
// Before Exercise 1.2
    GLFWwindow* window = glfwCreateWindow(800, 800, "YoutubeOpenGL", NULL, NULL);
    // And
    glViewport(0, 0, 800, 800);

// After Exercise 1.2
    GLFWwindow* window = glfwCreateWindow(400, 225, "YoutubeOpenGL", NULL, NULL);
    // And
    glViewport(0, 0, 400, 225);
```

Ex1.3

```
// Before Exercise 1.3
    GLFWwindow* window = glfwCreateWindow(800, 800, "YoutubeOpenGL", NULL, NULL);

// After Exercise 1.3
    GLFWwindow* window = glfwCreateWindow(800, 800, "I made this!", NULL, NULL);
```

Ex2.1

```
// Before Exercise 2.1
    while (!glfwWindowShouldClose(window))
    {
        glfwPollEvents();
    }

// After Exercise 2.1
    while (!glfwWindowShouldClose(window))
    {
        glfwSwapBuffers(window);
        glfwPollEvents();
    }
```

Ex3.1

```
// Before Exercise 3.1
    while (!glfwWindowShouldClose(window))
    {
        glfwPollEvents();
    }

// After Exercise 3.1
    float prev_time = float(glfwGetTime()); // Keeps track of time
    float angle = 0.0f; // Will control the color

    while (!glfwWindowShouldClose(window))
    {
        float time = float(glfwGetTime());
        if (time - prev_time >= 0.1f) // Every 0.1 seconds it's True
        {
            angle += 0.1f; // Changes angle in order to change color
            prev_time = time; // Resets prev_time to current time
        }
        // Use of trigonometry to nicely change colors
        glClearColor(float(sin(angle)), float(cos(angle)), float(tan(angle)), 1.0f);
        // Basic needed functions for changes to be visible
        glClear(GL_COLOR_BUFFER_BIT);
        glfwSwapBuffers(window);
        glfwPollEvents();
    }
```