Triangle OpenGL Exercises

Victor Gordan

1 Easy Difficulty

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

Exercise 1. Change the equilateral triangle to a right triangle
Hint: don't forget the coordinates are always between -1.0f and 1.0f

Exercise 2. Draw points instead of Triangles
Hint: use `GL_POINTS`

2 Medium Difficulty

These require the use of a function and the change of some variables!

Exercise 1. Draw a square
Hint: add three more vertices and don't forget about `glDrawArrays`

Exercise 2. Change VAO and VBO into VAOs and VBOs, and make them into arrays of size 1
Hint: there are multiple places you need to modify

3 Hard Difficulty

This requires the change of multiple numbers and words!

Exercise 1. Draw the outline of a square using `GL_LINE_LOOP` and 2D coordinates (get rid of the z axis)
Hint: google how `GL_LINE_LOOP` works and modify `glVertexAttribPointer` and `glDrawArrays`

Solutions

Each image shows the solution to one exercise

Ex1.1

```
84 GLfloat vertices[] =
85     {
86         -0.5f, -0.5f, 0.0f, // Lower left corner
87         0.5f, -0.5f, 0.0f, // Lower right corner
88         -0.5f, 0.5f, 0.0f // Upper left corner
89     };
```

Ex1.2

```
118 while (!glfwWindowShouldClose(window))
119     {
120         // Specify the color of the background
121         glClearColor(0.07f, 0.13f, 0.17f, 1.0f);
122         // Clean the back buffer and assign the new color to it
123         glClear(GL_COLOR_BUFFER_BIT);
124         // Tell OpenGL which Shader Program we want to use
125         glUseProgram(shaderProgram);
126         // Bind the VAO so OpenGL knows to use it
127         glBindVertexArray(VAO);
128         // Draw the triangle using the GL_TRIANGLES primitive
129         glDrawArrays(GL_POINTS, 0, 3);
130         // Swap the back buffer with the front buffer
131         glfwSwapBuffers(window);
132         // Take care of all GLFW events
133         glfwPollEvents();
134     }
```

Ex2.1

```
84 GLfloat vertices[] =
85     {
86         -0.5f, -0.5f, 0.0f, // Lower left corner
87         0.5f, -0.5f, 0.0f, // Lower right corner
88         -0.5f, 0.5f, 0.0f, // Upper left corner
89         - 0.5f, 0.5f, 0.0f, // Upper left corner
90         0.5f, 0.5f, 0.0f, // Upper right corner
91         0.5f, -0.5f, 0.0f // Lower right corner
92     };
...
132     glDrawArrays(GL_TRIANGLES, 0, 6);
```

Ex2.2

```
102     GLuint VAOs[1], VBOs[1];
103
104
105     glGenVertexArrays(1, VAOs);
106     glGenBuffers(1, VBOs);
107
108
109     glBindVertexArray(VAOs[0]);
110
111
112     glBindBuffer(GL_ARRAY_BUFFER, VBOs[0]);
...
130         glBindVertexArray(VAOs[0]);
...
142     glDeleteVertexArrays(1, VAOs);
143     glDeleteBuffers(1, VBOs);
```

Ex3.1

```
 84 GLfloat vertices[] =
 85     {
 86         -0.5f, -0.5f, // Lower left corner
 87         -0.5f, 0.5f, // Upper left corner
 88         0.5f, 0.5f, // Upper right corner
 89         0.5f, -0.5f // Lower right corner
 90     };
...
108 glVertexAttribPointer(0, 2, GL_FLOAT, GL_FALSE, 2 * sizeof(float), (void*)0);
...
130     glDrawArrays(GL_LINE_LOOP, 0, 4);
```