

CMPE 360

Hands-On Activity 7

Name(s):

True or False

1. Mark either True or False:

a)	True/False: _____	Raster images can be zoomed in infinitely without loss of quality; whereas vector images show pixelation effects when zoomed in.
b)	True/False: _____	Mip mapping is a technique that creates multiple copies of a texture scaled down (by a factor of two) multiple times and it is used to give better results for distant objects.
c)	True/False: _____	Texture mapping is an alternative rendering technique to using the Phong illumination model, you should use one or the other per triangle.
d)	True/False: _____	We can use textures for changing surface appearance, as well as shadow effects or any application-specific purposes.
e)	True/False: _____	Bump mapping can create surface roughness in the interior of individual triangles by displacing actual geometric position of points over the textured surface along the local surface normal, according to the value the texture function evaluates to at each point on the surface.
f)	True/False: _____	The term “topology” is used to define how the triangles of a mesh are connected (ignoring the positions).
g)	True/False: _____	Representing meshes as triangle strips instead of separate triangles wastes space.

Rendering Pipeline

2. Answer the following questions about the graphics rendering pipeline:

- a) Number the following steps of the graphics pipeline in the correct order, i.e. write '1' to the first step, '2' to the second step, and so on.

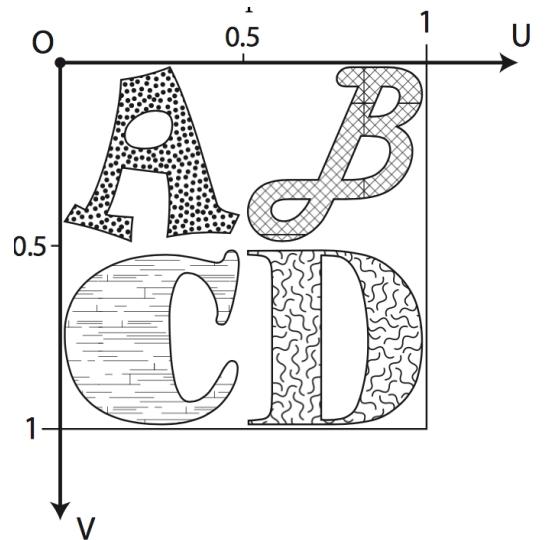
____ Fragment shading
____ Vertex shading
____ Blending (e.g. using color buffers)
____ Primitive assembly

- b) If you wanted to change all the vertex positions by multiplying each vertex's x -coordinate by the same vertex's y -coordinate, the best place to do it is: (choose one)

____ in the primitive assembly step
____ in the vertex shader
____ in the fragment shader
____ in the blending stage
____ it can't be done.

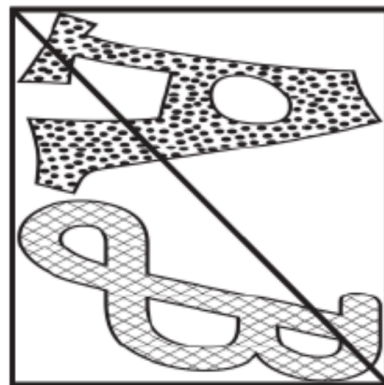
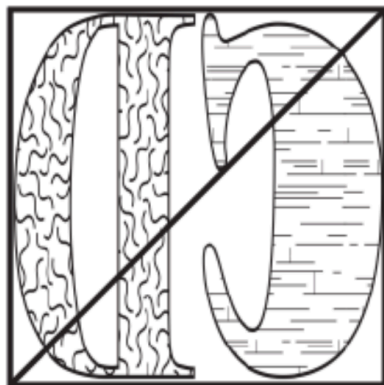
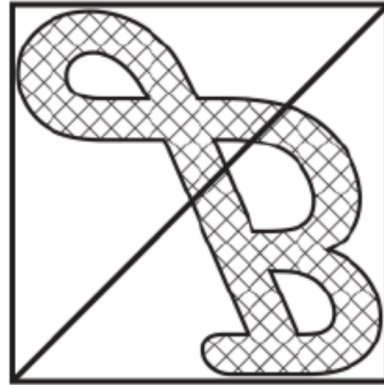
- c) What is the role of the primitive assembly step in the rendering pipeline?

3. Consider the texture map illustrated in the image below:



We want to apply this texture to the four square surfaces shown below, each of which has been split into two triangles:

(1,1)



For each vertex of each of the four squares, write the texture coordinates that we need to associate with this vertex in order to produce the desired appearance. **Write the coordinates in the form (u, v) next to each vertex in the figure.** (One example is given in the first figure).

Note: Don't be confused by the fact that each square is "split" into two triangles. You can simply answer this question on a vertex-by-vertex basis. At the end, you will write 16 (u, v) pairs of numbers, one next to each vertex of the squares above.

4. Use the following code magnets in the correct order to create a WebGL **vertex shader** and a **fragment shader** for mapping a texture pattern to a 3D surface. Also **fill in the missing parts** of the code magnets, marked within the text as blanks. (Note: assume that the texture and position coordinates of vertices are sent by the application; you do not need to write the application – Javascript – code).

Write the final code of the vertex shader and fragment shader.

```
attribute vec4 a_Position;  
attribute vec2 a_TexCoord;
```

```
uniform sampler2D u_Sampler;  
[ ] vec2 v_TexCoord;
```

```
gl_Position = [ ]  
[ ] = a_TexCoord; * [ ]
```

```
#ifdef GL_ES  
precision mediump float;  
#endif
```

```
gl_FragColor = texture2D([ ], v_TexCoord);
```

```
void main() {  
}
```

```
[ ] mat4 u_MvpMatrix;  
varying vec2 v_TexCoord;
```

```
void main() {  
  
}
```