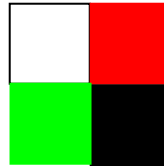
	<b>Computer Science</b>	<b>COMPSCI 372 S2 C – Exercise Sheet 7</b> 22 <sup>nd</sup> August 2008
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**Q1:** Give is a 2x2 pixel big texture image with the pixel colours

White (255, 255, 255)	Red (255, 0, 0)
Green (0, 255, 0)	black (0,0,0)



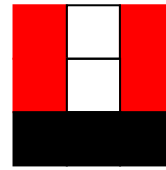
The image is mapped onto a polygon which occupies 3x3 pixels on the screen.

- (a) What is the colour of the screen pixels if **nearest neighbour interpolation** is used? Assume that if two distances are the same the first pixel in image order (left to right, bottom to top) is used.

- (b) What is the colour of the screen pixels if **linear interpolation** is used?

**Q2:** Give is a 3x3 pixel big texture image with the pixel colours

Red (255, 0, 0)	White (255, 255, 255)	Red (255, 0, 0)
Red (255, 0, 0)	White (255, 255, 255)	Red (255, 0, 0)
Black (0, 0, 0)	Black (0, 0, 0)	Black (0, 0, 0)

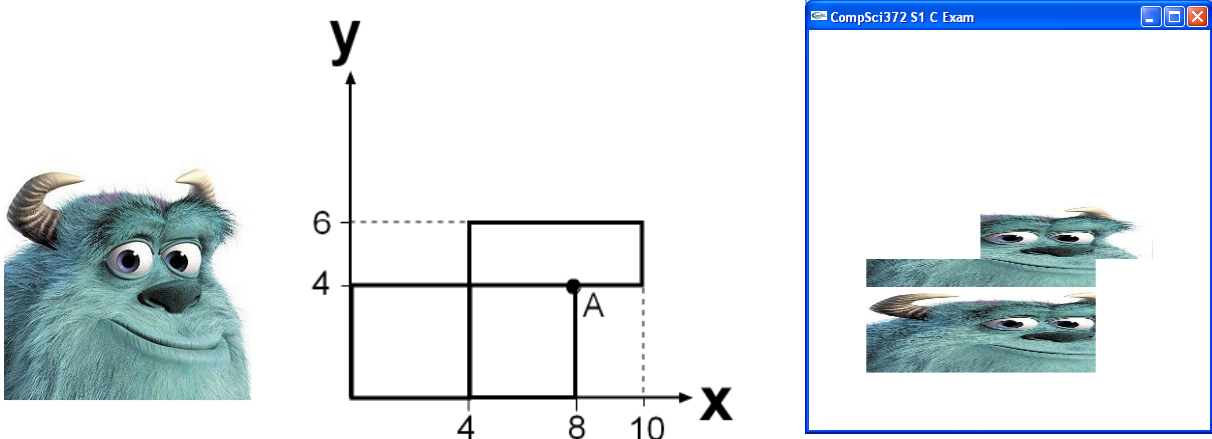


The image is mapped onto a polygon which occupies 2x2 pixels on the screen.

(a) What is the colour of the screen pixels if **nearest neighbour interpolation** is used?

(b) What is the colour of the screen pixels if **linear interpolation** is used?

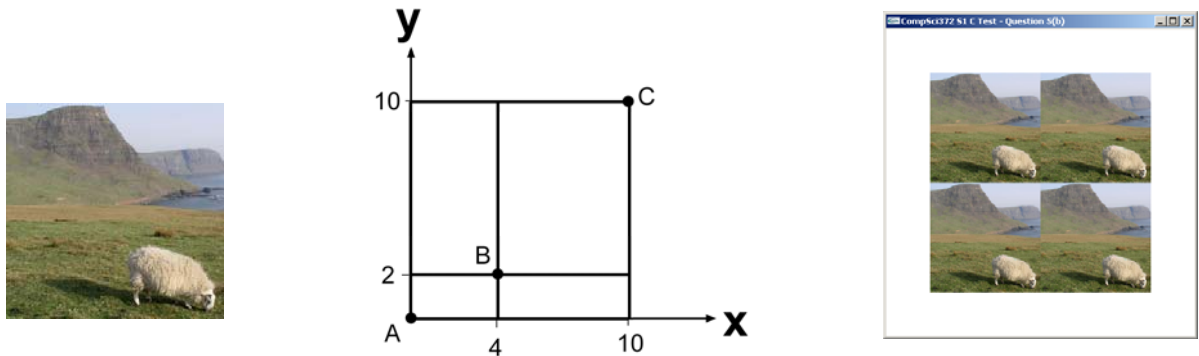
**Q3:** Given is the texture shown in the image below on the left and three polygons shown in the image below in the middle. Assume the texture coordinate of the bottom left vertex is (0,0) and the texture parameters `GL_REPEAT` are set. Which texture coordinates do we have to define for the vertex A in order to get the image shown below on the right?



**Q4:** Given is the texture shown in the image below on the left and four polygons shown in the image below in the middle. Assume the following texture parameters are set:

```
glTexParameteri(GL_TEXTURE_2D, GL_TEXTURE_WRAP_S, GL_REPEAT);
glTexParameteri(GL_TEXTURE_2D, GL_TEXTURE_WRAP_T, GL_REPEAT);
```

If the vertex A has the texture coordinates (0,0) which texture coordinates do you have to define for the vertices B and C in order to get the image shown below on the right?

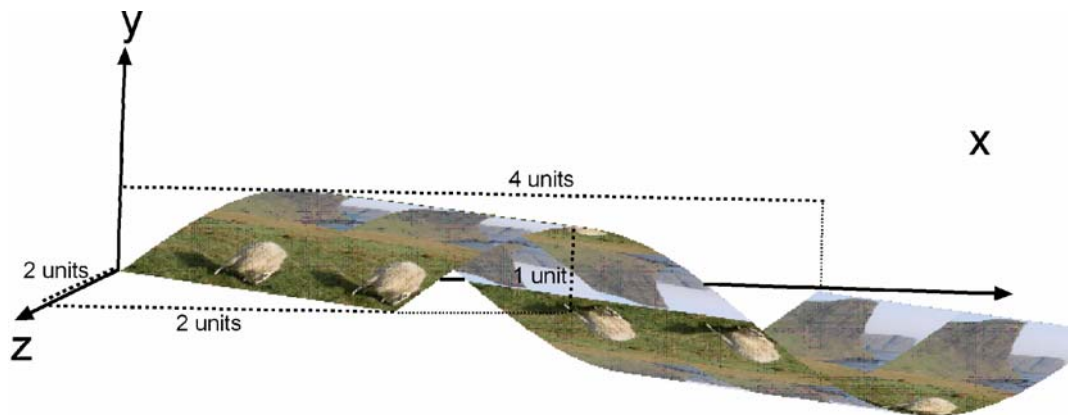


**Q5:** Given is the parametric surface  $\mathbf{p}(s,t) = (4t + 2s, \sin 2\pi t, 2s)$  where  $0 \leq s, t \leq 1$  and a function

```
float* point(float s, float t)
```

which implements  $\mathbf{p}(s,t)$  and returns an array of three floats.

Complete the code below which draws the surface below and repeats the texture image (shown on the right) four times in the  $t$  parameter direction and two times in the  $s$  parameter direction.



```
const int NUM_STEPS_T=32;
const int NUM_STEPS_S=16;

void display(void)
{
    // setting up the camera
    glMatrixMode( GL_MODELVIEW ); // Set the view matrix ...
    glLoadIdentity();           // ... to identity.
    gluLookAt(0,0,50, 2.5,0,0, 0,1,0); // camera is on the z-axis
    trackball.tbMatrix();       // rotate the cylinder using
                                // the trackball ...

    glClear( GL_COLOR_BUFFER_BIT | GL_DEPTH_BUFFER_BIT);

    // selecting the texture and enabling texture mapping.
    // NOTE: Assume that the texture wrap parameters are set to
    // GL_REPEAT.

    glBindTexture(GL_TEXTURE_2D, texName);
    glTexEnvf(GL_TEXTURE_ENV, GL_TEXTURE_ENV_MODE, GL_REPLACE);
    glEnable(GL_TEXTURE_2D);
```

```
// draw the surface and with suitable texture coordinates
```

```
glDisable(GL_TEXTURE_2D);  
glFlush ();  
glutSwapBuffers();  
}
```