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CMPUT 411: Introduction to Computer Graphics
Midterm Exam, October 25, 2000

1. What technical problems have to be addressed in writing an algorithm for scan-converting filled polygons? Note that you may assume flat shading of the polygons, so there is no change in brightness or color in the polygons (10 points).

2. Figure 1 below shows the content of a framebuffer, Figures 2 and 3 show two different patterns that can be shown, depending on how the look-up table is filled. Give the lookup-table entries (using B for black and W for white) to produce the two patterns (6 points).

0	0	0	0	0	0	0	0	0
0	1	3	7	6	7	8	10	0
0	1	3	5	6	5	8	10	0
0	1	4	4	6	5	9	10	0
0	2	3	4	6	5	8	10	0
0	2	3	4	6	5	8	10	0
0	2	3	4	6	5	8	10	0
0	0	0	0	0	0	0	0	0

Figure 1

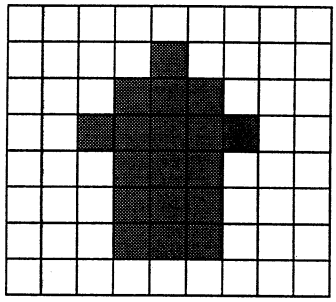


Figure 2

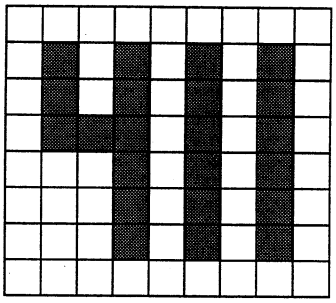
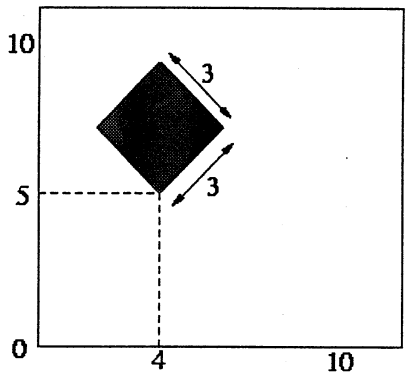


Figure 3

LUT address	LUT value (Figure 2)	LUT value (Figure 3)
0	W	W
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		

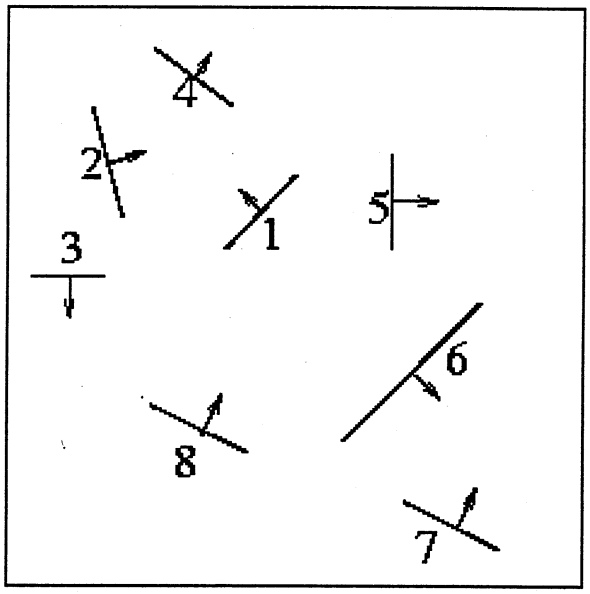
3. What techniques can be used to reduce aliasing effects in the rendering of primitives such as lines or polygons? (10 points)

4. What sequence of transformations has to be applied to the window below (shown in gray) in order to display it in the lower right quadrant of a 640 (horizontal) by 480 (vertical) raster screen? For both, the world-coordinate system and the screen, the lower left corner has coordinates (0,0). Note that you should give me the arithmetic expressions, not numerical values, so no calculator is needed (6 points).



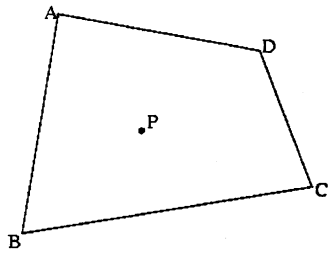
5. Three very closely related questions: a) What is a parallel canonical view volume? b) Sketch the sequence of transformations for mapping primitives into this canonical view volume. c) Why do we use a canonical view volume? (10 points)

...ollowing figure shows a top view of polygons. Each polygon is numbered and ...e arrow points in the direction of the front of the polygon. Show the BSP tree that is generated for this set of polygons. Whenever there is a choice between different polygons, choose the one with the lower number. That means you have to start with polygon 1. If necessary, amend the picture below to clarify your construction steps (8 points).



teps of the Cohen-Sutherland Algorithm for 3D clipping in a perspective
view volume (10 points).

8. In the polygon below, how is the pixel intensity at P determined for a) Phong shading and b) for Gouraud shading (8 points).



What are the advantages/disadvantages of Gouraud shading over Phong shading?