

Aids: None**Instructions**

The exam consists of 10 questions. The number of points awarded for each correct answer is stated next to the corresponding question. The maximum score is 22. To pass the exam, you need at least 13 points.

Read the questions carefully before answering and remain calm. Please write legibly in English – answers that I cannot understand will receive 0 points! Feel free to use figures/sketches to complement your written explanations.

Good luck!

Question 1 (3p): This piece of WebGL code will produce an animation by continually adjusting the *transformation* of an object. Only the most important part of the code is included. Describe, with the aid of a diagram, how the object (a square) will move.

```
var mvMatrix = mat4.create();
var anim = 0;

function animateWebGL()
{
    anim += 1.0;
}

function drawSceneWebGL()
{
    ...
    mat4.identity(mvMatrix);
    mat4.rotate(mvMatrix, anim, [0.0, 0.0, 1.0]);
    mat4.translate(mvMatrix, [0.0, anim, 0.0]);
    drawSquare();           //draws a square of width 1.0 on the screen with
                           //a local origin located at the square center
    ...
}
```

Question 2 (1p): What is a *local illumination model* in computer graphics?

Question 3 (3p): One common algorithm/principle for removing hidden surfaces in real-time graphics is *depth buffering* (or depth testing/Z-buffering). Explain how this algorithm/principle works.

Question 4 (2p): List four basic constituents of computer graphics scenes.

Question 5 (2p): Why are approximations necessary for creating interactive computer graphics applications?

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Question 6 (2p): Explain one important principle for creating natural looking movement in animation.

Question 7 (2p): Describe two simplifications (relating to light sources and object surfaces) that are often employed when lighting computer graphics scenes.

Question 8 (3p): List three data types in information visualization, providing one example of each.

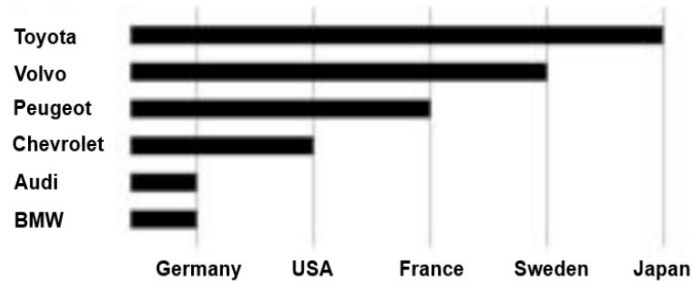


Figure 1. Graph illustrating the countries where respective car manufacturers are based.

Question 9 (2p): In Figure 1., a graph illustrates the respective countries where car manufacturers are based. For example, the graph indicates that Toyota is based Japan. Describe why the graph may lead to a risk of misinterpretation and suggest an alternative way of presenting the data that would minimize misinterpretation risks.

Question 10 (2p): What is meant by *regression analysis* and how is it useful in data mining?

END