1. Projection
   - Why we care so much about projection in 3D graphics
   - 3D setup: scene, camera, viewport, viewing frustum (and their representation in WebGL)
   - Coordinate systems: world, viewport, screen (be able to convert between coordinates)
   - Orthographic projection
   - Perspective projection (including concept of using similar triangles)
   - Review: Classes 10 and 13-14
2. Objects in 3D
   - How to define objects in 3D (vertices, faces, normal vector should point out)
   - Transformations in 3D, how they are used in WebGL (+ animation and rendering loop)
   - Review: Class 14, Labs 6-7, HWs 6-8
3. Hierarchical Models
   - Why we use hierarchical models
   - Concept of certain transformations being applied to different parts of an object or scene
   - Concept of using container variables in WebGL to achieve desired groupings
   - Review: Class 15, Lab 8, HW 7
4. Lighting
   - Concept of a light source and how it changes the shading on a object
   - Using normal vectors, light vectors, and the dot product to determine the color of a pixel
   - Different types of lights and their representation in WebGL (ambient, directional, point)
   - Review: Classes 16-17, Lab 9, HW 7
5. Texture Mapping
   - Main idea behind texture mapping: UV coordinates (3D object $\rightarrow$ 2D texture coordinates)
   - How to specify and use UV coordinates in WebGL
   - How to texture map planes/faces (not cone, sphere, etc)
   - Basic idea behind perspective-correct texture mapping (not the math)
   - Review: Classes 17-18, Lab 10, HW 8
6. Ray tracing
   - Main idea of "hidden surface removal", i.e. determining what is visible at each pixel
   - Z-buffering algorithm (alternative to ray tracing, loop over objects first)
   - Ray tracing (loop over rays first, one for each pixel)
   - How to draw different views, ray equation, how to find intersections
   - Review: Classes 19-22, HW 9
7. Pre-midterm topics
   - Less focus overall (recommend using your cheat sheet from the midterm as a quick guide)
   - Few key topics: recursion, transformations, Bézier curves (most issues on the midterm)

FINAL EXAM - December 2016

CSC 240 01: Computer Graphics

Instructor: Sara Mathieson

- This is a self-scheduled exam to be completed during one of the final exam periods.
- Please write all your work on these pages (front and back is okay, but do not use a blue book or any other pages).
- The exam is closed notes, closed Internet, and closed technology, but you may use two "cheat sheets".
- Your cheat sheets must be hand-written, created by you, 8.5" $\times$ 11", and can be double-sided (up to 4 sides total).
- Submit both cheat sheets with your exam.
- Do not discuss the exam with other students and respect the honor code of doing your own work.
- If you are unable to make progress on any part of the exam, tell me what you tried; describe your thought process.

Name	

Part 1	/20
Part 2	/20
Part 3	/20
Part 4	/20
Part 5	/20
Total	/100