CSE4203: Computer Graphics

Course Outline

Outline

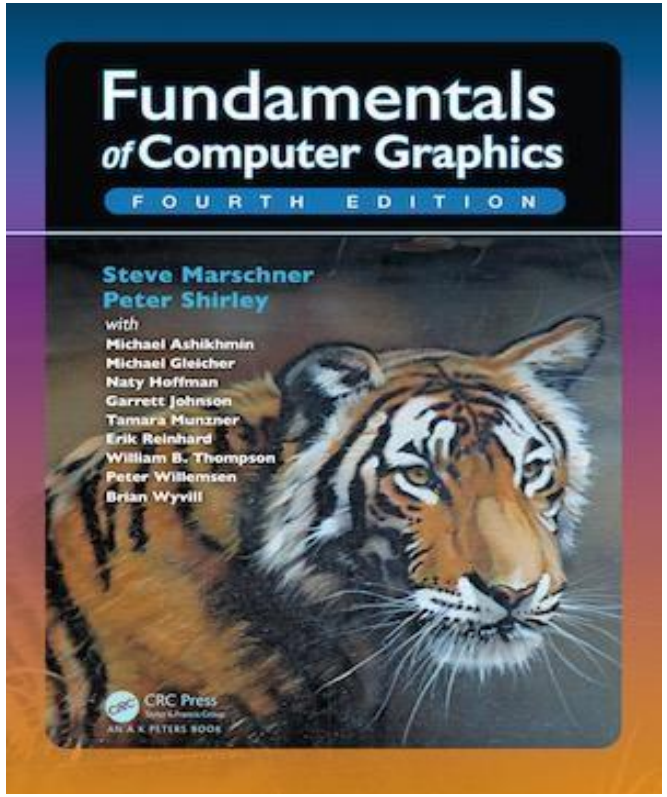
- Course Objective
- Required Books
- Week-wise Plan
- Tentative Date of Quizzes
- Marks Distribution
- Some Questions

Course Objectives

- Comprehend the basics of computer graphics and the graphics pipeline
- Apply 2D and 3D linear transformation, viewing, rasterization techniques, shading models and textures.
- Analyze different algorithms used in computer graphics.

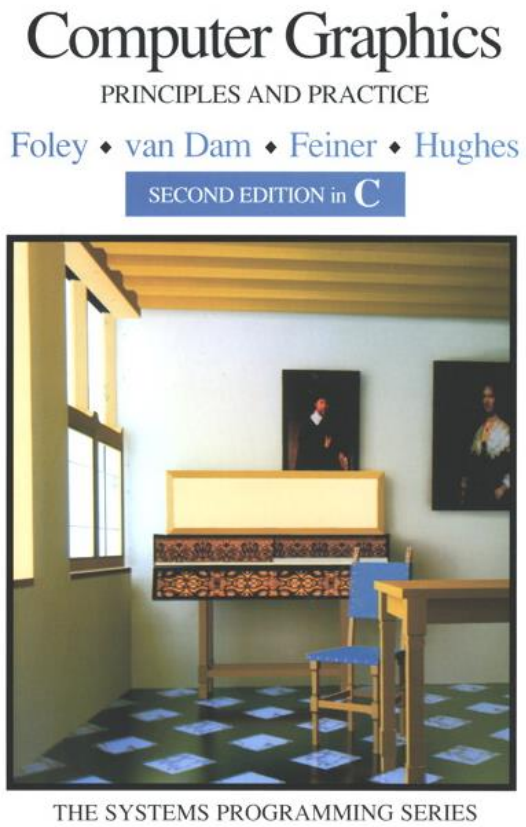
Required Books (1)

1. Fundamentals of Computer Graphics", 4th Edition. Authored by: Steve Marschner Peter Shirley



Required Books (2)

2. Computer Graphics Principles and Practice", Second Edition in C, 2003. Authored by: J. D. Foley, A. Van Dam, S. K. Feiner, and J. F. Hughes.



Week-wise Plan

Week	Topic
1	Introduction to Computer Graphics, Course Outline, and Motivation behind the course; Definition of Computer Graphics, Graphics areas and applications, Graphics API and Graphics pipeline.
2	What is Raster, Raster Images, Raster Devices (LED and LCD), Pixels, Geometry and RGB colors. Introduction to Ray Tracing and Basic Ray Tracing algorithm, Perspective, Viewing rays and Ray-Object Intersection

Week-wise Plan

Week	Topic
3	Ray-Object Intersection, Shading, A Ray Tracing program and Shadows, Introduction to Geometric Transformation and 2D Linear Transformation.
4	2D Linear Transformation and 3D Linear Transformation, 3D Linear Transformation

Week-wise Plan

Week	Topic
5	Viewing Transformation, Viewport Transformation, Orthographic Projection Transformation, and Camera Transformation; The Camera Transformation and Projective Transformations
6	Perspective Projection, Field-of-View, and Review of Transformations
7	More about Graphics Pipeline, Stages of Graphics Pipeline, Introduction to Rasterization and Line Drawing, Line Drawing

Week-wise Plan

Week	Topic
8	Circle Drawing, Triangle Rasterization and Introduction to Clipping, Clipping Before the Transform and Clipping in Homogeneous Coordinates.
9	Clipping against a Plane, perations Before and After Rasterization, Simple 2D Drawing and A Minimal 3D Pipeline, Using a z-Buffer for Hidden Surfaces, Per-vertex Shading, and Per-fragment Shading and Simple Antialiasing and Culling Primitives for Efficiency

Week-wise Plan

Week	Topic
10	Texture Mapping for Rasterized Triangle Data Structures for Graphics, Mesh Topology
11	Introduction to Surface Shading, Diffuse Shading, Diffuse Shading, and Phong Shading
12	Phong Shading, Introduction to Texture Mapping and 3D Texture Mapping 2D Texture Mapping
13	Curves, Bezier Curve, B-spline curves, Data structures used in Computer Graphics
14	Review classes

Tentative Date for Quizzes

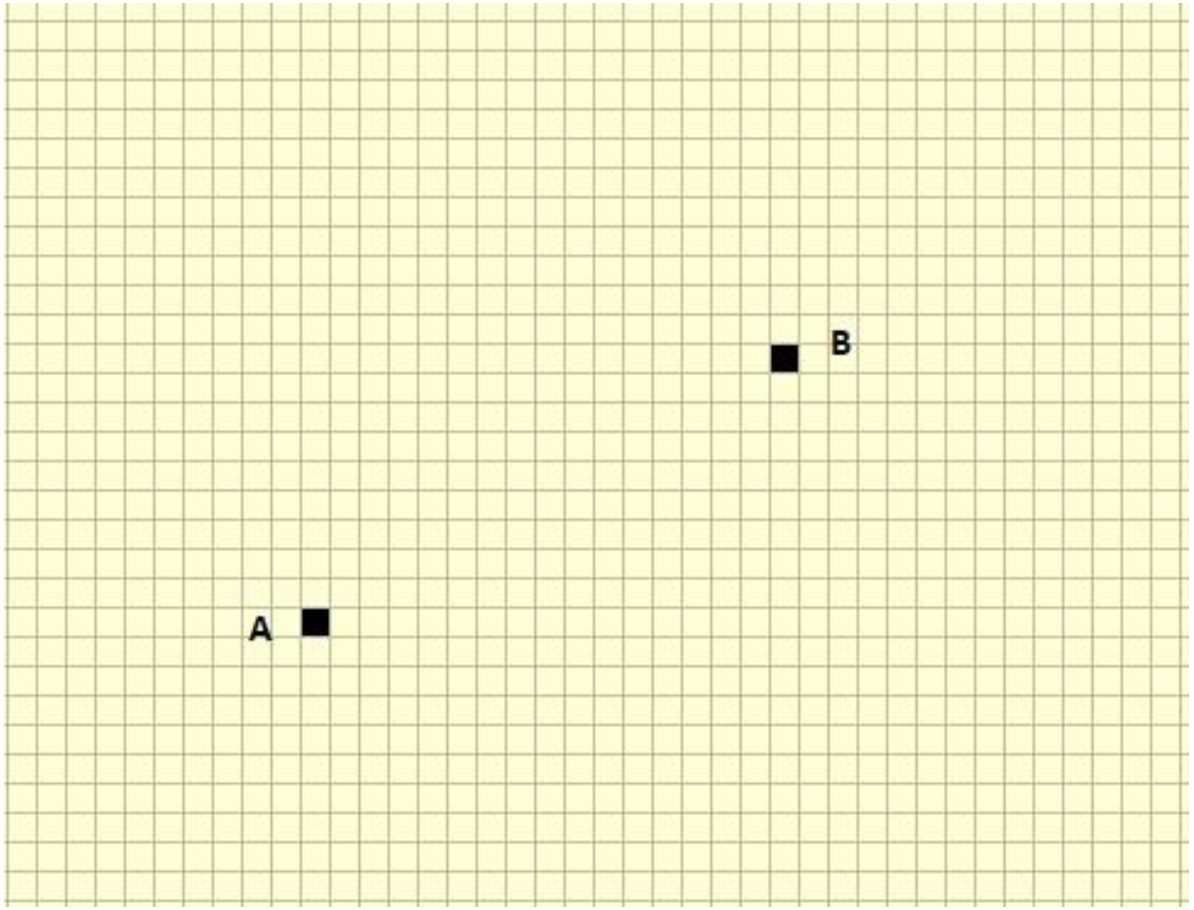
- Quiz 1 (Week - 4)
- Quiz 2 (Week – 6)
- Quiz 3 (Week – 11)
- Quiz 4 (Week – 13)

Marks Distribution

Class Performance	10%
Quizzes (Best 3 Out of 4)	20%
Final Examination	70%

Some Questions (1)

We have two points namely A and B. How does computer draws the line AB?



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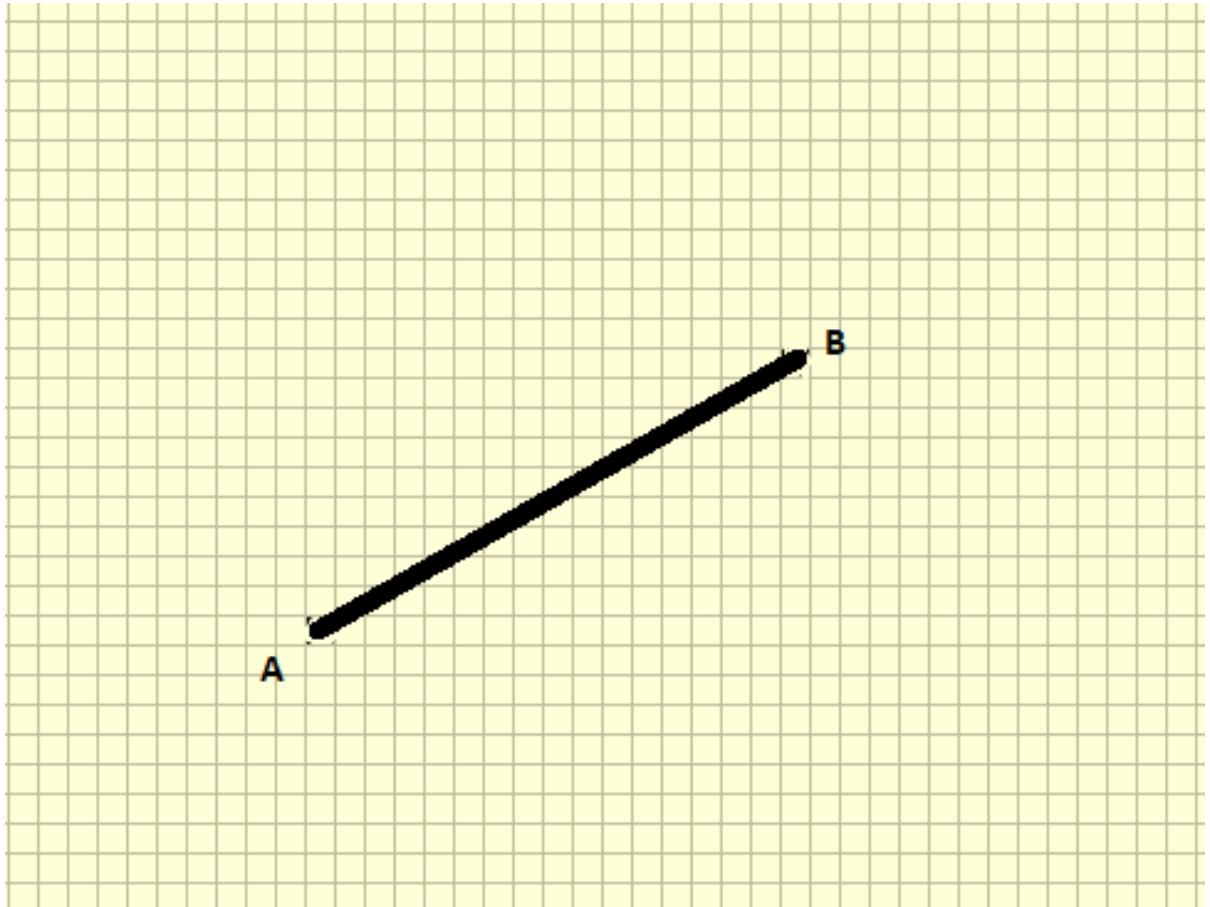

Is this correct?

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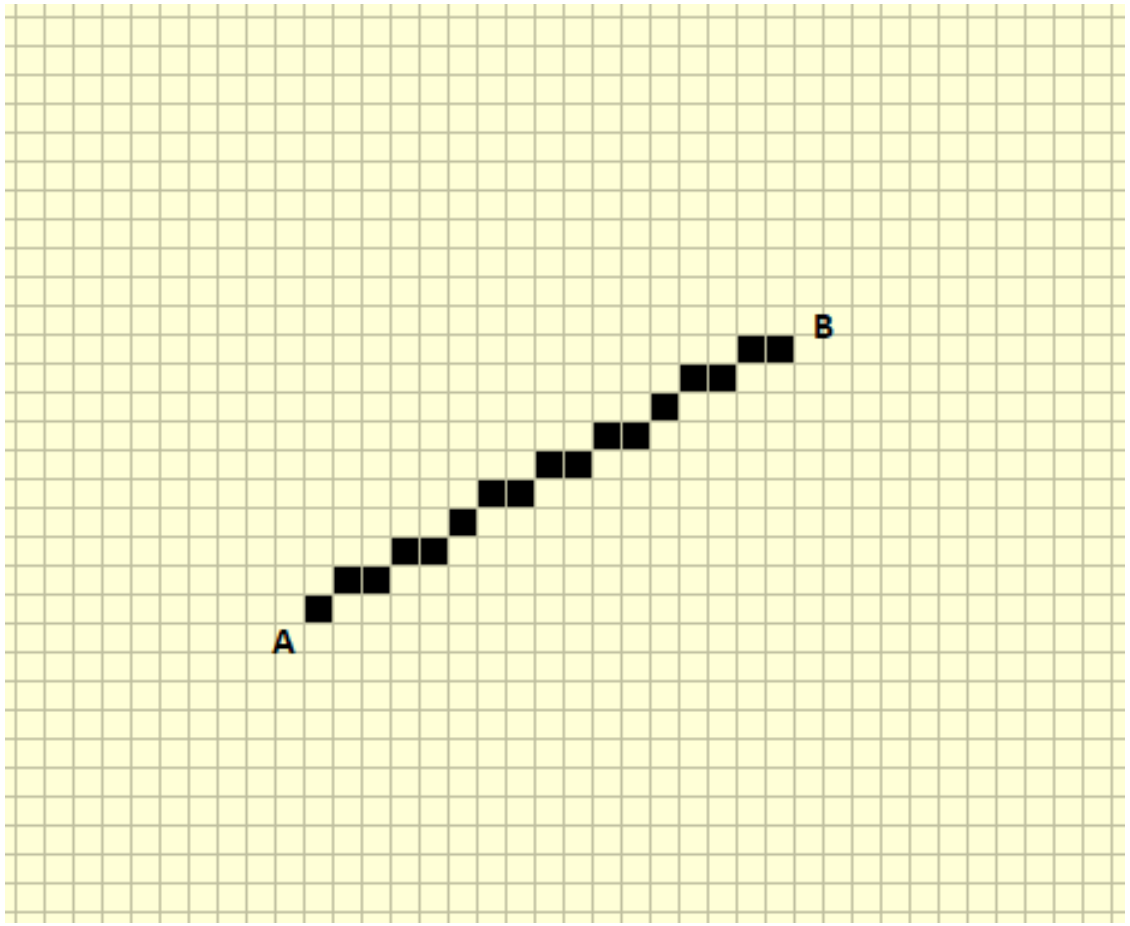
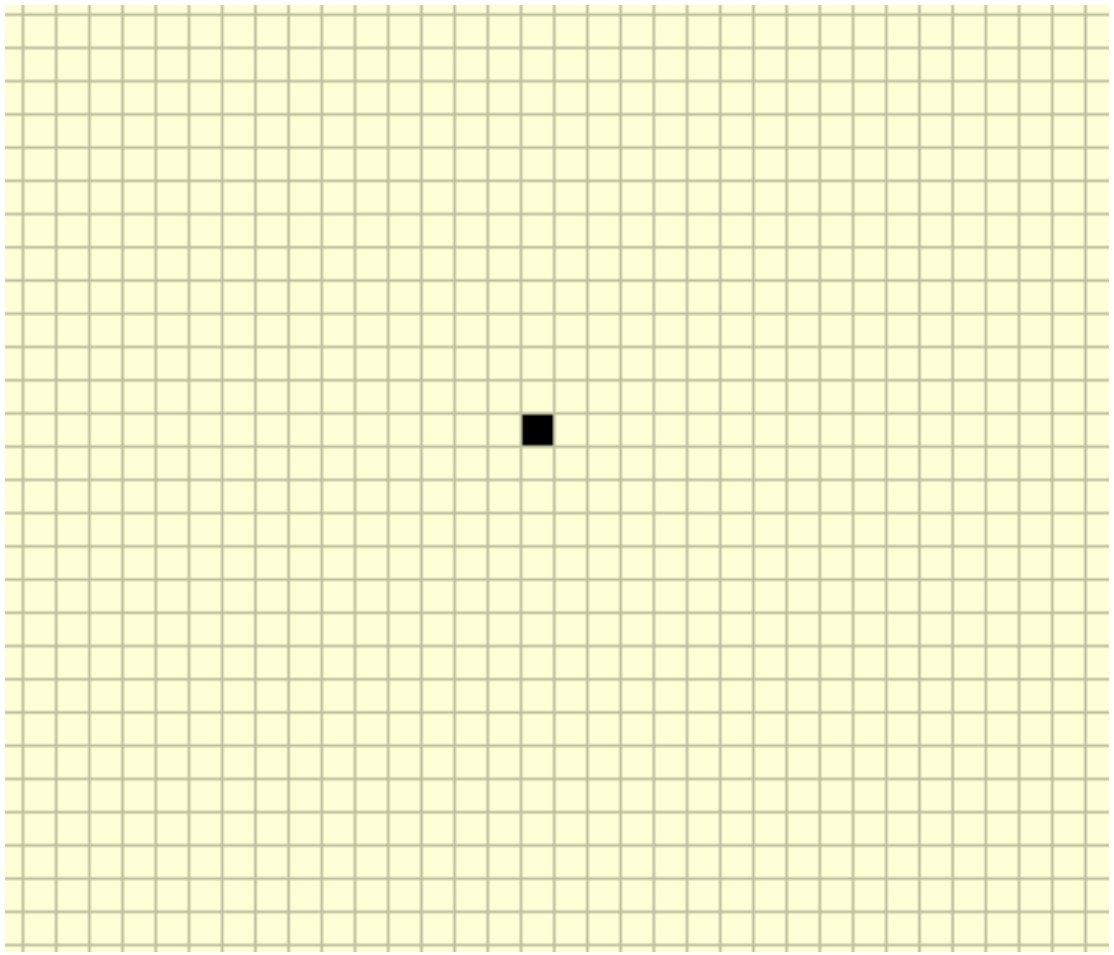


Some Questions (2)

How does computer draws a circle having radius of 5 pixels?



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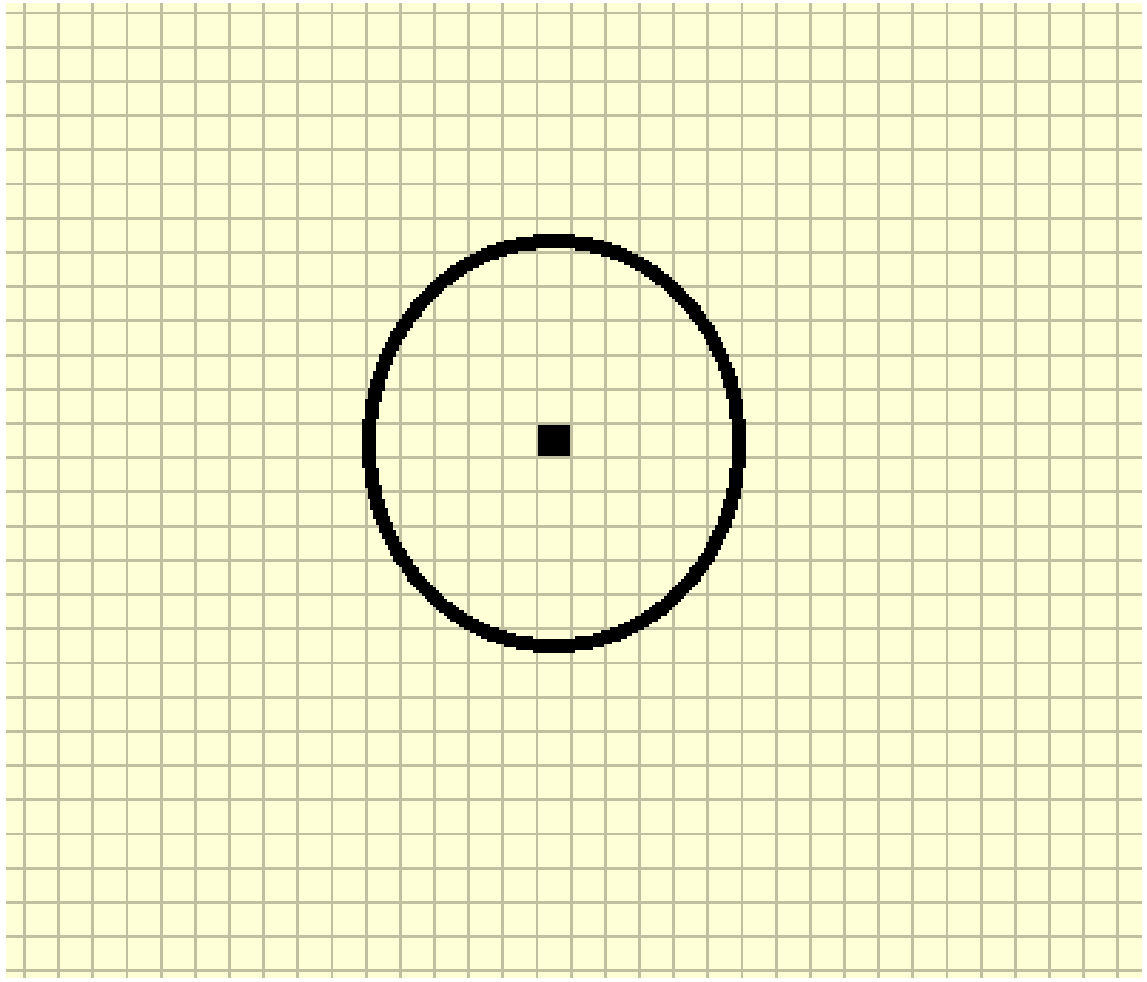

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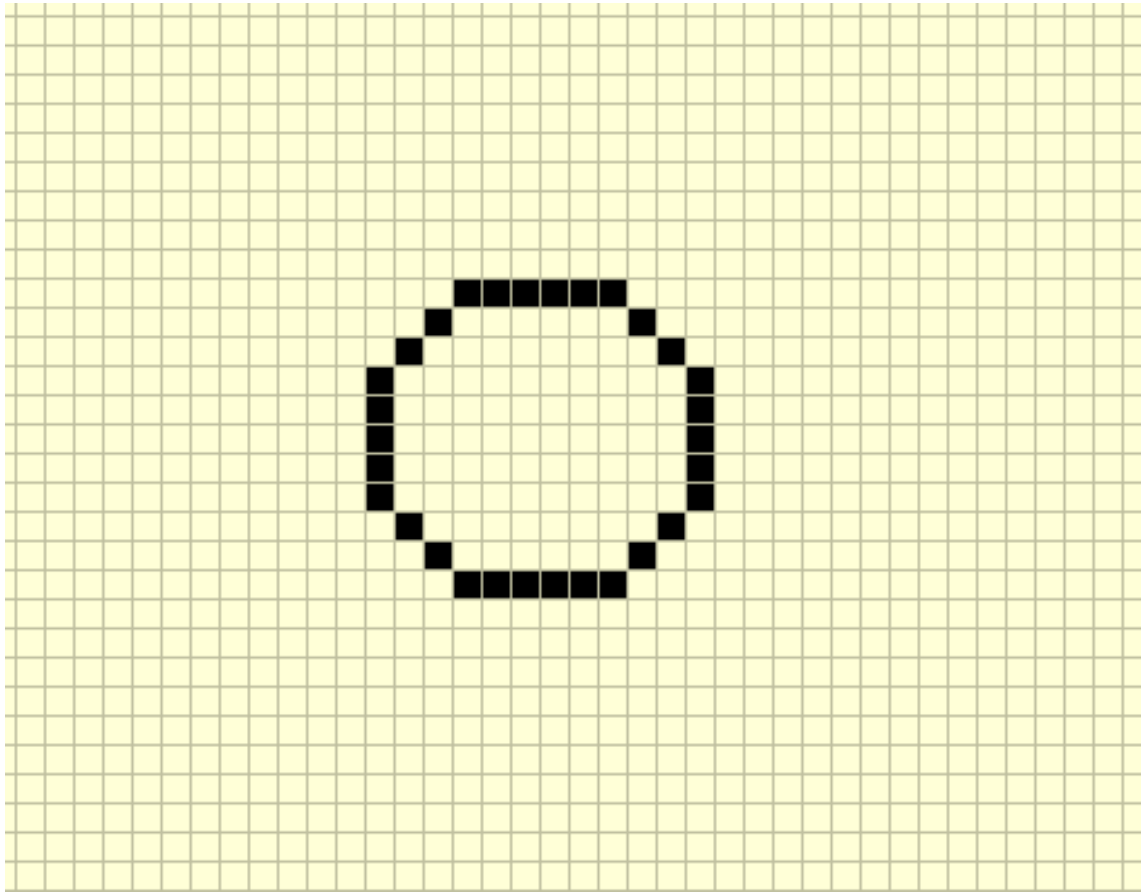
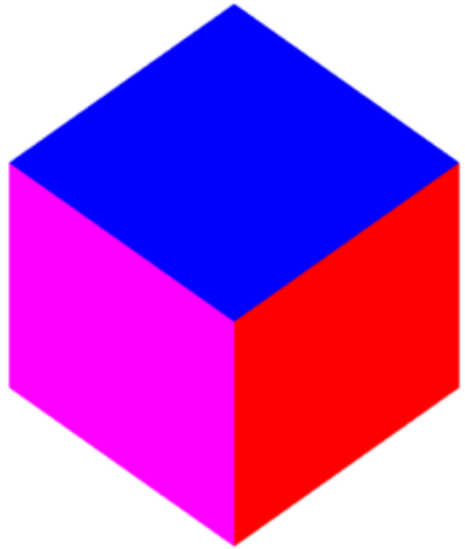


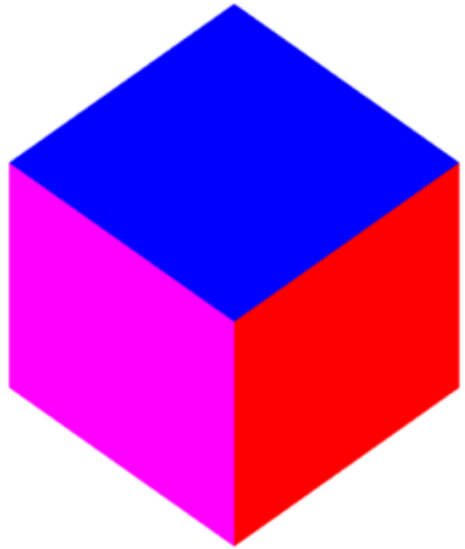
Activity: modeling and drawing a cube

- Goal: generate a realistic drawing of a cube
- Key questions:
  - Modeling: how do we describe the cube?
  - Rendering: how do we then visualize this model?



Activity: modeling and drawing a cube

- Suppose our cube is...
  - centered at the origin (0,0,0)
  - has dimensions 2x2x2
  - edges are aligned with x/y/z axes



Activity: modeling and drawing a cube

- QUESTION: What are the coordinates of the cube vertices?

  A: (1, 1, 1)
  E: (1, 1,-1)
  B: (-1, 1, 1)
  H: (-1,-1,-1)
  F: (-1, 1,-1)
  C: (1,-1, 1)
  G: (1,-1,-1)
  D: (-1,-1, 1)

- QUESTION: What about the edges?

  AB, CD, EF, GH,
  AC, BD, EG, FH,
  AE, CG, BF, DH