

- Draw a 3D unit cube centered at the origin, using polygons in the following colors: **red**, **green**, **blue**, **cyan**. Only draw four of the cube faces: do not draw the faces parallel to the XZ plane (i.e., you should draw a "box" that doesn't have a lid or a bottom). Draw the faces in this order: front (**red**), back (**green**), left (**blue**), right (**cyan**). Draw the faces using CCW vertex ordering.
- Polygon *front* faces should be filled (drawn using `GL_FILL`).
- Polygon *back* faces should be wireframe (drawn using `GL_LINE`).
- Draw a black 3D wireframe sphere centered at the origin that fits in the box, using `glutWireSphere`
- Draw the X, Y and Z axes as 3D "arrows" somewhat longer than the length of a box side, using your appropriately scaled display list from Lab 15 (X axis **red**, Y axis **green**, Z axis **blue**).
- Draw objects in this order: *cube*, then *sphere*, then *axes*.
- Use a menu to select between Perspective and Orthographic 3D projections.
- Use a menu to select between hidden surface removal methods:
  - z-buffering*
  - backface culling*
  - none*
- Use a menu to select **LookAt** eye positions, looking at the origin, with:
  - the eye at  $(0, 0, z)$  (i.e., on the +Z axis)
  - the eye at  $(x, 0, z)$  where  $0 < x = z$  (i.e., in the XZ plane)
  - the eye at  $(x, y, z)$  where  $0 < x = y = z$

Don't try to solve all parts all at once! First: get a 3D cube and sphere displayed with the eye on the Z axis, looking down -Z, without any hidden surface removal. Then: add Z-buffering. Then: draw the colored axes. Then: switch between projections. Then: add the z-buffer/face culling/no hidden surface removal option. Then: add different LookAt positions.

