Swing Concepts

- **Object < JComponent < JContainer < JFrame**
  - The component/container pair illustrates Composite pattern: Container has Components, including other Containers
    - Understanding Z-order, painting hierarchy is important in complex applications, see Core Java/Java Tutorial/O’Reilly
  - Containers have layout managers that control how widgets are added and appear
    - BorderLayout is versatile, FlowLayout is simple, GridBagLayout is the kitchen sink, GridLayout could be useful in OOGA
- **JPanel is the simplest container, use for holding widgets**
  - Defaults to FlowLayout, add widgets and other panels, ...
Swing continued

- **JFrame is a top-level window which is a container**
  - Widgets added to a frame’s content pain, retrieved via `getContentPane()`, different from AWT
  - `LayoutManager` used in default `getContentPane()` is `BorderLayout`
    - Use `BorderLayout.NORTH`, not “North” (some books)
- **Layout managers illustrates the Strategy Design Pattern**
  - Encapsulates algorithm/behavior as a class, pluggable
  - Users of strategy delegate responses/use to the the strategy
  - Put a new layout in every container you use (can’t hurt?)
Listeners

- Events propagate in a Java GUI as part of the event thread
  - Don’t manipulate GUI components directly, use the event thread
  - Listeners/widgets register themselves as interested in particular events
    - Events go only to registered listeners, can be forwarded/consumed

- ActionListener, KeyListener, ItemListener, MouseListener, MouseMotionListener, ..., see java.awt.event.*
  - Isolate listeners as separate classes, mediators between GUI, Controller, Application
  - Anonymous classes can help here too
Painting

- **How to paint/render a widget**
  - Eventually `paintComponent()` will be called, this does the painting
  - Don’t call `paintComponent`, don’t call `paint`, call `repaint`
    - Schedules repainting as part of event-handling thread

- **See** `java.awt.Graphics`, `Graphics2D`, `Image`
  - Different drawing and image manipulation is possible
  - Relative to GUI, not to screen (not absolute coordinates)