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Administrivia

- Homework 5 due dates posted. Design Thursday, code next Tuesday.

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One More ADT — Priority Queue

- Value — list of elements, of some type we can put in order.
- Operations:
 - Add element.
 - Remove element with lowest (or highest) value.
 - “Is empty?”

(Look at game framework `PriorityQueue` interface for a slightly different, but equivalent, list. You will write one of these for Homework 5.)

- How to implement? (Unordered list? List kept in order by value? Compare order of magnitude of “add” and “remove” operations.)

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Java GUI Libraries

- Java being an evolving language, it has two groups of GUI-related classes:
 - Abstract Window Toolkit (AWT) — older, “look and feel” consistent with platform’s windowing system.
 - Swing — newer, more extensive, look and feel more aimed at being consistent across platforms. Makes use of AWT components.
- Many, many classes to build GUIs:
 - GUI elements — buttons, labels, text boxes, menus, etc., etc., etc., etc.
 - “Containers” to group elements and arrange them for display.
 - “Listeners” and “events” to allow program to respond to user input.
- Programs are “event-based” or “event-driven”, can seem a little different from traditional text-in/text-out programs.

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Some GUI Classes

- `Component` — base class.
- `Container` — component that can contain other components.
- `JFrame` — window with titlebar, etc.; usually the “main” window for an application.
- `JDialog` — popup dialog box.
- `JPanel` — very simple container, useful for grouping things, providing custom graphics.
- `JMenuBar`.
- Etc., etc., etc., etc. — far more than we can cover in this course! Read the API. Some classes have links to online tutorials too.

Using the GUI Classes — Appearance

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- When using predefined components, key issue is how they're grouped into container and how things are laid out within each container.
 - Preferred method is to use a layout manager — places elements in some reasonable way, does something reasonable if container is resized.
 - Simple layouts include `FlowLayout`, `GridLayout`, `BorderLayout`, `BoxLayout`.
 - `GridBagLayout` provides more control, but is more complex.
- Some of them expand components to fit, others lay them out at their minimum size. See API and tutorials for more info.
- Often makes sense to group elements hierarchically — `JPanel` is useful for that.

Using the GUI Classes — Behavior

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- Runtime system (JVM) translates each user action (keyboard or mouse input) into an “event” and then calls method(s) in “event listener” objects.
- So, to tell the runtime system what should happen when, e.g., a `JButton` is clicked, call button's `addActionListener` with an object `listener` that implements `ActionListener` interface. Now when the button is clicked, `listener`'s `actionPerformed` method is called.
- Several approaches to defining listener objects. One is to have “main” class implement required interface. Another is to use anonymous inner classes.
- Example(s) as time permits . . .

Minute Essay

- None — quiz.

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