Final Exam Wed: May 11 1:00-3:00 (3:15)

like the midterm: 1 sheet of notes
(8 1/2 x 11 inches)

Emphasizes the stuff (including programming HW and Labs)
due before after the midterm.

See the list of homework topics used in the last lab!
See Ch 13 to Program GUI in Java.

Watch out for

- JFrame - one hand
- Trees of data - other hand

Class hierarchy from Java API documentation

Structure of the Graphical User Interface

Fig 13.5 Interface

See what the GUI with this structure looks like below↓
The JFrame object

![Diagram of JFrame with panel and buttons]

- Content Pane
- This is panel 1!

- Make a Sound
- Make a Action
\[ N = 1009000 \]

Total time \( = N \cdot \text{const.} \) \#levels
Calculate (tree T)
if T is a leaf with value v, RETURN v.
else
    if op of the root(T) = *
        int loc1 = calc(T, getLeft(1));
        int loc2 = calc(T, getRight(1));
        return (loc1 * loc2);
    else if op of root(T) = +
        int loc1 = calc(T, getLeft(1));
        int loc2 = calc(T, getRight(1));
        return (loc1 + loc2);
$34 \times 56 \times +$

$\frac{32}{12}$

$3 \times 4 \times 60$

$\frac{3}{4} \times \frac{5}{2}$

$3 \times 6 \times +$

$\frac{4}{5} \times \frac{6}{12}$

$3 \times 6 \times +$

$\frac{42}{12} \times \frac{3}{8}$

$42$