CSSE 220 Day 9

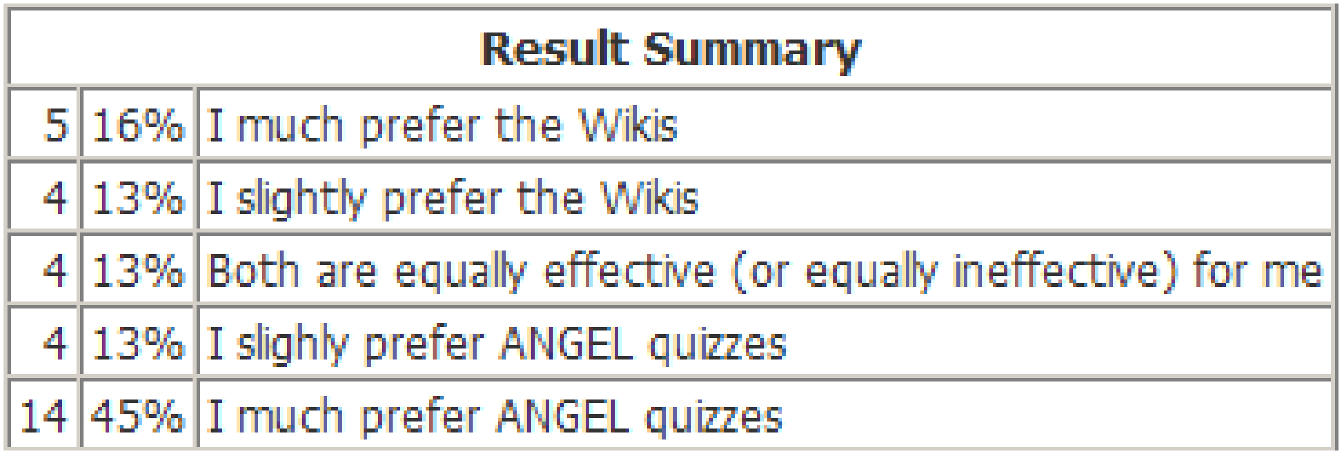
2D Arrays
Fun with GUIs

Check out *GUIExcursion* from SVN

Questions?

- Reading
- Pascal's Triangle Assignment
- Anything else?

Wiki Poll Results



Result Summary		
5	16%	I much prefer the Wikis
4	13%	I slightly prefer the Wikis
4	13%	Both are equally effective (or equally ineffective) for me
4	13%	I slighly prefer ANGEL quizzes
14	45%	I much prefer ANGEL quizzes

- So we will (perhaps gradually) make the switchover from Wikis to quizzes
- Thanks for participating in the experiment.
- We try new things that we think might make things better.
- Sometimes they work!

Copying Part of an Array

- Use built-in function:
  - `System.arraycopy(fromArray,fromStart,`
    `toArray,toStart,count);`
- Copies
  - **`count`** values from **`fromArray`**,
  - beginning at index **`fromStart`**,
  - copying into array **`toArray`**,
  - beginning at index **`toStart`**

Q1

Two Dimensional Arrays

- Consider:

  -
    ```
    final int ROWS = 3;
    final int COLUMNS = 3;
    String[][] board = new String[ROW][COLUMNS];
    ```
- What's the value of **board[1][2]** now?
- Need to fill the 2-d array:

  -
    ```
    for (int r=0; r < ROWS; r++) {
          for (int c=0; c < COLUMNS; c++) {
                board[r][c] = " ";
          }
    }
    ```

Q2

Exercise

- Complete the TODO items in TicTacToe and TicTacToeTest

  They're numbered; do them in order.

Quality Tip

- "Avoid parallel arrays"
- We did this in FractionArray class
- Instead of storing:
  - `ArrayList<Integer> numerators;`
    `ArrayList<Integer> denominators;`
    We used:
  - `ArrayList<Fraction> fList;`
    and put the 2 pieces of data for each fraction inside a Fraction object
- Why bother?

Q3

Pick the Right Data Structure

- Array or ArrayList, that is the question

- General rule: use ArrayList

- Exceptions:
  - Lots of primitive data in time critical code
  - Two (or more) dimensional arrays

Q4

GUIs in Java Swing

- So far we have seen:
- We add components to a JFrame (which represents a window)
- Draw on the component using the component's paintComponent( ) method.

Some Classes That We will be Using

Class	What it is
JFrame	a top-level window
JComponent	a region where we can draw; also parent of many other widget classes
JButton	a JComponent representing a button. When clicked, an action can happen
JLabel	a JComponent which gives us a place to put text in a window
JTextfield	a JComponent which provides a place for the user to enter text
JPanel	a JComponent that can be used as a container for organizing other widgets
Graphics	an object that can draw things on a JComponent. We never have to create this object; it is provided to us by the system
Graphics2D	a more "object-oriented" graphics object
JOptionPane	Request a single line of input from the user

Q5

Event-driven programming

- The flow of programs we have written so far is controlled by the program itself.
- It only accepts input when it asks for it.
- In most modern GUI programs, the user is in control.
  - Once it is initialized, the program does things in response to **events**. Examples:
    - A button or menu item is clicked (ActionEvent)
    - A key is pressed (KeyEvent)
    - The mouse is clicked (MouseEvent)
    - The mouse is moved (MouseMotionEvent)

Q6-7

Why There Are Listeners

- "Most Programs don't want to be flooded by boring events"
  – Cay Horstmann
- If I click the mouse on a button
  - The mouse moves over the button (mouseEntered)
  - Mouse moves within button's borders (mouseMoved)
  - Mouse button is pressed
  - Mouse button is released
- And I don't really care about any of that mouse stuff.
- So I choose not to listen for mouse events.
- I listen for an ActionEvent on the button.

Q8

Some demo programs we will write

- ButtonTester/ClickListener
  - About as simple as we can get and still respond to clicks. (from *BigJava*)
  - A separate ActionListener class.
- OneButton
  - Frame is filled with a button that changes colors when clicked.
- FollowTheMouse
  - Draw a small circle where the user clicks.
- OneButton2
  - Make the button smarter …
- ClickCounter
  - Clicking a button causes the contents of a label to change.
  - The JFrame is both the "boss" and the ActionListener.
- Multiplier
  - Get two numbers from text fields and display their product.

Live coding

- GUIExcursion
  May be continued later