The plan

• General info
• Graphics and interactivity
• 2D arrays
• ArrayLists
• HashMaps
• Data structure design
• Strings
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- General info
- Graphics and interactivity
- 2D arrays
- ArrayLists
- HashMaps
- Data structure design
- Strings
Midterm logistics

• Midterm is this **Wednesday** from **7pm - 10pm**

• Location is based on your **last name**:
  - **Abr - Che**: Gates B01
  - **Chi - Erd**: Gates B03
  - **Esp - Fre**: Gates B12
  - **Fu - Kea**: SkillAud
  - **Kel - Lim**: HerrinT175
  - **Lin - Oul**: Hewlett201
  - **Pad - Ren**: 200-205
  - **Rey - San**: 380-380W
  - **Sar - Sta**: 380-380X
  - **Ste - Tse**: 380-380Y
  - **Tsk - Zhu**: 420-041
Exam is open book, open notes, closed computer

The examination is open-book (specifically the course textbook *The Art and Science of Java* and the Karel the Robot coursereader) and you may make use of any handouts, course notes/slides, printouts of your programs or other notes you've taken in the class. You may not, however, use a computer of any kind (i.e., you cannot use laptops on the exam).
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Coverage
The second midterm exam covers the material presented throughout the class (with the exception of the Karel material). You are responsible for all topics covered in lectures up through and including Wednesday's lecture and for topics from the assignments.
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Key topics

- Primitives
Key topics

• Primitives
  • int, boolean, double, char
Key topics

- Primitives
  - int, boolean, double, char
- type conversion (typecasting)
Key topics

• Primitives
  • `int`, `boolean`, `double`, `char`
  • type conversion (typecasting)

• Control structures
Key topics

• Primitives
  • int, boolean, double, char
  • type conversion (typecasting)

• Control structures
  • if (else), switch
Key topics

• Primitives
  • `int`, `boolean`, `double`, `char`
  • type conversion (typecasting)

• Control structures
  • `if (else)`, `switch`
  • `loops`: `for`, `while`, `while (true)`, `break`, `continue`
Key topics

- Primitives
  - `int`, `boolean`, `double`, `char`
  - type conversion (typecasting)
- Control structures
  - `if (else)`, `switch`
  - loops: `for`, `while`, `while (true)`, `break`, `continue`
- Operators
Key topics

• Primitives
  • int, boolean, double, char
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• Control structures
  • if (else), switch
  • loops: for, while, while (true), break, continue

• Operators
  • (+, %, =, <=, >, ==, &&, ||, !, etc.)
Key topics

• Primitives
  • int, boolean, double, char
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• Control structures
  • if (else), switch
  • loops: for, while, while (true), break, continue

• Operators
  • (+, %, =, <=, >, ==, &&, ||, !, etc.)

• Variables
Key topics

- Primitives
  - `int`, `boolean`, `double`, `char`
  - type conversion (typecasting)
- Control structures
  - `if` (else), `switch`
  - `loops`: `for`, `while`, `while (true)`, `break`, `continue`
- Operators
  - `+`, `%`, `=`, `<=`, `>`, `==`, `&&`, `||`, `!`, etc.
- Variables
- `constants`
Key topics

- Primitives
  - int, boolean, double, char
  - type conversion (typecasting)

- Control structures
  - if (else), switch
  - loops: for, while, while (true), break, continue

- Operators
  - (+, %, =, <=, >=, &&, ||, !, etc.)

- Variables

- constants
- pass by reference vs. by value
Key topics

- Primitives
  - `int`, `boolean`, `double`, `char`
  - type conversion (typecasting)

- Control structures
  - `if (else)`, `switch`
  - `while`, `for` (true), `break`, `continue`

- Operators
  - `(+, \%, =, \leq, >, \geq, \&\&, |\|, !, etc.)`

- Variables

- Constants
- Pass by reference vs. by value
- Local vs. instance
Key topics

• Primitives
  • `int, boolean, double, char`
  • type conversion (typecasting)

• Control structures
  • `if (else), switch`
  • `loops: for, while, while (true), break, continue`

• Operators
  • `(+, %, =, <=, >, ==, &&, ||, !, etc.)`

• Variables

• constants
• pass by reference vs. by value
• local vs. instance
• scope (and masking)
Key topics

- Primitives
  - `int`, `boolean`, `double`, `char`
  - type conversion (typecasting)
- Control structures
  - `if`, `else`, `switch`
  - `loops: for`, `while`, `while` (true), `break`, `continue`
- Operators
  - `(+, %, =, <=, >, ==, &&, ||, !, etc.)`
- Variables
- constants
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- local vs. instance
- scope (and masking)
- Methods
Key topics

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  - int, boolean, double, char
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  - if (else), switch
  - loops: for, while, while (true), break, continue

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  - return statements
Key topics

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  - `int`, `boolean`, `double`, `char`
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  - `if` (else), `switch`
  - loops: `for`, `while`, `while (true)`, `break`, `continue`

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- Methods
  - `return` statements
  - Parameters
Key topics

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  • int, boolean, double, char
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  • if (else), switch
  • loops: for, while, while (true), break, continue

• Operators
  • (+, %, =, <=, >, ==, &&, ||, !, etc.)

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• String
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  • `int`, `boolean`, `double`, `char`
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• Scope (and masking)

• Methods
  • `return` statements
  • Parameters

• String

• Graphics and animation
Key topics

- Primitives
  - int, boolean, double, char
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- Control structures
  - if (else), switch
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- Operators
  - (+, %, =, <=, >, ==, &&, ||, !, etc.)
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- pass by reference vs. by value
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- scope (and masking)
- Methods
  - return statements
  - parameters
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- Graphics and animation
- Mouse interaction
Key topics

- Primitives
  - `int`, `boolean`, `double`, `char`
  - type conversion (typecasting)

- Control structures
  - `if (else)`, `switch`
  - loops: `for`, `while`, `while (true)`, `break`, `continue`

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  - `return` statements
  - Parameters

- String

- Graphics and animation

- Mouse interaction

- RandomGenerator
Key topics

• Primitives
  • `int`, `boolean`, `double`, `char`
  • type conversion (typecasting)

• Control structures
  • `if (else)`, `switch`
  • `loops: for, while, while (true), break, continue`

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• Variables

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  • scope (and masking)

• Methods
  • `return` statements
  • parameters

• String

• Graphics and animation
  • Mouse interaction
  • `RandomGenerator`
How do you convert a double to an int?

(typecasting)

double x = 5.2349;

println(_________); // 5
How do you convert a double to an int?

(typecasting)

double x = 5.2349;
println((int)x);  // 5
Key topics continued
Key topics continued

- Classes
Key topics continued

• Classes
  • inheritance: extends, implements
Key topics continued

- Classes
  - inheritance: extends, implements
  - constructors
Key topics continued

• Classes
  • inheritance: extends, implements
  • constructors
  • access (public vs. private)
Key topics continued

- Classes
  - inheritance: extends, implements
  - constructors
  - access (public vs. private)
- Graphs and networks
Key topics continued

• Classes
  • inheritance: extends, implements
  • constructors
  • access (public vs. private)

• Graphs and networks
• File reading
Key topics continued

• Classes
  • inheritance: extends, implements
  • constructors
  • access (public vs. private)

• Graphs and networks

• File reading
  • Exception handling (try-catch)
Key topics continued

- Classes
  - inheritance: extends, implements
  - constructors
  - access (public vs. private)
- Graphs and networks
- File reading
  - Exception handling (try-catch)

- Arrays
Key topics continued

- Classes
  - inheritance: extends, implements
  - constructors
  - access (public vs. private)
- Graphs and networks
- File reading
  - Exception handling (try-catch)
- Arrays
  - 1D and 2D
Key topics continued

- Classes
  - inheritance: extends, implements
  - constructors
  - access (public vs. private)

- Graphs and networks

- File reading
  - Exception handling (try-catch)

- Arrays
  - 1D and 2D
  - ArrayList
Key topics continued

- Classes
  - inheritance: extends, implements
  - constructors
  - access (public vs. private)

- Graphs and networks

- File reading
  - Exception handling (try-catch)

- Arrays
  - 1D and 2D
  - ArrayList
  - HashMap
Key topics continued

- Classes
  - inheritance: extends, implements
  - constructors
  - access (public vs. private)

- Graphs and networks

- File reading
  - Exception handling (try-catch)

- Arrays
  - 1D and 2D
  - ArrayList
  - HashMap
  - Iterators
Key topics continued

- Classes
  - inheritance: extends, implements
  - constructors
  - access (public vs. private)
- Graphs and networks
- File reading
  - Exception handling (try-catch)

- Arrays
  - 1D and 2D
    - ArrayList
    - HashMap
    - Iterators
    - Interactors
Key topics continued

- Classes
  - inheritance: extends, implements
  - constructors
  - access (public vs. private)
- Graphs and networks
- File reading
  - Exception handling (try-catch)
- Arrays
  - 1D and 2D
  - ArrayList
  - HashMap
  - Iterators
  - Interactors
- Data structure design
Key topics continued

- Classes
  - inheritance: extends, implements
  - constructors
  - access (public vs. private)
- Graphs and networks
- File reading
  - Exception handling (try-catch)
- Arrays
  - 1D and 2D
  - ArrayList
  - HashMap
  - Iterators
  - Interactors
  - Data structure design
  - GImage
### Key topics continued

<table>
<thead>
<tr>
<th>Classes</th>
<th>Arrays</th>
</tr>
</thead>
<tbody>
<tr>
<td>• inheritance: extends, implements</td>
<td>• 1D and 2D</td>
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<tr>
<td>• constructors</td>
<td>• ArrayList</td>
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<td></td>
</tr>
</tbody>
</table>
Other tips
Other tips

- Style doesn’t matter. You don’t need to comment.
Other tips

• Style doesn’t matter. You don’t need to comment.

• (but…)
Other tips

• Style doesn’t matter. You don’t need to comment.
  • (but…)

• Don’t worry about imports.
Other tips

• Style doesn’t matter. You don’t need to comment.
  • (but…)

• Don’t worry about imports.

• Pseudocode credit is capped at 50%.
Other tips

• Style doesn’t matter. You don’t need to comment.
  • (but…)

• Don’t worry about imports.

• Pseudocode credit is capped at 50%.

• Edge-cases are really important.
The plan

• General info

• **Graphics and interactivity**

• 2D arrays

• ArrayLists

• HashMaps

• Data structure design

• Strings
JSlider slide = new JSlider(min, max, initial);
JButton button = new JButton("[button text]");
JTextField field = new JTextField("[field text]");
JSlider slide = new JSlider(min, max, initial);
JButton button = new JButton("[button text]");
JTextField field = new JTextField("[field text]");
add(interactor, location);
addActionListeners();
public void actionPerformed(ActionEvent e) {
}

public void actionPerformed(ActionEventEvent e) {
}
addActionListeners();

public void actionPerformed(ActionEvent e) {
    if (e.getSource() == someInteractorIvar) {
        ...
    }
}
public void actionPerformed(ActionEvent e) {
    if (e.getSource() == someInteractorIvar) {
        // requires instance variables
    }
}
public void actionPerformed(ActionEvent e) {
    if (e.getSource() == someInteractorIvar) {
        // requires instance variables
    }
    if (e.getActionCommand().equals("[text in button]")) {
        //...
    }
}
addActionListeners();
public void actionPerformed(ActionEvent e) {
    if (e.getSource() == someInteractorIvar) {
        ...
    }
    if (e.getActionCommand().equals("[text in button]")) {
        ...
    }
    only works for buttons unless you use
    someInteractor.setActionCommand("[action command]"
    }
    addActionListeners();
}
How do I make a JTextField respond to the return key?
How do I make a JTextField respond to the return key?

private JTextField field;
How do I make a JTextField respond to the return key?

private JTextField field;

public init() {
How do I make a JTextField respond to the return key?

private JTextField field;

public init() {
    field = new JTextField(FIELD_WIDTH);
}
How do I make a JTextField respond to the return key?

private JTextField field;

public init() {
    field = new JTextField(FIELD_WIDTH);
    field.addActionListener(this);
}
How do I make a JTextField respond to the return key?

```java
private JTextField field;

public init() {
    field = new JTextField(FIELD_WIDTH);
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public actionPerformed(ActionEvent e) {

How do I make a JTextField respond to the return key?

private JTextField field;

public init() {
    field = new JTextField(FIELD_WIDTH);
    field.addActionListener(this);
}

public actionPerformed(ActionEvent e) {
    if (e.getSource() == field)
How do I make a JTextField respond to the return key?

```java
private JTextField field;

public init() {
    field = new JTextField(FIELD_WIDTH);
    field.addActionListener(this);
}

public actionPerformed(ActionEvent e) {
    if (e.getSource() == field)
        doSomethingInResponseToEnter();
```
How do I make a JTextField respond to the return key?

private JTextField field;

public init() {
    field = new JTextField(FIELD_WIDTH);
    field.addActionListener(this);
}

public actionPerformed(ActionEvent e) {
    if (e.getSource() == field)
        doSomethingInResponseToEnter();
}
How do I make a JTextField respond to the return key?

(private JTextField field;
How do I make a JTextField respond to the return key?

(version 2)

private JTextField field;

public init() {

How do I make a JTextField respond to the return key?

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How do I make a JTextField respond to the return key?
(version 2)

private JTextField field;

public init() {
    field = new JTextField(FIELD_WIDTH);
    field.addActionListener(this);
}
private JTextField field;

public init() {
    field = new JTextField(FIELD_WIDTH);
    field.addActionListener(this);
    field.setActionCommand("field");
}
How do I make a JTextField respond to the return key?

(version 2)

private JTextField field;

public init() {
    field = new JTextField(FIELD_WIDTH);
    field.addActionListener(this);
    field.setActionCommand("field");
}

How do I make a JTextField respond to the return key?

(version 2)

```java
private JTextField field;

public init() {
    field = new JTextField(FIELD_WIDTH);
    field.addActionListener(this);
    field.setActionCommand("field");
}

public actionPerformed(ActionEvent e) { 
```
How do I make a JTextField respond to the return key?
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private JTextField field;

public init() {
    field = new JTextField(FIELD_WIDTH);
    field.addActionListener(this);
    field.setActionCommand("field");
}

public actionPerformed(ActionEvent e) {
    if (e.getActionCommand().equals("field"))
How do I make a JTextField respond to the return key?

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private JTextField field;

public init() {
    field = new JTextField(FIELD_WIDTH);
    field.addActionListener(this);
    field.setActionCommand("field");
}

public actionPerformed(ActionEvent e) {
    if (e.getActionCommand().equals("field"))
        doSomethingInResponseToReturnKey();
}
How do I make a JTextField respond to the return key?

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private JTextField field;

public init() {
    field = new JTextField(FIELD_WIDTH);
    field.addActionListener(this);
    field.setActionCommand("field");
}

public actionPerformed(ActionEvent e) {
    if (e.getActionCommand().equals("field"))
        doSomethingInResponseToReturnKey();
}
```
In this problem, your task is to implement a simple graphical user interface for creating simple signs, each of which consists of lines of centered text displayed in different fonts. When you start the **SignMaker** program, the user interface looks like this, where the widths of the **JTextField** interactors are given by the constants `CHARS_IN_LINE_FIELD` and `CHARS_IN_FONT_FIELD`, respectively:
You can then add a line to the display by entering text in the field marked Line, as follows:

```
SignMaker
```

Line: Welcome to CS106A

Font: Times-Bold-36
Hitting ENTER should add a new \texttt{GLabel} to the graphics display containing the text in the field. That \texttt{GLabel} should be centered in the window in both dimensions, adjusting the vertical position of the text by half the font ascent as you did for Assignment #2. The first line therefore is set in Times-Bold-36 as follows:

\begin{verbatim}
SignMaker

Welcome to CS106A

\end{verbatim}
Note that hitting ENTER also clears the text field in the control strip making it easier for the user to enter the next line of the sign.

Once you have placed a label in the window, the user should be able to drag the label to another point on the screen. For example, the user might drag the label to the top, so the window looks like this:

![SignMaker window with text](image)

The text in the window reads "Welcome to CS106A."
The user can change the font of each line by typing a new font name in the Font field. For example, if the user wanted to add a second line to the message in a smaller, italic font, that user could do so by changing the contents of the Font field to Times-Italic-24 and then typing in the new message, like this:

![SignMaker window](image)

Welcome to CS106A

Line: Good Luck on the Final Exam!

Font: Times-Italic-24
Hitting ENTER at this point would add a new `Label` at the center of the window, like this:

![SignMaker window with a label](Image)

*Welcome to CS106A*

*Good Luck on the Final Exam!*

You can then reposition either of these labels by clicking on them and dragging them to the desired location.
/* SignMaker.java: this program allows the user to create a sign. */
public class SignMaker extends GraphicsProgram {

    public void init() {

    }

    /* Instance variables */

    /* Constants */
    private static final int CHARS_IN_LINE_FIELD = 30;
    private static final int CHARS_IN_FONT_FIELD = 15;
public class SignMaker extends GraphicsProgram {
    public void init() {
    
    }

    /* Called when an action event occurs */
    public void actionPerformed(ActionEvent e) {
    
    }

    /* Instance variables */
    /* Constants */
    private static final int CHAR_SIZE_IN_LINE_FIELD = 30;
    private static final int CHAR_SIZE_IN_FONT_FIELD = 15;
/* SignMaker.java: this program allows the user to create a sign. */
public class SignMaker extends GraphicsProgram {

    public void init() {
        lineInputField = new JTextField(CHARS_IN_LINE_FIELD);

    }

    /* Called when an action event occurs */
    public void actionPerformed(ActionEvent e) {

    }

    /* Instance variables */
    private JTextField lineInputField;

    /* Constants */
    private static final int CHARS_IN_LINE_FIELD = 30;
    private static final int CHARS_IN_FONT_FIELD = 15;
public class SignMaker extends GraphicsProgram {

    public void init() {
        lineInputField = new JTextField(CHARS_IN_LINE_FIELD);
        lineInputField.addActionListener(this);
    }

    /* Called when an action event occurs */
    public void actionPerformed(ActionEvent e) {

    }

    /* Instance variables */
    private JTextField lineInputField;

    /* Constants */
    private static final int CHARS_IN_LINE_FIELD = 30;
    private static final int CHARS_IN_FONT_FIELD = 15;
public class SignMaker extends GraphicsProgram {

    public void init() {
        lineInputField = new JTextField(CHARS_IN_LINE_FIELD);
        lineInputField.addActionListener(this);
        fontField = new JTextField(CHARS_IN_FONT_FIELD);
    }

    /* Called when an action event occurs */
    public void actionPerformed(ActionEvent e) {

    }

    /* Instance variables */
    private JTextField lineInputField;
    private JTextField fontField;

    /* Constants */
    private static final int CHARS_IN_LINE_FIELD = 30;
    private static final int CHARS_IN_FONT_FIELD = 15;
public class SignMaker extends GraphicsProgram {

    public void init() {
        lineInputField = new JTextField(CHARS_IN_LINE_FIELD);
        lineInputField.addActionListener(this);
        fontField = new JTextField(CHARS_IN_FONT_FIELD);
        fontField.setText("Times-Bold-24");
    }

    /* Called when an action event occurs */
    public void actionPerformed(ActionEvent e) {

    }

    /* Instance variables */
    private JTextField lineInputField;
    private JTextField fontField;

    /* Constants */
    private static final int CHARS_IN_LINE_FIELD = 30;
    private static final int CHARS_IN_FONT_FIELD = 15;
public class SignMaker extends GraphicsProgram {

    public void init() {
        lineInputField = new JTextField(CHARS_IN_LINE_FIELD);
        lineInputField.addActionListener(this);
        fontField = new JTextField(CHARS_IN_FONT_FIELD);
        fontField.setText("Times-Bold-24");
        add(new JLabel("Line: "), SOUTH);
    }

    /* Called when an action event occurs */
    public void actionPerformed(ActionEvent e) {
    }

    /* Instance variables */
    private JTextField lineInputField;
    private JTextField fontField;

    /* Constants */
    private static final int CHARS_IN_LINE_FIELD = 30;
    private static final int CHARS_IN_FONT_FIELD = 15;
/* SignMaker.java: this program allows the user to create a sign. */

public class SignMaker extends GraphicsProgram {

    public void init() {
        lineInputField = new JTextField(CHARS_IN_LINE_FIELD);
        lineInputField.addActionListener(this);
        fontField = new JTextField(CHARS_IN_FONT_FIELD);
        fontField.setText("Times-Bold-24");
        add(new JLabel("Line: "), SOUTH);
        add(lineInputField, SOUTH);
    }

    /* Called when an action event occurs */
    public void actionPerformed(ActionEvent e) {

    }

    /* Instance variables */
    private JTextField lineInputField;
    private JTextField fontField;

    /* Constants */
    private static final int CHARS_IN_LINE_FIELD = 30;
    private static final int CHARS_IN_FONT_FIELD = 15;
/* SignMaker.java: this program allows the user to create a sign. */
public class SignMaker extends GraphicsProgram {

    public void init() {
        lineInputField = new JTextField(CHARS_IN_LINE_FIELD);
        lineInputField.addActionListener(this);
        fontField = new JTextField(CHARS_IN_FONT_FIELD);
        fontField.setText("Times-Bold-24");
        add(new JLabel("Line: "), SOUTH);
        add(lineInputField, SOUTH);
        add(new JLabel(" Font: "), SOUTH);
    }

    /* Called when an action event occurs */
    public void actionPerformed(ActionEvent e) {

    }

    /* Instance variables */
    private JTextField lineInputField;
    private JTextField fontField;

    /* Constants */
    private static final int CHARS_IN_LINE_FIELD = 30;
    private static final int CHARS_IN_FONT_FIELD = 15;
/* SignMaker.java: this program allows the user to create a sign. */
public class SignMaker extends GraphicsProgram {

    public void init() {
        lineInputField = new JTextField(CHARS_IN_LINE_FIELD);
        lineInputField.addActionListener(this);
        fontField = new JTextField(CHARS_IN_FONT_FIELD);
        fontField.setText("Times-Bold-24");
        add(new JLabel("Line: "), SOUTH);
        add(lineInputField, SOUTH);
        add(new JLabel(" Font: "), SOUTH);
        add(fontField, SOUTH);
    }

    /* Called when an action event occurs */
    public void actionPerformed(ActionEvent e) {

    }

    /* Instance variables */
    private JTextField lineInputField;
    private JTextField fontField;

    /* Constants */
    private static final int CHAR_SIZE = 30;
    private static final int CHAR_FONT = 15;
/* SignMaker.java: this program allows the user to create a sign. */
public class SignMaker extends GraphicsProgram {

    public void init() {
        lineInputField = new JTextField(CHARS_IN_LINE_FIELD);
        lineInputField.addActionListener(this);
        fontField = new JTextField(CHARS_IN_FONT_FIELD);
        fontField.setText("Times-Bold-24");
        add(new JLabel("Line: "), SOUTH);
        add(lineInputField, SOUTH);
        add(new JLabel(" Font: "), SOUTH);
        add(fontField, SOUTH);
        addMouseListeners();
    }

    /* Called when an action event occurs */
    public void actionPerformed(ActionEvent e) {

    }

    /* Instance variables */
    private JTextField lineInputField;
    private JTextField fontField;

    /* Constants */
    private static final int CHARS_IN_LINE_FIELD = 30;
    private static final int CHARS_IN_FONT_FIELD = 15;
public class SignMaker extends GraphicsProgram {

    public void init() {
        lineInputField = new JTextField(CHARS_IN_LINE_FIELD);
        lineInputField.addActionListener(this);
        fontField = new JTextField(CHARS_IN_FONT_FIELD);
        fontField.setText("Times-Bold-24");
        add(new JLabel("Line: "), SOUTH);
        add(lineInputField, SOUTH);
        add(new JLabel("  Font: "), SOUTH);
        add(fontField, SOUTH);
        addMouseListeners();
    }

    /* Called when an action event occurs */
    public void actionPerformed(ActionEvent e) {
        if (e.getSource() == lineInputField) {

        }
    }

    /* Instance variables */
    private JTextField lineInputField;
    private JTextField fontField;

    /* Constants */
    private static final int CHARS_IN_LINE_FIELD = 30;
    private static final int CHARS_IN_FONT_FIELD = 15;
public class SignMaker extends GraphicsProgram {

    public void init() {
        lineInputField = new JTextField(CHARS_IN_LINE_FIELD);
        lineInputField.addActionListener(this);
        textField = new JTextField(CHARS_IN_FONT_FIELD);
        textField.setText("Times-Bold-24");
        add(new JLabel("Line: "), SOUTH);
        add(lineInputField, SOUTH);
        add(new JLabel(" Font: "), SOUTH);
        add(textField, SOUTH);
        addMouseListeners();
    }

    /* Called when an action event occurs */
    public void actionPerformed(ActionEvent e) {
        if (e.getSource() == lineInputField) {
            JLabel label = new JLabel(lineInputField.getText());
            
        }
    }

    /* Instance variables */
    private JTextField lineInputField;
    private JTextField textField;

    /* Constants */
    private static final int CHARS_IN_LINE_FIELD = 30;
    private static final int CHARS_IN_FONT_FIELD = 15;
}
/* SignMaker.java: this program allows the user to create a sign. */
public class SignMaker extends GraphicsProgram {

    public void init() {
        lineInputField = new JTextField(CHARS_IN_LINE_FIELD);
        lineInputField.addActionListener(this);
        fontField = new JTextField(CHARS_IN_FONT_FIELD);
        fontField.setText("Times-Bold-24");
        add(new JLabel("Line: "), SOUTH);
        add(lineInputField, SOUTH);
        add(new JLabel(" Font: "), SOUTH);
        add(fontField, SOUTH);
        addMouseListeners();
    }

    /* Called when an action event occurs */
    public void actionPerformed(ActionEvent e) {
        if (e.getSource() == lineInputField) {
            GLabel label = new GLabel(lineInputField.getText());
            label.setFont(fontField.getText());
        }
    }

    /* Instance variables */
    private JTextField lineInputField;
    private JTextField fontField;

    /* Constants */
    private static final int CHARs_IN_LINE_FIELD = 30;
    private static final int CHARs_IN_FONT_FIELD = 15;
/* SignMaker.java: this program allows the user to create a sign. */

public class SignMaker extends GraphicsProgram {

    public void init() {
        lineInputField = new JTextField(CHARS_IN_LINE_FIELD);
        lineInputField.addActionListener(this);
        fontField = new JTextField(CHARS_IN_FONT_FIELD);
        fontField.setText("Times-Bold-24");
        add(new JLabel("Line: "), SOUTH);
        add(lineInputField, SOUTH);
        add(new JLabel(" Font: "), SOUTH);
        add(fontField, SOUTH);
        addMouseListeners();
    }

    /* Called when an action event occurs */
    public void actionPerformed(ActionEvent e) {
        if (e.getSource() == lineInputField) {
            GLabel label = new GLabel(lineInputField.getText());
            label.setFont(fontField.getText());
            double x = (getWidth() - label.getWidth()) / 2;
            double y = (getHeight() + label.getAscent()) / 2;
        }
    }

    /* Instance variables */
    private JTextField lineInputField;
    private JTextField fontField;

    /* Constants */
    private static final int CHARS_IN_LINE_FIELD = 30;
    private static final int CHARS_IN_FONT_FIELD = 15;
public class SignMake {

    public void init() {
        lineInputField = new JTextField(CHARS_IN_LINE_FIELD);
        lineInputField.addActionListener(this);
        fontField = new JTextField(CHARS_IN_FONT_FIELD);
        fontField.setText("Times-Bold-24");
        add(new JLabel("Line: "), SOUTH);
        add(lineInputField, SOUTH);
        add(new JLabel(" Font: "), SOUTH);
        add(fontField, SOUTH);
        addMouseListener();
    }

    /* Called when an action event occurs */
    public void actionPerformed(ActionEvent e) {
        if (e.getSource() == lineInputField) {
            GLable label = new GLable(lineInputField.getText());
            label.setFont(fontField.getText());
            double x = (getWidth() - label.getWidth()) / 2;
            double y = (getHeight() + label.getAscent()) / 2;
            add(label, x, y);
        }
    }

    /* Instance variables */
    private JTextField lineInputField;
    private JTextField fontField;

    /* Constants */
    private static final int CHARS_IN_LINE_FIELD = 30;
    private static final int CHARS_IN_FONT_FIELD = 15;
public class SignMaker {

    public void init() {
        lineInputField = new JTextField(CHARS_IN_LINE_FIELD);
        lineInputField.addActionListener(this);
        fontField = new JTextField(CHARS_IN_FONT_FIELD);
        fontField.setText("Times-Bold-24");
        add(new JLabel("Line: "), SOUTH);
        add(lineInputField, SOUTH);
        add(new JLabel(" Font: "), SOUTH);
        add(fontField, SOUTH);
        addMouseListeners();
    }

    /* Called when an action event occurs */
    public void actionPerformed(ActionEvent e) {
        if (e.getSource() == lineInputField) {
            JLabel label = new JLabel(lineInputField.getText());
            label.setFont(fontField.getText());
            double x = (getWidth() - label.getWidth()) / 2;
            double y = (getHeight() + label.getAscent()) / 2;
            add(label, x, y);
            lineInputField.setText("");
        }
    }

    /* Instance variables */
    private JTextField lineInputField;
    private JTextField fontField;

    /* Constants */
    private static final int CHARS_IN_LINE_FIELD = 30;
    private static final int CHARS_IN_FONT_FIELD = 15;
/* Instance variables */
/* Called on mouse press to record the coordinates of the click */
public void mousePressed(MouseEvent e) {

}

/* Instance variables */
/** Called on mouse press to record the coordinates of the click */
   public void mousePressed(MouseEvent e) {

}


/* Instance variables */

   private GPoint last;
/* Called on mouse press to record the coordinates of the click */
public void mousePressed(MouseEvent e) {
    last = new GPoint(e.getPoint());
}

/* Instance variables */
private GPoint last;
/* Called on mouse press to record the coordinates of the click */
public void mousePressed(MouseEvent e) {
    last = new GPoint(e.getPoint());
}

/* Instance variables */
private GLabel dragLabel;
private GPoint last;
/* Called on mouse press to record the coordinates of the click */
public void mousePressed(MouseEvent e) {
    last = new GPoint(e.getPoint());
    dragLabel = (GLabel) getElementAt(last);
}

/* Instance variables */
private GLabel dragLabel;
private GPoint last;
/* Called on mouse press to record the coordinates of the click */
public void mousePressed(MouseEvent e) {
    last = new GPoint(e.getPoint());
    dragLabel = (GLabel) getElementAt(last);
}

/*/ Called on mouse drag to reposition the object */
public void mouseDragged(MouseEvent e) {

}

/*/ Instance variables */
private GLabel dragLabel;
private GPoint last;
/* Called on mouse press to record the coordinates of the click */
public void mousePressed(MouseEvent e) {
    last = new GPoint(e.getPoint());
    dragLabel = (GLabel) getElementAt(last);
}

/* Called on mouse drag to reposition the object */
public void mouseDragged(MouseEvent e) {
    if (dragLabel != null) {

    }
}

/* Instance variables */
private GLabel dragLabel;
private GPoint last;
public void mousePressed(MouseEvent e) {
   last = new GPoint(e.getPoint());
   dragLabel = (GLabel) getElementAt(last);
}

public void mouseDragged(MouseEvent e) {
   if (dragLabel != null) {
      dragLabel.move(e.getX() - last.getX(), e.getY() - last.getY());
   }
}

private GLabel dragLabel;
private GPoint last;
/* Called on mouse press to record the coordinates of the click */

public void mousePressed(MouseEvent e) {
    last = new GPoint(e.getPoint());
    dragLabel = (GLabel) getelementAt(last);
}

/* Called on mouse drag to reposition the object */

public void mouseDragged(MouseEvent e) {
    if (dragLabel != null) {
        dragLabel.move(e.getX() - last.getX(), e.getY() - last.getY());
        last = new GPoint(e.getPoint());
    }
}

/* Instance variables */

private GLabel dragLabel;
private GPoint last;
The plan

• General info
• Graphics and interactivity
  • 2D arrays
• ArrayLists
• HashMaps
• Data structure design
• Strings
Problem 4: Arrays (25 points)

A magic square is an \( n \times n \) grid of numbers with the following properties:

1. Each of the numbers 1, 2, 3, ..., \( n^2 \) appears exactly once, and
2. The sum of each row and column is the same.

For example, here is a \( 3 \times 3 \) magic square, which uses the numbers between 1 and \( 3^2 = 9 \):

\[
\begin{array}{ccc}
4 & 9 & 2 \\
3 & 5 & 7 \\
8 & 1 & 6 \\
\end{array}
\]

and here is a \( 5 \times 5 \) magic square, which uses the numbers between 1 and \( 5^2 = 25 \):

\[
\begin{array}{ccccc}
11 & 18 & 25 & 2 & 9 \\
10 & 12 & 19 & 21 & 3 \\
4 & 6 & 13 & 20 & 22 \\
23 & 5 & 7 & 14 & 16 \\
17 & 24 & 1 & 8 & 15 \\
\end{array}
\]

Write a method

```java
private boolean isMagicSquare(int[][] square, int n);
```

that accepts as input a two-dimensional array of integers (which you can assume is of size \( n \times n \)) and returns whether or not it is a magic square.
private boolean isMagicSquare(int[][] matrix, int n) {

/* Make sure we see all numbers 1 to n * n. */
if (!allExpectedNumbersFound(matrix, n)) return false;

/* Sum up the first row to get its value. */
int expected = rowSum(matrix, 0, n);

/* Check that all rows and columns have this value. */
for (int i = 0; i < n; i++) {
  if (rowSum(matrix, i, n) != expected || colSum(matrix, i, n) != expected)
    return false;
}

return true;
}

private int rowSum(int[][] grid, int row, int n) {
  int sum = 0;
  for (int col = 0; col < n; col++)
    sum += grid[row][col];
  return sum;
}

private int colSum(int[][] grid, int col, int n) {
  int sum = 0;
  for (int row = 0; row < n; row++)
    sum += grid[row][col];
  return sum;
}
private boolean isMagicSquare(int[][] matrix, int n) {
    /* Make sure we see all numbers 1 to n * n. */

    if (!allExpectedNumbersFound(matrix, n)) return false;

    /* Sum up the first row to get its value. */
    int expected = rowSum(matrix, 0, n);

    /* Check that all rows and columns have this value. */
    for (int i = 0; i < n; i++) {
        if (rowSum(matrix, i, n) != expected | colSum(matrix, i, n) != expected)
            return false;
    }

    return true;
}

private int rowSum(int[][] grid, int row, int n) {
    int sum = 0;
    for (int col = 0; col < n; col++) {
        sum += grid[row][col];
    }
    return sum;
}

private int colSum(int[][] grid, int col, int n) {
    int sum = 0;
    for (int row = 0; row < n; row++) {
        sum += grid[row][col];
    }
    return sum;
}
private boolean isMagicSquare(int[][][] matrix, int n) {
    /* Make sure we see all numbers 1 to n * n. */
    if (!allExpectedNumbersFound(matrix, n)) return false;

    /* Sum up the first row to get its value. */
    int expected = rowSum(matrix, 0, n);

    /* Check that all rows and columns have this value. */
    for (int i = 0; i < n; i++) {
        if (rowSum(matrix, i, n) != expected ||
            colSum(matrix, i, n) != expected)
            return false;
    }

    return true;
}

private int rowSum(int[][] grid, int row, int n) {
    int sum = 0;
    for (int col = 0; col < n; col++) {
        sum += grid[row][col];
    }
    return sum;
}

private int colSum(int[][] grid, int col, int n) {
    int sum = 0;
    for (int row = 0; row < n; row++) {
        sum += grid[row][col];
    }
    return sum;
}
private boolean isMagicSquare(int[][] matrix, int n) {
    /* Make sure we see all numbers 1 to n * n. */
    if (!allExpectedNumbersFound(matrix, n)) return false;

    /* Sum up the first row to get its value. */
private boolean isMagicSquare(int[][] matrix, int n) {
    /* Make sure we see all numbers 1 to n * n. */
    if (!allExpectedNumbersFound(matrix, n)) return false;

    /* Sum up the first row to get its value. */
    int expected = rowSum(matrix, 0, n);

    /* Check that all rows and columns have this value. */
    for (int i = 0; i < n; i++) {
        if (rowSum(matrix, i, n) != expected ||
            colSum(matrix, i, n) != expected) {
            return false;
        }
    }
    return true;
}

private int rowSum(int[][] grid, int row, int n) {
    int sum = 0;
    for (int col = 0; col < n; col++) {
        sum += grid[row][col];
    }
    return sum;
}

private int colSum(int[][] grid, int col, int n) {
    int sum = 0;
    for (int row = 0; row < n; row++) {
        sum += grid[row][col];
    }
    return sum;
}
private boolean isMagicSquare(int[][] matrix, int n) {
    /* Make sure we see all numbers 1 to n * n. */
    if (!allExpectedNumbersFound(matrix, n)) return false;

    /* Sum up the first row to get its value. */
    int expected = rowSum(matrix, 0, n);

    /* Check that all rows and columns have this value. */


}

private int rowSum(int[][] grid, int row, int n) {

}

private int colSum(int[][] grid, int col, int n) {

}
private boolean isMagicSquare(int[][] matrix, int n) {
    /* Make sure we see all numbers 1 to n * n. */
    if (!allExpectedNumbersFound(matrix, n)) return false;

    /* Sum up the first row to get its value. */
    int expected = rowSum(matrix, 0, n);

    /* Check that all rows and columns have this value. */
    for (int i = 0; i < n; i++) {
        if (rowSum(matrix, i, n) != expected | 
            colSum(matrix, i, n) != expected)
            return false;
    }
    return true;
}

private int rowSum(int[][] grid, int row, int n) {
    int sum = 0;
    for (int col = 0; col < n; col++) {
        sum += grid[row][col];
    }
    return sum;
}

private int colSum(int[][] grid, int col, int n) {
    int sum = 0;
    for (int row = 0; row < n; row++) {
        sum += grid[row][col];
    }
    return sum;
}
private boolean isMagicSquare(int[][] matrix, int n) {
    /* Make sure we see all numbers 1 to n * n. */
    if (!allExpectedNumbersFound(matrix, n)) return false;

    /* Sum up the first row to get its value. */
    int expected = rowSum(matrix, 0, n);

    /* Check that all rows and columns have this value. */
    for (int i = 0; i < n; i++) {
        if (rowSum(matrix, i, n) != expected ||
            colSum(matrix, i, n) != expected)
    }

    return true;
}

private int rowSum(int[][] grid, int row, int n) {
    int sum = 0;
    for (int col = 0; col < n; col++) {
        sum += grid[row][col];
    }
    return sum;
}

private int colSum(int[][] grid, int col, int n) {
    int sum = 0;
    for (int row = 0; row < n; row++) {
        sum += grid[row][col];
    }
    return sum;
}
private boolean isMagicSquare(int[][] matrix, int n) {
    /* Make sure we see all numbers 1 to n * n. */
    if (!allExpectedNumbersFound(matrix, n)) return false;

    /* Sum up the first row to get its value. */
    int expected = rowSum(matrix, 0, n);

    /* Check that all rows and columns have this value. */
    for (int i = 0; i < n; i++) {
        if (rowSum(matrix, i, n) != expected ||
            colSum(matrix, i, n) != expected)
            return false;
    }
    return true;
}

private int rowSum(int[][] grid, int row, int n) {
    int sum = 0;
    for (int col = 0; col < n; col++) {
        sum += grid[row][col];
    }
    return sum;
}

private int colSum(int[][] grid, int col, int n) {
    int sum = 0;
    for (int row = 0; row < n; row++) {
        sum += grid[row][col];
    }
    return sum;
}
private boolean isMagicSquare(int[][] matrix, int n) {
    /* Make sure we see all numbers 1 to n * n. */
    if (!allExpectedNumbersFound(matrix, n)) return false;

    /* Sum up the first row to get its value. */
    int expected = rowSum(matrix, 0, n);

    /* Check that all rows and columns have this value. */
    for (int i = 0; i < n; i++) {
        if (rowSum(matrix, i, n) != expected ||
            colSum(matrix, i, n) != expected)
            return false;
    }
    return true;
}

private int rowSum(int[][] grid, int row, int n) {
}

private int colSum(int[][] grid, int col, int n) {
}
private boolean isMagicSquare(int[][] matrix, int n) {
    /* Make sure we see all numbers 1 to n * n. */
    if (!allExpectedNumbersFound(matrix, n)) return false;

    /* Sum up the first row to get its value. */
    int expected = rowSum(matrix, 0, n);

    /* Check that all rows and columns have this value. */
    for (int i = 0; i < n; i++) {
        if (rowSum(matrix, i, n) != expected ||
            colSum(matrix, i, n) != expected)
            return false;
    }
    return true;
}

private int rowSum(int[][] grid, int row, int n) {
    int sum = 0;
    for (int col = 0; col < n; col++) {
        sum += grid[row][col];
    }
    return sum;
}

private int colSum(int[][] grid, int col, int n) {
    int sum = 0;
    for (int row = 0; row < n; row++) {
        sum += grid[row][col];
    }
    return sum;
}
private boolean isMagicSquare(int[][] matrix, int n) {
    /* Make sure we see all numbers 1 to n * n. */
    if (!allExpectedNumbersFound(matrix, n)) return false;

    /* Sum up the first row to get its value. */
    int expected = rowSum(matrix, 0, n);

    /* Check that all rows and columns have this value. */
    for (int i = 0; i < n; i++) {
        if (rowSum(matrix, i, n) != expected ||
            colSum(matrix, i, n) != expected)
            return false;
    }
    return true;
}

private int rowSum(int[][] grid, int row, int n) {
    int sum = 0;
    for (int col = 0; col < n; col++) {
    }
    return sum;
}

private int colSum(int[][] grid, int col, int n) {
    int sum = 0;
    for (int i = 0; i < n; i++) {
        sum += grid[i][col];
    }
    return sum;
}
private boolean isMagicSquare(int[][] matrix, int n) {
    /* Make sure we see all numbers 1 to n * n. */
    if (!allExpectedNumbersFound(matrix, n)) return false;

    /* Sum up the first row to get its value. */
    int expected = rowSum(matrix, 0, n);

    /* Check that all rows and columns have this value. */
    for (int i = 0; i < n; i++) {
        if (rowSum(matrix, i, n) != expected ||
            colSum(matrix, i, n) != expected)
            return false;
    }
    return true;
}

private int rowSum(int[][] grid, int row, int n) {
    int sum = 0;
    for (int col = 0; col < n; col++) {
        sum += grid[row][col];
    }
    return sum;
}

private int colSum(int[][] grid, int col, int n) {
}
private boolean isMagicSquare(int[][] matrix, int n) {
    /* Make sure we see all numbers 1 to n * n. */
    if (!allExpectedNumbersFound(matrix, n)) return false;

    /* Sum up the first row to get its value. */
    int expected = rowSum(matrix, 0, n);

    /* Check that all rows and columns have this value. */
    for (int i = 0; i < n; i++) {
        if (rowSum(matrix, i, n) != expected ||
            colSum(matrix, i, n) != expected)
            return false;
    }
    return true;
}

private int rowSum(int[][] grid, int row, int n) {
    int sum = 0;
    for (int col = 0; col < n; col++) {
        sum += grid[row][col];
    }
    return sum;
}

private int colSum(int[][] grid, int col, int n) {
}
private boolean isMagicSquare(int[][] matrix, int n) {
    /* Make sure we see all numbers 1 to n * n. */
    if (!allExpectedNumbersFound(matrix, n)) return false;

    /* Sum up the first row to get its value. */
    int expected = rowSum(matrix, 0, n);

    /* Check that all rows and columns have this value. */
    for (int i = 0; i < n; i++) {
        if (rowSum(matrix, i, n) != expected ||
            colSum(matrix, i, n) != expected)
            return false;
    }
    return true;
}

private int rowSum(int[][] grid, int row, int n) {
    int sum = 0;
    for (int col = 0; col < n; col++) {
        sum += grid[row][col];
    }
    return sum;
}

private int colSum(int[][] grid, int col, int n) {
    int sum = 0;
    for (int row = 0; row < n; row++) {
        sum += grid[row][col];
    }
    return sum;
}
private boolean allExpectedNumbersFound(int[][] square, int n) {

    boolean[] used = new boolean[n * n + 1];

    for (int row = 0; row < n; row++) {
        for (int col = 0; col < n; col++) {
            /* Make sure it's in range */
            if (square[row][col] < 1 || square[row][col] > n * n)
                return false;

            /* Make sure it isn't used. */
            if (used[square[row][col]])
                return false;

            /* Mark the square used. */
            used[square[row][col]] = true;
        }
    }

    /* At this point, we know that all numbers are in range and there are
    no duplicates, so everything is valid. */
    return true;
}

private boolean allExpectedNumbersFound(int[][] square, int n) {
    boolean[] used = new boolean[n * n + 1];

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The plan

• General info
• Graphics and interactivity
• 2D arrays
• ArrayLists
• HashMaps
• Data structure design
• Strings
ArrayList notes
ArrayList notes

• ArrayList is useful when you don’t know how many entries you will have
ArrayList notes

- ArrayList is useful when you don’t know how many entries you will have
- An ArrayList can be searched with .contains() which returns a boolean
ArrayList notes

- **ArrayList** is useful when you don’t know how many entries you will have.

- An **ArrayList** can be searched with `.contains()` which returns a **boolean**.

- Another useful method is `.add(int index, data)` which shifts everything after index over by one so `data` can take that spot.
ArrayList notes

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<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>0</td>
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<td>2</td>
<td>3</td>
</tr>
<tr>
<td>&quot;Hello&quot;</td>
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```
al.add(2, “Sup”);
```
ArrayList notes

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How can I iterate across an ArrayList<String> al?

Option 1:
“for loop”

Option 2:
“iterator”

Option 3:
“for each”
How can I iterate across an ArrayList<String> al?

Option 1: for (int i = 0; i < al.size(); i++)

Option 2: iterator

Option 3: for each
How can I iterate across an `ArrayList<String> al`?

**Option 1:**

```
for (int i = 0; i < al.size(); i++)
println(al.get(i));
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Iterator<String> iter = al.iterator();
```

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```
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for (int i = 0; i < al.size(); i++)
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Option 2: "iterator"
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Iterator<String> iter = al.iterator();
while(iter.hasNext())
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Option 3: "for each"
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Options:

- **for loop**
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HashMap usage
HashMap usage

HashMap hm = new HashMap<KeyType, ValueType>();
HashMap usage

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boolean in = hm.containsKey("john");

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lastName = hm.get("miles"); //lastName is "miles"

boolean in = hm.containsKey("john"); //in is FALSE
HashMap notes
HashMap notes

• If you call `get` on a key that doesn’t exist, you will get `null`. 
HashMap notes

• If you call `get` on a key that doesn’t exist, you will get `null`.

• If you `put` a value for a key that already exists, the previous value is overwritten.
HashMap notes

• If you call `get` on a key that doesn’t exist, you will get `null`.

• If you `put` a value for a key that already exists, the previous value is overwritten.

• A `HashMap` is unordered. The keys won’t be iterated over in the same order you put them in.
How can I iterate across a
HashMap<String, Integer> hm?

All the keys:

All the values:
How can I iterate across a `HashMap<String, Integer>` `hm`?

All the keys:

```java
for (String key : hm.keySet())
```

All the values:
How can I iterate across a HashMap<String, Integer> hm?

All the keys:

```java
for (String key : hm.keySet())
    println(key);
```

All the values:
How can I iterate across a
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    println(hm.get(key));
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The plan

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How do I find the size of each of these?
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ArrayList<Integer> al?
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```java
ArrayList<Integer> al?  al.size()
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How do I find the size of each of these?

`ArrayList<Integer> al? al.size()`

`char[] charArr?`
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ArrayList<Integer> al?    al.size()
char[] charArr?            charArr.length
How do I find the size of each of these?

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char[] charArr?

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HashMap<String, Integer> hm?
- # keys: hm.size()
- # values: hm.size()

int[][] bigArr?
- # rows: 
- # columns: 
How do I find the size of each of these?

`ArrayList<Integer> al?`  `al.size()`

`char[] charArr?`  `charArr.length`

`HashMap<String, Integer> hm?`  `hm.size()`

  # keys:
  # values:

`int[][] bigArr?`  `bigArr.length`

  # rows:
  # columns:
How do I find the size of each of these?

ArrayList<Integer> al?
- al.size()

char[] charArr?
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HashMap<String, Integer> hm?
- # keys: hm.size()
- # values: hm.size()

int[][][] bigArr?
- # rows: bigArr.length
- # columns: bigArr[0].length
Your task in this problem is to write a definition for a class called `Localizer` designed to help with the localization process. The constructor for the class has the form

```java
public Localizer(String filename)
```

The constructor creates a new `Localizer` object and initializes it by reading the contents of the data file. The data file consists of an English word, followed by any number of lines of the form

```
xx=translation
```

where `xx` is a standardized two-letter language code, such as `de` for German, `es` for Spanish, and `fr` for French. Part of such a data file, therefore, might look like this:

```
Localizations.txt
Cancel
de=Abbrechen
es=Cancelar
fr=Annuler
Close
de=Schließen
es=Cerrar
fr=Fermer
OK
fr=Approuver
Open
de=Öffnen
es=Abrir
fr=Ouvrir
```

Beyond the constructor, the only public method you need to define for `Localizer` is

```java
public String localize(String word, String language)
```
public class Localizer {

    private HashMap<String, HashMap<String, String>> map;

    public Localizer(String filename) {
        map = new HashMap<String, HashMap<String, String>>();
        try {
            BufferedReader rd = new BufferedReader(new FileReader(filename));
            String word = null;
            while (true) {
                String line = rd.readLine();
                if (line == null) break;
                int equalSign = line.indexOf(' = ');
                if (equalSign == -1)
                    word = line;
                else {
                    String lang = line.substring(0, equalSign);
                    String translation = line.substring(equalSign + 3);
                    if (map.get(word) == null)
                        map.put(word, new HashMap<String, String>());
                    map.get(word).put(lang, translation);
                }
            }
            rd.close();
        } catch (Exception e) {
            throw new ErrorException(e);
        }
    }

    public String localize(String word, String lang) {
        if (map.get(word) == null) return null;
        return map.get(word).get(lang);
    }
}
public class Localizer {

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            String word = null;
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                String line = rd.readLine();
                if (line == null) break;
                int equalSign = line.indexOf('=}');
                if (equalSign == -1) {
                    word = line;
                } else {
                    String lang = line.substring(0, equalSign);
                    String translation = line.substring(equalSign + 1);
                    if (map.get(word) == null) {
                        map.put(word, new HashMap<String, String>());
                    }
                    map.get(word).put(lang, translation);
                }
            }
            rd.close();
        } catch (Exception ex) {
            throw new ErrorException(ex);
        }
    }

    public String localize(String word, String lang) {
        if (map.get(word) == null) return null;
        return map.get(word).get(lang);
    }
}

Localizations.txt
Cancel
de=Abbrechen
es=Cancelar
fr=Annuler
Close
de=Schließen
es=Cerrar
fr=fermer
OK
fr=Approuver
Open
de=Öffnen
es=Abrir
fr=Ouvrir
public class Localizer {

    private HashMap<String, HashMap<String, String>> map;

    public Localizer(String filename) {
        map = new HashMap<String, HashMap<String, String>>();
        try {

            BufferedReader rd = new BufferedReader(new FileReader(filename));
            String word = null;
            while (true) {
                String line = rd.readLine();
                if (line == null) break;
                int equalSign = line.indexOf('=');
                if (equalSign == -1)
                    word = line;
                else {
                    String lang = line.substring(0, equalSign);
                    String translation = line.substring(equalSign + 1);
                    if (map.get(word) == null)
                        map.put(word, new HashMap<String, String>());
                    map.get(word).put(lang, translation);
                }
            }
            rd.close();

        } catch (Exception ex) {
            throw newErrorException(ex);
        }
    }

    public String localize(String word, String lang) {
        if (map.get(word) == null)
            return null;
        return map.get(word).get(lang);
    }
}

Localizations.txt
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            while (true) {

            }
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                    map.get(word).put(lang, line.substring(equalSign + 1));
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public class Localizer {

    private HashMap<String, HashMap<String, String>> map;

    public Localizer(String filename) {
        map = new HashMap<String, HashMap<String, String>>() {
            
            try {
                BufferedReader rd = new BufferedReader(new FileReader(filename));
                String word = null;
                while (true) {
                    String line = rd.readLine();
                    if (line == null) break;
                    int equalSign = line.indexOf('=');
                    if (equalSign == -1)
                        word = line;
                    else {
                        String lang = line.substring(0, equalSign);
                        String translation = line.substring(equalSign + 1);
                        map.get(word).put(lang, translation);
                    }
                }
                rd.close();
            } catch (Exception ex) {
                throw newErrorException(ex);
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        }
    }

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    }
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public class Localizer {

    private HashMap<String, HashMap<String, String>> map;

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        map = new HashMap<String, HashMap<String, String>>();
        try {
            BufferedReader rd = new BufferedReader(new FileReader(filename));
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            while (true) {
                String line = rd.readLine();
                if (line == null) break;
                int equalSign = line.indexOf( '=' );
                if (equalSign == -1)
                    word = line;
                else {
                    String lang = line.substring(0, equalSign);
                    String translation = line.substring(equalSign + 1);
                    if (map.get(word) == null)
                        map.put(word, new HashMap<String, String>());
                    map.get(word).put(lang, translation);
                }
            }
            rd.close();
        } catch (Exception ex) {
            throw new ErrorException(ex);
        }
    }

    public String localize(String word, String lang) {
        if (map.get(word) == null) return null;
        return map.get(word).get(lang);
    }
}
public class Localizer {

    private HashMap<String, HashMap<String, String>> map;

    public Localizer(String filename) {
        map = new HashMap<String, HashMap<String, String>>();
        try {
            BufferedReader rd = new BufferedReader(new FileReader(filename));
            String word = null;
            while (true) {
                String line = rd.readLine();
                if (line == null) break;
                int equalSign = line.indexOf('=');
                if (equalSign == -1)
                    word = line;
                else {
                    String lang = line.substring(0, equalSign);
                    String translation = line.substring(equalSign + 1);
                    if (map.get(word) == null)
                        map.put(word, new HashMap<String, String>());
                    map.get(word).put(lang, translation);
                }
            }
        } finally {
            rd.close();
        }
        catch (Exception ex) {
            throw new ErrorException(ex);
        }
    }

    public String localize(String word, String lang) {
        return map.get(word).get(lang);
    }
}
public class Localizer {

    private HashMap<String, HashMap<String, String>> map;

    public Localizer(String filename) {
        map = new HashMap<String, HashMap<String, String>>(0);
        try {
            BufferedReader rd = new BufferedReader(new FileReader(filename));
            String word = null;
            while (true) {
                String line = rd.readLine();
                if (line == null) break;
                int equalSign = line.indexOf(' = ');
                if (equalSign == -1)
                    word = line;
                else {
                    String lang = line.substring(0, equalSign);
                    String translation = line.substring(equalSign + 1);
                    if (map.get(word) == null)
                        map.put(word, new HashMap<String, String>(0));
                    map.get(word).put(lang, translation);
                }
            }
            rd.close();
        } catch (Exception ex) {
            throw new ErrorException(ex);
        }
    }

    public String localize(String word, String lang) {
        if (map.get(word) == null) return null;
    }
}
public class Localizer {

    private HashMap<String, HashMap<String, String>> map;

    public Localizer(String filename) {
        map = new HashMap<String, HashMap<String, String>>();
        try {
            BufferedReader rd = new BufferedReader(new FileReader(filename));
            String word = null;
            while (true) {
                String line = rd.readLine();
                if (line == null) break;
                int equalSign = line.indexOf('=');
                if (equalSign == -1)
                    word = line;
                else {
                    String lang = line.substring(0, equalSign);
                    String translation = line.substring(equalSign + 1);
                    if (map.get(word) == null)
                        map.put(word, new HashMap<String, String>());
                    map.get(word).put(lang, translation);
                }
            }
            rd.close();
        } catch (Exception ex) {
            throw newErrorException(ex);
        }
    }

    public String localize(String word, String lang) {
        if (map.get(word) == null) return null;
        return map.get(word).get(lang);
    }
}
The plan

• General info
• Graphics and interactivity
• 2D arrays
• ArrayLists
• HashMaps
• Data structure design
• Strings
How do I insert a letter in the middle of a String?
How do I insert a letter in the middle of a String?

```java
String letters = "ABDE";
```
How do I insert a letter in the middle of a String?

String letters = “ABDE”;
char toInsert = ‘C’;
How do I insert a letter in the middle of a String?

```java
String letters = "ABDE";
char toInsert = 'C';
int insertPos = 2;
```
How do I insert a letter in the middle of a String?

String letters = "ABDE";
char toInsert = 'C';
int insertPos = 2;
String fixed =
How do I insert a letter in the middle of a String?

String letters = "ABDE";
char toInsert = 'C';
int insertPos = 2;
String fixed =
    letters.substring(0, insertPos) +
How do I insert a letter in the middle of a String?

String letters = "ABDE";
char toInsert = 'C';
int insertPos = 2;
String fixed =
    letters.substring(0, insertPos) +
    toInsert +
How do I insert a letter in the middle of a String?

String letters = "ABDE";
char toInsert = 'C';
int insertPos = 2;
String fixed =
    letters.substring(0, insertPos) +
    toInsert +
    letters.substring(insertPos, letters.length());
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String letters = “ABDE”;
char toInsert = ‘C’;
int insertPos = 2;
String fixed =
    letters.substring(0, insertPos) +
    toInsert +
    letters.substring(insertPos, letters.length());
Your job in this problem is to write a predicate method

    public boolean isAnagram(String s1, String s2)

that takes two strings and returns true if they contain exactly the same alphabetic characters, even though those characters may appear in any order. Thus, your method should return true for each of the following calls:

    isAnagram("O, Draconian devil!", "Leonardo da Vinci")
    isAnagram("Oh, lame saint!", "The Mona Lisa")
    isAnagram("ALGORITHMICALLY", "logarithmically")
    isAnagram("Doctor Who", "Torchwood")

These examples illustrate two important requirements for the isAnagram method:

- The implementation should look only at letters (i.e., characters for which the Character.isLetter method returns true), ignoring any extraneous spaces and punctuation marks thrown in along the way.
- The implementation should ignore the case of the letters in both strings.
/** Returns true if s1 and s2 are anagrams of each other */
private boolean isAnagram(String s1, String s2) {

}


/** Returns true if s1 and s2 are anagrams of each other */
private boolean isAnagram(String s1, String s2) {
    int[] table1 = createFrequencyTable(s1);
    int[] table2 = createFrequencyTable(s2);
    }
/** Returns true if s1 and s2 are anagrams of each other **/ private boolean isAnagram(String s1, String s2) {      int[] table1 = createFrequencyTable(s1);      int[] table2 = createFrequencyTable(s2);  }

/** Creates a letter-frequency table for the string **/ private int[] createFrequencyTable(String str) {  }
/** Returns true if s1 and s2 are anagrams of each other */
private boolean isAnagram(String s1, String s2) {
    int[] table1 = createFrequencyTable(s1);
    int[] table2 = createFrequencyTable(s2);
}

/** Creates a letter-frequency table for the string */
private int[] createFrequencyTable(String str) {
    int[] letterCounts = new int[26];

    return letterCounts;
}
/** Returns true if s1 and s2 are anagrams of each other */
private boolean isAnagram(String s1, String s2) {
    int[] table1 = createFrequencyTable(s1);
    int[] table2 = createFrequencyTable(s2);
}

/** Creates a letter-frequency table for the string */
private int[] createFrequencyTable(String str) {
    int[] letterCounts = new int[26];
    for (char ch = 'A'; ch <= 'Z'; ch++) {
        letterCounts[ch - 'A'] = 0;
    }
    return letterCounts;
}
/** Returns true if s1 and s2 are anagrams of each other */
private boolean isAnagram(String s1, String s2) {
    int[] table1 = createFrequencyTable(s1);
    int[] table2 = createFrequencyTable(s2);
}

/** Creates a letter-frequency table for the string */
private int[] createFrequencyTable(String str) {
    int[] letterCounts = new int[26];
    for (char ch = 'A'; ch <= 'Z'; ch++) {
        letterCounts[ch - 'A'] = 0;
    }
    for (int i = 0; i < str.length(); i++) {
    }
    return letterCounts;
}
/** Returns true if s1 and s2 are anagrams of each other */
    private boolean isAnagram(String s1, String s2) {
        int[] table1 = createFrequencyTable(s1);
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    }

/** Creates a letter-frequency table for the string */
    private int[] createFrequencyTable(String str) {
        int[] letterCounts = new int[26];
        for (char ch = 'A'; ch <= 'Z'; ch++) {
            letterCounts[ch - 'A'] = 0;
        }
        for (int i = 0; i < str.length(); i++) {
            char ch = str.charAt(i);
        }
        return letterCounts;
    }
private boolean isAnagram(String s1, String s2) {
    int[] table1 = createFrequencyTable(s1);
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    for (int i = 0; i < str.length(); i++) {
        char ch = str.charAt(i);
        if (Character.isLetter(ch)) {
        }
    }
    return letterCounts;
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/** Returns true if s1 and s2 are anagrams of each other */
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        }
        for (int i = 0; i < str.length(); i++) {
            char ch = str.charAt(i);
            if (Character.isLetter(ch)) {
                letterCounts[Character.toUpperCase(ch) - 'A']++;
            }
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        return letterCounts;
    }
/** Returns true if s1 and s2 are anagrams of each other */
private boolean isAnagram(String s1, String s2) {
    int[] table1 = createFrequencyTable(s1);
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    for (int i = 0; i < table1.length; i++) {
    }
}

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private int[] createFrequencyTable(String str) {
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    int[] table1 = createFrequencyTable(s1);
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    for (int i = 0; i < table1.length; i++) {
        if (table1[i] != table2[i]) return false;
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        char ch = str.charAt(i);
        if (Character.isLetter(ch)) {
            letterCounts[Character.toUpperCase(ch) - 'A']++;
        }
    }
    return letterCounts;
}
You know what...
yes you CAN!

Good Luck 4 ur Exam

Wishing You The Best of Luck

Wish You a Good luck

Best of Luck
You know what... yes you CAN! Good Luck 4 ur Exam

Wishing You The Best of Luck

Best of Luck