Announcements

- Program 1 & Lab 2 were both due at 9:45a today
# Midterm Survey Responses

<table>
<thead>
<tr>
<th>Miterm Graded by Drop Deadline?</th>
<th>Lab/Program Before Midterm?</th>
<th>Lab Preference is Stronger?</th>
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**Total Responses** 24

- **Lab Preference Stronger** 21
- **Drop Deadline Stronger** 3
- **Lab Before Midterm** 22
- **Lab Not Needed** 2
- **Midterm Graded by Drop** 13
- **Drop Not Issue** 11
Midterm

- Midterm will be on July 9

- Topics: Everything through Arrays (Monday)
  - Computer Basics
  - Strings
  - Console I/O
  - JOptionPane
  - Branching Statements
  - Loops
  - Arrays
Questions?

- Yesterday:
  - More Loops
    - Loop Types
    - Scope
    - Advanced Loop Control
  - Lab 3: Smiley
Today in COMP 110

- Even More Loops
  - Lecture: Common Loop Bugs
  - Worksheet: Designing Loops

- Lecture/Demo: Debugging Programs
Loop Bugs

- Bug: Problem with program preventing correct execution
  - Syntax, Runtime, & Logic Errors

- Two most common mistakes in loops
  - Off-by-One Error: error involving the discrete equivalent of a boundary condition
    - Typically a logic error but can be a runtime error
  - Infinite Loop: a loop that never terminates

6/29/2012

COMP 110 - Summer II 2012
Off-by-One Error: Logic

Example

// Execute Loop Body 5 times
for (int i = 0; i <= 5; i++)
{
    // Loop Body
}

Wrong! The loop is executed 6 times
Off-by-One Error: Logic

Example

// Execute Loop Body 5 times
for (int i = 0; i <= 5; i++)
{
    // Loop Body
}

Wrong! The loop is executed 6 times

Error Fixed

// Execute Loop Body 5 times
for (int i = 0; i < 5; i++)
{
    // Loop Body
}
Off-by-One Error: Logic

- Slight Variant of Previous Example
  ```
  // Execute Loop Body 5 times
  for (int i = 1; i < 5; i++)
  {
    // Loop Body
  }
  ```

- Error Fixed
  ```
  // Execute Loop Body 5 times
  for (int i = 1; i <= 5; i++)
  {
    // Loop Body
  }
  ```

WRONG! The loop is executed 4 times
Off-by-One Error: Runtime

Example

```java
int i = 0;
while (i < myStr.length()) {
    char ch = myStr.charAt(i);
    System.out.println(ch);
    i++;
}
```

WRONG! What if `myStr = ""`
Off-by-One Error: Runtime

Example

```java
int i = 0;
do {
    char ch = myStr.charAt(i);
    System.out.println(ch);
    i++;
} while (i < myStr.length());
```

Error Fixed

```java
int i = 0;
while (i < myStr.length())
{
    char ch = myStr.charAt(i);
    System.out.println(ch);
    i++;
}
```
Off-by-One Error: Runtime

- Example

```java
int i = 0;
do {
    char ch = myStr.charAt(i);
    System.out.println(ch);
    i++;
} while (i < myStr.length());
```

- Error Fixed (Better)

```java
for (int i = 0; i < myStr.length(); i++)
{
    char ch = myStr.charAt(i);
    System.out.println(ch);
}
```

Wrong! What if `myStr = ""`
Resolving Off-by-One Errors

- If you want to execute for \( n \) times
  - Use a for loop
  - If you want to start at 0
    - Use a strictly less than condition: \( < n \)
  - If you want to start at 1
    - Use a less than or equals condition: \( \leq n \)

- When testing, be aware of the this error possibility
Infinite Loops

- Usually results from forgetting to change the loop variable

Example

```java
int i = 0;
while (i < myStr.length())
{
    char ch = myStr.charAt(i);
    System.out.println(ch);
}
```

WRONG! The program will print the 0th character forever (i never changes)
Infinite Loops

- Nested Example
  
  ```java
  for (int i = 0; i < studentCount; i++)
  {
    for (int j = 0; j < studentCount; i++)
    {
      System.out.println("Student "+i+" shook Student "+j+"'s hand");
    }
  }
  ```

- Fixed
  
  ```java
  for (int i = 0; i < studentCount; i++)
  {
    for (int j = 0; j < studentCount; j++)
    {
      System.out.println("Student " + i + " shook Student " + j + "'s hand");
    }
  }
  ```

WRONG! Incremented the wrong variable
Resolving Infinite Loops

- Remember to include some condition that will terminate the loop
  - Sometimes this is best as the controlling `Boolean_Expression`
  - Sometimes this is best using a `break` statement
In-Class Worksheet

- Solve the problems on the provided worksheet
- You may use the book and lecture notes
- Work alone
Worksheet Solutions

- Solutions demoed in Eclipse

- The code fragments and solutions document will be posted after class
Questions?
Logistics

- Next:
  - Debugging Techniques