CSE 121 – Lesson 5

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Autumn 2023

Music: 121 23au Lecture Tunes 🐐

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Announcements, Reminders

• Creative Project 1 is out, due Tues October 17
• Resubmission Cycle 0 released yesterday, due Thurs October 19
  • Even if you're not resubmitting – read your feedback!!
• Quiz 0: Thursday, Oct 19 during section
  • Quiz logistics announcement
• Office Hour Problems (Miya's OH)
Last time: for loops!

For loops are our first *control structure*.
A syntactic structure that *controls* the execution of other statements.

```plaintext
for ( initialization ; test ; update ) {
    body (statements to be repeated)
}
```
Fencepost Pattern

Some task where one piece is repeated $n$ times, and another piece is repeated $n-1$ times and they alternate

g-u-m-b-a-l-l-l
Fencepost Pattern

Some task where one piece is repeated \( n \) times, and another piece is repeated \( n-1 \) times and they alternate.
(PCM) Nested for loops

```java
for (int outerLoop = 1; outerLoop <= 5; outerLoop++) {
    System.out.println("outer loop iteration "+ outerLoop);
    for (int innerLoop = 1; innerLoop <= 3; innerLoop++) {
        System.out.println(" inner loop iteration "+ innerLoop);
    }
    System.out.println(outerLoop);
}
```
What output is produced by the following code?

```
for (int i = 1; i <= 5; i++) {
    for (int j = 1; j <= i; j++) {
        System.out.println(i);
    }
    System.out.println();
}
```

A. 1 12 123 1234 12345  
B. i ii iii iiii  
C. 1 22 333 4444 55555
Poll in with your answer!

What code produces the following output?

A. ```java
for (int i = 1; i <= 5; i++) {
    System.out.print(i);
    System.out.println();
}
```  

B. ```java
for (int i = 1; i <= 5; i++) {
    for (int j = 1; j <= i; j++) {
        System.out.print(j);
    }
    System.out.println();
}
```  

C. ```java
for (int i = 1; i <= 5; i++) {
    for (int j = 1; j <= i; j++) {
        System.out.print(i);
    }
    System.out.println();
}
```  

D. ```java
for (int i = 1; i <= 5; i++) {
    for (int j = 1; j <= i; i++) {
        System.out.print(j);
    }
    System.out.println();
}
```
Pseudo-Randomness

Computers generate numbers in a predictable way using mathematical formulas.

Input may include current time, mouse position, etc.

True randomness is hard to achieve – we rely on natural processes

- e.g., atmospheric noise, lava lamps
(PCM) Random

A Random object generates *pseudo*-random numbers.

- The Random class is found in the `java.util` package
  
  ```java
  import java.util.*;
  ```

<table>
<thead>
<tr>
<th>Method</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><code>nextInt()</code></td>
<td>Returns a random integer</td>
</tr>
<tr>
<td><code>nextInt(max)</code></td>
<td>Returns a random integer in the range [0, <code>max</code>), or in other words, 0 to <code>max</code>-1 inclusive</td>
</tr>
<tr>
<td><code>nextDouble()</code></td>
<td>Returns a random real number in the range [0.0, 1.0)</td>
</tr>
</tbody>
</table>
### (PCM) Math

**Calling:**  
`Math.<method>(...)`

<table>
<thead>
<tr>
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</tr>
</thead>
<tbody>
<tr>
<td>Math.abs(value)</td>
<td>Returns the absolute value of <code>value</code></td>
</tr>
<tr>
<td>Math.ceil(value)</td>
<td>Returns <code>value</code> rounded up</td>
</tr>
<tr>
<td>Math.floor(value)</td>
<td>Returns <code>value</code> rounded down</td>
</tr>
<tr>
<td>Math.max(value1, value2)</td>
<td>Returns the larger of the two values</td>
</tr>
<tr>
<td>Math.min(value1, value2)</td>
<td>Returns the smaller of the two values</td>
</tr>
<tr>
<td>Math.round(value)</td>
<td>Returns <code>value</code> rounded to the nearest whole number</td>
</tr>
<tr>
<td>Math.sqrt(value)</td>
<td>Returns the square root of <code>value</code></td>
</tr>
<tr>
<td>Math.pow(base, exp)</td>
<td>Returns <code>base</code> raised to the <code>exp</code> power</td>
</tr>
</tbody>
</table>