START

THE 90's?

NO

STOP

YES

STOP

HAMMERTIME

COLLABORATE

LISTEN
The if/else statement

reading: 4.1, 4.6
Conditionals

- “If you eat your vegetables, then you can have dessert.”

- “If you do your homework, then you may go outside to play, or else you’ll be grounded for life.”
The `if` statement

Executes a block of statements only if a test is true

```java
if (test) {
    statement;
    ...
    statement;
}
```

- Example:
```
double gpa = console.nextDouble();
if (gpa >= 3.0) {
    System.out.println("Good job! Here’s a cookie.");
}
```
The if/else statement

Executes one block if a test is true, another if false

if (test) {
    statement(s);
} else {
    statement(s);
}

• Example:
  double gpa = console.nextDouble();
  if (gpa >= 3.0) {
      System.out.println("Good job! Here’s a cookie.");
  } else {
      System.out.println("No cookie for you!");
  }
Relational expressions

- *if* statements and *for* loops both use logical tests.

```java
for (int i = 1; i <= 10; i++) { ... 
if (i <= 10) { ... 
```

- These are Boolean expressions, seen in Ch. 5.

- Tests use *relational operators*:

<table>
<thead>
<tr>
<th>Operator</th>
<th>Meaning</th>
<th>Example</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>==</td>
<td>equals</td>
<td>1 + 1 == 2</td>
<td>true</td>
</tr>
<tr>
<td>!=</td>
<td>does not equal</td>
<td>3.2 != 2.5</td>
<td>true</td>
</tr>
<tr>
<td>&lt;</td>
<td>less than</td>
<td>10 &lt; 5</td>
<td>false</td>
</tr>
<tr>
<td>&gt;</td>
<td>greater than</td>
<td>10 &gt; 5</td>
<td>true</td>
</tr>
<tr>
<td>&lt;=</td>
<td>less than or equal to</td>
<td>126 &lt;= 100</td>
<td>false</td>
</tr>
<tr>
<td>&gt;=</td>
<td>greater than or equal to</td>
<td>5.0 &gt;= 5.0</td>
<td>true</td>
</tr>
</tbody>
</table>
What's wrong with the following code?

Scanner console = new Scanner(System.in);
System.out.print("What percentage did you earn? ");
int percent = console.nextInt();
if (percent >= 90) {
    System.out.println("You got an A!" consultancy);
}
if (percent >= 80) {
    System.out.println("You got a B!" consultancy);
}
if (percent >= 70) {
    System.out.println("You got a C!" consultancy);
}
if (percent >= 60) {
    System.out.println("You got a D!" consultancy);
}
if (percent < 60) {
    System.out.println("You got an F!" consultancy);
}
...
Nested if/else

Chooses between outcomes using many tests

if (test) {
    statement(s);
} else if (test) {
    statement(s);
} else {
    statement(s);
}

- Example:
  
  ```java
  if (x > 0) {
      System.out.println("Positive");
  } else if (x < 0) {
      System.out.println("Negative");
  } else {
      System.out.println("Zero");
  }
  ```
Nested if/else/if

- If it ends with else, exactly one path must be taken.
- If it ends with if, the code might not execute any path.

```java
if (test) {
    statement(s);
} else if (test) {
    statement(s);
} else if (test) {
    statement(s);
}
```

- Example:

```java
if (place == 1) {
    System.out.println("Gold medal!");
} else if (place == 2) {
    System.out.println("If you're not first, you're last!");
} else if (place == 3) {
    System.out.println("What comes after last place?");
}
```
Summary: if structures

- **exactly 1 path**  \((\textit{mutually exclusive})\)
  
  ```java
  if (test) {
      statement(s);
  } else if (test) {
      statement(s);
  } else {
      statement(s);
  }
  ```

- **0 or 1 path**  \((\textit{mutually exclusive})\)
  
  ```java
  if (test) {
      statement(s);
  } else if (test) {
      statement(s);
  } else if (test) {
      statement(s);
  }
  ```

- **0, 1, or many paths**  \((\textit{independent tests; not exclusive})\)
  
  ```java
  if (test) {
      statement(s);
  }
  if (test) {
      statement(s);
  }
  if (test) {
      statement(s);
  }
  ```
Which nested \texttt{if/else}?

- **(1) \texttt{if/if/if}**  
  - Whether a user is lower, middle, or upper-class based on income.  
  - **(2) \texttt{nested if/else if/else}**

- **(2) \texttt{nested if/else if/else}**  
  - Whether you made the dean's list (GPA \geq 3.8) or honor roll (3.5-3.8).  
  - **(3) \texttt{nested if/else if}**

- **(3) \texttt{nested if/else if}**  
  - Whether a number is divisible by 2, 3, and/or 5.  
  - **(1) \texttt{sequential if/else if}**

- **(1) \texttt{sequential if/else if}**  
  - Computing a grade of A, B, C, D, or F based on a percentage.  
  - **(2) \texttt{nested if/else if/else if/else if/else}**
The if/else hammer

- Just because you learned a new construct does not mean that every new problem has to be solved using that construct!

```java
int z;
if (x > y) {
    z = x;
} else {
    z = y;
}

int z = Math.max(x, y);

double d = a;
if (b < d) {
    d = b;
}
if (c < d) {
    d = c;
}
double d = Math.min(a, Math.min(b, c));
```