CMSC131

Conditional Statements and Logical Operators
Flow of Control

• The typical "flow" through a program is top-to-bottom with each statement being executed in turn.
• We can alter this flow!

• Method calls {kinda} (we saw this last week)
• Conditional statements (this slide set)
• Iteration (we will see this soon)
Conditional Statements

• We can use a conditional statements to test whether something is true and then decide what to execute based on that.
  – **if** statements
  – **if-else** statements
if (condition) {
    statement(s) to execute...
}
next_statement_in_the_code;

• The **condition** is tested.
• **IF** it evaluates to **TRUE**, then the statements are executed and then control moves on to the next statement in the code.
• Otherwise (it evaluated to **FALSE**) control skips right to that next statement in the code without executing the statements inside the braces.

**NOTE:** For style purposes, we will ALWAYS place the statement(s) to execute within a `{ }` block.
if (condition) {
    first group of statements to execute...
}
else {
    second group of statements to execute...
}
next_statement_in_the_code;

• The condition is tested.
• IF it evaluates to TRUE, then the first group of statements are executed after which control moves on to the next statement in the code.
• ELSE (it evaluated to FALSE) the second group of statements are executed after which control moves on to the next statement in the code.

NOTE: the first or second group are executed, not both, not neither.
import java.util.Scanner;

public class SimpleConditional {
    public static void main(String[] args) {
        int i;
        Scanner sc = new Scanner(System.in);

        System.out.print("Enter an odd number: ");
        i = sc.nextInt();
        if (i%2 == 1) {  //the % op returns the remainder
            System.out.println("That's great, thanks!");
        } else {
            System.out.println("Um, that was an EVEN number");
        }
    }
}
Will \((i \% 2 == 1)\) always be true when \(i\) is an odd number?

1. Yes
2. No
3. I'm not sure.
Some Logical Operators

• We can create more detailed conditions using Boolean logic.

• There are several operators available.
  – and  **&&** in Java
  – or  **||** in Java
  – not  **!** in Java

NOTE: Parenthesis are your friend if you are concerned about order of operations.
int num;
const int lower = 35;
const int upper = 70;
...
if ((num > lower) && (num < upper)) {
    System.out.println("Thank you.");
}
else {
    System.out.println(
        "That's not between "+lower+" and "+upper+"!");
}
int months, miles;
const int monthLimit=3;
const int milesLimit=3000;
...
if ((months>=monthLimit)||(miles>milesLimit)) {
    System.out.println("Get an oil change!");
}
else {
    System.out.println("Keep on driving...");
}
Constants

• In some class examples I will use literal values where stylistically named constants would normally be used. This is mostly so that things fit well in the PowerPoint slides on-screen in these initial examples.
Nested/Cascading Conditionals

• The "nesting" of conditionals is when the block of statements within an if or else block itself contains a conditional statement.

• The "cascading" of conditionals is when you start an else by asking another if question.

```java
if (n<10) {
    System.out.println("Less than 10");
}
else if (n<20) {
    System.out.println("10 or more but less than 20");
}
else {
    System.out.println("20 or more");
}
```
if (numberOwned < 0) {
    System.out.println(
        "How can you own a negative number of " +
        animal + "s?");
} else if (numberOwned == 0) {
    System.out.println("That's a shame :(");
} else if ( ( 
    animal.equals("dog") ||
    animal.equals("cat") ||
    animal.equals("hamster")
    ) &&
    numberOwned < 4 ) {
    System.out.println("You are a typical "+animal+" owner.");
} else {
    System.out.println("That's unusual!");
}
What is a danger in the following code and how would you try to fix it?

```java
public static void main(String[] args) {
    float taxrate;

    Scanner sc = new Scanner(System.in);
    String s = sc.next();

    if (s.equals("MD")) {
        taxrate = 0.06F;
    }
    System.out.println("Tax Rate is " + taxrate);
}
```