Virginia Tech MASTERS OF INFORMATION TECHNOLOGY

# CS 5044
# Object-Oriented Programming with Java

## Q&A Session

## Comparisons

- Java relational operators are similar to those of most other languages:

| | | | | | |
|---|---|---|---|---|---|
| <= | < | == | > | >= | != |

  - Compatible with all non-boolean primitives (byte, short, char, int, long, float, double)
    - However, beware of using `==` and `!=` with double and float (see Section 5.2.2)
    - boolean primitives can only work with `==` and `!=`
- Comparing objects requires special consideration
  - Using `==` and `!=` will compare whether **references** point to the same object or not
    - Also useful for checking whether a reference is (or is not) null
      - Note: `null` is an explicit value used when a reference doesn't point to *any* object
    - These operators don't consider whether the **objects** are **equivalent** or not
      - Note: `enum` values of the same type are compared via `==` and `!=` (see Special Topic 5.4)
  - We use the `equals()` method to compare the **equivalence** of **objects**
    - Use of relational operators is a common mistake, especially with String objects:

```
String a = "a";
String b = "b";
boolean x = "ab".equals(a + b);       // x is true, as expected
boolean y = "ab" == (a + b);          // y is false (probably unexpected!)
```

    - NOTE: The `equals()` method won't (yet!) work as expected for your own classes

## Conditionals

- Conditionals are just boolean expressions, enclosed within parentheses
  - If you already have a boolean, just use it (or *NOT* it) directly, without any comparison
    - *Always* use `(valid)` or `(!valid)` rather than `(valid == true)` or `(valid == false)`
  - Avoid confusion: Be consistent, rearrange, and use parentheses when at all in doubt

```
(inStock && count == 0 || -1 != 3 + type)           // valid, but potentially confusing

((inStock && (count == 0)) || ((type + 3) != -1))     // much better equivalent
```

  - Short-circuits apply to `&&` and `||` operators, always from left to right

```
(perfect || goodEnough)                       // goodEnough is only considered if perfect is false

(perfect || isGoodEnough())                   // accessor is only called if perfect is false

(perfect || fixSomething())                   // mutator is only called if perfect is false (CAUTION!)
```

- Notable differences from some other programming languages:
  - Conditionals *must* evaluate to a formal boolean (Java primitive type)
    - All relational operators (previous slide) return a boolean
    - Common typos such as `(a = 3)` as boolean instead of `(a == 3)` are errors (that's good!)
      - Beware of boolean typos: `(valid = true)` changes `valid` to true, then evaluates as true!
  - Neither boolean expressions nor conditionals are valid as stand-alone statements
    - Some languages allow/encourage this: `perfect || fixSomething(); // not valid in Java`

## Branches: if () statements

- Branches can appear alone or in any combinations
  - The following patterns are common (names aren't standardized, nor are they important)
    - Chain:

```
if (...) { /*...*/ }
else if (...) { /*...*/ }
else if (...) { /*...*/ }
else { /*...*/ }
```

      - In certain cases, this can become a `switch()` statement (but normally better left as-is)
    - Ladder:

```
if (...) { /*...*/ }
if (...) { /*...*/ }
if (...) { /*...*/ }
```

      - Mutually exclusive sub-sequences can (and should) be converted to a chain
    - Nest:

```
if (...) {
    //...
    if (...) {
        //...
        if (...) {
            //...
        }
        //...
    }
    //...
}
```

    - Nests more than 2-3 levels deep are very hard to read, and generally discouraged

## Loops: while (), for (), and do-while () statements

- `while () { ... }` is the most fundamental loop structure
  - Conditional is re-evaluated before every entry into the loop body
    - Loop body is never executed if the conditional begins as false
    - Continues executing body statements "while" the conditional remains true
- `for () { ... }` is just a special case of a while () loop, in its own scope
  - `for (A; B; C) { ... }` is exactly equivalent to: `{ A; while (B) { ... C;} }`
  - Typically used for counted iterations (see idiomatic usage in Programming Tip 6.1)
  - It's never "wrong" to use a while () loop instead, but if the usage is appropriate...
    - ...then a for () loop is more convenient (and less surprising to other developers)
- `do { ... } while ();` is just a while () loop, with the conditional evaluated at the end
  - Guaranteed to execute the loop body at least one time
  - Much less common than the others, but quite useful in certain situations
- As with branches, nested loops are also naturally expected on occasion
  - Nests more than 2-3 levels deep are very hard to read, and generally discouraged

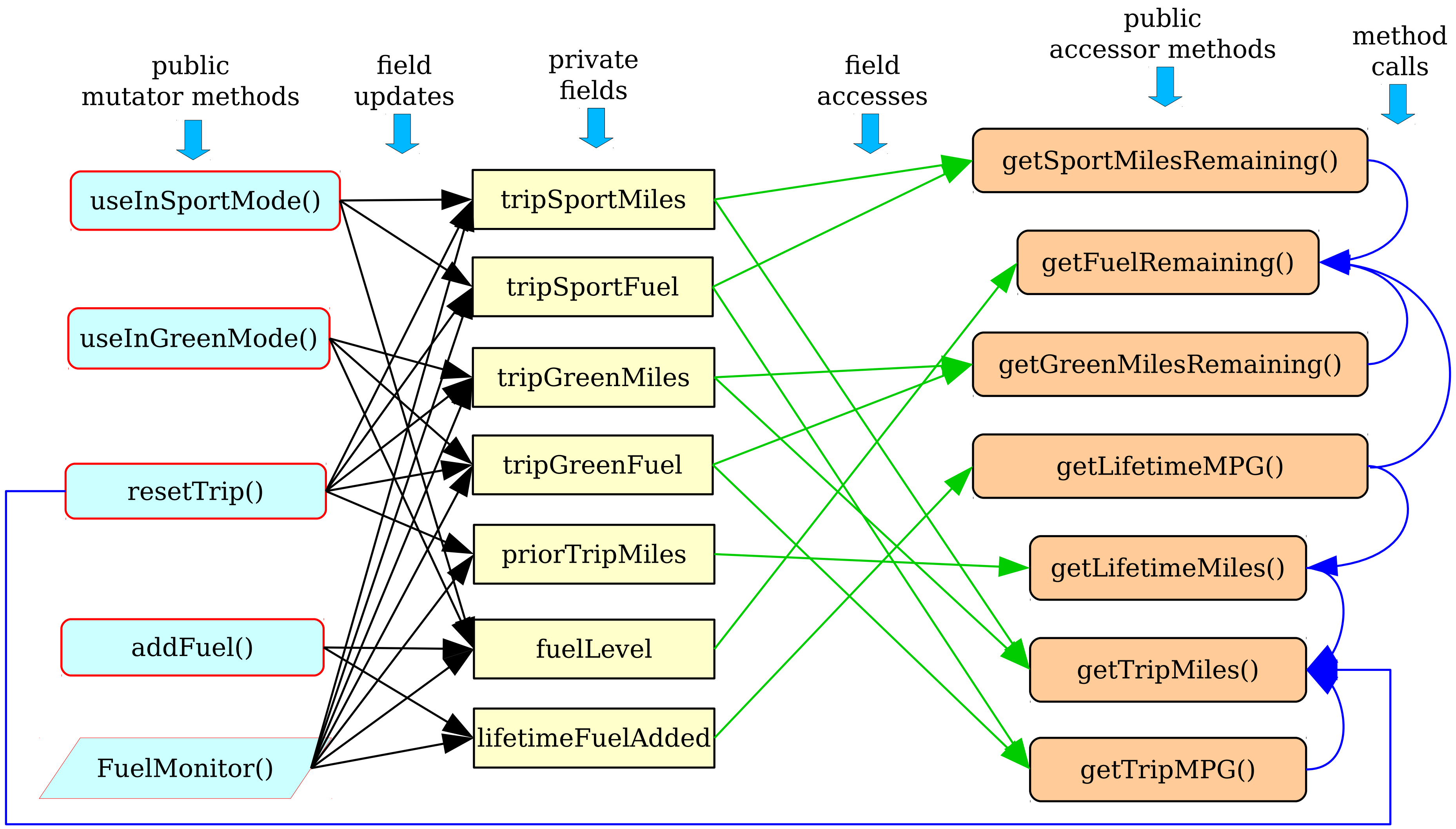
## Other considerations for branches/loops

- *Always* use braces to enclose the loop or branch body
  - Java will allow you to omit the braces, if the body contains only one statement
    - This was only done for consistency with other popular languages when Java was new
  - Please don't *ever* omit the braces!

```
while (!done)
{
    doSomething();
}
```

  - Note: Web-CAT treats this as "best practice" issue, rather than a Checkstyle rule
- Both `break` and `continue` are perfectly acceptable
  - The textbook implies that these are improper and to be avoided
    - Feel free to use them, as long as they simplify your code
  - However, don't use labels, nor the labeled-break; these are actually considered improper

# Project 1 - Programming the model


public mutator methods
field updates
private fields
field accesses
public accessor methods
method calls
useInSportMode()
useInGreenMode()
resetTrip()
addFuel()
FuelMonitor()
tripSportMiles
tripSportFuel
tripGreenMiles
tripGreenFuel
priorTripMiles
fuelLevel
lifetimeFuelAdded
getSportMilesRemaining()
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getGreenMilesRemaining()
getLifetimeMPG()
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