

## More Conditionals and Loops

- Objectives - when we have completed this set of notes, you should be familiar with:
  - switch statement
  - the conditional (ternary) operator
  - do-while statement (do-while loop)
  - for statement (for loop)
  - for-each statement (for-each loop)



## *switch* Statement

- Consider the following if statement, where input is a char value:

```
String answer;  
if (input == 't') {  
    answer = "true";  
}  
else if (input == 'f') {  
    answer = "false";  
}  
else {  
    answer = "invalid";  
}
```



## *switch* Statement

- The switch statement is very similar to the if statement (assume `input` is a `char` and `answer` is a `String`):

```
if (input == 't') {
    answer = "true";
}
else if (input == 'f') {
    answer = "false";
}
else {
    answer = "invalid";
}

switch(input) {
    case 't':
        answer = "true";
        break;
    case 'f':
        answer = "false";
        break;
    default:
        answer = "invalid";
}
```



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## *switch* Statement

- Now that you know the syntax, let's look a little more closely

- Expression in the switch is evaluated → `switch` (input) {
- Its value is matched to one of the cases. Suppose input is equal to `'f'`... → `case 'f':`  
answer will be set to `"false"` → `answer = "false";`
- The `break` statement breaks out of the switch → `break;`
- Note that `case 't':`, `case 'f':`, and `default:` are labels, not executable statements → `default:`  
→ `answer = "invalid";`

[TrueOrFalse.java](#)



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## switch Statement

**Q1**

- What happens when there is no break statement? Suppose *input* is 't'

- It will jump to the appropriate case...  
switch (input) {  
    case 't':  
        answer = "true";  
    case 'f':  
        answer = "false";  
    default:  
        answer = "invalid";  
}
- And then it will execute each statement in the switch until a break or the end of the switch statement. In this case, answer will be "invalid" even if input is 't' or 'f'  
[FallThroughSwitch.java](#)
- We probably meant to include breaks here, but consider how to print the remaining days in the week using a "fall through" switch (i.e., a switch with one or more missing break statements)



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## switch Statement

- When to use a switch statement?
  - When checking to see if a result is equal to different values (i.e., a lot of == logic)
  - When you can have alternatives based on an acceptable switch expression type
- Java 6 and earlier: the switch statement works on the primitive types: char, byte, short, int
  - Java 7 and later: switch statement also works on the wrapper classes of the types above, as well as String and enum types

[TaxesWithIfElseIf.java](#)

[TaxesWithSwitch.java](#)



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## ***switch* Statement**

- Why use a **switch** statement?
  - Depending on the circumstances, it can reduce a code's visual complexity and possibly the logic
    - Think of the "remaining days of week" example with the fall through switch; an **if** statement version would have replicated print statements
  - A **switch** statement can jump directly to the correct case, whereas an *if-else-if-else* has to evaluate each boolean expression until one is true or all are false
    - In other words, using a switch statement can make your program more efficient
  - Example: consider how the OS handles character input from the keyboard



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## **Conditional (Ternary) Operator**

**\_\_\_\_?\_\_\_\_:\_\_\_\_**

- Like a concise if-else but an expression:  
*boolean expression ? do\_this\_if\_true : do\_this\_if\_false*
- Examples:
  - Print **"Right!"** or **"Wrong."** depending on `isCorrect`  
`System.out.println(isCorrect ? "Right!" : "Wrong.");`
  - Subtract `discount` (a **double**) from `price` (a **double**) only if `discount` is above 0  
`double total = (discount > 0) ? (price - discount) : price;`
  - Print **" unit"** or **" units"** based on `unit`  
`System.out.println("Total: " + units + (units == 1 ? " unit":" units"));`



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## Conditional (Ternary) Operator

- When to use the ternary operator:
  - It can make a simple *if-else* statement more concise:

```
if (isCorrect) {  
    System.out.println("Right!");  
}  
else {  
    System.out.println("Wrong.");  
}
```

can be converted to...

```
System.out.println(isCorrect ? "Right!" : "Wrong.");
```



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## Conditional (Ternary) Operator

- Conciseness vs. Readability
  - May make the logic of your code hard to follow.
  - The following method returns the number of small bars needed to reach the goal based on small and large chocolate bars available. Having all the logic in a single return expression using multiple ternary operators likely makes the code harder to understand than multiple if statements had been used.

```
public int makeChocolate(int small, int big, int goal) {  
    return small - (goal - (big * 5 > goal ? goal / 5 : big) * 5) >= 0  
        ? (goal - (big * 5 > goal ? goal / 5 : big) * 5) : -1;  
}
```

[MakeChocolateExample.java](#)

**Q2**



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## ***do-while* Statement**

- **do-while** loop
  - Similar to a **while** loop, except that the boolean expression is evaluated at the end of the loop (the **do-while** statement is a *post-test* loop whereas the **while** statement is a *pre-test* loop)
  - This means the body of the **do-while** will always be executed at least once, regardless of whether the boolean expression is true

```
do {  
    /* code performed on each iteration */  
} while (/* boolean expression */);
```



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## ***do-while* Statement**

**Q3**

- A good use of a **do-while** is evaluating user input
- Suppose the user is to enter either a y or n, and you want to repeat the request until the input is y or n:

```
Scanner stdIn = new Scanner(System.in);  
String yOrN = "";  
do {  
    System.out.print("Continue? (enter y or n): ");  
    yOrN = stdIn.nextLine().trim();  
} while (!yOrN.equals("y") && !yOrN.equals("n"));
```

[YesOrNoInput.java](#)

[YesOrNoMaxInput.java](#)



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## ***for* Statement**

- **for** loop - Similar to the **while** loop, but well-suited for iterating a specific number of times or over a range of values

```
for ( _____; _____; _____ ) {  
    /* code performed on each iteration */  
}
```

*Initialization* -  
Performed before  
the first iteration.

*Termination* -  
boolean expression  
checked before  
each iteration

*Increment* -  
Performed after  
each iteration.



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## ***for* Statement**

- Suppose that you wanted code that would calculate the sum of all numbers from 1 to n. (i.e.,  $1+2+3+\dots+n$ )
  - Initialize a sum to 0.
  - Set up an index to count from 1 to n.
  - On each iteration of the loop...
    - Add the current index to a the sum
    - Increment the index
  - Break out of the loop if the index exceeds n.



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## ***for* Statement**

- Suppose that you wanted code that would calculate the sum of all numbers from 1 to n. (i.e.,  $1+2+3+\dots+n$ )

```
int n = 5;
int sum = 0;
for (int i = 1; i <= n; i++) {
    sum += i;
}
```

[AddMultiply.java](#)



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## ***for* loop vs. *while* loop**

*// for loop to add 1 to n:*

```
int n = 5;
int sum = 0;
for (int i = 1; i <= n; i++) {
    sum += i;
}
```

*// Equivalent while loop to add 1 to n:*

```
int n = 5;
int sum = 0;
int j = 1;
while (j <= n) {
    sum += j;
    j++;
}
```



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## ***for* Statement**

- Suppose that `list` is an `ArrayList` holding names of type `String`, and that you wanted to print out each name. You could use the following code:

```
for (int i = 0; i < list.size(); i++) {  
    System.out.println(list.get(i));  
}
```



## ***for-each* Statement**

- An `ArrayList` is an `Iterable` object, which means it can be the target of the "for-each" statement
- "for-each" (a.k.a. enhanced `for` loop) can be used to loop through `list`:

```
for (String name : list) {  
    System.out.println(name);  
}
```

- Read the loop header as:  
`for each String name in list ...`



## ***for-each* Statement**

- The loop header assigns each `String` object in order to `name`. On each iteration, the `String` object can be accessed using the variable `name`

Type of object held  
in the `ArrayList`

Variable used to  
reference the  
current item in  
each iteration

The variable name  
for the `ArrayList`

```
for (String name : list) {  
    System.out.println(name);  
}
```

[GroupRoster.java](#)



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## ***break* and *continue***

- A **`break`** statement in a loop immediately exits the loop
- The **`continue`** statement will skip the rest of the code in that iteration and attempt to do the next iteration of the loop
- Usually the **`break`** and **`continue`** statements in loops are used in conjunction with an **`if`** statement inside a loop

[YesOrNoMaxInput.java](#)

[BreakForExample.java](#)   [ContinueForExample.java](#)



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## TriangleListMenuApp

- Displays a menu of options then uses a **do-while** loop with a **switch** statement to take action based on the user's selection
- Options include:
  - R - Read in File and Create TriangleList
  - P - Print TriangleList
  - S - Print Smallest Perimeter
  - L - Print Largest Perimeter
  - T - Print Total of Perimeters
  - A - Add Triangle Object
  - D - Delete Triangle Object
  - Q - Quit"

[TriangleListMenuApp.java](#) (in separate folder)

