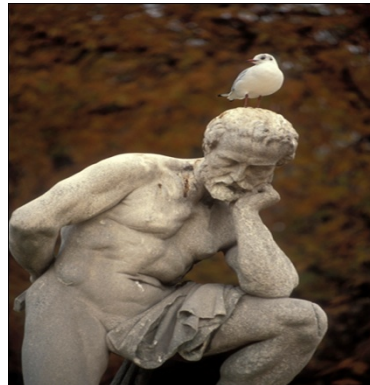


Simple Decisions

If ... else and conditions



Learning Objectives

- Learn about conditional expressions
- Examine equality, and relational operators
- Write selection (if) statements
- Write one-way and two-way selection statements
- Revisit operator precedence and explore order of operations

Decision making basics

- Consider a bank
- The bank calculates interest based on the following schedule
 - 3.5% annual interest if the deposit amount is more than \$5000
 - 2% annual interest for deposits less than \$5000
- Program is required to calculate the interest
- Programs can evaluate one or more conditions and take action based on the result

Boolean Expressions - basics

- English examples:
 1. if (gradePointAverage is greater than 3.80)
awardType is assigned deansList
 2. if (letterGrade is equal to 'F')
display message “You must repeat”
- Both statements have a *Conditional Expression* or a *Test Condition*
 - (gradePointAverage is greater than 3.80)
 - The result of the condition can be either true or false

Boolean Expressions - basics

- Both statements are associated with an action statement
 - awardType is assigned deansList
- Conditional statements are used to make decisions during a program's execution
- The action statement or statements are executed if the conditional expression is true
- The action statement is skipped (or alternate action is executed) if the conditional expression is false

Boolean Expressions - basics

```
if (condition) {  
    action statement(s)  
}
```

- Action statement(s) is executed only if the *condition* is true
- Example:
if (gradePointAverage is greater than 3.80)
 awardType is assigned deansList
- awardType is assigned deansList only if the gradePointAverage is more than 3.80
- awardType is not assigned anything if the gradePointAverage is at most 3.80

Test Condition

- Format:
(Conditional Expression)
- Parenthesis is required
- The result of evaluation of the conditional expression can only be **true** or **false**
- Operators Used in Test Conditions
 - Equality operators == !=
 - Relational operators > < >= <=
 - Logical operators && (AND) || (OR) ! (NOT)

Condition

```
if (gradePointAverage > 3.80) {  
    awardType = deansList;  
}
```

gradePointAverage	Condition	awardType
3.81	true	deansList
3.80	false	????
3.79	false	????

Equality Operators

Operator	Meaning	Example	Result
<code>==</code>	Equal	<code>(1 == 2)</code>	false
<code>!=</code>	NOT equal	<code>(1 != 2)</code>	true
<code>==</code>	Equal	<code>('A' == 'a')</code>	false
<code>!=</code>	NOT equal	<code>('A' != 'a')</code>	true
<code>==</code>	Equal	<code>(25 == Math.pow(5,2))</code>	true

- `double Math.pow(double x, double y) => xy`
- `Math.pow()` is an utility method

Equality Operator

```
double aValue = 10.0 / 3.0;  
if (aValue == 3.3333)  
    System.out.println("true");
```

- The test condition is **false**
- The floating point division 10.0/3.0 does not produce a finite value
 - The result can be unpredictable due to rounding

Relational Operators

Operator	Meaning	Example	Result
>	Greater than	(8 > 5)	true
>	Greater than	(5 > 7)	false
<	Less than	('A' < 'a')	true
>=	Greater than or equal	(272 >= 272)	true
<=	Less than or equal	(25 <= 18)	false
>	Greater than	(100 > (80+120))	false
<	Less than	(100 < "Money")	Error

One-way if statement

- Used when an expression needs to be tested
- If the condition is true, additional action is done
- If the condition is false, the next statement after the if is executed
- Format:

```
if (conditional_expression) {  
    statement (s);  
}
```

Two-way if statement

- Used when there are two possible outcomes based on the evaluation of the conditional expression
- If the condition is true, truth block is executed
- If the condition is false, false block is executed

- Format:

```
if (conditional_expression) {  
    truth statement (s);  
} else {  
    false statement (s);  
}
```

Operator Precedence

Category	Operator	Associative
Multiplicative	* / %	Left to Right
Additive	+ -	Left to Right
Relational	< > <= >=	Left to Right
Equality	== !=	Left to Right