# Additional Language Features

## Overview

In this lab, you will write an application that makes use of various additional language features in the Java programming language. You will also enhance previous lab code to use these language features where appropriate.

## Source modules

Student module: StudentAdditionalLanguageFeatures

Solution module: SolutionAdditionalLanguageFeatures

## Roadmap

There are 5 exercises in this lab, of which the last exercise is "if time permits". Here is a brief summary of the tasks you will perform in each exercise; more detailed instructions follow later:

1. Using autoboxing and unboxing
2. Defining and calling variable-argument-list methods
3. Defining and using enums
4. Using static imports
5. Additional suggestions

## Exercise 1: Using autoboxing and unboxing

Open AutoBoxingUnboxing.java, and write an application that explores autoboxing and unboxing in Java.

Suggestions and requirements:

* Write a simple main() method that declares an Integer variable. Try to assign it an integer constant (e.g. 42). Does this work? Now try to assign it a (previously declared) int variable. Does this work?
* Try to assign your Integer variable to an int variable. What happens?
* Create an ArrayList object (you'll need an import statement to import the java.util.ArrayList class). Try to add a mixture of Integer objects and int variables to the ArrayList. Does it work?
* Write a loop to iterate through your ArrayList. Each time round the loop, try to assign the current element to an Integer variable, and also to an int variable. What works? Explain to yourself what's happening under the covers.

## Exercise 2: Defining and calling variable-argument-list methods

Open Varargs.java, and write a method named sum(). The method should take at least 2 double parameters, plus any number of additional double values, and return the sum.

Suggestions and requirements:

* Implement sum() as a varargs method. Inside the method, use a loop to add up all the incoming values.
* Call sum() from main(), passing in a variety of different values.
* What happens if you pass in exactly 2 parameters?
* What happens if you pass in more than 2 parameters?
* What happens if you pass in fewer than 2 parameters?
* What happens if you pass in 2 double parameters, plus some illegal parameter types?

## Exercise 3: Defining and using enums

Open Employee.java, and take a look at the existing code. This is the solution code from earlier in the course.

Enhance the Employee class so that it holds the employee's contract type (full-time, part-time, or casual). Define an enum type named ContractType to represent the allowable contract types. Modify the constructor/display capabilities of the Employee class, to initialize and to output the employee's contract type. Test the Employee class in UseEmployee.java.

## Exercise 4: Using static imports

Still in the Employee class, add another method named displayJoiningDateInfo(). The method should make use of various static members of the Calendar class, to display detailed information about the employee's joining date.

Suggestions and requirements:

* The Calendar class provides extensive date/time capabilities for modern Java code. Calendar is an abstract class, so you can't create a Calendar object itself; instead, you create a GregorianCalendar object as follows (GregorianCalendar is a concrete subclass of Calendar):  
    
  Calendar cal = new GregorianCalendar();  
    
  Once you've created your GregorianCalendar object, you can set its date/time based on an existing Date object as follows (the following code snippet assumes you have a Date object named joined):  
    
  cal.setTime(joined);
* You can invoke the get() method on your (Gregorian)Calendar object, to get various pieces of information about the date/time. The get() method can take a static value from the Calendar class, to indicate which piece of information you require. For example, the following code snippet gets the year value:  
    
  int year = cal.get(Calendar.YEAR);
* Write code to get various pieces of date/time info from your (Gregorian)Calendar object. You'll need to make use of several static values from the Calendar class… use static imports to simplify your code.

## Exercise 5 (If time permits): Additional suggestions

Refactor the ContractType enum definition, which represents the employee's contract type. Specifically:

* Add an instance variable to the ContractType enum, to provide a textual representation of each enum value (e.g. "full-time", "part-time", and "casual").
* Add another instance variable to the ContractType enum, to indicate how many days paid vacation an employee gets depending on their contract type (e.g. full-time employees get 25 days paid leave per year, part-time employees get 10 days paid leave per year, and casual employees sadly don't get any days paid leave per year).
* Add a constructor to the ContractType enum, to initialize the instance variables you've just added. Also modify your enum field definitions, to pass appropriate values into the constructor.
* Add methods to the ContractType enum, to encapsulate its instance variables as you see fit.