# Exceptions and Assertions

## Overview

In this lab, you will take an existing application and add exception-handling capabilities to it. If time permits, you will also use assertions to unit-test the application functionality.

## Source modules

Student module: StudentExceptionsAssertions

Solution module: SolutionExceptionsAssertions

## Roadmap

There are 4 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. Throwing and catching runtime exceptions
2. Defining a custom exception class
3. Throwing and catching checked exceptions
4. Using assertions

## Familiarization

Open your student module and take a look at the code in Employee.java:

* Each employee has a (unique) ID, name, and salary.
* Each employee also has a "retired" flag; the system will keep track of employees even after they have retired.
* Employees can have a pay rise.

Now take a look at the code in Company.java:

* A company has a collection of employees, indexed by employee id.
* The company can hire, fire, and retire employees. The company doesn't forget its employees when they retire.
* The company allows employees to have a pay rise.
* The company allows you to get a list of all employees, or just those that are still working, or just those that have retired.

Finally take a look at the code in UsingCompany.java. This is the main entry point for the application, and displays a menu of options for the user. The code in this class is almost entirely complete.

## Exercise 1: Throwing and catching runtime exceptions

In Employee.java, locate the payRise() method. Add code to throw runtime exceptions, as indicated by the TODO comments. Then in UseCompany.java, add try/catch logic to deal with these exceptions.

Run the application, and make sure all the options work as expected. For example, ensure the following behaviour is exhibited:

* You can't give an employee a negative pay rise, not even in the current economic climate!
* You can't give a retired employee a pay rise.
* You can give a non-retired employee a positive pay rise ☺.

## Exercise 2: Defining a custom exception class

In CompanyException.java, define a custom exception class named CompanyException. The exception class should cater for the following information about a company-related problem:

* An error message
* The id of the employee that was being processed when the exception occurred
* An "inner exception" cause. This will enable a CompanyException object to encapsulate a lower-level technical exception object.

Run the application, and make sure all the options work as expected.

## Exercise 3: Throwing and catching checked exceptions

In Employee.java, add code to throw CompanyException exceptions, as indicated by the TODO comments in the following methods:

* hireEmployee()
* fireEmployee()
* retireEmployee()
* giveEmployeePayRise()

Then modify UsingCompany.java, to catch these exceptions.

## Exercise 4 (If time permits): Using assertions

Open TestCompanyAndEmployee.java, and add code to test the various capabilities of your Employee class. Hint: Call various methods, and use assert to ensure you get the expected results; the comments give you some suggestion.

Don't forget to enable assertions before you run the application - ask your instructor if you need help to do this.