**Lab 2: Inheritance and polymorphism**

Submission due date: 3/8/2020 (11:59 pm Sunday)

Total score:100 points + extra 10 points

Design and implement a Java project with inheritance structure for Walmart online shopping. Under the Walmart supermarket, there are different departments and various type of products. Each product in Walmart should have name, ID and price. In the Walmart inheritance structure, you should set up at least three levels in the whole inheritance hierarchy: grandpa🡪parent🡪child. Moreover, each parent class should have two children class.

**Part 1. Word / PDF document:** (20 points)

1. In the word document, please give a brief introduction about your project design, including instance variable or method declared in each class. Please draw UML diagram with appropriate variables and method. (20 points)

**Part 2. Java source files:** (80 points)

* 1. In the superclass, you need to set up appropriate instance variables and methods. (5 pts)
  2. When you build the related subclass, please declare at least one special instance variable for the current subclass, and figure out this instance variable is protected or private. (5 pts)
  3. In each subclass, except for *constructor,* *setter, getter* methods, you need to override toString() method, and design at least one special method for this subclass. (20 pts)
  4. In the driving class, you need to realize the following operations for Walmart online shopping: (50 pts)

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| 1. Create at least two objects for each class, and use 1-D array [] to accept all products (5 pts) |
| 1. Print all products information (loop statement) (5 pts) |
| 1. Search one product based on its name, and output its information (search algorithm) (10 pts) |
| 1. Sort product value (sort algorithm) (20 pts)  * based on the item ID * based on its’ price, * output the above two sorted results. |
| 1. Search one product based on the sorted item ID by binary search algorithm, and output this product information (10 pts) |

**Part 3. Bonus part:** **Polymorphism** (extra 10 points)

Implement Polymorphism in your project. Give necessary comments in your word and Java file.

**Submission:** submit word & Java files to eLearning.