

# Extra Credit Assignment 1

Due: 07/12/13 11:55 PM

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## Important

There are a few guidelines you must follow in this homework. If you fail to follow any of the following guidelines you will receive a 0 for the entire assignment.

- All submitted code must compile under JDK 7. This includes unused code, don't submit extra files that don't compile. Java is backwards compatible, so if it compiles under JDK 6 it should compile under JDK 7.
- DO NOT include any package declarations in your classes.
- DO NOT change any existing class headers, constructors, or method signatures. It is fine and encouraged to add extra methods and classes.
- DO NOT import anything that would trivialize the assignment. (e.g. don't import `java.util.LinkedList` for a Linked List assignment. Ask if you are unsure.)
- You must submit your source code (ie. the `.java` files), NOT the compiled bytecode (ie. the `.class` files)

After you submit your files, redownload them and run them to make sure they are what you intended to submit. We are not responsible if you submit the wrong files. DO NOT submit `.class` files.

Complete the missions below as best you can. Make sure you read the dialogs and the javadocs in each class so that you thoroughly understand the task at hand. Feel free to jump from mission to mission. (For example, basic training may be pretty hard, so you can do that one last if you want).

## Prelude

**General Dhannani:** Good morning, private! You are currently enlisted in one of the most honorable coding forces in the nation! My name is General Dhannani. After basic training, you will report directly to me. I have a few important missions for you. This is Sergeant Reddaway. He will be your mentor until you get up to speed.

**Sgt. Reddaway:** We have a lot of work ahead of us, let's get started.

**General Dhannani:** That's what I like to hear! Here in battalion #CS1332, nobody gets to sleep! Now get off to basic training! Move, move, move!

## Basic Training

**Sgt. Reddaway:** Here in battalion #CS1332, you either sink or swim. So, your only test for

basic training is to code quicksort. Muhahaha.

### Mission 1: Sorting Soldiers

**General Dhannani:** You may not have noticed, but as every soldier completes basic training, we evaluate them. That way we can create squadrons that are all about the same strength. Back home, the President has been pressuring me to send him a file of the results. Of course, he wants them listed in descending order with the best soldier first. Problem is that our computer is just one of those field laptops and we do not have enough RAM to store much extra data in memory, so you will need to write the sort in-place.

**Sgt. Reddaway:** Hmm...so it looks like we won't be able to use any extra arrays to do the sorting because we won't have enough RAM. Best thing to do will be to find the best soldier in the array and move him up to the front. Problem is, you will have to ignore that soldier the next time you are finding the best soldier.

### Mission 2: Selecting Targets

**General Dhannani:** The enemy is attacking! There are so many targets! Which one do we shoot first?

**Lt. Paladugu:** The one that is more important! Duh.

**General Dhannani:** But we can't have everyone shooting at the same thing! That would be a waste. Private! I need you to solve this problem ASAP! I'll give you targets as the battle progresses, and you need to tell me which ones are the highest priority without delay. Get moving!

**Sgt. Reddaway:** It sounds like the general will be both adding stuff to your list and looking up targets from it. It also sounds like it is more important for him to retrieve targets faster than adding them. In order for him to retrieve targets quickly, we should probably have the list sorted before he tries to retrieve from it. This means we should sort the list whenever he adds a new target. Or better yet, add each new target where it would go to maintain the list's sorted order.

**General Dhannani :** I'll also need to be able to remove targets once they are destroyed!

**Sgt. Shareghi:** That shouldn't be hard.

### Mission 3

**General Dhannani :** Private, your coding ability was admirable the past few battles. I'm considering you for a promotion!

**Sgt. Reddaway** : O.o And what about the person who trained him?

**General Dhannani** : You still haven't written that "Hello, World!" program I've asked for!

**Sgt. Reddaway** : Oh yea...

**General Dhannani** : Anyway, after a day of fighting, Colonel Kim, the other officers, and I like to wind down at the bars. Of course, all we talk about is how many medals we have won—which is a lot. I have the most of course.

**Col. Kim** : But Akbar, yours aren't better than mine!

**Lt. Paladugu** : That's not true, Joonho!

**Col. Kim** : Anyway, all of the officers have decided to play a game to see who is the most prestigious. It works like this: first we sort two officers' medals by prestige. Then we give points to each officer depending on where their medals are in the list. The least prestigious medal earns 1 point, the second least prestigious earns 2 points, the third least prestigious earns 3 points, and so on. For example, if the sorted array of medals from least prestigious to most prestigious looked like this (D for Dhannani and K for Kim) DDDKDKKDKD

General Dhannani would get  $1 + 2 + 3 + 5 + 8 + 10 = 29$  points.

Colonel Kim would get  $4 + 6 + 7 + 9 = 26$  points.

In this case, General Dhannani wins by 3 points.

**General Dhannani**: I need you to write a program that will speed up the game for us. I will give you two arrays of medals, and I need you to return the difference between the first and the second array. To help you out, I will make sure that the arrays of medals I give you will already be sorted.

**Sgt. Reddaway** : Ha! Merging two arrays that are already sorted won't be hard at all! You're on your own this time smarty-pants.

## **Deliverables:**

1. **BasicTraining.java**
2. **MissionOne.java**
3. **MissionTwo.java**
4. **MissionThree.java**