

# Software Engineering



## Introduction

Financial firms find themselves facing an ever growing variety of engineering problems, and many choose to turn to established experts for help. Galatea Associates is one such expert, and projects it has been involved in affect the management and tracking of billions of dollars in securities. *This is your chance to gain insight into the kinds of challenges Galatea's analysts face.*

## Key traits

The key traits firms in this space look for are:

- **Technical expertise** A lot of the systems you will be helping develop are used on massive amounts of data, so you should be able to take advantage of every opportunity to streamline or optimise your code.
- **Agility** One day you may be asked understand new financial regulations and the next to figure out the architecture of a legacy system. You should be comfortable quickly switching from one task to another.
- **Versatility** You should be able to function effectively across different points of the systems development life cycle.

Please note that a strong understanding of Object Oriented Programming is a plus but not a necessity to complete this assignment. This program is being run in large part so as to give you a chance to improve your expertise in the aforementioned areas.

## Your assignment

### Background

One of the main sources of revenue for Broker/Dealers is providing financing to their customers. One such solution is allowing customers to trade on margin accounts – allowing investors to borrow money in order to purchase securities. The goal of this project is to create a system for estimating margin account balances.

Your client is global broker primarily catering to retail investors. In this initial assignment you have been asked to focus strictly on positions held in US equity markets. For clients based in Europe and Asia, official positions are not readily available; you have to estimate them by combining the previous day's positions and records of trade executions for the current day.

### Problem

Please download the assignment data-set [here](#). This zip-file contains the following files:

prices.csv	Closing prices
na_t.csv	Positions held by clients in North America
emea_t-1.csv, emea_trades.csv	Positions and trade execution records for clients in Europe
apac_t-1.csv, apac_trades.csv	Positions and trade execution records for clients in Asia

Fields:

Price files		Position files		Trade history files	
asset	Asset ID	act	Account ID	act	Account ID
name	Asset name	type	"STK" or "CASH"	asset	Asset ID
px	Closing price	asset	Asset ID or "n/a"	order	Can be "Buy", "Sell", "Short"
		size	Position size or Cash balance	size	Order quantity
		pos	"Long" or "Short"	done	Quantity executed
				price	Average execution price

The client wants you to generate a file with three fields: Account ID, Cash balance, and Margin balance. Margin calls will be issued account holders whose required margin balance exceeds their cash balance. The client has also expressed interest in building a UI around this tool.

Rules for calculating margin requirements in this exercise can be viewed [here](#). Please note that this client does not allow stocks to be bought on margin, so assume all long positions are fully paid for and require no margin balance.

### Instructions

We are most interested in seeing how you approach this problem. The first required deliverable is a 1-2 page design document explaining the specific data structures you would create and how you would implement them as well as the sequence in which you would complete your calculations. Remember that this program is being designed for large-scale use – it should be made as efficient as possible.

*You are encouraged to submit your code in a zip file alongside your write-up.*

Feel free to [contact us](#) if you feel you have hit a dead end or would like more information. Please make note of the Key Traits we look for (above). **Authors of strong submissions will be highlighted to Galatea's recruiting team.**

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