

# 1 Introduction

During the course of the interview sessions that I have been I have encountered a number problems that could have made my experience less painful. My advice is to use this as gauge of what is expected from you during quants interviews. Quite frankly, I found this very hard in the beginning because I did not know what to expect and as such I did not have sufficient practice. If you use this a pointer and do some background during your spare time, I think it will be very beneficial. If you have answers to these questions - please don't memorize them ! It is easy to get found out as usually the interviews are more keen on your thought process.

Questions that I have encountered range from simple Brain teasers to some difficult questions on diffusions. Of course I the more you impress the more difficult they get and don't get put out or feel bad if the questions get difficult too soon. Learning the background material is what is important. They do not only test your knowledge but a variety of things - you communication skills, your interaction with people - how you respond to challenges etc. I would prepare well, be yourself and be honest. If you say know something they might ask you something deep on it - please do not try to bluff your way - it could be embarrassing.

## 2 Brain Teasers

Brain teasers could be anything quite frankly and you will usually need to ask for clarifications. Thought process is essential - In fact I tend vocalize most of my thoughts and sometimes I find that the focus of the question is changed by the interviewer to gel with your thought process.

### Coin Toss Questions

These questions are based on coin tossing experiments as well as dices etc. They can be very interesting after a few practice questions and reflective thinking.

#### Average Stopping Time

- **Consider tossing a fair several times. What is the average time to get two consecutive heads.** For such questions read around ruin

probability in any good probability text.

- Consider tossing a fair dice. What is the average number of tosses to get a 3 ?

### Growth Questions

- Suppose you had a pool with a fixed surface. A given bacterial colony takes 6 days to cover the surface. Assuming that the surface of the bacterial colony multiplies each day, How long would it take twice as many bacterial to fill up the pool completely ?

## 3 Probability Questions

### Brownian Bridge

- Consider a brownian motion  $B(t)$  starting from zero at  $t = 0$  and passing through  $t_1$  and  $t_2$ . Find the probability distribution of  $B(t_1)$  given that  $B(t_2) = x$
- Consider a brownian motion  $B(t)$  starting from zero at  $t = 0$  and passing through  $t_1 = 1$  and  $t_2 = 2$ . Find the probability that  $B(t_1) > 0$  and  $B(t_2) < 0$

### Expected Stopping Time

### Optimal Stopping Time

Consider tossing a dice. What fee would you pay to play a game based on the dice if you received the number that turns up. Suppose you are asked to play to play again after the first toss - would you accept this offer ? What is the optimal stopping time of the game?

### Strategy Questions - Games

- Consider a 2 people - one of whom is barred from playing a game. The other person is is you ! Now imagine the game is

such that when a fair coin is tossed you can guess the outcome along with a fee. If you win you double your amount. The other person approaches you to play the same game and tells you that they have 50 and they think the next outcome will be a head. If it isn't they lose their 50 to you otherwise you give them twice the fee. Come with a strategy that will guarantee a profit for yourself. Can you maximize this profit?

### Problem solving

- You are provided with two identical strings with a match. It takes exactly one hour for each string completely burn out. The thickness of the string is not necessarily uniform so that 30 minutes after a string has been burning, half the amount of string might not have been consumed. How can you tell that 45 minutes have elapsed.
- Consider a game in which two people take turns to place small circular coins on a large circular table. What strategy must one take to guarantee a win if the loser is the one who first lacks a position to place a coin on the table?
- You have two containers - one of 3 litres and another of 5 litres. If you have endless supply of water, how can you measure exactly 4 litres of water - assuming the containers are unmarked?
- In a party - you observe 66 handshakes. Assuming that everybody makes a handshake - how many people were in the party?

### Optimal Height detection - Two plates

- Imagine that there a building of 100 floors. You have one bowl that will break after a certain floor (height). What is the minimum amount of trials needed to determine the height at which the bowl will break. No suppose you had identical bowls - what is the minimum number of trails required to determine this height.

## 4 Programming Questions

### General Unix Questions

- Can you tell me the difference between a thread and a process ?
- What's difference in stack size?
- Can you tell me two ways to search for text in a file?
- How would you find text somewhere in a directory tree ?
- Can you tell what a union is?
- What's the difference between automatic and static in a function variable declaration?
- What's stack overflow? *Most operating systems allow you to define the stack size which may also use virtual memory. If you define large amounts of local memory (eg a big array) then you may end up building the stack up beyond the defined size which causes a stack overflow. Another common cause is to define a recursive function that has a bug and keeps calling itself, indefinitely adding stack frames to the stack*
- How might you experience one?
- What's the difference between pass by value and pass by reference?
- What's more efficient?
- Can you compare two doubles ?
- Name three ways you can get a segmentation violation.
- What is a deadlock and how might you avoid it?
- In C, what's good and bad about a void pointer?
- How would you import or call a C function from C++?
- How can you call C++ from C?
- If you had a day to test a program and it took a day to add logging, would you test it or add the debugging?

- When are constructors and destructors called?
- What's operator and destructor overloading?
- Can you differentiate overloaded functions by their return type?
- What's inheritance?
- what calls would you make to establish a socket connection?
- What's the difference between a file descriptor and a file pointer?
- What calls would you use on each?
- How would you detect deadlock?
- Name three IPC mechanisms? *Generally you should know that IPC is Inter-Process Communication - Examples include FIFOs(first in first out, named pipes), anonymous pipes, message queues, shared memory, semaphores (mutex & condition variables), sockets, memory mapped files, regular files with locking, signals, RPC (Remote procedure calls), TCP/IP.*
- When would you use a semaphore and when would you use a mutex?
- What's the difference between library and system calls?
- Which would be more efficient?
- What is polymorphism?
- What is a fork? What does it do?
- What is the static keyword in C?
- Arrays are one way of storing multiple objects. Can you suggest some other way? *linked list, double linked list, hash table, binary tree, stack,heap, queue,vector, associative arrays, fifo*

## 5 General Topics To Revise

### C

- Pointers
- variable types/scope
- Program architecture (memory, stack, heap, registers, etc.)
- Read/write small code examples

### OO && C++

- Object Oriented Design
- C++ constructs that support OO

### UNIX

- Unix architecture (file system, piping, stdin, stdout, stderr, etc)
- Permissioning
- System Calls

### Data Structures & Run Time Analysis

- Basic data structures
- Run-time analysis of data structures