

Supposed Google and/or Microsoft Interview Questions

- (a) You are given 8 identical looking balls. 7 of them weigh exactly the same and 1 is heavier than the rest. You are provided with a simple mechanical balance and you are restricted to only 2 uses. Find the heavier ball.
 - (b) Now you are give 12 identical looking balls. One of them is heavier or lighter (you don't know which) than the rest of the 11. You are provided with a simple mechanical balance and you are restricted to only 3 uses. Find the odd ball and determine whether it is heavier or lighter than the rest.
- Four people need to cross a rickety bridge at night. Unfortunately, they have only one torch and the bridge is too dangerous to cross without one. The bridge is only strong enough to support two people at a time. Not all people take the same time to cross the bridge. The times for the four people are, 1 min, 2 mins, 7 mins and 10 mins. When two people cross together the time taken is equal to the time of the slower person. What is the shortest time needed for all four of them to cross the bridge?
- If you had an infinite supply of water, a 5 quart, and a 3 quart pail, how would you measure exactly 4 quarts? You are only allowed to fully fill a pail from your supply, transfer from one pail to another until the receiving pail is full, or empty a pail. Each step is considered as a single fill, empty, or transfer. What is the least number of steps you need?
- Five pirates discover a chest containing 100 gold coins. They decide to sit down and devise a distribution strategy. The pirates are ranked based on their experience (Pirate 1 to Pirate 5, where Pirate 5 is the most experienced). The most experienced pirate gets to propose a plan and then all the pirates vote on it. If at least half of the pirates agree on the plan, the gold is split according to the proposal. If not, the most experienced pirate is thrown off the ship and this process continues with the remaining pirates until a proposal is accepted. The first priority of the pirates is to stay alive and the second is to maximize the gold they get. Pirate 5 devises a plan which he knows will be accepted for sure and will maximize his gold. What is his plan?
- 100 prisoners are stuck in the prison in solitary cells. The warden of the prison got bored one day and offered them a challenge. He will put one prisoner per day, selected at random (a prisoner can be selected more than once), into a special room with a light bulb and a switch which controls the bulb. No other prisoners can see or control the light bulb while not in the room. The prisoner in the special room can either turn on the bulb, turn off the bulb, or do nothing. On any day,

any prisoner can stop this process and say every prisoner has been in the special room at least once. If that happens to be true, all the prisoners will be set free. If it is false, then all the prisoners will be executed. The prisoners are given some time to discuss and figure out a solution. Once they agree on a solution and the random choosing starts, they are not able to communicate until they are either released or executed in which case they won't be able to communicate anyway. How do they ensure they all go free?

6. You have two identical eggs. Standing in front of a 100 floor building, you wonder what is the maximum number of floors from which the egg can be dropped without breaking it. What is the minimum number of tries needed to find out the solution? What if the building has n floors?
7. A certain town is comprised of 100 married couples. Everyone in the town lives by the following rule: If a husband cheats on his wife, the husband is executed as soon as his wife finds out about him. All the women in the town only gossip about the husbands of other women. No woman ever tells another woman if her husband is cheating on her. So every woman in the town knows about all the cheating husbands in the town except her own. It can also be assumed that a husband remains silent about his infidelity. One day, the mayor of the town announces to the whole town that there is at least 1 cheating husband in the town. What happens?
8. Given an array of natural numbers:
 - Efficiently find the longest contiguous increasing subsequence.
 - Efficiently find the longest increasing subsequence, i.e. numbers need not be immediately after each other in the array.
9. There are 3 baskets. One of them has apples, one has oranges, and the other has mixture of apples and oranges. The labels on their baskets always lie, i.e. if the label says oranges, you are sure that it doesn't have oranges only, it could be apples only or it could be a mixture. The task is to pick one basket and pick only one fruit from it and then correctly label all the three baskets.
10. You have two jars, 50 red marbles, and 50 blue marbles. A jar will be picked at random, and then a marble will be picked from the jar. Placing all of the marbles in the jars, how can you maximize the chances of a red marble being picked? What are the exact odds of getting a red marble using your scheme?
11. You have 5 jars of pills. Each pill weighs 10 grams, except for contaminated pills contained in one jar, where each pill weighs 9 grams. Given a scale, how could you tell which jar had the contaminated pills in just one measurement?
12. You are given three sorted arrays, a , b , and c of n numbers each, for any triplet $(a[i], b[j], c[k])$ the distance of that triplet is defined as the maximum value of the absolute differences between any of the three values. In other words, the distance of any triplet is the maximum of, $|a[i] - b[j]|$, $|a[i] - c[k]|$, and $|b[j] - c[k]|$. Find the minimum distance triplet in $O(n)$ time.

13. Given an array $t[n]$ which contains numbers between 1 and $n - 1$ return the duplicated value. Also, given an array of length n containing integers between 1 and n , determine if it contains any duplicates. Is there an $O(n)$ time solution that uses only $O(1)$ extra space and does not destroy the original array?
14. Given a singly linked list, determine whether it contains a loop or not using only $O(1)$ words of memory.