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Lab 2

If we suppose there are n bottles of wine and the spy poisoned one bottle then our objective is to find the bottle that was poison. However the poison takes effect in one month's time and we need to find a way to figure out what bottle is poison.

Our goal is to achieve an order of growth of log(n) in order to achieve it we must use binary.

We can individually assign each bottle as a unique binary pattern.

Assuming there are 8 bottles, we represent them as 0 to n-1 in their binary equivalent.

1 000

2 001

3 010

4 011

5 100

6 101

7 110

8 111

And our goal is to reach O(log n ) which then becomes O ( log 8 ) => 3, therefore three testers will be used to find the poisoned bottle.

Now we have to separate our group testers based on the binary pattern. Binary works by uniquely separating each patterns as a decimal digit. We can then label the digit to a corresponding values; in this case 1 => dead 0 => alive. Each sequence is tested by a tester. The tester gets a drop from half of their sequence and tastes that. Since one drop is enough to kill, if the tester dies, then the poisoned barrel is in the group that they tested, otherwise it is in the other half.

By grouping them by their digit 1, base on each column, we can then make a unique set of numbers.

These are the three wine testing groups that the wine tasters tested. Mentioned earlier, if the tester survives, then the poisoned wine is the the other half of the groupings.

S = [ {5 , 6 , 7 , 8 } , { 3 , 4 , 7 , 8 } , { 2 , 4 , 6 , 8 } ]

Now to find the poisoned barrel all we need to do is conduct three test and see with one of them either dead (1) or alive (0) and match them to the binary equivalent to determine which barrel is poisonous

Assuming the 6th barrel is poisoned, we can check by our set. The first element of S[0] would fail, S[1] would pass and S[2] would fail. This gives us the binary pattern 101 which is the barrel number 6.