

1. A version of the "There are three persons X Y Z, one of which always lies".. etc..
2. There are 3 ants at 3 corners of a triangle, they randomly start moving towards another corner.. what is the probability that they don't collide.
3. Write an efficient algorithm and C code to shuffle a pack of cards.. this one was a feedback process until we came up with one with no extra storage.
4. The if (x == 0) y = 0 etc..
5. Some more bit wise optimization at assembly level
6. C++ (what is virtual function ? what happens if an error occurs in constructor or destructor. Discussion on error handling, templates, unique features of C++. What is different in C++, (compare with unix).
7. Given a list of numbers (fixed list) Now given any other list, how can you efficiently find out if there is any element in the second list that is an element of the first list (fixed list).
8. Given 3 lines of assembly code : find it is doing. IT was to find absolute value.
9. If you are on a boat and you throw out a suitcase, Will the level of water increase.
10. Print an integer using only putchar. Try doing it without using extra storage.
11. Let $f(k) = y$ where k is the y -th number in the increasing sequence of non-negative integers with the same number of ones in its binary representation as y , e.g. $f(0) = 1$, $f(1) = 1$, $f(2) = 2$, $f(3) = 1$, $f(4) = 3$, $f(5) = 2$, $f(6) = 3$ and so on. Given $k \geq 0$, compute $f(k)$.
12. A character set has 1 and 2 byte characters. One byte characters have 0 as the first bit. You just keep accumulating the characters in a buffer. Suppose at some point the user types a backspace, how can you remove the character efficiently. (Note: You cant store the last character typed because the user can type in arbitrarily many backspaces)
13. What is the simplest way to check if the sum of two unsigned integers has resulted in an overflow.
14. How do you represent an n-ary tree? Write a program to print the nodes of such a tree in breadth first order.
15. Give a very good method to count the number of ones in a "n" (e.g. 32) bit number.

ANS. Given below are simple solutions, find a solution that does it in $\log(n)$ steps. Iterative

```
function iterativecount (unsigned int n)
begin
```

```
int count=0;
```

```
while (n)
```

```
begin
```

```
count += n & 0x1 ;
```

```
n >>= 1;
```

```
end
```

```
return count;
```

```
end
```

Sparse Count

```
function sparsecount (unsigned int n)
```

```
begin
```

```
int count=0;
```

```
while (n)
```

```
begin
```

```
count++;
```

```
n &= (n-1);
```

```
end
```

```
return count ;
```

```
end
```

16. Given a rectangular (cuboidal for the puritans) cake with a rectangular piece removed (any size or orientation), how would you cut the remainder of the cake into two equal halves with one straight cut of a knife ?

17. You're given an array containing both positive and negative integers and required to find the sub-array with the largest sum ($O(N)$ a la KBL). Write a routine in C for the above.

18. Given an array of size N in which every number is between 1 and N , determine if there are any duplicates in it. You are allowed to destroy the array if you like. [I ended up giving about 4 or 5 different solutions for this, each supposedly better than the others].

19. Write code for reversing a linked list.

20. Write, efficient code for extracting unique elements from a sorted list of array. e.g. (1, 1, 3, 3, 3, 5, 5, 5, 9, 9, 9, 9) -> (1, 3, 5, 9).