1 Mystery Routines

Not so mysterious I suppose. The second script checks each number of the list against 1. And if it finds a match, it says yes. So, this is the routine for (a). The first script takes each pair of consecutive numbers in the list and checks to see if they are in descending order. If there is one such pair, the list is not in ascending order. So, this is the routine for (b). The third routine always checks the first element of the list with some other element. If we have a match, it means that the first element appears elsewhere as well. So, this answers (c).

2 Song Growth

2.1 Girl Named Fred

First, note that every verse is larger than the previous. So, it certainly is greater than \(O(n)\). As an approximation of the size of the verse, we can count the number of lines. The number of lines are 6, 8, 9, 10, 12, 13, 14. Doesn’t it look very similar to \(1 + 2 + \ldots + n = O(n^2)\)?

2.2 L-Y

Each verse has 4 lines and the size of the verse is roughly the same (not more than some constant). Nor is there anything (like a number) that changes in the number of syllables. So, the total length of the song is less than \(cn = O(n)\).

2.3 Little Monkeys

You may be tempted to say \(O(n)\). But note that you have a number associated—the number of monkeys. So, the paragraph with 6 monkeys, will not have the same number of syllables as the paragraph with 66 monkeys. We know that the number of syllables needed for saying a number grows as \(O(\log n)\). So, the growth of this song is \(O(n \log n)\).
3 Exponential Right?

1. The amount of junk mails have surely gone up. But, they have no figures to backup their claim that the growth is exponential.

2. Again there are no figures to support the claim. Probably what they mean is that the number of pictures has jumped to a higher number. To be exponential, it has to keep growing with time.

3. They have some statistics here and the growth is also large. If we are not overly strict, we can term this as an exponential growth.

4. No data or explanation provided. So, I would not say its a proper use.

4 Play it Again

The probability of having 'Blue' is 1/4. So, on average you expect to see a 'Blue' in every $\frac{1}{\frac{1}{4}} = 4$ spins.

Since 3 of the 4 colors are primary, the probability of seeing a primary color is 3/4. So, on average you will need $\frac{1}{\frac{3}{4}} = \frac{4}{3}$ spins. Now note that you cannot have fractional spins. So, we need 2 spins.

5 Sing, Sing a song

There are many ways of doing this. If you did not use any looping or recursive verse calling, I took off 5 points because I wanted to make the point that it is a very poor way of writing programs.