

Problem 1. Arrange the following functions in order of increasing growth rate:  $2^{\lg_2 n}$ ,  $2^{2^{\lg_2 n}}$ ,  $n^{5/2}$ ,  $2^{n^2}$ ,  $n^2 \lg_2 n$ . Show your work.

Problem 2. Write pseudo-code for the nursery rhyme, ‘*five little monkeys...*’ with  $n$  monkeys instead of five. You may use the version, <https://www.lyrics.com/lyric/17203207/The+Countdown+Kids/Five+Little+Monkeys>. Find the exact number of times, the word ‘*monkeys*’, appears in the rhyme. Show your work. You may use digits for the numbers instead of the words.

Problem 3. You are given two arrays,  $A$  and  $B$ , of lengths,  $m$  and  $n$ , respectively. Write pseudo-code to find whether or not there is a number  $x$  in both  $A$  and  $B$ . Return TRUE if you find such number and FALSE otherwise. Find the exact total work (comparisons) in the worst case. Show your work.

Problem 4. You are given an array,  $A$ , of length  $n$ . Write pseudo-code to find whether or not  $A$  contains a number more than once. Return TRUE if there is such a number and FALSE otherwise. Find the exact runtime to count the number of comparisons in the worst case. Show your work.