*Problem 13.42: To determine if a graph G with 50 vertices is 3-colorable, you test all possible 3-colorings. Your computer checks a million 3-colorings per second. Estimate how long it is going to take, in the worst case.

Test all possible 3-color: permutations

total number (n) = number of vertices = 50

selected colors (k) = 3

$$P = \frac{n!}{(n-r)!}$$
$$= \frac{50!}{(50-3)!}$$
$$= \frac{50!}{47!}$$
$$= 50 \times 49 \times 48$$
$$= 11760$$

The number of possible 3-colorings is 11760, calculating a million per second:

$$T = \frac{11760}{1000000}$$
$$= 0.01176$$

The worst case, it will take $\boxed{\textbf{0.01176s}}$

*Problem 13.50. How many 7-digit phone-numbers are non-decreasing (each digit is not less than the previous one.)