***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

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

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

$$\begin{aligned} T &= \frac{11760}{1000000} \\ &= 0.01176 \end{aligned}$$

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

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

start with 9: we only have 1 possibility