

## 2) (5 pts) ANL (Algorithm Analysis)

An algorithm to process input data about  $n$  cities takes  $O(n!)$  time. For  $n = 10$ , the algorithm runs in 10 milliseconds. How many *seconds* should the algorithm take to run for an input size of  $n = 12$ ?

Let the algorithm with input array size  $n$  have runtime  $(n) = cn!$ , where  $c$  is some constant.

Using the given information, we have:

$$T(10) = c(10!) = 10ms$$

$$c = \frac{10ms}{10!}$$

Now, solve for the desired information:

$$T(12) = c(12!)$$

$$= \frac{10ms}{10!} \times 12! = \frac{10ms}{10!} \times 10! \times 11 \times 12 = 10ms \times (132) = 1320ms = 1.32sec$$

**Grading: 2 pts solving for  $c$ , 2 pts for plugging 12 and canceling to get to 1320 ms, 1 pt to answer in seconds.**