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CS-225: Discrete Structures in CS
Homework 8, Part 1
Exercise Set #: 9.2: Problem #(32.c, 33.c, 34, 39.b.d.)
Exercise Set #: 9.5 Problem #(20.a.b.c.)

Exercise Set 9.2

32. c.)

A, L, G, O, R, I, T, H, M = 9 objects. If we treat GOR as one object which must remain together in order, ALGORITHM is now 7 objects – A, L, GOR, I, T, H, M. Thus n = 7, and 7! = $\boxed{5040}$.

33. c.)

3 couples seated together with the older member on the left => n = 3, 3! = $\boxed{6}$ arrangements of the couples.

34.

8 people seated around a circular table = {A B C D E F G H}. Person A is placed anywhere and all arrangements around them are considered, thus (8-1)! => 7! = $\boxed{5040}$.

39.
b.)

{A L G O R I T H M} = 9 letters

6 of 9 letters => number of 6-permutations of the set. Thus r = 6 and n = 9:

P(9, 6) = $\dfrac{9!}{(9-6)!}=\dfrac{9!}{3!}=60{,}480$

d.)

{OR A L G I T H M} = 7 letters

4 of 7 letters => number of 4-permutations of the set. Thus r = 4 and n = 7

P(7, 4) = $\dfrac{7!}{(7-4)!}=\dfrac{7!}{3!}=840$

Exercise Set 9.5

#20.

a) MILLIMICRON

n = 11

2 M = n_1 = 2
3 I = n_2 = 3
2 L = n_3 = 2
1 C = n_4 = 1
1 R = n_5 = 1
1 O = n_6 = 1
1 N = n_7 = 1

By Theorem 9.5.2,

$$\frac{n!}{n!n2!n3!...n_k!}=\frac{11!}{2!\cdot3!\cdot2!\cdot1!\cdot1!\cdot1!\cdot1!}=1{,}663{,}200$$

b) M|ILLIMICRO|N but with M in the first position and N in the last position

n = 9
1 M = n_1 = 1
3 I = n_2 = 3
2 L = n_3 = 2
1 C = n_4 = 1
1 R = n_5 = 1
1 O = n_6 = 1

$$\frac{n!}{n!n2!n3!...n_k!}=\frac{9!}{1!\cdot3!\cdot2!\cdot1!\cdot1!\cdot1!}=30{,}240$$

c) MILLIMICRON but with CR and ON next to each other
= M I L L I CR ON

n = 9
2 M = n_1 = 2
3 I = n_2 = 3
2 L = n_3 = 2
1 CR = n_4 = 1
1 ON = n_5 = 1

$$=\frac{n!}{n!n2!n3!...n_k!}=\frac{9!}{2!\cdot3!\cdot2!\cdot1!\cdot1!}=15{,}120$$