Math 220 Homework 4

Due on September 29, 2021 Name_____

1. Consider all positive integers with seven **different** digits. (Note that zero cannot be the first digit, and by different, we mean that there is no repeated digit in the number.)
    a. Find the number of them if there is no other restriction.

1 2 3 4 5 6 7

[1-9][0-9][0-9][0-9][0-9][0-9][0-9]

8 * 9 * 9 * 9 * 9 * 9 * 9 = 4251528 total positive integers with seven digits.

9 * (9!/(9-6)!) = 9*9*8*7*6*5*4 = 544320 total positive integers with seven different digits.

    b. Find the number of them which are greater than 8000000.

2* (9!/(9-6)!) = 2*9*8*7*6*5*4 = 120960 total positive integers with seven different digits are greater than 8000000.

    c. Find the number of them which are odd.

9 * (9!/(9-6)!) = 9*9*8*7*6*4 = 544320 total positive integers with seven different digits.

Since even number can divided total by 2.

272160 total positive integers with seven different digits are odd.

    d. Find the number of them which are divisible by 5.

9 * (9!/(9-6)!) = 9*9*8*7*6*4 = 544320 total positive integers with seven different digits.

Since even number can divided total by 5.

108864 total positive integers with seven different digits are divisible by 5.

2. A class contains eight boys and eight girls. In how many ways can they stand in a line if they must alternate in gender (no two boys and no two girls are standing next to one another)?

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suppose line begins with a boy

position 1 : 8 choices for boys b[1-8]

position 2: 8 choices for girls g[1-8]

position : 7 choices for boys b[1-8]

position : 7 choices for girls b[1-8]

position : 6 choices for boys g[1-8]

position : 6 choices for girls b[1-8]

Continuing this process, we get 10*10*9*9*8*8*7*7*6*6*5*5*4*4*3*3*2*2*1*1 = 10! * 10!

so if starting with boy 10! * 10! multiple lines

so if starting with girl 10! * 10! multiple lines

so 2* 10! * 10!

3. **When 80! Is written out in full it equals**

80! = 80 * 79 * ... * 1

80! = 71569457046263802294811533723186532165584657342365752577109445058227039255480148842668944867280814080000000000000000000(19 0's)

4.

90! = 1457159 . . . 00000.

Without using a computer, determine the number of 0 digits at the end of this number.

14857159644817614973095227336208257378855699612846887669422168637049853930940658765459921313708840596456172344699781120000000000000000000000 (21 0's)

zeros after 90 = 1 zero

multi of 10, multi of 5

10*20*30*40*50*60*70*80*90

=(1*10)* (3*10)*(2*10) *(4*10)* (5*10)* (6*10)*(7*10) *(8*10)*(9*10)

=(1*2*3*4*5*6*7*8*9)*(10*10*10*10*10*10*10*10*10)

= (1*2*3*4*5*6*7*8*9)*(1000000000) 10 zeros

2*5= 10

4*15 = 60

8*25 = 200

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12*35 =420

14*45= 630

16*55 = 880

18*65 = 1170

24 * 75 = 1800

26*85 = 2210

11 zeros

So 90! has 21 zeros