Name:_____ Date:_____

Math 10 Honours: HW Section 6.1 Permutations and FCP

1. Simplify each of the following factorial expressions. Show all your work and steps:

a) $\frac{10!7!4!}{9!6!3!}$	b) $\frac{(99!)(101!)}{(98!)(102!)}$	c) $\frac{7!-6!-5!}{6!-5!}$
d) $\frac{10!\times 9!\times 8!}{(9!)^2}$	e) $\frac{100!-99!}{99!-98!}$	f) $\frac{7!\times 5!}{10!}\left(\frac{9!}{3!\times 5!}-\frac{10!}{2!\times 7!}\right)$
g) $\frac{(n-1)!(n+1)!}{n!}$	h) $\frac{n!-(n-1)!}{(n+1)!-2(n-1)!}$	i) $\frac{(n-2)!}{(n-1)!}-\frac{(n-3)!}{(n-1)!}$

2. Solve each equation for "n"

a) $nP_2 = 20$	b) $nP_3 = 4080$	c) $6P_n = 120$

3. In how many different ways can three students be seated in a row of six desks?

4. In how many different ways can first, second, and third prize winners be chosen in a random drawing if 40 people entered a contest?

5. In how many different ways can the letters in the word “DANGER” be scrambled?

6. Tom has 9 sweaters, 7 jeans, and 5 pairs of shoes. How many different outfits consisting of a sweater, jeans, and a pair of shoes can Tom chose?

7. A student, taking a True-False test, randomly guesses all 10 questions. How many different sets of answers could be produced?

8. Four candidates are running for president of an organization. Their names are placed in a ballot of random order. How many different ways are there to order the names?

9. What is the sum of all possible odd four digit numbers that can be formed using digits 2, 3, 4, and 5? Each digit can only be used once.

10. If the digits 1, 2, 3, 5, and 7 can be used more than once, how many different even three-digit numbers can be written?

11. Using each of the digits 2, 5, 7, and 8 once in each number, how many different four-digit numbers can be formed? How many of these numbers are even?

12. How many four letter words begin and end with the same letter?

13. A restaurant has four types of beverages and six types of sandwiches. How many different orders consisting of one beverage and two sandwich are there?

14. A cafeteria has 3 different soups, 4 different main course, and 5 different desserts. How many different meals can Jim have if he must order something and he can not buy the same thing twice?

15. Jazmin wants to make a sandwich. There are 3 types of bread to choose from: white, wheat, or all grain. She can have one, two, or all three types of meat: ham, turkey, and chicken. She can have one of the two condiments or none: Mayo and mustard. How many different sandwiches can she make?

16. Jack has twice as many shirts as pants. What is the fewest number of shirts he needs in order to wear a different combination of shirt and pants each day of the year?

17. A 3-number combination lock contains numbers from 0 to 20. How many combinations are possible if the second and first digits are different, AND the second and third must also be different?

18. How many ways can Amy, Betty, Cindy, Donna, and Elaine sit in a row if Amy and Betty can not sit next to each other?

19. 6 dating couples are sitting a row of 12 chairs. If each couple must sit next to each other, how many different arrangements can there be?

20. In how many distinct ways can five children be seated around a circular merry-go-round which has five identical seats?

21. Rick Wants to arrange three 1s, three 2's, two 3's, and one 4 to form nine-digit positive integers with the following properties:
    i) When reading from left to right, there is at least one 1 before the first 2, at least one 2 before the first 3, and at least one 3 before 4
    ii) No digit 2 can be next to another 2

    For Example, the integer 121 321 234 works! In total, how many such nine digit positive integers can Rick Make? (Cayley 2020)