Name:_____   Date:_____

<u>**Ch 1 Assignment 4b: Combinations with Multiple Cases**</u>

1. How many different seven letter words can be created using letters from the word – MOSCROP

2. How many ways can 6 students be arranged around a merry go around with 6 seats?

3. How many ways can 6 students arrange themselves around a circular table if 2 people must sit together? How many ways if the 2 people must NOT sit together?

4. A family of six kids and two parents are to sit in a row of 8 seats. How many ways can they be seated if each parent must be seated at the endpoints? How many ways can they be seated if only one parent needs to be at the endpoint?

5. Three boys and three girls are on a date. How many ways can these six people be arranged in a row if each person must sit next to their date?

6. How many ways can 5 boys and 4 girls sit in a row if every boy must sit next to a girl?

7. How many ways can five people "A, B, C, D, and E" be seated in a row if "A' and "B" can not sit together? How many ways can they be seated if "A" and "B" must be together?

8. How many ways can seven people "A", "B", "C", "D", "E", "F", and "G" be seated in a row if "B" must be to the left of "C" but not necessarily next to each other?

9. A circle has 10 points evenly divided around the circumference of a circle. How many lines can be drawn? How many triangles can be drawn? If you have a 10 sided polygon, how many diagonals can be drawn?

10. How many three digit or four digit even numbers can be formed from the numbers 2, 3, 5, 6, and 7?

11. A multiple choice test has 15 questions. Four questions have "A" as an answer, three have "B" as an answer, six have "C", and the rest have "D". How many different answer sheets can be created?

12. How many ways can 3 numbers be chosen from 1, 2, 3, 4, 5, 6, 7, 8, and 9 such that none of the numbers are consecutive of each other?

13. If $nP_r = 6720$ and $nC_r = 56$, then what are the values of "n" and "r"?

14. If $nP_r = 55440$ and $nC_r = 462$, then what are the values of "n" and "r"?

15. Simplify: a) $\dfrac{(n-1)!}{(n-3)!} - \dfrac{n!}{(n-2)!}$ b) $\dfrac{n! - 2(n-2)!}{(n-2)(n-2)!}$ c. $\dfrac{(n-1)!}{n!} + \dfrac{(n-2)!}{n!}$

16. Solve for "n" a) $\dfrac{3!(n-1)!}{(n-3)!} = 72$ b) $\dfrac{(2n-1)!}{2!(2n-3)!} = 10$ c. $\dfrac{3n(n-2)!}{(n-3)!} = 105$

17. Solve for "n" a) $nP_3 = 336$ b) $11C_n = 330$ c. $12C_n = 792$

BUCKET METHOD:

18. There are 8 men and 12 women in a classroom. A teacher needs to select 4 men and 3 women to form an advanced team. How many ways can the teacher form his team?

19. A committee requires one accountant, two marketing agents, and four board members. If there are five accountants, three marketing agents, and 9 board members available to choose from, how many committees can be formed?

20. How many five card hands from a deck of 52 cards can you create if there must be 3 hearts and 2 spades?

21. There are 7 men and 9 women available for selection on a 6 person committee. If the committee must have atleast one man, then how many committees are possible?

22. How many five card hands are possible if you must have atleast 3 hearts?

23. There are 8 math teachers, 5 science, 9 english teachers. A small team of 6 teachers is to be created. How many different teams are possible if you must have atleast 3 science teachers?

POKER HANDS:

24. How many five card hands are possible if all the suits must be the same?

25. How many five card hands are possible if you have a triple and a pair? (Fullhouse)

26. How many five card hands are possible if you have a four of a kind?

27. How many five card hands are possible if you have 2 pairs? (ie: AA KK Q)

28. How many five card hands are possible if you have a straight flush? (Consecutive and same suit)

29. How many five card hands are possible if you have a straight?

30. How many five card hands are posisble if you only have one pair?

31. A deck of cards has only 2 Kings, 2 Aces, 2 Queens, 2 Jacks, 2 tens, 2 nines, …..2 twos. How many ways can three cards be chosen if you can not have any pairs?

32. Challenge: Prove the following expression: $\dfrac{n!}{r!(n-r)!} + \dfrac{n!}{(r+1)!(n-r-1)!} = \dfrac{(n+1)!}{(r+1)!(n-r)!}$