Math 3201 **Chapter 2 Review** Name:_____

Part I: **Multiple Choice. Place the correct answer in the corresponding blank at the end of this section.**

1. A student incorrectly wrote 4! = 12. To produce a correct solution for 4!, what operation should be applied to 12.

    $4! = 4 \cdot 3 \cdot 2 \cdot 1 = 24$

    (A) add 2

    (B) divide by 2

    (C) multiply by 2

    (D) subtract 2

2. Consider the word CAR. In how many different ways can the letters be arranged?

    $P = 3! = 6$

    $P = 3 \times 2 \times 1 = 6$

    (A) 1

    (B) 3

    (C) 4

    (D) 6

3. A student must select a protective case for her new cell phone. She must choose a colour and a style for her case. Given the selections below, how many protective case choices does she have?

    (A) 8

    (B) 12

    (C) 15

    (D) 30

Case Colour	Case Style
Red	
Blue	hard
Green	
Black	
White	soft
Silver	

    FCP!!

    6 x 2 = 12

4. In the grid below, a person must travel from A to B by only heading East (E) or South (S). One example of a route is shown representing three moves East followed by two moves South (EEESS). Under these rules, which represents the total number of possible routes that can be taken to get from A to B?

(handwritten) $\dfrac{5!}{3!\,2!}$

(A) $\dfrac{5!}{3!2!}$

(B) $\dfrac{6!}{3!2!}$

(C) $5!$

(D) $6!$
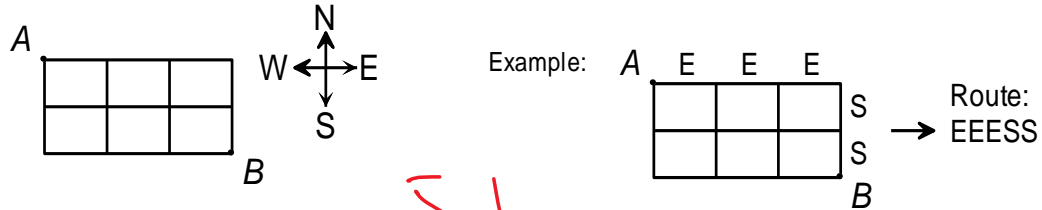
5. Corner Brook Minor Hockey Association has 10 parents wanting to serve on the executive as President, Vice-President, secretary and treasurer. Which of the following expressions could be used to determine the number of ways the executive can be chosen?

(A) $_4C_{10}$

(B) $_4P_{10}$

(C) $_{10}C_4$

(D) $_{10}P_4$

6. How many three digit numbers can be formed using the digits 1, 2, 3, 4, 5, 6 if the last number can't be three and repetition is allowed?

(handwritten) $P = \underline{\,6\,} \times \underline{\,6\,} \times \underline{\,5\,}$

(A) 120

(B) 180

(C) 216

(D) 720

(handwritten) $= 180$

7. There are 7 marbles in a bowl: 2 white, 3 green and 2 blue. If taken out one at a time, in how many different ways can all 7 marbles be taken out of the bowl?

(A) 105

(B) 210

(C) 420

(D) 5040

$$P = \frac{7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1}{2! \cdot 3! \cdot 2!}$$

$$P = \frac{7!}{2! \cdot 3! \cdot 2!} = 210$$

8. Christine is the coach of a Pole Push team that consists of nine players: 5 male and 4 female. In each competition, teams of four complete against each other to push competitors out of a circle. The team that is successful wins. How many different four person teams with exactly two males does Christine have to choose from?

(A) 60

(B) 126

(C) 240

(D) 3024

2 males ¦ 2 females

$${}_5C_2 \times {}_4C_2$$

$$10 \times 6$$

$$= 60$$

9. Simplify: $\frac{(n-2)!}{n!}$

(A) $\frac{1}{n^2-n}$

(B) $\frac{1}{n^2-3n+2}$

(C) $n^2 - n$

(D) $n^2 - 3n + 2$

$$\frac{(n-2)!}{n(n-1)(n-2)!}$$

$$= \frac{1}{n(n-1)}$$

$$= \frac{1}{n^2-n}$$

Answers to multiple choice.

1.___   2.___   3.___   4.___   5.___

6.___   7.___   8.___   9.___

Part II: Constructed Response. Answer each question in the space provided. Show all workings.

10. In how many ways can a teacher seat four girls and two boys in a row of six seats if the two boys must be seated next to each other?

$$P = \boxed{\overset{5}{\frac{2}{B} \times \frac{1}{B}} \times} \frac{4}{} \times \frac{3}{} \times \frac{2}{} \times \frac{1}{}$$

$$P = 2! \, 5! = 2 \cdot 120 = 240$$

11. Algebraically solve for n: $_nP_2 = 12$

$$_nP_r = \frac{n!}{(n-r)!}$$

$$\frac{n!}{(n-2)!} = 12$$

$$\frac{n(n-1)(n-2)!}{(n-2)!} = 12$$

$$n(n-1) = 12$$

$$n^2 - n - 12 = 0$$

$$(n-4)(n+3) = 0$$

$$n - 4 = 0, \quad n + 3 = 0$$

$$n = 4 \qquad n = -3$$

Check

$$\frac{(-3)!}{(-3-2)!} = 12 \quad \text{undefined}$$

$$\frac{4!}{(4-2)!} = 12$$

$$\frac{4!}{2!} = 12$$

$$\frac{4 \cdot 3 \cdot 2 \cdot 1}{2 \cdot 1} = 12$$

$$4 \cdot 3 = 12$$

$$12 = 12 \checkmark$$

12. Algebraically solve for n: $_{n+2}C_2 = 6$

$$_nC_r = \frac{n!}{r!(n-r)!}$$

$$\frac{(n+2)!}{2!(n+2-2)!} = 6$$

$$\frac{(n+2)!}{2!\,n!} = 6$$

$$\frac{(n+2)(n+1)\,n!}{2\cdot 1\cdot n!} = 6$$

$$2\cdot\frac{(n+2)(n+1)}{2} = 6\cdot 2$$

$$(n+2)(n+1) = 12 \quad (FOIL)$$

$$n^2 + n + 2n + 2 - 12 = 0$$

$$n^2 + 3n - 10 = 0$$

$$(n-2)(n+5) = 0$$

$$n-2 = 0, \quad n+5 = 0$$

$$n = 2, \quad n = -5$$

$$\frac{(-5+2)!}{2!\,(-5)!} = 6 \quad \text{undefined}$$

$$\frac{(2+2)!}{2!\,(2)!} = 6$$

$$\frac{4!}{2!\,2!} = 6$$

$$\frac{4\cdot 3\cdot 2\cdot 1}{2!\cdot 2!} = 6$$

$$\frac{12}{2} = 6$$

$$6 = 6 \checkmark$$

13. Algebraically solve for n where $n \in I$; be sure to check your answers:

$$2\binom{n}{2} = 20 \qquad 2\binom{n}{2} = 20 \longrightarrow 2\left({}_nC_2\right) = 20$$

$$\binom{n}{2} = 10$$

$$\frac{n!}{2!(n-2)!} = 10$$

$$\frac{n(n-1)(n-2)!}{2!(n-2)!} = 10$$

$$2 \cdot \frac{n(n-1)}{2} = 10 \cdot 2$$

$$n(n-1) = 20$$

$$n^2 - n = 20$$

$$n^2 - n - 20 = 0$$

$$(n-5)(n+4) = 0$$

$$n = 5, \; n = -4$$

15. Four students are to be chosen from a group of 12 to fill the positions of president,vice-president, treasurer and secretary. In how many ways can this be accomplished?

$$P = \underline{12} \times \underline{11} \times \underline{10} \times \underline{9} = 11\,880$$

or

$$_{12}P_4 = \frac{12!}{(12-4)!} = \frac{12!}{8!} = \frac{12 \cdot 11 \cdot 10 \cdot 9 \cdot 8!}{8!} = 11\,880$$

16. How many permutations are possible using all the letters of the word BANANAS if the three A's must be put together?

$$P = \frac{P}{T} = \boxed{\frac{\underline{3} \times \underline{2} \times \underline{1}}{\underset{A}{} \; \underset{A}{} \; \underset{A}{}}} \times \underline{4} \times \underline{3} \times \underline{2} \times \underline{1}$$

$$P = \frac{3! \cdot 5!}{3! \cdot 2!} = \frac{120}{2} = 60$$

17. Dasher, Dancer, Prancer, Vixen and Comet are to be arranged in a line to test run are Santa's new sleigh. How many ways can they be arranged if Dasher and Dancer **NOT** to stand next to each other?

$$P_T = \frac{5 \times 4 \times 3 \times 2 \times 1}{4} = 120$$

$$P(DD) = \boxed{\frac{2 \times 1}{D \quad D}} \times 3 \times 2 \times 1$$

$$= 2! \circ 4! = 48$$

$$P(DD)' = P_T - P(DD) = 120 - 48 = 72$$

18. How many 6 person committees can be formed from a group of 4 teachers and 30 students if there must be **at most** 2 teachers?

At most 2: 0 or 1 or 2

0 teachers
or
1 teacher
or
2 teachers

$${}_4C_0 \times {}_{30}C_6 = 1 \times 593775 = 593775$$
$$+$$
$${}_4C_1 \times {}_{30}C_5 = 4 \times 142506 = 570024$$
$$+$$
$${}_4C_2 \times {}_{30}C_4 = 6 \times 27405 = \underline{164430}$$

$$C = 1328229$$