Math 3201 **Review Practice Sheet – Sections 2.1 – 2.3**

Name: _____

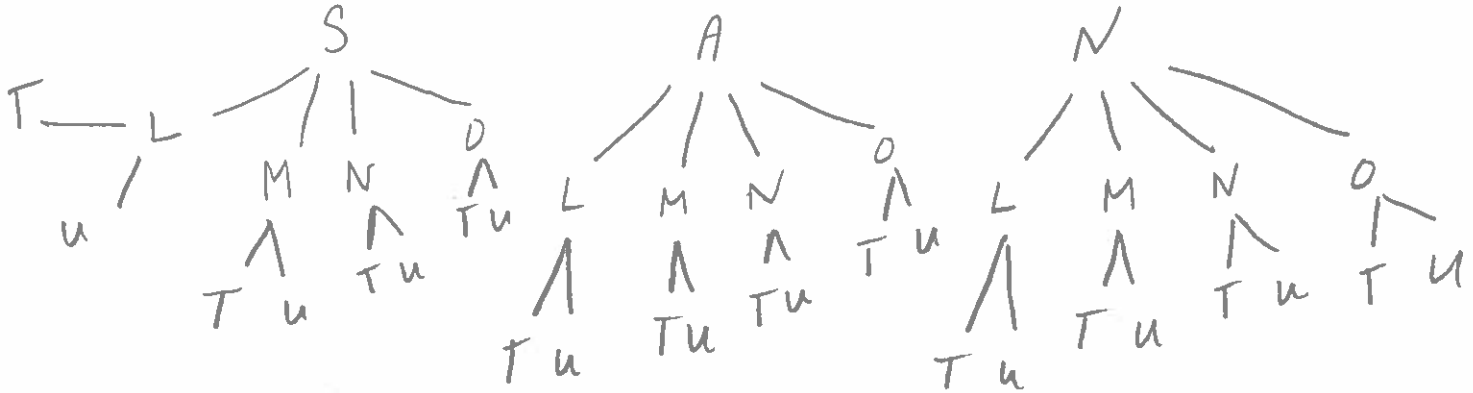
Section 2.1 – Counting Principles

1. Canadian postal codes consist of a letter-digit-letter-digit-letter-digit arrangement. How many postal codes are possible? 26 10 26 10 26 10 = 17,576,000

2. Greg is trying to select a new cell phone based on the following categories:

Brands:	Samsung, Apple, Nikon
Color:	Lime, Magenta, Navy, Orange
Plans:	Text, Unlimited Calling

   With the aid of a **tree diagram**, explain why it makes sense to multiply the options from each category to determine the number of ways of selecting Greg's new cell phone.



24 choices multiplying gives $3 \times 4 \times 2 = 24$ (same!)

3. In how many ways can a teacher seat five boys and three girls in a row of eight seats if a girl must be seated at <u>each</u> end of the row?

   $\frac{3}{G} \_ \_ \frac{6!}{} \_ \_ \_ \frac{2}{G} = 4320$

4. How many ways can you order the letters MUSIC if it must start with a consonant and end with a vowel?

   $3 \_ 3! \_ 2 = 36$

5. In how many different ways can a set of 5 distinct books be arranged on a shelf?

   $5! = 120$

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6. Car number plates in an African country consist of a letter other than I or O followed by three digits, the first of which cannot be zero, followed by any two letters which are not repeated. How many different car number plates can be produced?

$24 \quad 9 \quad 10 \quad 10 \quad 26 \quad 25$

$= 14,040,000$

Section 2.2 – Introducing Permutations and Factorial Notation

7. Find the value of the following:

A) $\frac{43!}{40!}$

$43 \times 42 \times 41$

$= 74046$

B) $\frac{37!}{33!4!}$

$\frac{37 \times 36 \times 35 \times 34}{4 \times 3 \times 2 \times 1}$

$= 66045$

C) $\frac{(n-3)!}{(n-2)!}$

$\frac{(n-3)!}{(n-2)(n-3)!}$

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

8. Solve the following equations for n:

A) $\frac{(n+1)!}{n!} = 6$

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

$n+1 = 6$

$\boxed{n = 5}$

B) $\frac{n!}{(n-2)!} = 182$

$\frac{n(n-1)(n-2)!}{(n-2)!} = 182$

$n^2 - n = 182$

$n^2 - n - 182 = 0$

$(n-14)(n+13) = 0$

$\boxed{n = 14} \quad n = -13$

Section 2.3 – Permutations When All Objects are Distinguishable

9. The code for a lock consists of three numbers selected from 0, 1, 2, 3, with no repeats. (For example, the code 1-2-1 would <u>not</u> be allowed but 3-0-2 would be allowed.) Using the permutation formula, determine the number of possible codes.

$P_{4\ 3} = \frac{4!}{(4-3)!} = 24$

10. How many two digits numbers can be formed using the digits 1, 2, 3, 4, 5, 6, if repetition is allowed?

$6 \quad 6 \quad = 36$

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11. How many distinct arrangements of three letters can be formed using the letters of the word LOCKERS?

$${}_7P_3 = \frac{7!}{(7-3)!} = 210 \quad \text{or} \quad \underline{7}\ \underline{6}\ \underline{5} = 210$$

12. How many arrangements of the word DAUGHTER can be formed if all the vowels must be kept together?

$$\boxed{\_\ 3!\ \_} \_\ \_\ \underline{6!}\ \_\ \_\ \_ = 4320$$

13. A code consists of three letters chosen from A to Z and three digits chosen from 0 to 9, with no repetition of letters or numbers. What is the total number of possible codes?

$$\underline{26}\ \underline{25}\ \underline{24}\ \underline{10}\ \underline{9}\ \underline{8} = 11232000 \quad \text{or} \quad {}_{26}P_3 \cdot {}_{10}P_3 = 11232000$$

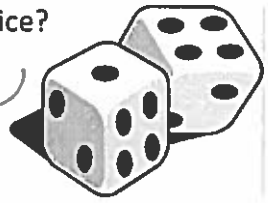
14. In how many ways can a sum of 2 or a sum of 10 be rolled with a pair of standard dice?

↓means plus

Sum of 2 = 1+1 (1 way)

sum of 10 = 5+5, 6+4, 4+6 (3 ways)

Total = 4 ways



15. Solve for n: ${}_nP_2 = 42$

$$\frac{n!}{(n-2)!} = 42 \qquad \frac{n(n-1)(n-2)!}{(n-2)!} = 42$$

$$n^2 - n = 42$$

$$n^2 - n - 42 = 0$$

$$(n-7)(n+6) = 0$$

$n = 7$ or ~~$n = -6$~~

16. Mr. Pi creates a multiple choice quiz consisting of 10 questions. If the possible answers for each question are A, B, C, and D, how many different answer keys are possible?

$$\boxed{4^{10} = 1\,048\,576} \quad \underline{4}\ \underline{4}\ \underline{4}\ \_\ \_\ \_\ \_\ \_\ \_\ \_$$

17. Ann, Brian, Colin, Diane and Eric go to watch a movie and sit in 5 adjacent seats. In how many ways can this be done under the following conditions?

A) Without restrictions?

$$5! = 120$$

B) If Brian sits next to Diane?

$$\boxed{\_\ 2!\ \_}\ \_\ \underline{4!}\ \_\ \_ = 48$$

C) If Ann refuses to sit next to Eric?

Total possibilities – when they sit together

$$120 - 48 = 72$$