11-1 Counting and Permutations Notes

Each of these methods can be verified with a tree diagram. Tree diagrams are used to list all possibilities without omitting possibilities or counting possibilities multiple times … Making tree diagrams and counting possibilities can be time consuming. Wish there was a formula … ☺

A. Counting Principle – Multiply number of possibilities.

Example 1: There are three T-shirt sizes available in red, blue, purple, green, and orange. How many different products does that make?

Example 2: Each day at a four day conference, you have 3 choices for lunch. How many possibilities are there for the four days?

B. Factorial – Counting the number of ways when every possibility is used.

Example: How many ways can you arrange all six of your books on a shelf.

C. Permutation – Counting the number of ways something can be arranged. Look for key words: arrange, order, placed,

$$_nP_r = \frac{n!}{(n-r)!}$$, where n = total and r = number selected.

Example: You have 10 books, and you are arranging 6 of them on a shelf. How many possibilities are there?

Ponder this: When is the permutation of n total objects the same as the factorial of n? What is 0! equal to and why? Why are total possibilities important? … Research these answers on your own for tomorrow.

Name _____ Hour _____ Date _____

11-1 Practice

Form G

Permutations

1. How many 2-letter pairs of 1 vowel and 1 consonant can you make from the English alphabet? Consider "y" to be a consonant.

2. An ice cream shop offers 33 flavors of ice cream and 7 toppings. How many different sundaes can the shop make using 1 flavor and 1 topping?

3. A contest winner gets to choose 1 of 8 possible vacations and bring 1 of 10 friends with her. How many different ways could the contest winner select her prize?

Evaluate each expression.

4. $8!$

5. $\frac{11!}{9!}$

6. $6!4!$

7. $3(5!)$

8. $\frac{9!}{2!6!}$

9. $3(7!)$

10. $\frac{10!}{5!}$

11. $\frac{3!8!}{5!}$

12. An art gallery plans to display 7 sculptures in a single row.

a. How many different arrangements of the sculptures are possible?

b. If one sculpture is taken out of the show, how many different arrangements are possible?

Evaluate each expression.

13. ${}_{12}P_{11}$

14. ${}_{12}P_{10}$

15. ${}_{12}P_{5}$

16. ${}_{12}P_{1}$

17. ${}_{5}P_{2}$

18. ${}_{7}P_{4}$

19. ${}_{8}P_{6}$

20. ${}_{6}P_{2}$

21. In how many ways can four distinct positions for a relay race be assigned from a team of nine runners?