Name ______________________________ Date __________ Class __________

LESSON 11-1

Reteach

Permutations and Combinations

A **permutation** is a selection of items from a group in which the order is important. In a permutation, *AB* is NOT the same as *BA*.

The number of permutations of *n* items taken *r* at a time is shown by the following formula.

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

The value of *r* must be less than or equal to the value of *n*.

How many ways can club members select a president, a vice president, a secretary, and a treasurer from a group of 10 members?
Order matters since each office is different.

To find the number of permutations of 10 items taken 4 at a time, use $n = 10$ and $r = 4$ in the permutation rule. Then evaluate.

$$_{10}P_4 = \frac{10!}{(10-4)!} = \frac{10!}{6!} = \frac{10\cdot9\cdot8\cdot7\cdot\cancel{6\cdot5\cdot4\cdot3\cdot2\cdot1}}{\cancel{6\cdot5\cdot4\cdot3\cdot2\cdot1}} = 10\cdot9\cdot8\cdot7 = 5040$$

Remember that *n*! or "*n* factorial" means to find the product of the whole numbers from 1 to *n*.

There are 5040 ways to select the officers.

Evaluate.

1. 8! ____________

2. 5! ____________

3. 10! ____________

4. $\frac{6!}{3!}$ ____________

5. $\frac{9!}{4!}$ ____________

6. $\frac{15!}{14!}$ ____________

Solve.

7. How many ways can the letters from *A* through *H* be used to create 5-letter passwords is there are no repeated letters in a password?

a. Does the order of the letters matter in the password? ____________

b. How many letters are there from *A* through *H*? ____________

c. Find the number of permutations of 8 letters taken 5 at a time.

$$_8P_5 = \frac{8!}{(8-5)!} = \underline{\qquad\qquad}$$

8. An editor has 4 different spaces to arrange articles in a magazine. He must choose from 6 articles. How many different arrangements are possible?

Write and evaluate the permutation rule to solve.

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Name ______________________ Date ___________ Class ___________

LESSON 11-1

Reteach

Permutations and Combinations (continued)

A **combination** is a selection of items from a group in which the order is NOT important. In a combination, *AB* is the same as *BA*.

The number of combinations of *n* items taken *r* at a time is shown by the following formula.

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

The combination rule is a modification of the permutation rule.

How many ways can club members select a committee of 4 people from a group of 10 members?
The order of the committee members does not matter. Selecting Tom and Pat is the same as selecting Pat and Tom.

To find the number of combinations of 10 items taken 4 at a time, use $n = 10$ and $r = 4$ in the combination rule. Then evaluate.

$$_{10}C_4 = \frac{10!}{(10-4)!4!} = \frac{10!}{6!4!} = \frac{10 \cdot 9 \cdot 8 \cdot 7 \cdot \cancel{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}}{(\cancel{6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1})(4 \cdot 3 \cdot 2 \cdot 1)}$$

$$= \frac{10 \cdot \overset{3}{\cancel{9}} \cdot \cancel{8} \cdot 7}{\cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot 1} = 10 \cdot 3 \cdot 7 = 210$$

Divide out common factors to simplify.

There are 210 ways to select the committee members.

Evaluate.

9. $_5C_2$ ______________

10. $_7C_6$ ______________

11. $_9C_4$ ______________

Solve.

12. A pollster has the names of 8 people available to answer her questions. She must select 3 of the people to interview. How many ways can she select the respondents?

a. Does the order of the respondents matter? ______________

b. Find the number of combinations of 8 people taken 3 at a time.

$$_8C_3 = \frac{8!}{(8-3)!3!} = \underline{\qquad\qquad}$$

13. The track team has 6 runners in a race. The coach selects 2 runners to run in the first heat. In how many ways can the runners be selected? Write and evaluate the combination rule to solve.

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