ALGEBRA 2 Name:_____ Date:_____

10.5 Combinations

Combinations:

- a selection of r objects form a group of n objects where the order **is not** important
- ORDER DOES NOT MATTER
- Objects **CANNOT** be repeated
- These are different from a Permutation bc in a Permutation, order matters!

In the calculator, type: ${}_nC_r$

ALWAYS Ask yourself….. can the object be repeated?

- Yes : Use Fundamental Counting Principal
- No: Use a Permutation or a Combination – see next question

ALWAYS Ask yourself….. does the order matter?

- Yes : Permutation
- No: Combination

Examples:

1. Jamal, Kay, Li, and Max have volunteered to help a nonprofit organization build houses. Three of the 4 will be assigned to work as painters. How many choices are there for the 3 painters? List the possibilities.

2. At CB East, there are 13 math teachers. If 4 teachers will be selected to work together to create a new Algebra 2 Final Exam, how many choices are possible?

3. For summer reading, you are asked to read 2 books from a list of 6 books. How many different pairs of books can you choose to read?

4. Twelve students enter a talent show. Awards are given for the first place through fifth place. In how many ways can the students finish first through fifth?

5. In how many ways can a soccer team choose 2 captains from 12 players?

6. There are 3 girls and 2 boys. You want to select a group of 3 students with exactly 2 girls and 1 boy. How many ways are there?

7. How many ways can you choose 3 dogs and 2 cats from 5 dogs and 6 cats?

<u>Standard Deck of Playing Cards</u>:

- 52 cards
- 26 red, 26 black
- 4 suits (diamonds, hearts, spades, clubs)
- 13 cards in each suit
- 12 total face cards (4 Jacks, 4 Queens, 4 Kings)
- 4 of each card (2, 3, 4, 5, 6, 7, 8, 9, 10, J, Q, K, A)

When choosing a hand of cards, the order in which the cards are dealt is never important.

8. Consider a standard deck of 52 playing cards. The order in which the cards are dealt for a "hand" does not matter.

    a) How many different 5-card hands are possible?

    b) How many different 5-card hands have all 5 cards of a single suit?

    c) How many different 5-card hands have all 5 cards of a single color?

9. How many ways can you make a 3-topping pizza if you have 12 toppings to choose from?

10. How many ways can you pick a starting 5-person basketball squad from 11 kids?

11. How many ways can 10 people be selected to attend a concert from 40 possible people?

12. From a group of 6 guys and 5 girls, How many groups of 3 guys and 3 girls can be formed?

13. How many ways can 3 people finish in the top 3 of a race out of 50 people? All top three finishers get the same prize.

14. How many ways out of 50 people can the runners finish 1st, 2nd, or 3rd in a race? 1st place gets $100, 2nd place gets $50, and 3rd place gets $25.

15. A restaurant serves omelets that can be ordered with any of the ingredients shown. Suppose you want exactly 2 vegetarian ingredients and 1 meat ingredient in your omelet. How many different types of omelets can you order?

16. **Determine whether each situation involves a permutation or a combination.**

a) 3-letter pattern, chosen from the letters in the word statistics P or C

b) a hand of 5 cards from a deck of cards P or C

c) a team of 5 people chosen from a group of 12 people P or C

d) the batting order of the Philadelphia Phillies P or C

e) putting students in assigned seats P or C

Keywords:

Permutation: **No Repeats and ORDER MATTERS**	**Combination:** **No repeats and ORDER DOES NOT MATTER**

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In Exercises 8 and 9, tell whether the question can be answered using a *permutation* or a *combination*. Then find the answer.

8. Video Clips You are going to send 3 video clips to a friend as attachments to an e-mail. How many different groups of 3 video clips can you choose from 7 video clips?

9. Vacations You wanted to see 7 tourist sites on your vacation, but decide you have time to see only 4. In how many orders can you visit 4 of the 7 sites?

10. Movies How many different groups of 2 comedies and 1 drama can you select from 6 comedies and 5 dramas?

Pizza **In Exercises 11–13, use the following information.**

You are ordering pizza for a birthday party. You plan to choose 2 toppings from 5 available toppings: pepperoni (p), hamburger (h), mushrooms (m), olives (o), and roasted peppers (r).

11. Use an ordered list to find all possible pairs of toppings.

12. How many different choices of 2 toppings do you have?

13. When you place your order, you learn that extra cheese is also an available topping. How many different choices of 2 toppings do you have now?

22. Dance Groups A choreographer needs 4 dancers to perform a work. How many different combinations of 4 dancers can the choreographer choose from a dance company consisting of 9 dancers?

23. Entertainment A comedian begins a routine by choosing 4 people from the audience. How many different groups of 4 people can the comedian choose from an audience of 50 people?

Permutations and Combinations **In Exercises 24–27, tell whether the question can be answered using a *permutation* or a *combination*. Then find the answer.**

24. Track In a 4 by 100 meter relay race, a different runner runs each of the four successive 100 meter "legs" of the race. In how many ways can 4 from a group of 8 runners be assigned to run the legs of the race?

26. Kentucky Derby Twenty horses competed in the 2006 Kentucky Derby. In how many ways could the horses have finished in first place through third place?

27. Work Groups Your teacher divides the class into groups of 5 for an activity. How many possibilities are there for the group that contains you if there are 25 students in the class in all? (*Hint:* How many remain to be chosen?)

28. Menus Planners for a company party will choose 2 of 4 vegetarian entrees and 3 of 6 meat entrees for the buffet. How many entree combinations are possible?

49. Multiple Choice In how many ways can you choose 3 fish from 15?

Ⓐ 0 Ⓑ 220 Ⓒ 455 Ⓓ 2730

52. Permutations Ten bands are marching in a parade. In how many ways can you order (a) all 10 bands (b) the first 3 of the 10 bands? *(Lesson 10.4)*

In Exercises 11–13, tell whether the number of possibilities can be found using a *permutation* or a *combination*. Then find the answer.

11. Amusement Parks An amusement park ride seats 4 people in a row. In how many ways can you and 3 friends be seated on the ride?

12. Concerts At an all-day concert, 12 bands are performing on the main stage. How many different possibilities are there of 4 of the bands that you can see?

13. Game Show A contestant on a game show has to choose 3 cases to open from 5 cases. How many possibilities are there for which cases to open?