Unit 7 Day 2 CW   **Name:** _____

Directions: Identify the following problems as either C (combination) or P (permutation) then proceed with finding a solution. Leave large answers in scientific notation to the nearest tenth.

1. A DJ is making a playlist of 12 songs. If she has 400 song to choose from, in how many ways can she arrange the playlist?

   1. P/C _____

2. How many sets of 10 photos can be chosen from a box of 500 photos?

   2. P/C _____

3. 50 actors auditioned for a movie which is casting for 4 different roles. In how many ways can the roles be filled?

   3. P/C _____

4. Of the 1200 songs on your iPod, you can only listen to 5 on your way to work. In how many ways can the songs be arranged?

   4. P/C _____

5. How many different teams of 5 athletes can be made from a group of 350?

   5. P/C _____

6. In a race with 12 horses, how many possibilities are there for first and second place?

   6. P/C _____

7. On a hockey team of 45 players, only 9 play at any given time. How many different groups of people could be on the ice?

   7. P/C _____

8. How many different sets of 5 books can a person choose in a library of 10,000 books?

   8. P/C _____

9. Out of 234 people who took an exam, how many different arrangements are possible for the top 10 scores?

   9. P/C _____

10. How many ways can you arrange the letters of the word MATHEMATICS?

    10. P/C _____

11. How many ways can seven different books be arranged on a shelf?

    11. P/C _____

12. How many groups of 3 dogs can be selected from a group of 45?

    12. P/C _____

13. Out of 30 students, how many ways can the teacher choose groups of 3 for a project?

    13. P/C _____

14. In a seven color rainbow, how many different ways could the colors be arranged?

    14. P/C _____

15. In a club with 36 members, how many groups of 7 can be chosen to run a bake sale?

    15. P/C _____

1–6 ■ Evaluate the expression.

~~1. P(8, 3)~~   2. *P*(9, 2)   ~~3. P(11, 4)~~

~~4. P(10, 5)~~   5. *P*(100, 1)   ~~6. P(99, 3)~~

7. In how many different ways can a president, vice president, and secretary be chosen from a class of 15 students?

8. In how many different ways can first, second, and third prizes be awarded in a game with eight contestants?

~~9.~~ In how many different ways can six of ten people be seated in a row of six chairs?

10. In how many different ways can six people be seated in a row of six chairs?

~~11.~~ How many three-letter "words" can be made from the letters *FGHIJK*? (Letters may not be repeated.)

12. How many permutations are possible from the letters of the word *LOVE*?

~~13.~~ How many different three-digit whole numbers can be formed using the digits 1, 3, 5, and 7 if no repetition of digits is allowed?

14. A pianist plans to play eight pieces at a recital. In how many ways can she arrange these pieces in the program?

~~15.~~ In how many different ways can a race with nine runners be completed, assuming there is no tie?

16. A ship carries five signal flags of different colors. How many different signals can be sent by hoisting exactly three of the five flags on the ship's flagpole in different orders?

~~17.~~ In how many ways can first, second, and third prizes be awarded in a contest with 1000 contestants?

18. In how many ways can a president, vice president, secretary, and treasurer be chosen from a class of 30 students?

~~19.~~ In how many ways can five students be seated in a row of five chairs if Jack insists on sitting in the first chair?

Jack

20. In how many ways can the students in Exercise 19 be seated if Jack insists on sitting in the middle chair?

21–24 ■ Find the number of distinguishable permutations of the given letters.

~~21.~~ *AAABBC*   22. *AAABBBCCC*

~~23.~~ *AABCD*   24. *ABCDDDEE*

25. In how many ways can two blue marbles and four red marbles be arranged in a row?

26. In how many different ways can five red balls, two white balls, and seven blue balls be arranged in a row?

27. In how many different ways can four pennies, three nickels, two dimes, and three quarters be arranged in a row?

28. In how many different ways can the letters of the word *ELEEMOSYNARY* be arranged?

29. A man bought three vanilla ice-cream cones, two chocolate cones, four strawberry cones, and five butterscotch cones for his 14 chidren. In how many ways can he distribute the cones among his children?

30. When seven students take a trip, they find a hotel with three rooms available—a room for one person, a room for two people, and a room for three people. In how many different ways can the students be assigned to these rooms? (One student has to sleep in the car.)

31. Eight workers are cleaning a large house. Five are needed to clean windows, two to clean the carpets, and one to clean the rest of the house. In how many different ways can these tasks be assigned to the eight workers?

32. A jogger jogs every morning to his health club, which is eight blocks east and five blocks north of his home. He always takes a route that is as short as possible, but he likes to vary it (see the figure). How many different routes can he take? [*Hint:* The route shown can be thought of as *ENNEEENENEENE*, where E is East and N is North.]

Health Club

Home
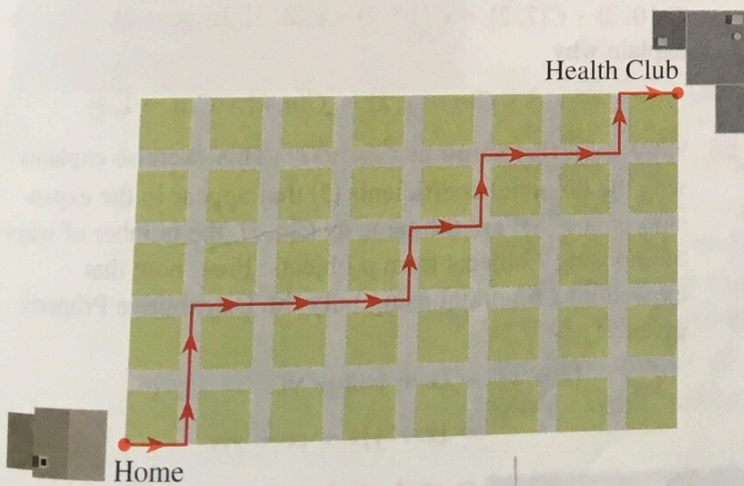
33–38 ■ Evaluate the expression.

33. C(8, 3)   34. C(9, 2)   35. C(, 4)

36. C(10,)   37. C(100, 1)   38. C(, 3)

39. In how many ways can three books be chosen from a group of six?

40. In how many ways can three pizza toppings be chosen from 12 available toppings?

41. In how many ways can six people be chosen from a group of ten?

42. In how many ways can a committee of three members be chosen from a club of 25 members?

43. How many different five-card hands can be dealt from a deck of 52 cards?
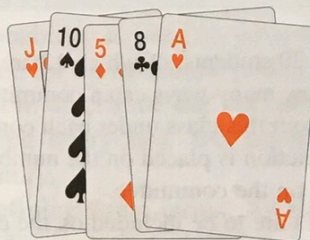
44. How many different seven-card hands can be picked from a deck of 52 cards?

45. A student must answer seven of the ten questions on an exam. In how many ways can she choose the seven questions?

46. A pizza parlor offers a choice of 16 different toppings. How many three-topping pizzas are possible?

47. A violinist has practiced 12 pieces. In how many ways can he choose eight of these pieces for a recital?

48. If a woman has eight skirts, in how many ways can she choose five of these to take on a weekend trip?

49. In how many ways can seven students from a class of 30 be chosen for a field trip?

50. In how many ways can the seven students in Exercise 49 be chosen if Jack must go on the field trip?

51. In how many ways can the seven students in Exercise 49 be chosen if Jack is not allowed to go on the field trip?

52. In the 6/49 lottery game, a player picks six numbers from 1 to 49. How many different choices does the player have?

53. In the California Lotto game, a player chooses six numbers from 1 to 53. It costs $1 to play this game. How much

would it cost to buy every possible combination of six numbers to ensure picking the winning six numbers?

YOU CAN WIN $1,000,000
•••LOTTO•••

1	2	3	4	5	6	7	8	9	10
11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40
41	42	43	44	45	46	47	48	49	50
51	52	53							

54. class has 20 students, of which 12 are females and 8 are males. In how many ways can a committee of five students be picked from this class under each condition?
(a) No restriction is placed on the number of males or females on the committee.
(b) No males are to be included on the committee.
(c) The committee must have three females and two males.

A set has eight elements.
(a) How many subsets containing five elements does this set have?
(b) How many subsets does this set have?

56. travel agency has limited numbers of eight different free brochures about Australia. The agent tells you to take any that you like, but no more than one of any kind. How many different ways can you choose brochures (including not choosing any)?

A hamburger chain gives their customers a choice of ten different hamburger toppings. In how many different ways can a customer order a hamburger?

58. Each of 20 shoppers in a shopping mall chooses to enter or not to enter the Dressfastic clothing store. How many different outcomes of their decisions are possible?

From a group of ten male and ten female tennis players, two men and two women are to face each other in a men-versus-women doubles match. In how many different ways can this match be arranged?

60. school dance committee is to consist of two freshmen, three sophomores, four juniors, and five seniors. If six freshmen, eight sophomores, twelve juniors, and ten seniors are eligible to be on the committee, in how many ways can the committee be chosen?

61. A group of 22 aspiring thespians contains ten men and twelve women. For the next play the director wants to choose a leading man, a leading lady, a supporting male role, a supporting female role, and eight extras—three women and five men. In how many ways can the cast be chosen?

62. A hockey team has 20 players of which twelve play forward, six play defense, and two are goalies. In how many ways can the coach pick a starting lineup consisting of three forwards, two defense players, and one goalie?

A pizza parlor offers four sizes of pizza (small, medium, large, and colossus), two types of crust (thick and thin), and 14 different toppings. How many different pizzas can be made with these choices?

DISCOVERY • DISCUSSION

Complementary Combinations Without performing any calculations, explain in words why the number of ways of choosing two objects from ten objects is the same as the number of ways of choosing eight objects from ten objects. In general, explain why $C(n, r) = C(n, n - r)$.

An Identity Involving Combinations Kevin has ten different marbles, and he wants to give three of them to Luke and two to Mark. How many ways can he choose to do this? There are two ways of analyzing this problem: He could first pick three for Luke and then two for Mark, or he could first pick two for Mark and then three for Luke. Explain how these two viewpoints show that $C(10, 3) \cdot C(7, 2) = C(10, 2) \cdot C(8, 3)$. In general, explain why

$$C(n, r) \cdot C(n - r, k) = C(n, k) \cdot C(n - k, r)$$

Why is $\binom{n}{r}$ the Same as $C(n, r)$? This exercise explains why the binomial coefficients $\binom{n}{r}$ that appear in the expansion of $(x + y)^n$ are the same as $C(n, r)$, the number of ways of choosing r objects from n objects. First, note that expanding a binomial using only the Distributive Property gives

$$(x + y)^2 = (x + y)(x + y)$$
$$= (x + y)x + (x + y)y$$
$$= xx + xy + yx + yy$$
$$(x + y)^3 = (x + y)(xx + xy + yx + yy)$$
$$= xxx + xxy + xyx + xyy + yxx$$
$$+ yxy + yyx + yyy$$

Unit 7 Day 2 HW

State if each scenario involves a permutation or a combination. Then find the number of possibilities.

1) A group of 35 people are going to run a race. The top three runners earn gold, silver, and bronze medals.

2) Kali and Kim are planning trips to four countries this year. There are 11 countries they would like to visit. One trip will be one week long, another two days, another two weeks, and the other a month.

3) Mofor has homework assignments in four subjects. He only has time to do one of them.

4) A team of 15 field hockey players needs to choose three players to refill the water cooler.

5) The student body of 60 students wants to elect a president, vice president, secretary, and treasurer.

6) There are 160 students at a meeting. They each shake hands with everyone else. How many handshakes were there?

7) A team of 15 field hockey players needs to choose a captain and co-captain.

8) You are setting the combination on a four-digit lock. You want to use the numbers 1234 but don't care what order they are in.

9) There are 40 applicants for two jobs: computer programmer and software tester.

10) A team of 9 dodgeball players needs to choose two players to refill the water cooler.

11) The student body of 100 students wants to elect a president, vice president, and secretary.

12) Selecting which eight players will be in the batting order on a 12 person team.

13) A group of 25 people are going to run a race. The top three runners earn gold, silver, and bronze medals.

14) 3 out of 11 students will ride in a car instead of a van

15) Mike and John are planning trips to two countries this year. There are 11 countries they would like to visit. One trip will be one week long and the other two weeks.

16) 5 out of 9 students will ride in a car instead of a van

17) There are 10 applicants for four jobs: Computer Programmer, Software Tester, Manager, and Systems Engineer.

18) The batting order for seven players on a 9 person team.