Name_____Teacher_____Period_____Date_____

COUNTING PRINCIPLE, PERMUTATIONS, AND COMBINATIONS WORKSHEET

1. If a girl has 5 skirts, 8 shirts, and 6 pairs of shoes, how many outfits can she wear?

$5 \cdot 8 \cdot 6 = 240$

Answer:_____

2. Three people run for class president, 4 for vice-president, and 2 for secretary. How many ways can the 3 officers be selected?

$3 \cdot 4 \cdot 2 = 24$

Answer:_____

3. For a school lunch you can get a hamburger, hot dog, or chicken sandwich. To drink you can get a soft drink or a milkshake. List all of the different lunches consisting of 1 sandwich and 1 drink are possible below and give the total number of possibilities as well.

$3 \cdot 2 = 6$

Answer:_____

4. Sally has 7 candles, each a different color. How many ways can she arrange from left to right the candles in a candelabra that holds three candles?

$7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 5040$

Answer:_____

5. Eight toppings for pizza are available. In how many ways can Jim choose 3 of the toppings?

$8C_3 = \frac{8!}{3!\,5!} = 56$

Answer:_____

6. How many different ways can 1 committee of 5 students be selected from a class of 25?

$25C_5 = \frac{25!}{5!\,20!} = 53{,}130$

Answer:_____

7. A car dealer sells 4 makes of cars in 5 colors with either standard or automatic transmissions. How many variations does the dealership offer?

$4 \cdot 5 \cdot 2 = 40$

Answer:_____

8. How many outcomes are possible when you roll 3 dice?

$6 \cdot 6 \cdot 6 = 216$

Answer:_____

9. A briefcase lock has 3 rotating cylinders, each containing 10 digits. How many numerical codes are possible?

$10 \cdot 10 \cdot 10 = 1000$

Answer:_____

10. A golf club manufacturer makes irons with 7 different shaft lengths, 3 different grips, and 2 different club head materials. How many different combinations are offered?

$7 \cdot 3 \cdot 2 = 42$

Answer:_____

11. How many 7-digit telephone numbers can be formed if the first digit cannot be a 0 or a 1?

$1 \cdot 1 \cdot 10 \cdot 10 \cdot 10 \cdot 10 \cdot 10 = 100{,}000$

Answer:_____

12. In how many ways can the 4 call letters of a radio station be arranged if the first letter must be W or K and no letters repeat?

$2 \cdot 25 \cdot 24 \cdot 23 = 27,600$

Answer:_____

13. There are 5 different routes that a commuter can take from her home to the office. In how many ways can she make a round trip if she uses different routes for coming and going?

$\underbrace{5}_{\text{going}} \cdot \underbrace{4}_{\text{returning}} = 20$

Answer:_____

14. How many ways can you select a volleyball team (6 players) from a group of 8 people?

$8C_6 = \frac{8!}{6!\,2!} = 28$

Answer:_____

15. How many 4-letter "words" can you make from a list of 12 letters if you use each letter only once in each word?

$12 \cdot 11 \cdot 10 \cdot 9 = 11,880$

Answer:_____

16. How many ways can eight different cans of soup be displayed in a row on a shelf?

$8! = 8 \cdot 7 \cdot 6 \cdot 5 \cdot 4 \cdot 3 \cdot 2 \cdot 1 = 40,320$

Answer:_____

17. At the 1992 Olympic Games, eight women qualified for the women's 400-meter finals in track and field. Only three women can win medals. How many different ways could the top three medal winners occur?

$8P_3 = \frac{8!}{5!} = 8 \cdot 7 \cdot 6 = 336$

Answer:_____

18. The state of Ohio has a Super Lotto drawing twice a week in which 6 numbers (1 through 46) are drawn at random. How many ways are 6 numbers drawn?

$46P_6 = \frac{46!}{40!} = 6,744,109,688$

Answer:_____

19. A box contains 12 black and 8 green marbles. In how many ways can 3 black and 2 green marbles be chosen?

$\underbrace{12C_3}_{\text{Black}} \cdot 8C_2 = \frac{12!}{3!\,9!} \cdot \frac{8!}{2!\,6!} = 220 \cdot 28 = 6,160$

Answer:_____

Hint: This is a double combination AND a counting principle at the same time.

MORE COMBINATION AND PERMUTATION PRACTICE PROBLEMS:

1. Suppose that 7 people enter a swim meet. Assuming that there are no ties, in how many ways could the gold, silver, and bronze medals be awarded? $7P_3 = \frac{7!}{4!} = 210$

2. How many different committees of 3 people can be chosen to work on a special project from a group of 9 people? $9C_3 = \frac{9!}{3!\,6!} = 84$

3. A coach must choose how to line up his five starters from a team of 12 players. How many different ways can the coach choose the starters? $12P_5 = \frac{12!}{7!} = 95{,}040$

4. John bought a machine to make fresh juice. He has five different fruits: strawberries, oranges, apples, pineapples, and lemons. If he only uses two fruits, how many different juice drinks can John make? $5C_2 = \frac{5!}{2!\,3!} = 10$

5. How many different four-letter passwords can be created for a software access if no letter can be used more than once? $26P_4 = \frac{26!}{22!} = 358{,}800$

6. How many different ways you can elect a Chairman and Co-Chairman of a committee if you have 10 people to choose from. $10P_2 = \frac{10!}{8!} = 90$

7. There are 25 people who work in an office together. Five of these people are selected to go together to the same conference in Orlando, Florida. How many ways can they choose this team of five people to go to the conference? $25C_5 = \frac{25!}{5!\,20!} = 53{,}130$

8. There are 25 people who work in an office together. Five of these people are selected to attend five different conferences. The first person selected will go to a conference in Hawaii, the second will go to New York, the third will go to San Diego, the fourth will go to Atlanta, and the fifth will go to Nashville. How many such selections are possible? $25P_5 = 6{,}375{,}600$

9. John couldn't recall the Serial number on his expensive bicycle. He remembered that there were 6 different digits, none used more than once, but couldn't remember what digits were used. He decided to write down all of the possible 6 digit numbers . How many different possibilities will he have to create? $10 \cdot 9 \cdot 8 \cdot 7 \cdot 6 \cdot 5 = 151{,}200$

10. How many different 7-card hands can be chosen from a standard 52-card deck? $52C_7 = 133{,}784{,}560$

11. One hundred twelve people bought raffle tickets to enter a random drawing for three prizes. How many ways can three names be drawn for first prize, second prize, and third prize? $112P_3 = 1{,}367{,}520$

12. A disc jockey has to choose three songs for the last few minutes of his evening show. If there are nine songs that he feels are appropriate for that time slot, then how many ways can he choose and arrange to play three of those nine songs? $9C_3 = \frac{9!}{3!\,6!} = 84$