

Worksheet #1: Counting, Permutations, Combinations

Name _____

Part I

- How many different ways can 5 cars be arranged on a carrier truck with room for 5 vehicles?
 $5 * 4 * 3 * 2 * 1 = 120$
- A computer operator must select 4 jobs from among 10 available jobs waiting to be completed. How many different sequences are possible? $10 P 4 = 5040$
- A computer operator must select 4 jobs from among 10 available jobs waiting to be completed. How many different combinations of 4 jobs are possible? $10 C 4 = 210$
- An IRS agent must audit 12 returns from a collection of 22 flagged returns. How many different combinations are possible? $22 C 12 = 646646$
- A health inspector has time to visit 7 of the 20 restaurants on a list. How many different routes are possible? $20 P 7 = 390700800$
- How many different 7-digit telephone numbers are possible if the first digit cannot be 0 or 1?
 $8 * 10^6 = 8000000$
- Each Social Security number is a sequence of 9 digits. How many Social Security numbers are possible?
 $10^9 = 1000000000$
- A pollster must randomly select 3 of 12 available people. How many different groups of 3 are possible?
 $12 C 3 = 220$
- A union must elect 4 officers from 16 available candidates. How many different slates are possible if 1 candidate is nominated for each office?
 $16 P 4 = 43680$
- How many different zip codes are possible if each code is a sequence of 5 digits? $10^5 = 100000$
- If a computer randomly generates 5 digits, what is the probability it will produce your zip code?
 $1/100000 = 0.00005$
- A typical combination lock is opened with the correct sequence of 3 numbers between 0 and 49 inclusive. How many different sequences are possible? (A number can be used more than once.) Are the sequences combinations or are they actually permutations? $50 P 3 = 117600$ – *These are permutations because the order of the sequence matters. A combination of 281 isn't the same as a combination of 128, and so on.*
- A space shuttle crew has available 10 main dishes, 8 vegetable dishes, 13 desserts, and 3 appetizers. If the first meal includes 2 desserts and 1 item from each of the other categories, how many different combinations are possible? $10 * 8 * 13 C 2 * 3 = 18720$
- A television program director has 14 shows available for Monday night, and 5 shows must be chosen. How many different possible combinations are there? $14 C 5 = 2002$
- A common lottery win requires that you pick the correct 6-number combination randomly selected from the numbers between 1 and 49 inclusive (no repeats will be allowed). Find the probability of such a win and compare it to the probability of being struck by lightning this year, which is approximately 1/700,000.
 $1/(49 * 48 * 47 * 46 * 45 * 44) = 9.932 * 10^{-11}$... *You have a much better chance of getting struck by lightning ($1.429 * 10^{-6}$). How lovely.*
- Data are grouped according to sex (female, male) and income level (low, middle, high). How many different possible categories are there? $2 * 3 = 6$

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Part II

1. Snack shack serves egg or ham sandwiches; coffee, soft drink, or milk; and donuts or pie for dessert. Draw a tree diagram to illustrate the possible meals if one item is chosen from each category. $2 * 3 * 2 = 12$

2. Four different books are displayed on a shelf. Illustrate the possible arrangements with a tree diagram. $4 * 3 * 2 * 1 = 24$

3. Bill has 3 sweaters and 4 pairs of slacks. In how many ways can he select an outfit? $3 * 4 = 12$

4. Alisha has 5 blouses, 4 skirts, and 4 sweaters in her wardrobe. In how many ways can she select an outfit, assuming she wears three items at once? $5 * 4 * 4 = 80$

5. Six boys and six girls were nominated for a homecoming celebration at a local school. In how many ways can a king, a queen, and a court of 2 students be selected from those nominated? $6 * 6 * 10 C 2 = 1620$

6. In how many ways can a 6-member committee be formed from 10 people, if 2 particular people must be on the committee? $8 C 4 = 70$

7. In how many ways can 4 or more students be selected from 8 students?

$$8 C 4 + 8 C 5 + 8 C 6 + 8 C 7 + 8 C 8 = 163$$

8. How many 2-member committees can be chosen from 7 people? $7 C 2 = 21$

9. How many 3-letter combinations can be formed from the letters of VECTORS? $7 C 3 = 35$

10. How many different 20-question examinations can be formed from a test bank containing 30 questions? $30 C 20 = 30045015$

11. A football team has 6 basic plays. How many arrangements of three different plays could be called?

$$6 P 3 = 120$$

12. A map of the four western provinces is to be colored using a different color for each province. How many different ways are possible if there are 9 colors available? $9 C 4 = 126$

13. There are seven empty seats on a bus and four people enter. In how many ways can they be seated?

$$7 P 4 = 840$$

14. In the United States, a postal code consists of five digits. In Canada, a postal code consists of a letter, a digit, a letter, a digit, a letter, and a digit. How many different postal codes are possible in each country?

$$US: 10^5 = 100000; \text{Canada: } 26 * 10 * 26 * 10 * 26 * 10 = 17576000$$

15. There are 7 horses in one race and 6 in another. For a person placing a bet, in how many ways can the winner of the two races be chosen? $7 * 6 = 42$

16. There are 8 horses in a race. In how many ways can the win, place, and show horses be selected?

$$8 P 3 = 336$$

17. An ice cream parlor features 64 flavors and 20 toppings in 3 sizes. How many different sundaes can be made? $64 * 20 * 3 = 3840$

18. A sports club with 30 members wishes to pick a president, vice-president, secretary, and treasurer. Assuming that no person can hold two offices, in how many ways can the selections be made?

$$30 P 4 = 657720$$