

The Counting Principle, Combinations, and Permutations

1. List all the arrangements of the letters C, A, and T.
2. How did you organize your list so you knew you had all possibilities?
3. In question 1, how many choices did you have for the first letter?
4. Once the first letter is chosen, how many choices did you have for the second letter?
5. Once the first 2 letters are chosen, how many choices did you have for the third letter?

Calculate the following factorials:

- 6) $3!$ 7) $5!$ 8) $2!$ 9) $1!$
- 10) $8!$ 11) $6!/3!$ 12) $8!/6!$ 13) $100!/98!$

- 14) My bike lock has a three-digit code, how many possible codes are there?
- 15) How many codes would there be if digits were not allowed to be repeated?
- 16) How many three-letter “words” could I make with our alphabet?
- 17) How many three-letter “words” are there that do not have a letter repeated?

18) How many possibilities are there for Utah license plates (XXX 000)?

19) What is the product of answer 14 and 16?

20) Explain the relationship between answers 18 and 19.

Calculate:

21) $P(6, 3)$

22) $P(8, 2)$

23) $P(100, 2)$

24) $P(10, 3)$

25) $P(89, 5)$

26) $P(100, 3)$

27) $P(5, 4)$

28) $P(6, 1)$

29) List all the possible orderings of the letters T, O, and P.

30) List all the possible orderings of the letters P, O, and P.

31) Explain the relationship between answers 29 and 30.

32) Calculate the number of orderings of the letters W, E, N, and T.

33) Calculate the number of orderings of the letters W, E, E, and E.

34) Calculate the number of orderings of the letters P, E, E, and P.

35) Explain the relationship between the answers to questions 32 and 33.

36) Explain the relationship between the answers to questions 32 and 34.

37) Calculate the number of orderings of the letters M, I, S, S, I, S, S, I, P, P, and I.

38) There are 8 homecoming princesses and you need to choose a queen and her first and second attendants from the princesses. How many ways can you pick the court from the 8 princesses?

39) All 8 princesses decide that they don't want to have a queen and first and second attendant. How many ways could you pick three co-queens?

40) A basketball team has 26 players how many ways can the coach choose his starting five?

41) Is problem 40 the same as asking how many 5 letter "words" can you make if you do not let the letters repeat? How are they the same or different? How would this affect your calculations?

Calculate:

42) $C(12, 3)$

43) $C(4, 2)$

44) $C(5, 1)$

45) $C(5, 5)$

46) $C(5, 0)$

47) $C(6, 1)$

48) $C(6, 5)$

49) $C(100, 97)$

50) A class has 14 men and 16 women in it and they need to form a committee of 3 men and 3 women, how many committees can be formed?