

Warm Up

Explore:

You place eight pieces of paper, numbered from 1 to 8, in a box. You draw one piece of paper at random from the box, record its number, and *replace* the paper in the box. Then, you draw a second piece of paper at random from the box and record its number. Finally, you add the two numbers. How many different ways can you obtain a sum of 12?

Fundamental Counting Principle:

Let E_1 and E_2 be two events. The first event, E_1 , can occur in m_1 different ways. After E_1 has occurred, E_2 can occur in m_2 different ways. The number of ways that the two events can occur is _____.

Example) How many ways can you select two letters from the English alphabet?

Example) A combination lock will open when you select the correct two numbers (0 to 30 inclusive). How many different combinations are possible for the lock?

Example) Telephone numbers in the United States currently have 10 digits. The first three are the *area code* and the next seven are the *local telephone number*. How many different telephone numbers are possible within each area code? (Note that at this time, a local telephone number cannot begin with 0 or 1.)

Permutations:

A permutation of n different elements is an ordering of the elements such that one element is first, one is second, one is third, and so on.

Example) How many permutations are there of the letters A, B, C, D, E, and F?

The number of permutations of n elements is given by _____.

Example) Eight horses are running in a race. In how many different ways can these horses come in first, second, and third? (Assume that there are no ties).

The number of permutations of n elements taken r at a time is given by _____.

Example) The same eight horses that are running in the race are subject to random drug testing. In how many different ways can three of these horses be selected for random drug testing?

The number of combinations of n elements taken r at a time is given by _____.

Example) How many distinguishable ways can the letters of MISSISSIPPI be written?

The number of **distinguishable permutations** of n elements is given by _____.

Example) A standard poker hand consists of five cards dealt from a deck of 52. How many different poker hands are possible? (The order in which a poker player receives the cards is not important because they can reorder them in their hand once they've received their five cards).

