Example: How many different 4 digit numbers can be made from the digits

1, 2, 3, 4, 5, 6, 7

a) If there are no restrictions?

b) If the number must be even?

c) If it is even and there are no repeats?

d) If four of the same digit is not allowed?

Example: How many ways can 10 students be seated in a row of 10 chairs?

Example: How many ways can 4 of 10 students be seated in a row of 4 chairs?

Permutations: If we have a finite set of n elements and we want to place r of them in an arrangement, we say the number of permutations of n things arranged r at a time is $P(n, r)$.

Example How many ways can gold, silver and bronze medals be awarded in a race of 12 people?

Example How many ways can a group of 4 students be chosen from 10 students?

Combinations: If we have a finite set of n elements and we want to take r of them in an group, we say the number of combinations of n things grouped r at a time is $C(n, r)$.

Example: How many ways can a hand of 6 clubs be chosen from a standard deck?

Example: From a group of 12 people, how many ways can a committee of 4 be formed if one person is the chair of the committee?

Example: A class of 12 students will divide into 3 teams of 4. How many ways can this be done?

Example: A bag contains 6 blue, 1 green and 3 pink jelly beans. You choose 3 at random. How many samples are possible in which

a) the jelly beans are all blue?

b) the jelly beans are all green?

c) the jelly beans are all pink?

d) there are 2 blue and 1 pink?

e) How many ways to choose 3 jelly beans?

f) How many ways to choose no blue?

g) How many ways to choose at least one blue?

Example: A school is putting together a committee. The committee will have a chair and an assistant chair chosen from a group of 10 teachers, two parents chosen from a group of 15 parents and two students chosen from a group of 20 students. How many different committees are possible?

Example: You are dealt a hand of four cards from a well-shuffled standard deck of 52 cards.
(a) How many ways can you be dealt at least 3 spades?

(b) How many ways can you be dealt exactly two diamonds or exactly two clubs?

Example: You have 2 different math books, 4 different history books and 5 different fiction books. How many ways can these books be arranged on a shelf if books of the same type are kept together?