

Section 6.4: Permutation and Combinations

Standard Deck of Cards: A deck of cards has 4 suits: diamonds, hearts, clubs, and spades. The suits of diamonds and hearts are both red and the suits of clubs and spades are both black. Each suit has the following denominations: Ace, 2, 3, 4, 5, 6, 7, 8, 9,10, Jack, Queen, and King. The Jacks, Queens and Kings are also called face cards.

Definition: The number of **permutations**, $P(n, r)$, of n distinct items of which r objects are chosen to be placed in an ordered setting, i.e. row, list,..., is given by $P(n, r) = \frac{n!}{(n - r)!}$

Definition: The number of **combinations**, $C(n, r)$, of n distinct items of which r objects are chosen to be placed in an unordered setting is given by $C(n, r) = \frac{n!}{(n - r)!r!}$

Example: Compute: $C(10, 3) = \underline{\hspace{2cm}}$ $P(10, 3) = \underline{\hspace{2cm}}$

Combinations	Permutations	Multiplication Principle
No Repetition	No Repetition	Reps or no reps.
Order is NOT Important	Order IS Important	Order IS Important

Example: How many different batting orders are possible for a baseball team that has 15 players?

Example: How many different ways can 4 books be selected from a pile of 8 different books and arranged on a shelf?

Example: How many ways can you select 4 books to read next week from a pile of 8 different books?

Example: A box contain 10 red, 5 green, and 4 yellow balls. In how many ways can a sample of 4 be selected such that exactly 2 are yellow or exactly 3 are green?

Example: From a group of 9 people. How many ways can 2 subcommittees be formed where one has 4 people and the other has 3 people.

Example: 100 students are taking a bus trip. How many different ways can the teacher set up a seating chart for the first bus if the bus holds 30 students?

Distinct Rearrangements

How many distinct rearrangements are there for the letters in these words?

kat

katt

kattt

Example: How many ways can the letters of the word **mississippi** be rearranged?

Example: How many ways can the letters of the word **Mathematical** be rearranged?

Example: 7 people are asked to each pick a number from 1 to 20. How many ways can exactly 4 of the people pick a number bigger than 13?

Example: A group has 12 guys and 10 girls. How many pictures are possible that contain 7 people in a row if there are exactly 4 boys in the picture?