

## SATPREP

### Assignment : Permutation and combination.

1. From a group of 9 different books, 4 books are to be selected and arranged on a shelf. How many arrangements are possible?
2. In how many ways can the letters of the word SPECIAL be arranged using:
  - a) All the letters?
  - b) Only 4 letters at a time?
3. How many arrangements are possible for four people in a line? There are four spaces to fill.
4. How many different combinations are possible if the 5 numbers, 1, 2, 3, 4 and 5 are grouped two at a time?
5. How many different combinations are possible if 10 numbers are grouped five at a time.
6. There are 10 balls in a bag numbered from 1 to 10. Three balls are selected at random. How many different ways are there of selecting the three balls?
7. A standard deck of cards consists of 4 suits (spades, hearts, diamonds, and clubs) of 13 cards each. In how many ways can 5-card hands be dealt that include 3 diamonds and 2 cards from other suits?
8. How many four-digit numbers can be formed from the digits 2, 3, 4, 5, 6 & 7 without repetition?
9. A little league baseball team has six outfielders, seven infielders, five pitchers, and two catchers. Each outfielder can play any of the three outfield positions and each infielder can play any of the four infield positions. In how many ways can a team of nine players be chosen?
10. How many 4-digit arrangements can be created using the digits 5, 7, 8 and 2 if
  - a) the numbers can be repeated
  - b) the five must be the first number
  - c) the five must be the first number and the two the second
11. The baseball club has 50 members, 20 who are girls. A special group of 7 is to be selected. How many ways can this group be selected if
  - a) everyone is considered equally
  - b) it must contain 4 girls

Practice Problems (answers):

1

n = total number available to arrange

r = number to be arranged

$${}_9P_4 = 9! / (9 - 4)! = 9! / 5! = 9 \times 8 \times 7 \times 6 = 3024$$

2

a)

$${}_7P_7 = 7! = 7 \times 6 \times 5 \times 4 \times 3 \times 2 \times 1 = 5040$$

b)

$${}_7P_4 = 7! / (7 - 4)! = 7! / 3! = 7 \times 6 \times 5 \times 4 = 840$$

3

$$\underline{4} \times \underline{3} \times \underline{2} \times \underline{1} = 24 \text{ or } 4! = 24$$

4

How many different combinations are possible if the 5 numbers, 1, 2, 3, 4 and 5 are grouped two at a time?

$${}_5C_2 = \underline{5!}$$

$$[(5-2)! \times 2!] = \underline{5!}$$

$$[3! \times 2!] = \underline{120}$$

$$[6 \times 2] = \underline{10}$$

5

$${}_{10}C_5 = \underline{10!}$$

$$[(10-5)! \times 5!] = 252.$$

6

$${}_{10}C_3 = \underline{10!} = \underline{10 \times 9 \times 8} =$$

$$\underline{120}$$

$$3! (10 - 3)! 3 \times 2 \times 1$$

7

${}_{13}C_3 = 13! / [3! \times (13-3)!] = 13! / (3! \times 10!) = 286$  (selecting 3 cards from the diamond suit)

${}_{39}C_2 = 39! / [2! \times (39-2)!] = 39! / (2! \times 37!) = 741$  (selecting 2 cards from the other suits)

$$C = {}_{13}C_3 \times {}_{39}C_2 = 286 \times 741 = 211,926$$

There are 211,926 possible ways to deal 5-card hands with the diamond suit taken 3 cards at a time, and the other suits taken 2 cards at a time.

8

Six items, four at a time =  ${}_6P_4$

$$\frac{6!}{(6-4)!} = \frac{6 \times 5 \times 4 \times 3 \times 2 \times 1}{2 \times 1} = 360$$

9

The number of ways of choosing three outfielders from the six candidates is:

$$C(6,3) = \frac{6!}{(6-3)!3!} = \frac{6!}{3!3!} = \frac{(6 \times 5 \times 4)3!}{(3 \times 2 \times 1)3!} = 20$$

The number of ways of choosing the four infielders is

$$C(7,4) = \frac{7!}{(7-4)!4!} = \frac{7 \times 6 \times 5}{3 \times 2 \times 1} = 35$$

There are five ways to choose a pitcher and two choices for a catcher. The total number of ways to choose a team mixes the fundamental counting principle and combinations together.

$$\# \text{ of ways} = 20 \times 35 \times 5 \times 2 = 70000$$

9. a) 256 b) 63 c) 16

10.a) 99884400 b) 19670700