

919-757-0311

919-577-0311

Permutations: The arrangement of objects in a specific order.

- The choice of r things from a set of n things, in which **order matters**.
- Notation: ${}_n P_r$ or $P(n, r) \leftarrow$ A permutation of n choose r
 - n - the total number of objects
 - r - the number of objects chosen.

• Formula:

$${}_n P_r = \frac{n!}{(n-r)!}$$

• Examples: Compute each of the following.

$${}_5 P_3 = \frac{5!}{(5-3)!} = \frac{5!}{2!} = \frac{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{2 \cdot 1} = 60$$

$$n=5$$

$${}_7 P_7 = 5040$$

$$n=7$$

$$r=7$$

Calculator

Enter # n

(math) → PROB

2 ${}_n P_r$

[Enter]

Enter the # r

• Example: Find the number of ways to arrange $\underset{r}{5}$ paintings chosen from a set of $\underset{n}{7}$ different paintings?

$${}_7 P_5 = 2520$$

✦ Arranged

✦ Jobs

✦ Places (1st, 2nd, 3rd)

✦ Positions

Combinations: A set of objects in which position (order) is not important.

- The choice of r things from a set of n things, in which order **does not matter.** # Groups

• Notation: ${}_nC_r$ or $C(n, r)$ ← A combination of n choose r

○ n – the total number of objects

○ r – the number of objects chosen.

• Formula:

$$\circ {}_nC_r = \frac{n!}{r!(n-r)!}$$

• Examples: Compute each of the following.

$$\circ {}_7C_2 = \frac{7!}{2!(7-2)!} = \frac{7!}{2!5!} = \frac{7 \cdot 6 \cdot \cancel{5} \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot 1}{2 \cdot 1 \cdot \cancel{5} \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot 1} = \frac{42}{2} = 21$$

$$n=7$$

$$r=2$$

$$\circ {}_5C_5 = 1$$

Calculator

- Same as a permutation but you use #3

- Example: There are $\frac{25}{n}$ students in Ms. Mendoza's math class. Find the number of ways Ms. Mendoza can create a $\frac{6}{r}$ person team for next week's math competition.

$${}_{25}C_6 = 177,100$$

Permutation or Combination?

- Example: Determine if each is a permutation or a combination.

1. Selecting three students to attend a conference in Washington

D.C. *Combination*

2. Selecting a lead and an understudy for a school play. *Permutation*

3. Assigning students to their seats on the first day of school.

Permutation

- Example:

1. A basketball coach needs to pick 5 starters from a team of 12.

How many different starting line-ups are possible?

$${}_{12}P_5 = 95,040$$

2. There are 12 juniors and 24 seniors in a service club.

a) How many different ways are there to select a group of 4 to go to a conference?

$${}_{36}C_4 = 58,905$$

b) If the club decides to send 2 juniors and 2 seniors to a conference, how many groups are possible?

$${}_{12}C_2 \cdot {}_{24}C_2 = 18,216$$

Juniors Senior

c) How many ways can the club pick a president, vice president, and secretary?

$${}_{36}P_3 = 42,840$$