

10.2

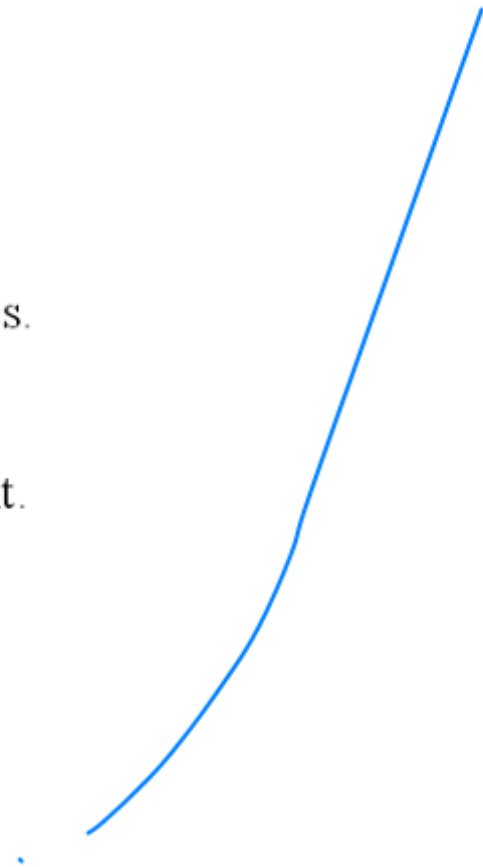
Sometimes order is NOT important!!!

Examples: picking a committee, picking friends to come to a party, most card games.

Combination: a selection of r objects from a group of n objects where order is not important.

$${}^n C_r =$$

$$\frac{n!}{(n-r)! \cdot r!}$$



Example 1: You are packing for a vacation. At home, you have 10 shirts and 7 pairs of shorts.

$$\frac{7!}{(7-4)! 4!}$$

- a) How many ways can you choose 4 pairs of shorts to take?

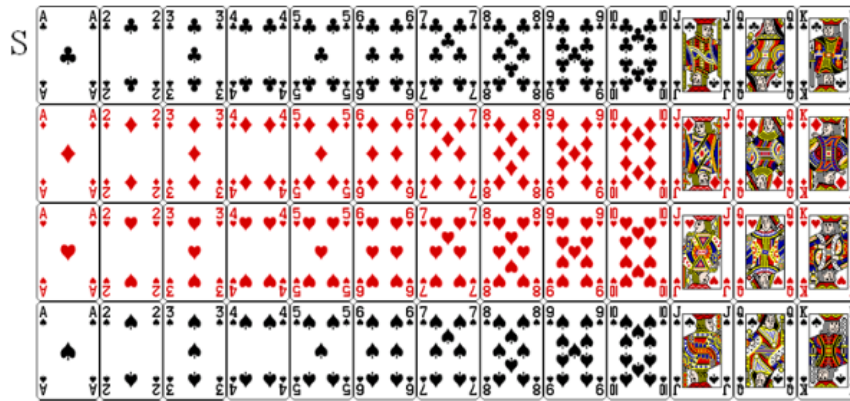
$$7C4 = 35$$

- b) How many ways can you choose 6 shirts?

$$10C6 = 210$$

- c) How many ways can you pick shirts to wear on the first day, then the second day of vacation from the 6 you took on vacation?

$$\frac{6}{6P2} \cdot \frac{5}{1} = 30$$



$$4 \times 13 = 52 \text{ cards}$$

Example 2: In a standard deck of cards, how many different 5 card hands are possible?

$$52C_5 = 2,598,960$$

b) In how many ways can all 5 cards be red?

$$26C_5 = 65,780$$

c) In how many ways can all 5 cards be the same color?

5 cards are black or 5 cards are red

$$26C_5 + 26C_5$$

Multiple Events:

When finding the number of ways both an event

A and an event B can occur, you need to

multiply

When finding the number of ways that event A

or event B can happen, you need to

add

Example 3:

The student senate consists of 6 seniors, 5 juniors, 4 sophomores, and 3 freshmen.

a) How many different committees of exactly 2 seniors and 2 juniors can be chosen?

$$6C_2 \cdot 5C_2$$

$$150$$

b) How many different committees of at most 4 students can be chosen?

$$18C_4 + 18C_3 + 18C_2 + 18C_1$$

4 or 3 or 2 or 1

Example 4:

A parent has 10 books they can read to their children, five books are fiction and five are nonfiction.

a) If the order in which they read the books is not important, how many different sets of 4 books can the parent choose?

$${}_{10}C_4 = 210$$

$$\frac{10 \cdot 9 \cdot 8 \cdot 7}{4!}$$

b) If the order is important, how many ways can the 4 books be read?

$${}_{10}P_4 = 5040$$

c) In how many groups of 4 are all the books either fiction or nonfiction?

$$\begin{array}{r} 5C_4 + 5C_4 \\ 5 + 5 \\ 10 \end{array}$$

Order
NOT
important

d) in how many groups of 4 are 3 books fiction and 1 book nonfiction?

$$\begin{array}{r} 5C_3 \cdot 5C_1 \\ 10 \cdot 5 \\ 50 \end{array}$$

Example 5:

In how many ways can you get a 5 card hand with 5 hearts?

$$13C_5 = 1287$$

Example 6:

In how many ways can you get a 5 card hand with 3 hearts and 2 cards of a different suit (not hearts)?

$$13C_3 \cdot 39C_2 = 286 \cdot 741 = 211,926$$

\uparrow 3 hearts any other 2 cards

Example 7: In how many ways can you get a five card hand with exactly 1 queen?

$$4C_1 \cdot 48C_4$$

\uparrow picks queen \uparrow other 4 cards from non-queen cards