Combinations

A set or collection of things in no particular order

In permutations: ORDER MATTERS

In combinations: Order does NOT matter

In general, the number of combinations of "n"

things taken or chosen "r" at a time

$$nCr = \frac{n!}{(n-r)! \ r!}$$
 Reads "**n choose r**"

Perms:

Phone numbers
Locker Combinations
License Plates

VS. Card ha

Card hands Lottery Numbers Committees

Ex) In how many ways can a committee of 4 be chosen from 4 teachers and 3 students if

(a) all are equally eligible?

$$7C_4 = \frac{7!}{(7-4)!4!} = \frac{7.6.5.4!}{3!4!} = 35$$

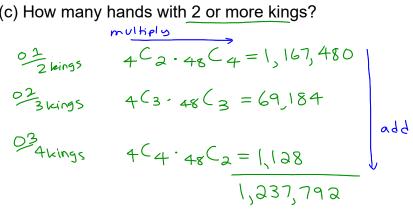
(b) If Amanda, one of the students, has to be on the committee, how many are possible?

(c) the committee must include 2 teachers AND 2 students?

(a) How many different hands are possible?

(b) How many hands with 3 kings only are possible?

(c) How many hands with 2 or more kings?



- Ex) A class has 15 girls and 20 boys.
- (a) How many committees of eight consisting of 3 girls and 5 boys can be made?

(b) If Jill, Melissa, and Adam must be on the committee of eight? T+M A boys - girls

(c) A committee of 5 with at least 3 girls?

3 girls
$$15^{C_3 \cdot 20^{C_2}} =$$
4 girls $15^{C_4 \cdot 20^{C_1}} =$
5 girls $15^{C_5 \cdot 20^{C_0}} =$

Solving Equations with Combinations

$$(a)_{n}^{n}C_{2} = 21$$

$$\frac{n!}{(n-2)!2!} = 21$$

$$\frac{n(n-1)(n-3)!}{(n-2)!2!} = 21$$

$$\frac{n^2-n-42=0}{(n-7)(n+6)=0}$$

$$\frac{n!}{(n-2)!2!} = 21$$

(b)
$$_{n}C_{n-2} = 6$$

$$\frac{n!}{(n-2)! \, 2!} = 2!$$

$$\frac{n!}{(n-2)! \, 2!} = 2!$$

$$\frac{n(n-1)(n-2)!}{(n-2)! \, 2!} = 6$$

$$\frac{n!}{(n-2)! \, 2!} = 6$$

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$$\frac{n!}{(n-2)! \, 2!} = 6$$

$$\frac{n!}{(n-2)!} = 6$$

Ex) Solve for n if
$$2(_{n}C_{2}) = _{n+1}C_{3}$$

$$\frac{2n!}{(n-a)!2!} = \frac{(n+1)!}{(n+1-3)!3!}$$

$$\frac{n!}{(n-a)!2!} = \frac{(n+1)!}{(n-a)!}$$

$$6 = \frac{(n+1)!}{(n+1)!}$$

$$6 = \frac{(n+1)!}{(n+1)!}$$

$$8 = \frac{(n+1)!}{(n+1)!}$$

$$1 = \frac{(n+1)!}{(n+1)!}$$

$$2 = \frac{(n+1)!}{(n+1)!}$$

$$3 = \frac{(n+1)!}{(n+1)!}$$

$$4 = \frac{(n+1)!}{(n+1)!}$$

$$5 = \frac{(n+1)!}{(n+1)!}$$

$$6 = \frac{(n+1)!}{(n+1)!}$$

Permutations only

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Fundamental Counting Principle

P.731 #15

Restrictions & Fill first

i.e. Female President etc.

Start and end with vowel

Repeating Letters -> divide by # of repeats!

Cases - multiply across & add down J

- Alternating boys + girls

Of least/at most

Arrangements - 2 people wait sit together

Subtract) Total - together