

CS1800
10/14 - Tue.

Admin

- HW3 due 9pm
- HW4 out, due 10/21 9pm

Agenda

1. counting examples/cats
2. Distinguishability - combos
3. Distinguishability - perms

Lecture Question

Will we be able to have cheat sheets on future quizzes or was that only for quiz 1?

↳ Quiz 2 10/24

- all rules/setup the same for all quizzes

D. Review

	rep not ok	rep ok
order matters	$P(n, k)$	n^k
order doesn't matter	$C(n, k)$ $\binom{n}{k}$	$C(n, k)$ $n = \# \text{ stars} + \# \text{ bars}$ $k = \# \text{ stars}$

(ex) 10 choc, identical
4 kids
How many ways to distribute?
stars: 10 bars: 3

$$\{k_{i1} | k_{i2} | k_{i3} | k_{i4}\}$$

$$n = 10 + 3 \quad k = 10$$

$$C(13, 10) = \frac{13!}{10! 3!} = 286$$

1. counting examples/cats ~ slides

2. Distinguishability and combos

10 students ~ 2 groups of 5

$$\underline{C(10, 5)} \cdot \underline{C(5, 5)} \quad \text{but this would overcount!}$$

when groups are indistinguishable

ABCDE, FGHIJ are outcome!

↳ soln when groups are distinguishable

↳ ABCDE, FGHIJ ≠ FGHIS, ABCDE

overcount fix: divide by 2!

all the ways
to permute the groups

$$\frac{C(10, 5) \cdot C(5, 5)}{2}$$

(ex) 10 students ~ 5 groups of 2 (no labels) - start assuming labels, then divide

$$\underline{C(10, 2)} \cdot \underline{C(8, 2)} \cdot \underline{C(6, 2)} \cdot \underline{C(4, 2)} \cdot \underline{C(2, 2)}$$

↳ this would solve distinguishable groups

↳ within 2 group, order doesn't matter

$$\frac{C(10, 2) \cdot C(8, 2) \cdot C(6, 2) \cdot C(4, 2) \cdot C(2, 2)}{5!}$$

3. Distinguishability + Permutations

• arrange n, o, r, t, h $P(5,5) = 5!$

• arrange e, a, s, t, e, r, n $P(7,7) = 7!$ ~ world overcount!

↳ letters are indistinguishable, 7! counts these as separate



↳ overcounts by not the ways to permute the repeated letters
2! ways to permute e₁, e₂

$$e_1, a, s, t, e_2, r, n \quad \frac{7!}{2!} = 2520$$

(ex) arrange o, o, f, o, s ? $P(5,5) = \frac{5!}{3!} = \frac{5 \cdot 4 \cdot 3 \cdot 2 \cdot 1}{3 \cdot 2 \cdot 1} = 20$

3! ways to arrange o₁, o₂, o₃