Tutorial 8

Monday, 11 November 2024 08:54

Q1 – a) H_0 = guessing

$H_1 \neq$ guessing

b) $\binom{8}{4} = 70$ configs (8 → cups; 4 → 4 of each in any order)

c)

i) 0 correct assignments – 1

ii) 1 correct assignment:

1 cup correct, 3 wrong

$\binom{4}{1} \times \binom{4}{3} = 16$ ($\binom{4}{1}$ → correct; $\binom{4}{3}$ → wrong)

iii) 2 correct assignments:

$\binom{4}{2} \times \binom{4}{2} = 36$

iv) 3 correct:

$\binom{4}{3}\binom{4}{1} = 16$

v) All correct: 1

Succ	# configs
0	1
1	16
2	36
3	16
4	1
Total	70

→ Hypergeometric

↳ Hypergeom(N, K, n)

↳ $\sum_{0 \le k \le \min(K,n)} \frac{\binom{K}{k}\binom{N-K}{n-k}}{\binom{N}{n}}$

↳ NOT NEEDED Just for your info

d) $2 \times \left(\frac{1}{70}\right) \rightarrow < 0.05$

e) Lady wasn't guessing. Reject H_0

Q2

a) p → param of interest = proportion of voters who prefer T

$H_0: p = 0.5$

$H_1: p \neq 0.5$

b) Test statistic $\hat{p}$ → proportion of people who prefer T.

↳ $\frac{\#\text{ individuals who prefer T}}{\text{sample size}}$

c) $H_0: p = 0.5$

dist: mean = 0.5

sd: $= \sqrt{\frac{p(1-p)}{n}} = \sqrt{\frac{0.5(1-0.5)}{100}} = 0.05$

$N(0.5, 0.05)$

d) $\hat{p} = \frac{61}{100} = 0.61$

$z\text{score} = \frac{\hat{p} - p}{\sigma_{\hat{p}}} = 2.2$

$2 \times P(Z > 2.2)$

↳ 2×0.486

↳ $0.972 \rightarrow 1 - 0.972$

↳ 0.028

e) Reject H_0 → has majority.