Subject: See 6 $\boxed{11}$

- to Prove p.m.f. → $\sum_x f(x) = 1$ — بجمع احتمالات كل Run

- to prove p.d.f → $\int_R f(x) = 1$

"Random" X → 1, 2, 3 ∴ ★ note
$\therefore P(X = 4) = 0$
"Continuous" او بيرو ب zero و
$1 \le X \le 4$
$P(x = 2) = \int_2^2 f(x)\,dx = 0$

- notes to Calculate z-score for normal distribution

1) $P(Z < a) = 1 - P(Z < -a)$ $Z = \frac{X - \mu}{\sigma}$

2) $P(Z > a) = 1 - P(Z < a)$

3) $P(a < Z < b) = P(Z < b) - P(Z < a)$

→ average → $\boxed{\mu = 40}$ مثال بيعة ←
→ standard deviation → $\boxed{\sigma \to 6.3}$
لو جابلنا ممكن شيء او قال Variance أجيب الجذر

← عاوز probability ؛ more Than 32 months

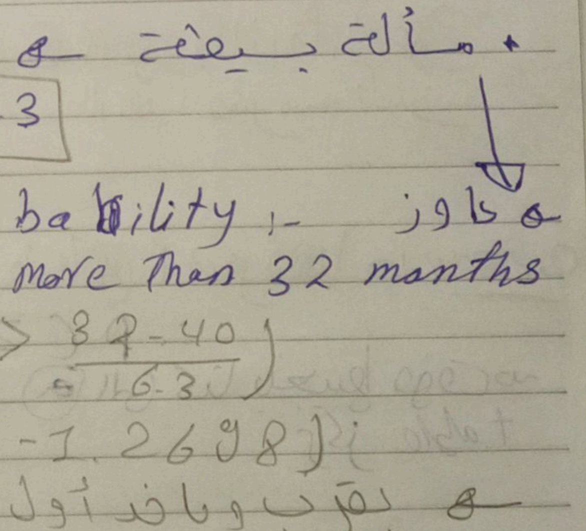
$\therefore P(X > 32) = P\left(\frac{X - \mu}{\sigma} > \frac{32 - 40}{\sqrt{6.3}}\right)$

$= P(Z > -1.2698)$

← بقرب وباخد أول رقمين بعد العلامة

$1 - P(Z < -1.27)$
$= 1 - 0.1020$
$= 0.898$ #

هاتها من الجدول ←



Subject : dollar إجابة

مثال تانى رقم (11)

$\mu = 11.90\$$

$\sigma = 40\ cent = \frac{40}{100} = 0.4\$$

هنا لازم نحول من cent لدولار

و طلب: your wage if 75 % of all workers earn more than you?

$\therefore P(Z > a) = 0.75$

$\therefore P(Z < a) = 1 - 0.75 = 0.25$

أنا ديما بحولها مش بشتغل لو Z أكبر من حاجة

$a = ? \rightarrow P(Z < a) = 0.25$

مش الرقم ده موجود في table

Z	.07	.08
0.6	0.2514	0.2483

لو مش 0.25 موجود فى لو ملقتش هشوف أقرب الأرقام وبطرح الرقم الصغير من الكبير

يعني (A) $0.2514 - 0.25 = 0.0014$

(B) $0.25 - 0.2483 = 0.0017$

طبعا (A) أصغر فهنا هاخد 0.2514

$\therefore P(Z < -0.67) = 0.25$

هو ده الـ (a) اللي كنا بنحسبها فوق من table ركز

$\therefore Z = -0.67$

$Z = \frac{X - \mu}{\sigma} \rightarrow X = Z \cdot \sigma + \mu$

$\therefore X = (-0.67)(0.4) + 11.90$

$= 11.632$

[3]

- Binomial distribution

$n \to$ num. trails

- $F(x) = P(X = r) = \binom{n}{r} p^r q^{n-r}$

$1 = \left[\begin{array}{l} p \to \text{success} \\ q \to \text{failure} \end{array}\right.$

- $E(x) = np$
- $Var(x) = n \cdot p \cdot q$

note:

P → success هي اللي متوقعة أعرفها يعني نجاح في أي حاجة حتى لو هشرب مخدرات !!00

* لو مديك $n = 5$

$P = 0.75$

$\therefore q = 1 - 0.75 = 0.25$

→ at most [3] $= 1 - P(X > 3)$

$= 1 - [P(X=4) + P(X=5)]$

$= 1 - \left[\binom{5}{4} \cdot (0.75)^4 \cdot (0.25)^{5-4} + \binom{5}{5} (0.75)^5 \cdot (0.25)^0\right]$

5C4 هي الـ

= ____

sample mean [4] Sec 7

Subject :

Central limit theorem → normal dis بنقرب ال

Population → نفس النظرية ال variable

- $\mu_{\bar{x}} = \mu$ "mean"

- $\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}$, $Z = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}} = \frac{\bar{x} - \mu}{\frac{\sigma}{\sqrt{n}}}$, n → sample size"

"Standard deviation"

→ مسائلها كلها سهلة بس هنعرف أنه بيتكلم عنها لما يجيلك معلومات population → كاملة

مثال ←

mean → 90 → μ

standard dev → σ → 15

sample size of population → 25

Find Probability when sample between (85, 92)?

$\therefore P(85 < \bar{x} < 92) = P\left(\frac{85-90}{\frac{15}{\sqrt{25}}} < Z < \frac{92-90}{\frac{15}{\sqrt{25}}}\right)$

$= P\left(\frac{-5}{3} < Z < \frac{2}{3}\right) = P(-1.6667 < Z < 0.6667)$

$= P(-1.67 < Z < 0.67)$

$= P(Z < 0.67) - P(Z < -1.67) = 0.74 - 0.04 = 0.7$

من الجدول

طب لو عندي عينتين !!

$$Z = \frac{(\bar{x}_1 - \bar{x}_2) - \mu_{\bar{x}_1 - \bar{x}_2}}{\sigma_{\bar{x}_1 - \bar{x}_2}}$$

$$= \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}}$$

- $\mu_{\bar{x}_1 - \bar{x}_2} = \mu_1 - \mu_2$
- $\sigma_{\bar{x}_1 - \bar{x}_2} = \sqrt{\frac{\sigma_1^2}{n_1} + \frac{\sigma_2^2}{n_2}}$

The mean and the standard deviation of sampling distribution of the difference between two parameters

GHARIB

Subject Sec 8 (5) Sec 7 نفس نظرية
Sample بس شغال ع
proportion

$\hat{p} = \frac{X}{n}$ "Proportion"

* $\mu_{\hat{p}} = p$

* $\sigma^2_{\hat{p}} = \frac{pq}{n} \longrightarrow \sigma_{\hat{p}} = \sqrt{\frac{pq}{n}}$, $q = 1 - p$

* $Z = \frac{\hat{p} - \mu_{\hat{p}}}{\sigma_{\hat{p}}} = \frac{\hat{p} - p}{\sqrt{\frac{p \cdot q}{n}}}$

* هيقولك أي ال sample distribution $\hat{p}$ كلمة ركز

- مثال الشركة advertise it ships
90 % of it's order

و simple random sample

$\boxed{p = 0.9} \rightarrow q = 1 - 0.9 = \boxed{0.1}$ $\{\underline{100} \rightarrow \underline{n}\}$

* mean of $\hat{p}$? $\mu_{\hat{p}} = p = 0.9$

S.d of $\hat{p}$? $\sigma_{\hat{p}} = \sqrt{\frac{p \cdot q}{n}} = \sqrt{\frac{0.9 \times 0.1}{100}} = 0.03$ #

* to check if this sample approximately normal?
- ① E(x) of success
$\therefore np = 100 \times 0.9 = 90 \geq 15$ ✓
- ② E(x) of failure
$\therefore n \cdot q = 100 \times 0.1 = 10 < 15$ ✗

* الاتنين لازم يبقوا ≥ 15 يعني

$n \cdot p \geq 15$
$n \cdot q \geq 15$

→ distrib $\hat{p}$ not approximately normal distribution

$P(\hat{p} \leq 0.8)$ "لو طلب احتمال مثلا
هقوله not normal
فمش هجيب حاجة

لازم تتأكد فكل مسألة هل هجيب اي احتمال

Subject : .... (61)

$\hat{P}_1, \hat{P}_2$

two proportions

* $\mu_{\hat{p}_1 - \hat{p}_2} = P_1 - P_2$

* $\sigma_{\hat{p}_1 - \hat{p}_2} = \sqrt{\frac{P_1 q_1}{n_1} + \frac{P_2 q_2}{n_2}}$

* $Z = \frac{(\hat{P}_1 - \hat{P}_2) - \mu_{\hat{p}_1 - \hat{p}_2}}{\sigma_{\hat{P}_1 - \hat{P}_2}} = \frac{(\hat{P}_1 - \hat{P}_2) - (P_1 - P_2)}{\sqrt{\frac{P_1 q_1}{n_1} + \frac{P_2 q_2}{n_2}}}$

ركز من واحدة
بطلع قيمة واحدة
$\hat{P}, P$ لا

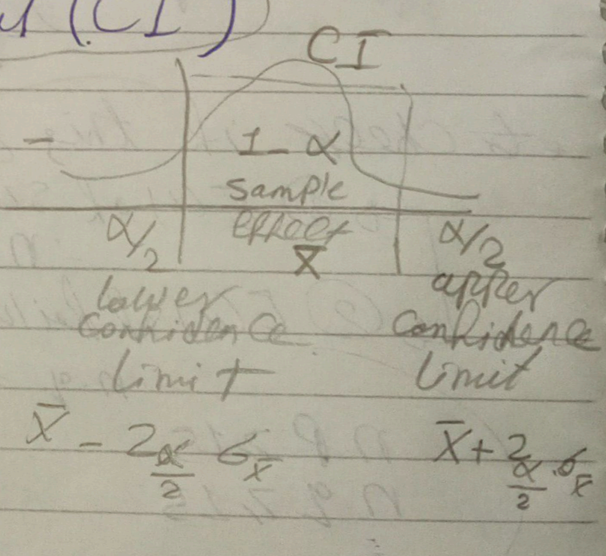
sec 9 Confidence interval (CI)

ازاى نحسب الفترة ؟

① n = هات sample size

sample mean → $\bar{X}$ = هات $= \frac{\sum_{i=1}^{n} x_i}{n}$

$S = \sqrt{\frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n-1}}$



② CI → $(1-\alpha)\%$ هتفهم
فمتال العبر

باقي الخطوات ③

σ "Standard deviation"

(Known)

(unknown)

σ unknown – S Known

بلا نادي زي و

Z-table

$CI = \bar{X} \pm Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$

$n \geq 30$

– Z-table

$CI = \bar{X} \pm Z_{\frac{\alpha}{2}} \frac{S}{\sqrt{n}}$

$n < 30$

– T-table

$CI = \bar{X} \pm t_{\frac{\alpha}{2}, v} \frac{S}{\sqrt{n}}$

$v = n - 1$

مثال هيفلك هاتي: Confidence interval (n)

Sample of 30 bulbs → $n = 30$ ① step

average like 780 hours → $\bar{X} = 780$

S.d 40 hours → $\sigma = 40$

find 96% confidence interval for population mean?

② step $(1-\alpha)\% = 96\% \rightarrow 1-\alpha = 0.96 \rightarrow \alpha = 1 - 0.96 = \boxed{0.04}$

∴ σ known ← فوق 40 أهي → Z-table خش ع

$\therefore Z_{\frac{\alpha}{2}} = Z_{\frac{0.04}{2}} = Z_{0.02} = 2.05$

دور في جدول ع رقم قريب

Z	0.05	
-2.0	0.0202	0.0197

Ⓐ $0.0202 - 0.02 = 0.0002$ ✓

Ⓑ $0.02 - 0.0197 = 0.0003$

step ③ CI of μ

$= \bar{X} \pm Z_{\frac{\alpha}{2}} \frac{\sigma}{\sqrt{n}}$

$= 780 \pm (2.05) \cdot \left(\frac{40}{\sqrt{30}}\right)$

$\therefore 780 - 14.97 \leq \mu \leq 780 + 14.97$

$765 \leq \mu \leq 795$

Subject : ....

$n = 12$, $\bar{x} = 79.3$, $S = 7.8$ (1)

$(1-\alpha)\% = 95\% = 1-\alpha = 0.95$

$\therefore \alpha = 1 - 0.95 = 0.05$ (2)

(3) σ unknown , $n^{(12)} < 30$ → t-table

$t_{\frac{\alpha}{2}, v} = t_{\frac{\alpha}{2}, n-1} = t_{\frac{0.05}{2}, 11} = 2.201$

$t_{0.025}$

v	0.025
11	2.201

CI of μ → $\bar{x} \pm t_{\frac{\alpha}{2}, v} \cdot \frac{S}{\sqrt{n}}$

$= 79.3 \pm (2.201)\left(\frac{7.8}{\sqrt{12}}\right)$

$= 79.3 - 4.95 \leq \mu \leq 79.3 + 4.9$

CI of $\hat{p}$ "Population Proportion"

(1) n , $\hat{p} = \frac{x}{n}$ "n. success" , $\hat{q} = 1 - \hat{p}$ "n. failure"

(2) $(1-\alpha)\%$

(3) $\hat{p} - z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p} \cdot \hat{q}}{n}} \leq p \leq \hat{p} + z_{\frac{\alpha}{2}} \sqrt{\frac{\hat{p} \cdot \hat{q}}{n}}$

$n, \hat{p}, \alpha$ يعني هات

$z_{\frac{\alpha}{2}}$, $\hat{q}$

وترابيزات

بليا ردو وبيبع !!

هيخو