

長庚大學期中、期末考試答案用紙

科目

學年度 第 學期 考

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2. $n=100$ $\hat{p} = \frac{y}{n}$

① unbiased estimate: $\mu_0 = E(\hat{\theta}) = 0$

$$E(\hat{p}) = E\left(\frac{y}{n}\right) = \frac{1}{n} E(y) = \frac{1}{n} \times np = p$$

$$\textcircled{2} \text{Std}(\hat{p}) = \sqrt{\frac{p^2}{n}} = \sqrt{\frac{E(y^2)}{n^2}} = \sqrt{\frac{E(y^2) - [E(y)]^2}{n^2}} = \sqrt{\frac{E(y^2) - [E(p)]^2}{n^2}} = \sqrt{\frac{E\left(\frac{y^2}{n^2}\right) - p^2}{n^2}} = \sqrt{\frac{E\left(\frac{y^2}{n^2}\right) - p^2}{n^2}}$$

$$\textcircled{3} 95\% \quad n=100 \quad \bar{x} = \frac{60}{100} = \frac{3}{5} \quad S^2 = \frac{1}{n-1} \sum_{i=1}^n (x_i - \bar{x})^2 = \frac{1}{99} \sum_{i=1}^n (x_i - \frac{3}{5})^2 = \frac{1}{99} (9.6 + 14.4) = 0.2727$$

$$S = \sqrt{0.2727} = 0.5222$$

$$\bar{x} - 2\alpha/2 \times \frac{S}{\sqrt{n}} < \mu < \bar{x} + 2\alpha/2 \times \frac{S}{\sqrt{n}} \Rightarrow \frac{3}{5} - 1.96 \times \frac{0.5222}{\sqrt{100}} < \mu < \frac{3}{5} + 1.96 \times \frac{0.5222}{\sqrt{100}}$$

$$\Rightarrow \frac{3}{5} - 0.102 < \mu < \frac{3}{5} + 0.102 \Rightarrow 0.498 < \mu < 0.702$$

④ $90\% \rightarrow 1.64$

$$\bar{x} - 2\alpha/2 \times \frac{S}{\sqrt{n}} < \mu < \bar{x} + 2\alpha/2 \times \frac{S}{\sqrt{n}} \Rightarrow \frac{3}{5} - 1.64 \times \frac{0.5222}{\sqrt{100}} < \mu < \frac{3}{5} + 1.64 \times \frac{0.5222}{\sqrt{100}}$$

$$\Rightarrow \frac{3}{5} - 0.085608 < \mu < \frac{3}{5} + 0.085608 \Rightarrow 0.515 < \mu < 0.685$$

3. $n=100$

$$\textcircled{1} P(X=66) = b(66; 100, 0.6) = \binom{100}{66} \times 0.6^{66} \times 0.4^{34} = 0.039$$

$$\textcircled{2} P(X \geq 66) = b(x; 100, 0.6) = 1 - P(X < 66) = 1 - \sum_{x=0}^{65} b(x; 100, 0.6)$$

$$\textcircled{3} P(X > x^*) = 1 - P(X \leq x^*) = 0.05$$

$$\Rightarrow 1 - \sum_{x=0}^{x^*} b(x; 100, 0.6) = 0.05 \Rightarrow \sum_{x=0}^{x^*} b(x; 100, 0.6) = 0.95$$

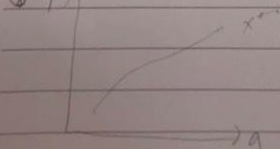
→ x 有整數

④ 拒絕 H_0

$$\textcircled{1} \alpha = P(X \geq x^* | H_0) = 1 - P(X < x^*) = 0.05 \quad \text{利用OBEX}$$

$$\textcircled{2} \beta = P(X < x^* | H_1) = P(X < x^*) = \sum_{x=0}^{x^*} b(x; 100, 0.7)$$

③ β



增加

(請翻面繼續作答)

```
In [2]: import scipy.stats as st
# 3-(c)
st.binom.sf(67,100,0.6)

Out[2]: 0.061503909592474384
```

所以 x^* 應該是 67。

c-(d) 為不拒絕接受，因為 66 沒 > 67。

```
In [3]: # 3-(f)
st.binom.cdf(67,100,0.7)

Out[3]: 0.2892814436923527
```

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$$1. \mu = 70 \quad \sigma = 8 \quad n = 25 \quad \bar{X} = 73$$

$$H_0 = \mu = 70 \quad H_1: \mu > 70$$

$$(2) Z = \frac{\bar{X} - \mu_0}{\sigma/\sqrt{n}} = \frac{73 - 70}{8/\sqrt{25}} = \frac{3}{8/5} = 1.875$$

$$p = P(Z > 1.875) = 1 - 0.97 = 0.03$$

$0.03 < 0.05$ small enough \Rightarrow reject H_0

$$(3) S = 9 \quad t = \frac{\bar{X} - \mu_0}{s/\sqrt{n}} = \frac{73 - 70}{9/\sqrt{25}} = \frac{3}{9/5} = 1.6$$

$p(t > 1.6), v = 24 \Rightarrow 0.0538 > 0.05 \Rightarrow$ 勿拒絕 H_0

(請翻面繼續作答)