

統計學(一)小考(3)參考解答

1. (20%)名詞解釋

(5%/per)

a. a simple random sample

A simple random sample of size n from a finite population of size N is a sample selected such that each possible of size n has the same probability for being selected.

b. sampling distribution

it' s a probability distribution of a estimator from a random sample.

c. Central limit theorem

in selecting random samples of size n from a population, the sampling distribution of the sample mean \bar{x} can be approximated by a normal distribution as the sample size becomes large.

d. interval estimation

it provides information about how close the point estimate, provided by the sample, is to the value of the population parameter.

2.

a. 5%

機器平均每工作 10 個小時會故障一次，則兩次機器故障的時間間隔可用指數分配描述，服從 $\exp(\mu=10\text{hr})$

某間店平均 1 分鐘會有一筆訂單，則等待訂單時間可用指數分配做描述，服從 $\exp(\mu=1 \text{ min})$

b. 10%

the exponential probability distribution would be used in this example to describe the time between cars that arrive at a toll booth, and the population parameter μ , that means the expected time, would be 0.02 minute per car.

c. 10%

The CPA Practice Advisor reports that the mean preparation fee for 2017 federal income tax returns was \$273. Use this price as the population mean and assume the population standard deviation of preparation fees is \$100.

We want to know the probability that the mean price for a sample of

50 federal income tax returns is within \$16 of the population mean.

$P(257 < \bar{X} < 289)$, by C.L.T

$$\frac{\bar{X} - 273}{100/\sqrt{50}} \sim N(0,1)$$

$$P(257 < \bar{X} < 289) = P(-1.13 \leq z \leq 1.13) = 0.8708 - 0.1292 = 0.7416$$

d. 10%

不偏性 unbiased: 參數估計量之期望值等於母體參數。

有效性 efficiency: 不偏估計量中，估計量表準差越小者越具有有效性。

一致性 consistency: 當樣本數夠大時，估計量逼近母體參數。

e. 10%

$$\sigma \text{ 已知: } (\bar{X} \mp \frac{\sigma}{\sqrt{n}} Z_{\alpha/2})$$

$$\sigma \text{ 未知: } (\bar{X} \mp \frac{s}{\sqrt{n}} t_{\alpha/2(n-1)})$$

you can be $(1 - \alpha)\%$ certain contains the population mean in this confidence interval

4.

a. 0.76

$$b. P(0.73 \leq p \leq 0.79) = P(-1.40 \leq z \leq 1.40) = 0.9192 - 0.0808 = 0.8384$$

$$c. P(0.73 \leq p \leq 0.79) = P(-1.92 \leq z \leq 1.92) = 0.9726 - 0.0274 = 0.9452$$

5.

a. (60.54, 81.46)

b. you can be 95% certain contains the population mean in this confidence interval