STAT Ch1

Census survey : 對象

Sample survey :

population : ★ Tom's Tips :

計出黎

sample :

有 Estimation 的係 statistics

就咁描述的係 statistics

Types of Data:

: eg. Colour

: Numerical

→ : eg. No. of people

→ : eg. Weight, time

Levels of Measurement:

: eg. Gender

: eg. Grades

: eg. Dates ★ Tom's Tips :

: eg. Height

有 treatment 的 study 係：

有 treatment 的 study 係：

Sampling:

: Non-prob.

: Random 抽

★ Tom's Tips:

: 分 subgroup，每 subgroup 抽

: 分做 heterogeneous groups，抽 group

: 每 k^{th} 個抽

☆ Variable：

⇒ Supp Ex 1 Q 3c

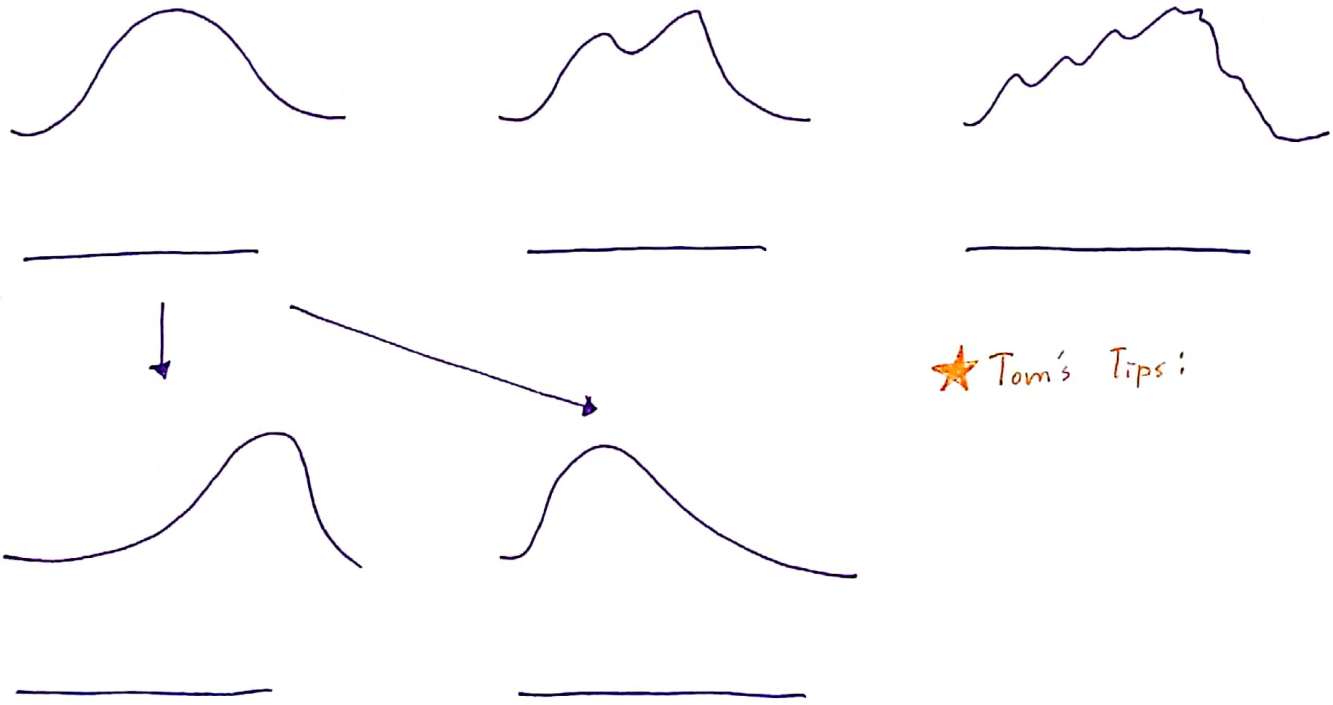
A manager wanted to estimate the mean daily travel expense for all staff in Company B.

Stat Ch2

☆ Class width = $\frac{\square}{\square}$

★ Tom's Tips

Shapes of Histogram:



★ Tom's Tips:

Stem and Leaf:

Stem	Leaves (Unit = ?)

★ Tom's Tips:

★ Tom's Skill:

Frequency distribution:

The objective is to provides _____ about the data.

Pareto Diagram:

Use to quickly identify which data appearing more often than others.

Scatter Diagram:

Show relationships between 2 numerical variables.

STAT Ch.3

Mean (Sensitive to outliers ?)

★ Tom's Tips:

Sample mean = $= \frac{\sum x}{}$

Population mean = $= \frac{\sum x}{}$

Weighted mean = $\frac{\sum xw}{\sum w}$

Median (Sensitive -- -- ?)

ODD : Median = $\_^{th}$ order data = ?

EVEN : Median = $\frac{A+B}{2}$ = ?

Mode (Sensitive -- -- ?)

★ 全部數量一樣 ⇒

Percentile (Sensitive -- -- ?)

$i = \left(\frac{P}{100}\right)n$ ★ Tom's Tips

i is integer :

i is NOT integer :

Quartiles (Sensitive --- ?)

Q_1 is percentile

Q_2 is percentile

Q_3 is percentile

Range (Sensitive -- -- ?)

Largest - Smallest

Interquartile Range (Sensitive -- -- ?)

$Q_3 - Q_1$

$\left(\frac{75}{100}\right)n \quad - \quad \left(\frac{25}{100}\right)n$

Variance (Sensitive -- -- ?)

SD (Sensitive -- -- ?)

★ Tom's Tips:

population	sample
$\sigma^2 =$	$s^2 =$
$\sigma =$	$s =$

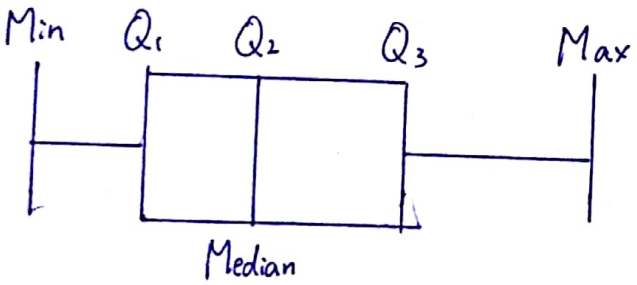
CV (Sensitive -- -- ?)

population	sample
CV=	CV=

Chebyshev's Theorem

$\left(1 - \frac{1}{k^2}\right) \times 100\%$

Box Plot



Numerical Measures

Mean, Range, Variance, Percentile, Mode, Median,

Quartiles, SD, CV, Interquartile Range

Measure of location	Variability
>	>
>	>
>	>
>	>
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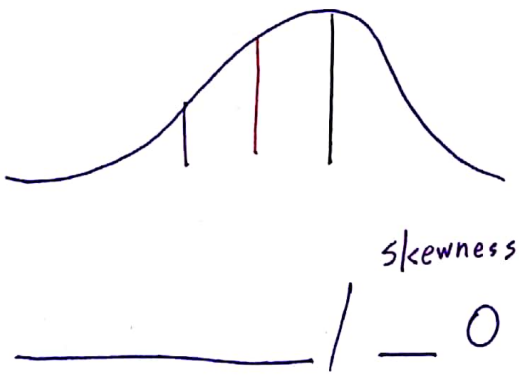
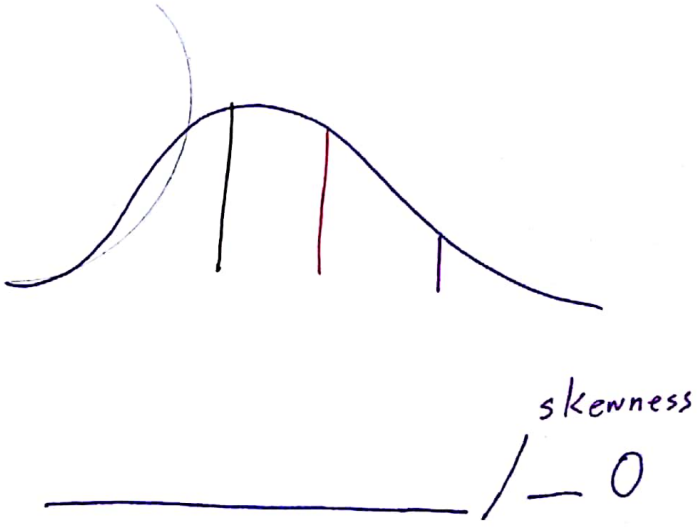
★ Tom's Tips

★ Shape of a Distribution





★ Tom's Skill

STAT Ch.4 AND Ch.5

$P_r^n = \frac{n!}{(n-r)!}$ $\binom{n}{r} = \frac{n!}{n!(n-r)!}$

$A \cap B$ ↑ AND

$P(B^c) = 1 - P(B)$

$A \cup B$ ↑ OR

$A^c \cup B \cup C^c$

★ Tom's Tip:

$P(A \cup B) = P(A) + P(B) - P(A \cap B)$

Collectively Exhaustive

★ Tom's Tip:

$P(A \cup B) =$

Mutually Exclusive

$P(A \cap B) =$

Conditional Prob.

$P(A|B) =$ _____

Independent

$P(A \cap B) \square P(A)P(B)$

Dependent

$P(A \cap B) \square P(A)P(B)$

Marginal Prob.

$$P(B) = P(B|A_1)P(A_1) + \cdots + P(B|A_k)P(A_k)$$

Bayes' Theorem

$$P(A_1|B) = \frac{P(B|A_1)P(A_1)}{P(B|A_1)P(A_1) + \cdots + P(B|A_k)P(A_k)}$$

★ Tom's Skill

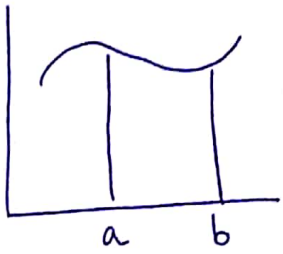
STAT Ch6

Cumulative Prob. Function

$$F(X_0) = P(X \leq X_0) = \sum_{X \leq X_0} P(X)$$

Cumulative p.d.f.

★ Tom's Tips



Discrete Random Variable:

$$\mu = E(X) = \sum P(x)X$$

★ Tom's Tips

$$Var(X) =$$

Linear Transformation

$$\forall \{a, b\} \in \mathbb{R},$$

★ Tom's Tips

$$E(a+bX) =$$

$$Var(a+bX) =$$

Sum and Diff

$$E(X_1+X_2) = \qquad Var(X_1+X_2) =$$

$$E(X_1-X_2) = \qquad Var(X_1-X_2) =$$

★ Tom's Tips

Jointly Distributed Discrete Random Variables

★

$P(X+Y \leq 1) \neq P(X \leq 1 \text{ AND } Y \leq 1)$

Marginal Prob. sum = ___

STAT Ch. 7

Bernoulli Distribution

★ Tom's Tips.

$P(0) = (1-p)$ $P(1) = p$

★ $E(X) =$ ★ $Var(X) =$

Binomial Distribution $X \sim B(n,p)$

$$p(x) = \binom{n}{x} p^x (1-p)^{n-x}$$

★ Tom's Tips

★ $\mu = E(X) =$ ★ $Var(X) =$

Multinomial Distribution

$$P = \frac{n!}{x_1! x_2!} P_1^{x_1} P_2^{x_2}$$

Hypergeometric Distribution

★ Tom's Skill

$$p(x) = \frac{\binom{r}{x}\binom{N-r}{n-x}}{\binom{N}{n}}$$

★ $\mu = E(X) =$ ★ $Var(X) =$

vs Binomial

$\frac{n}{N} \leq 5\% \Rightarrow$ Binomial $\approx$ Hypergeometric

if $\frac{r}{N} = p$

$\mu = E(X)$ [Same] $Var(X)$ diff $\left(\frac{N-n}{N-1}\right)$

Binomial: with / without replacement

Hypergeometric: with / without replacement

Negative Binomial Distribution

$$\binom{x-1}{k-1} p^k (1-p)^{x-k}$$

★ Tom's Tips

★ $\mu =$ ★ $Var(X) =$

Geometric Distribution

$$p(1-p)^{x-1}$$

★ Tom's Tips

★ $\mu =$ ★ $Var(X) =$

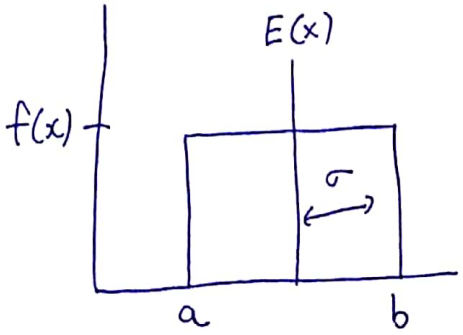
Poisson Distribution

$$p(x) = \frac{\lambda^x e^{-\lambda}}{x!}$$

★ $E(x) = \lambda = \sigma^2$

STAT Ch.8

Uniform Distribution $X \sim U(a,b)$



$f(x) =$

$E(X) =$

$\sigma =$

$\sigma^2 =$

Exponential Distribution

$P(X \leq x) =$ $=$

λ μ

★ $E(X) =$ $=$

★ $Var(X) =$ $=$

Poisson $\Leftrightarrow$ Exponential

★ Tom's Skill

Normal Distribution $X \sim N(\mu, \sigma^2)$

Standard Normal $X \sim Z(0,1)$

$$\frac{X - \quad}{\quad} = Z$$

★ percentile meaning :

Binomial under Normal Approximation

$P(a \leq X \leq b) = P($ $\leq Z \leq$ $)$

★ $np(1-p) >$ __

★ Tom's Tips

STAT Ch.9

population	sample
mean :	mean :
SD :	SD :

Sampling Distribution of MEAN

with replacement :

★ Tom's Tips

$\mu_{\bar{x}} =$ $\sigma_{\bar{x}} =$

without replacement

$\mu_{\bar{x}} =$ $\sigma_{\bar{x}} =$

$\frac{n}{N} \leq 5\% \Rightarrow$ No need $\sqrt{\frac{N-n}{N-1}}$

★ $\sigma_{\bar{x}}$: standard error of the mean

CLT $X \sim N(\mu_{\bar{x}}, \sigma_{\bar{x}}^2)$ ★ Tom's Tips

$\mu_{\bar{x}} =$ $\sigma_{\bar{x}} =$

Sampling Variance

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

★ $\chi^2_{(d.f.,\alpha)} = \frac{(n-1)S^2}{\sigma^2}$ Chi-square

★ Tom's Skill (Graph) ★ Tom's Tips (d.f.)

STAT Ch.10

Confidence Level ★Tom Tips: (Graph)

$(1-\alpha)$

Confidence Interval for μ ($\equiv$)

σ^2 ?

normally distributed ?

$n \geq 30$?

$$\bar{x} - z_{\alpha/2}\frac{\sigma}{\sqrt{n}} < \mu < \bar{x} + z_{\alpha/2}\frac{\sigma}{\sqrt{n}}$$

★ Tom's Tips: ★ Tom's Tips: Graph

★ $\bar{x} \pm ME$

Confident Interval for μ (t)

σ?
normally distributed ?
$n \geq 30$?

★ $t =$

$$\bar{x} - t_{(d.f., \alpha/2)} \frac{s}{\sqrt{n}} < \mu < \bar{x} + t_{(d.f., \alpha/2)} \frac{s}{\sqrt{n}}$$

★ Tom's Tips (Graph)

★ $n = \frac{Z_{\alpha/2}^2 \sigma^2}{ME^2}$ (ALWAYS ROUND UP)

Confident Interval for Var(X)

★ $\chi_{n-1}^2 = \frac{(n-1)s^2}{\sigma^2}$

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

$$\Rightarrow \frac{(n-1)s^2}{\chi^2_{n-1, \alpha/2}} < \sigma^2 < \frac{(n-1)s^2}{\chi^2_{n-1, 1-(\alpha/2)}}$$

★ Tom's Tips (Graph)