

Date: / /

Stat: 9709 : FORMULA SHEET

Ch # 1, 2, 3

Class boundary: 0-5 0 ≤ 5 < 10
 5-10

Class width: ~~0-5~~ 5-10 0 ≤ 5 < 10

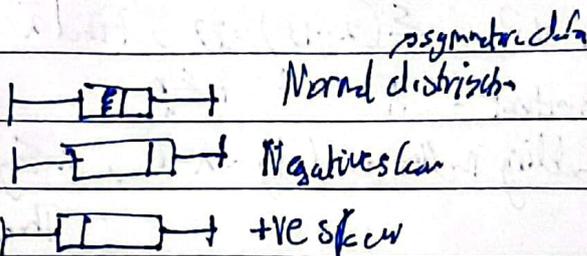
Correction factor = $\frac{\text{Lower limit of 2nd class} - \text{Upper limit of 1st class}}{2}$

Substituted to ~~lower~~ ^{upper} limits / subtracted from lower limits

Ch 1

For c.f graph: ~~0~~ < limit

Box plot:



Arithmetic Mean: $\bar{x} = \frac{\sum x_i}{n} = \frac{\sum f(x)}{\sum f}$
 Group Group

$\bar{x} = A + \frac{\sum d}{n}$ where A is arbitrary
 & ED is set of Deviation

ED for $D = x - \bar{x}$ is 0

Deviation $D = x - A$

Standard deviation formula:

① $S.D. = \sqrt{\frac{\sum (x - \bar{x})^2}{n}}$

② $S.D. = \sqrt{\frac{\sum x^2}{n} - \left(\frac{\sum x}{n}\right)^2}$

③ $S.D. = \sqrt{\frac{\sum x_i^2}{n} - (\bar{x})^2}$ (ungrouped)

④ $S.D. = \sqrt{\frac{\sum f(x)^2}{\sum f} - \left(\frac{\sum f(x)}{\sum f}\right)^2}$

⑤ $S.D. = \sqrt{\frac{\sum f(x)^2}{\sum f} - (\bar{x})^2}$ (grouped)

⑥ $S.D. = \sqrt{\frac{\sum (ED)^2}{n} - \left(\frac{\sum ED}{n}\right)^2}$

⑦ $S.D. = \sqrt{\frac{\sum f(ED)^2}{\sum f} - \left(\frac{\sum f(ED)}{\sum f}\right)^2}$

Date: / /

$$\text{Variance } s = S.D^2 = \frac{\sum x^2}{n}$$

$$\text{Combined Mean \& S.D: } \bar{x} = \frac{\sum x_1 n_1}{n_1 + n_2} \quad ; \quad S.D_{\text{comb}} = \sqrt{\frac{\sum x^2 n_1}{n_1 + n_2} - (\bar{x})^2}$$

Properties of Arithmetic mean

$$\begin{aligned} & \textcircled{1} \text{ If } y = ax + b, \quad \bar{y} = a + b\bar{x} \\ & \textcircled{2} \sum a = na \quad \therefore \sum y = b + b\bar{x} \\ & \quad \quad \quad = \sum y = na + b\bar{x} \end{aligned}$$

eg. q. 5. $n = 10, \sum(x-13) = 27$, Find \bar{x}

$\textcircled{1}$ Shortcut: $F = A + \frac{\sum D}{n}$

$\textcircled{2}$ Coding method: Let $y = x - 13, \therefore \sum y = 27, \therefore \bar{y} = \frac{\sum y}{n} = \frac{27}{10} = 2.7$

Then use property $\textcircled{2}$ for \bar{x}

$\textcircled{3}$ Direct Method: $\sum(x-13)$

$$17 = \sum(x-13) \Rightarrow \sum x - 13(10) = 17$$

$$\therefore \sum x = 157$$

Then use $\bar{x} = \frac{\sum x}{n}$ for \bar{x}

S.D (a) and variance (a) = 0, where a is constant

$$\therefore S.D.(x \pm a) = S.D(x) \pm S.D(a), S.D(a) = 0$$

$$\therefore S.D(x) = S.D(x \pm a)$$

$$\therefore \text{Variance}(x) = \text{Variance}(x \pm a)$$

Equally likely event: $P(A) = P(B)$

~~not mutually exclusive~~ not exclusive event: $A \cap B \neq \emptyset$

exclusive event: $A \cap B = \emptyset$

Addition law \Rightarrow ~~exclusive~~ $P(A \cup B) = P(A \cup B) = P(A) + P(B)$ } $P(A \cup B) = P(A \cup B) = P(A) + P(B) - P(\text{common})$

Independent event: $P(A \cap B) = P(A) \times P(B)$

Conditional Probability: $P\left(\frac{A}{B}\right) = \frac{P(A \cap B)}{P(B)}$

of A given B

Factorial \Rightarrow eg. $4! \Rightarrow 4 \times 3 \times 2 \times 1$

$0! \Rightarrow$ always $= 1$

Order effects result \rightarrow Permutation

" doesn't " \Rightarrow combinations

$P!$ \Rightarrow No. of possible arrangements of P items

n items with some repeats $\Rightarrow \frac{n!}{(\text{repeated 1 count})! \times (\text{repeated 2 count})! \dots}$

Permutation: $nPr \rightarrow$ no. of spaces
 \hookrightarrow no. of items $nPr = \frac{n!}{(n-r)!}$

Combinations: $nCr \rightarrow$ set no. to select/choose/draw
 \hookrightarrow no. of items $nCr = \frac{n!}{r!(n-r)!}$

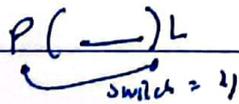
$$nCr = \frac{n!}{r!(n-r)!}$$

eg. REFRIGERATOR \Rightarrow select 4 letters, with exact 2 E's and no R's

\therefore Total = 12

$r=4$ $E=2$ $o=6$ "EE" $\binom{6}{2} = 15$

eg. TELEPHONE with P, G, L at end



Total 9, $E=3$ $\therefore \frac{7!}{3!} \times 2! = 7680$

of 2s, and above part of same letter

If no restrictions, last part 1, then it means no restriction that when

eg. for same TELEPHONE, no restriction, and all parts above of E

\therefore "EE" $\binom{6}{3} +$ "EE" $\binom{6}{2} +$ "EEE" $\binom{6}{1} = 41$

Date: / /

Q3

freq. dist. table:

x	F

Probability distribution

x	$P(x)$

$$\text{Mean} = E(x) = \frac{\sum x P(x)}{\sum P(x)} \quad (\sum P(x) \text{ always} = 1)$$

$$\therefore E(x) = \sum x P(x)$$

$$\text{Variance} = \text{Var}(x) = \frac{\sum x^2 P(x)}{\sum P(x)} - \left(\frac{\sum x P(x)}{\sum P(x)} \right)^2 \quad (\sum P(x) = 1)$$

$$\therefore \text{Var}(x) = \sum x^2 P(x) - (\sum x P(x))^2 \quad \text{or}$$

$$\text{Var}(x) = \sum x^2 P(x) - (E(x))^2$$

$$\text{S.D.}(x) = \sqrt{\text{Var}(x)}$$

$$P(x) = \frac{\binom{k}{x} \binom{N-k}{n-x}}{\binom{N}{n}}$$

where $N = \text{Total}$

$k = \text{interest}$

$n = \text{select/drawn/drawn/taken}$

$x = 0$ to smallest of n or k