Poker Test
- Based on Chisquare Test

Steps:-
S1: Define Hypothesis for testing indepedence ces

H_0: $R_i \sim$ independently

H_1: $R_i \nsim$ indepedently.

S2: Generate frequency distribution table for all possible combinations & apply Chisquare test

S3: Compute $\chi_{calc} = \chi_0^2 = \sum_{i=1}^{n} \frac{(O_i - E_i)^2}{E_i}$

S4: Determine $\chi_{calc} = \chi^2_{\alpha, df}$

$df = n-1$

where n is total number of combinations

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S8 Compare X_{calc} & X_{tab}

If $X_{calc} < X_{tab}$

Accept H_0.

* Variation of Poker Test

i) For 3 digits

ii) For 4 digits

iii) For 5 digits

Numerical 1 (For 3 digits)

Possible combinations

567 - All diff

555 - All Same

565 - One pair

~~Probability for all diff = P(1st & 2nd same~~ diff)
~~P(1st~~

223
232
322

Date . .

a) Probability all digits are diff

$= P(2^{nd}$ digit diff from $1^{st}) \times$
$P(3^{rd}$ digit diff from 1^{st} and $2^{nd})$

$= 0.9 \times 0.8 = 0.72$

b) Probability all digits are same

$= P(2^{nd}$ same as $1^{st}) \times P(3^{rd}$ same as $1^{st})$

$= 0.1 \times 0.1 = 0.01$

c) Probability of one pair

$= P(2^{nd}$ diff than $1^{st}) \times$
$P(2^{nd}$ and third same$) \times {}^3C_2$

$= 0.9 \times 0.1 \times 3$
$= 0.27$

OR

$= 1 - 0.72 - 0.01$
$= 0.27$ //

Ques:- A sequence of 3 digits nos are generated and anlaysis indicates that

560 have 3 diff digits
60 contain 3 like digits
380 contain one pair of like digits

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Based on Poker Test, test for independence use $\alpha = 0.05$

S_1 Define Hypothesis

S_2: Generate frequency table & apply Chisquare test

Comb^n	O_i	E_i	$\frac{(O_i - E_i)^2}{E_i}$
3 diff digits	560	0.72 × 1000 = 720	= 35.55
3 like digits	60	= 0.01 × 1000 = 10	= 280
Exactly 1 pair	380	= 0.27 × 1000 = 270	= 44.81

Here N = 1000

$$\chi_{calc} = \chi^2_0 = \cancel{\sum_{i=(O_i-E_i)^2}} \sum_{i=0}^{n} (O_i - E_i)^2 / E_i$$

Where n is total number of comb^n possible

Scanned with CamScanner

$= 330.36$

S_4 :- $\chi^2_{\alpha/n-1} = \chi^2_{0.05/2} = 5.99$

S_5 Compare

$\chi^2_{calc} > \chi^2_{tab}$

so reject Ho.

For 4 digits possible combinations are :-

1234 - All diff

1111 - All same

1123 - One pair

1122 - Two pair

1112 - Three of a kind

P (All diff) = P (2nd diff from first)
* P (3rd diff from 1st and 2nd)
* P (4th diff from 1st, 2nd & 3rd)

$= 0.9 \times 0.8 \times 0.7 = 0.504$

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2) P (All same) = P(2rd same as 1st) * P(3rd same as 1st) * P(4th same as 1st)

= 0.1 × 0.1 × 0.1

= 0.001

3) P (one pair) = $4C_2$ × P (2nd same as 1st) * P(3rd diff from 2nd) * P(~~3rd~~ 4th diff from 2nd & 3rd)

= $4C_2$ * 0.1 * 0.9 × 0.8

= 0.432

4) P (Three of a kind) = $4C_3$ * P(2nd and 1st same) * P(3rd & second same) * P (4th diff than first)

= $4C_3$ * 0.1 × 0.1 * 0.9

= 0.036

5) P (~~an~~ two pair) = 1 − 0.001 − 0.504 − 0.036 − 0.432

= 0.027

OR

= $\frac{4C_2}{2!}$ × (1st and 2nd same) * (3rd diff from 1st) * (4th & 3rd same)

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$= \frac{{}^4C_2}{2!} * 0.1 * 0.9 \times 0.1$

$= 0.027$

For 5 digits

Possible combinations

12345 - All diff

11111 - All same

11234 :- Exactly one pair

11123 :- 3 of a kind

11112 :- 4 of a kind

11223 :- Exactly two pair

111222 : Full house.

$P(\text{all diff}) = 0.9 \times 0.8 \times 0.7 \times 0.6$

$=$

$P(\text{all same}) = 0.1 \times 0.1 \times 0.1 \times 0.1$

$= 0.01\%$

$= 0.0001$

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

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P(3 of a kind) = P(~~@~~) 0.1 × 0.1 × 0.9 × 0.8 × $5C_3$ = 0.072

P(Exactly one pair) = 0.1 × 0.9 × 0.8 × 0.7 × $5C_2$ = 0.5040

P(Two pairs) = $\frac{5C_2}{2!}$ × 0.1 × 0.9 × 0.1 × 0.8 = 0.1080

P(4 of a kind) = $5C_4$ × 0.1 × 0.1 × 0.1 × 0.9
= 0.0045

P(Full house) = 1 − Above all
= 0.009