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Assignment #2

L	M	N	O	T
7	1	11	2	23
3	5	19	1	43
2	9	21	3	17
6	2	27	5	41

Problem 1:-

Feature L:

$$\bar{x} = \frac{7+3+2+6}{4} = \frac{18}{4} = 4.5$$

calculating deviations for feature L

$7 - 4.5 = 2.5$

$3 - 4.5 = -1.5$

$2 - 4.5 = -2.5$

$6 - 4.5 = 2.5$

squaring deviations for feature L

$(2.5)^2 = 6.25$

$(-1.5)^2 = 2.25$

$(-2.5)^2 = 6.25$

$(1.5)^2 = 2.25$

Sum: $6.25 + 2.25 + 6.25 + 2.25 = 17$

chi-Square test score for L = 17

Feature M:

$$\bar{x} = \frac{1+5+9+2}{4} = \frac{17}{4} = 4.25$$

Deviations	Squared Deviations
$1 - 4.25 = -3.25$	$(-3.25)^2 = 10.5625$
$5 - 4.25 = 0.75$	$(0.75)^2 = 0.5625$
$9 - 4.25 = 4.75$	$(4.75)^2 = 22.5625$
$2 - 4.25 = -2.25$	$(-2.25)^2 = 5.0625$

Sum: $10.5625 + 0.5625 + 22.5625 + 5.0625$

$= 38.75$

Chi-Square test score of M = 38.75

Feature N

$$\bar{x} = \frac{11+19+21+27}{4} \Rightarrow \frac{78}{4} = 19.5$$

deviations	Squared deviations
$11 - 19.5 = -8.5$	$(-8.5)^2 = 72.25$
$19 - 19.5 = -0.5$	$(-0.5)^2 = 0.25$
$21 - 19.5 = 1.5$	$(1.5)^2 = 2.25$
$27 - 19.5 = 7.5$	$(7.5)^2 = 56.25$

Sum: $72.25 + 0.25 + 2.25 + 56.25 = 131$

chi-square test score for N = 131

Feature O

$$\bar{x} = \frac{2+1+3+5}{4} = \frac{11}{4} = 2.75$$

deviations	squared deviations
$2 - 2.75 = -0.75$	$(-0.75)^2 = 0.5625$
$1 - 2.75 = -1.75$	$(-1.75)^2 = 3.0625$
$3 - 2.75 = 0.25$	$(0.25)^2 = 0.0625$
$5 - 2.75 = 2.25$	$(2.25)^2 = 5.0625$

sum: $0.5625 + 3.0625 + 0.0625 + 5.0625 = 8.75$

Chi-square test for $O = 8.75$

Feature T

$$\bar{x} = \frac{23+43+17+41}{4} = \frac{124}{4} = 31$$

Deviations	Squared deviations
$23 - 31 = -8$	$(-8)^2 = 64$
$43 - 31 = 12$	$(12)^2 = 144$
$17 - 31 = -14$	$(-14)^2 = 196$
$41 - 31 = 10$	$(10)^2 = 100$

sum: $64 + 144 + 196 + 100 = 504$

Chi-square for $T = 504$

Results for Problem

L = 17
M = 38.75
ON = 131
O = 8.75
T = 504

Problem 2

$$s = \sqrt{\frac{\Sigma(x_i - \bar{x})^2}{n-1}}$$

Feature L

$\Sigma(x_i - \bar{x})^2 = 17$

$s = \sqrt{\frac{17}{3}} \approx 2.38$

Feature M

$\Sigma(x_i - \bar{x})^2 = 38.75$

$s = \sqrt{\frac{38.75}{3}} \approx 3.59$

Feature N

$\Sigma(x_i - \bar{x})^2 = 131$

$s = \sqrt{\frac{131}{3}} \approx 6.61$

Feature O

$\Sigma(x_i - \bar{x})^2 = 8.75$

$s = \sqrt{\frac{8.75}{8}} \approx 1.71$

Feature T

$\Sigma(x_i - \bar{x})^2 = 504$

$s = \sqrt{\frac{504}{3}} \approx 12.96$

Result for Problem 2

L : 2.38

M : 3.59

N : 6.61

O : 1.71

T : 12.96

Feature	ChiSquare Test score	standard Deviations
L	17	2.38
M	38.75	3.59
N	131	6.61
O	8.75	1.71
T	504	12.96