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STATISTICAL METHODS

Practical Manual

Ist Semester, B. Fisheries Sciences

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Problems:

1. **Calculation of Arithmetic Mean for Continuous Frequency Distribution**
2. **Calculation of Median for Continuous Frequency Distribution**
3. **Calculation of Mode for Continuous Frequency Distribution**
4. **Calculation of Standard Deviation for Continuous Frequency Distribution**
5. **Calculation of Pearson's Correlation Coefficient**
6. **Calculation of Pearson's Correlation Coefficient**
7. **Calculation of Spearman's Rank Correlation Coefficient**
8. **Problem on Chi-Square Goodness of fit**

1) Calculate the mean for the following frequency distribution

Class interval :	0-8	8-16	16-24	24-32	32-40	40-48
Frequency :	8	7	16	24	15	7

=) Solution : Here, we take $A = 28$ and $h =$

Computation of Mean

Class interval	Mid-Value (x)	Frequency (f)	$d = \frac{x-A}{h}$	fd
24-32	28	24	0	0
32-40	36	15	1	15

$\bar{x}$ $A + \frac{h \Sigma fd}{}$

$28 + 8 \times (-25)$ 28 $\frac{200}{}$ $25.404.$

2) Find the median wage of the following distribution

Wages (in Rs) :	2000-3000	3000-4000	4000-5000	5000-6000	6000-7000
of					

Computation of median

Wages (in Rs)	No. of employees	c.f
/000 TOOO	5	8
0000 #000	10	28
000 $00	10	
E000 - 000		re

Cumulative frequency just greater than 21.5 is 28 and the corresponding class is 000 - SOOO. Auu r o?a a T*

Hence using median $4000 + \frac{1000}{20}(21.5 - 8)$ $4000 + 675 = 4675$

3) Calculate mode for the following distribution:

Class interval : 0-10 10-20 20-30 30-40 40-50 50-60 60-70

70-80

f_1

Thus, the class interval 40-50 is the modal class. Using mode formulae, the value of the mode is given by:

Mode $40 + \frac{10(28-12)}{(2\times 28 - 12 - 20)}$ - 46.

4) Calculation of standard deviation for continuous frequency distribution

Age (in years): 20-30 30-40 40-50 50-60 60-70 70-80 80-90

No. of members: 3 61 132 153 140 EI 2

Age group	Mid value (x)	Frequency (f)	$d = \frac{x-55}{10}$	fd	fd^2
20-30	25	3	-3	-Q	27
30-40	35	61	2	-122	244
50-60	55	153	0	0	0
		140	1	IVO	I 0
po-gO	go	51	2	102	204
80-90	85	2	3	6	

$\bar{x}$ $A + h\frac{\Sigma fd}{N}$

$55 + 10 \times (-15)$ $55 - 0.28$ 54.72 years.

$\sigma^2 \quad h^2 \left[\frac{1}{N} \quad (\frac{1}{N}\Sigma fd)^2\right] \quad 100\left[\frac{765}{542} - (0.028)^2\right]$

$\therefore \sigma$ (Standard Deviation) $= \sqrt{141.07}$ 11.88 years.

5. Calculate the co-relation co-efficient for the following heights (in inches) for father's (x) and their sons (y):

x: 65 66 67 67 68 69 70 72

y: 67 68 65 68 72 72 69 71

65	67	4225	4489	4355
&Q	#i	#8&	f{8#	
80		$ 900	$8#;	4830
#$	#{	#}$\	30#}	5112
Total	544	552	37028	38132	37560

$\bar{x} \quad \frac{1}{n}\Sigma x \quad 544 \quad 68 \quad \bar{y} \quad \frac{1}{n}\Sigma y \quad \frac{1}{8} \times 552 \quad 69$

$r(x,y) \quad \frac{cov(x,y)}{\sigma_x \sigma_y} \quad \frac{\frac{1}{n}\Sigma xy - \bar{x}\bar{y}}{\sqrt{(\frac{1}{n}\Sigma x^2 - \bar{x}^2)(\frac{1}{n}\Sigma y^2 - \bar{y}^2)}}$

$\frac{\frac{1}{8} \times 37560 - 68 \times 69}{\sqrt{\quad\quad}}$

$\sqrt{\quad\quad}\}\{\quad\quad\}$

$\frac{4695 - 4692}{\sqrt{\quad\quad}}$

6) The ranks of same 16 students in Mathematics and Physics are as follows. Two numbers within brackets denote the ranks of the

ri f 1, fr, o) f s,+; f a, vj ts, 1 t‹ •» I* •1 I* *1 /* •9

(10,11) (11,15) (12,9) (13,14) (14,12) (14,12) (15,16) (16,13)

Calculate the rank correlation co-efficient for proficiencies of this group in Mathematics and Physics.

Maths (x)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Ranks in Physics (y)	1	0	3	4	5	7	2	6	8	11	15	9	14	12	16	13
$d = x - y$	0	-8	0	0	0	-1	5	2	1	-1	-4	3	-1	2	-1	3
							25	4								

Total $(d^2) = 136$

∴ Rank correlation co-efficient is given by:

$$1 \quad \frac{6\Sigma d^2}{n(n^2-1)} \quad 1 \quad \frac{6 \times 136}{16 \times 255} \quad 1 - \frac{1}{5} \quad \frac{4}{5} \quad 0.8$$

7) Find the equation of the least square straight line (considering x as independent variable) using the following data:

4	4	16	16	/g
8	5	64	40	25
11	8	121	88	64
56	40	524	364	251

$= \Sigma x$

Therefore, the normal equation :

$$40 = 8a + 56b$$

$$364 = 56a + 524b.$$

Finding the solution of the above equations we get,

$$a = \frac{6}{11}, \quad b = \frac{7}{11}$$

∴ The equation of least square sd. line is

8) Test the hypothesis that the number of parts demanded does not depend on the day of the week. (Given, the values of chi-square significance at 5, 6, 7 d.f are respectively 11.07, 12.59, 14.07, at the 5% level of

[illegible]

number of parts demanded does not depend on the day of week.

Under the null hypothesis, the expected frequencies of the spare part demanded on each of the six days should be $\frac{1}{6}$ (1124 + 1125 + 1110 + 1120 + 1126 + 1115)

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Days	frequency		$(f_i - e_i)$	$\frac{(f_i - e_i)^2}{e_i}$
	Observed (f_i)	Expected (e_i)		
Mon	1124	1120	16	0.014
Tues	1125	1120	25	0.022
Wed	1110	1120	100	0.089
Thurs	1120	1120	0	0
Fri	1126	1120	36	0.032
Sat	1115	1120	25	0.022
Total	6720	6720		0.149

$\chi^2 \quad \Sigma \frac{(f_i - e_i)^2}{e_i} \quad 0.179$

The number of degrees of freedom = 6 - 1 5 (since we are given 6 frequencies subjected to only one linear constraint $\Sigma f_i = \Sigma e_i = 6720$)

The tabulated $\chi^2_{0.05}$ for 5 d.f 11.07

Since calculated value of χ^2 is less than the tabulated value it is not significant and the null hypothesis may be acc. accepted at 5% level of significance. Hence we conclude that the number of parts demanded are same