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paper :- probability and
statistics :-

Q# (3)

Part (a)

Q= Discuss the steps of testing of hypothesis with data Example.

A= Main steps in testing of hypothesis:-

(1) State / formulate the Null and alternative hypothesis.

(2) choose the level of significance generally 1% 5% and 10% of significance are used in literature.

(3) Choose the statistic to be used i.e Z testing, t-testing, F test etc.

(4) Compute the value of test statistic from the sample data and available information given under the Null hypothesis, the value so obtain is called calculated value.

(5) Define the critical value of test statistic, called tabulated

value OR calculated the p-value of the test statistic-

(6) compare the calculated and tabulated value of the test statistic
Reject Null hypothesis if calculated value of the test statistic is greater than tabulated value-

(7) Make the Decision and calculated the Result-

Date Example:-

Q= A Random sample of 50 item given the mean 6.2 and variance 10.24 - can it be regarded as draw from a normal population with mean 5.4 at 5% level of significance-

(Ans)

$n = 50 \quad \bar{X} = 6.2 \quad \sigma = 10.24$

(1) Null hypothesis $H_0: \mu = 5.4$
Alternative hypothesis $H_a: \mu \neq 5.4$

(ii) Test statistics

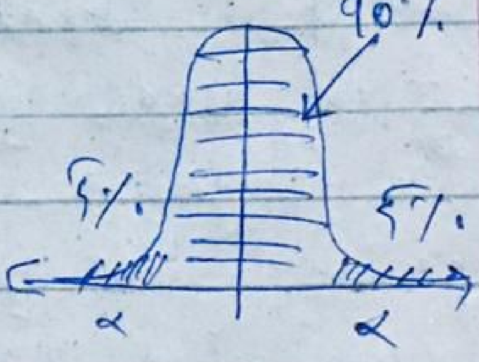
$$Z = \left| \frac{\bar{x} - \mu}{\sigma / \sqrt{n}} \right|$$

$$Z = \left| \frac{6.2 - 5.4}{10.24 / \sqrt{50}} \right|$$

$$Z = 1.77$$

(iii) level of significance α

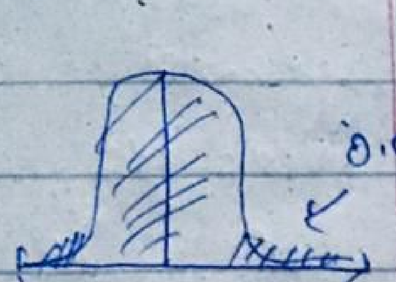
$$\alpha = 0.05$$



(iv) Critical value -

$$\alpha = 0.05 \longrightarrow Z = 1.36$$

(v) Decision



$$Z = 1.77$$

$$1.77 < 1.96$$

Null hypothesis is Accepted.

→ Yes it can be regarded as drawn the

than normal pupulation -

(part # B)

Q= Differentiate the concept of Regression and correlation with data Example.

A= Regression:

① it is the study, about the impact of the independ variable on the depended variable -
it is used for prediction -

② The Regression co-efficent is positive than for evry unit increase in x, the corresponding average increase in Y in bxx - similarly if the regression co-efficiat is negative than for every unit increase in x the corresponding average decrease in Y is bxx -

(3) care must be taken for the choice of independent variable and dependent variable we can not assign arbitrarily X as independent variable and Y as dependent variable.

(4) it is not symmetric in x and y that is bxy and byx have different meaning and interpretation.

⇒ Correlation:

(1) it indicates only the nature and extent of linear relationship

(2) if the linear correlation is coefficient is positive than the two variable are positively / or negatively correlated.

(3) one of the variable can be taken as x and the other one can be taken as the variable Y.

(4) it is symmetric in x and y -
i.e $r_{xy} = r_{yx}$ -

Example 2 -

	X	Y	X^2	Y^2	XY
	-1	-1	1	1	1
	1	2	1	4	2
	2	3	4	9	6
	4	3	16	9	12
	6	5	36	25	30
	7	8	49	64	36
Σ	19	20	107	112	107

$n = 6$

$$Y = \hat{a}X + \hat{b}$$

$$\hat{a} = \frac{(\Sigma x)(\Sigma y) - n\Sigma xy}{(\Sigma x)^2 - n\Sigma x^2}$$

$$\hat{a} = \frac{(19)(20) - 6(107)}{(19)^2 - 6(107)}$$

$$\hat{a} = \frac{-262}{-281} = 0.9324$$

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$$\hat{b} = \frac{(\Sigma x)(\Sigma xy) - (\Sigma x)(\Sigma x^2)}{(\Sigma x)^2 - n\Sigma x^2}$$

$$\hat{b} = \frac{(19)(107) - (20)(107)}{(19)^2 - 8(107)}$$

$$\hat{b} = \frac{-107}{-281} = 0.3808.$$

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

$$S_x = \sqrt{\frac{107 - \frac{1}{8}(19)^2}{5}}$$

$$S_x = 3.0605.$$

$$S_y = \sqrt{\frac{112 - \frac{1}{8}(20)^2}{5}} = 3.0111$$

$$r = \frac{S_x}{S_x}\hat{a} = 0.9477 \ (\approx 1).$$

$$r = \frac{\Sigma xy - \frac{1}{n}(\Sigma x)(\Sigma y)}{(n-1)\, s_x\, s_x}$$

$r = 0.9477$

—— x —— x —— x ——

(9)

Q# 1

part (a)

X	Y	XY	X^2
5	16	80	25
6	19	114	36
8	23	184	64
10	28	280	100
12	36	432	144
13	41	533	169
15	44	660	225
16	45	720	256
17	50	850	289
102	302	3853	1308

The estimated regression line of Y on X is

$$\hat{Y} = a + bX$$

and two normal equation are

and the two normal equation are -

$$\Sigma y = na + b\Sigma x$$
$$\Sigma xy = a\Sigma x + b\Sigma x^2$$

Now

$$\bar{x} = \frac{\Sigma x}{n} = \frac{102}{9} = 11.33$$

$$\bar{y} = \frac{\Sigma y}{n} = \frac{302}{9} = 33.56$$

$$b = \frac{n\Sigma xy - (\Sigma x)(\Sigma y)}{n\Sigma x^2 - (\Sigma x)^2}$$

$$b = \frac{9(3853) - (102)(302)}{9(1308) - (102)^2}$$

$$= \frac{34677 - 30804}{11772 - 10404} = \frac{3873}{1368}$$

$= 2.831$ so

$a = \bar{Y} - b\bar{X} = 33.56 - (2.831)(11.3)$

$\boxed{a = 1.47}$

Hence the desired estimated regression of Y on X is

$Y' = 1.47 + 2.831X$

The estimated regression co-efficient $b = 2.831$, which indicates that the value of Y increase by 2.831 unit for unit increase in X

Part # (b)

P.T.O

(12)

(part II B)

co-efficient of correlation b/w X and Y.

we know that

$$\gamma = \frac{\Sigma(X-\bar{X})(Y-\bar{Y})}{\sqrt{\Sigma(X-\bar{X})^2 \Sigma(Y-\bar{Y})^2}}$$

$$\gamma = \frac{n\Sigma XY - \Sigma X \Sigma Y}{\sqrt{(n\Sigma X^2 - (\Sigma X)^2)(n\Sigma Y^2) - (\Sigma Y)^2}}$$

putting the value - $\Sigma Y^2 = 11341$

$$\frac{9(3853) - (102)(302)}{\sqrt{[9(1308) - (102)^2][9(11341) - (302)^2}}$$

$$r = \frac{34677 - 30804}{(11772 - 10404) - (102089 - 91204)}$$

$$r = \frac{3873}{1368 - 10865}$$

$$\boxed{r = -0.4078}$$

(14)

Q # (2)

part # (a)

Given data:

measured sample weight in gram:

25 pies-

$n = 25$

Mean pencil = 170

$\bar{x} = 170$

Null hypothesis: $H_0: \mu = 5.4$.

Alternate hypothesis $H_a = \mu \neq 5.4$.

We know that

Test statistics:

$$z = \frac{\bar{x} - \mu}{\delta / \sqrt{n}}$$

$$z = \frac{170 - 5.4}{10 / \sqrt{25}}$$

$$Z = \frac{164.6}{50}$$

$$\boxed{Z = 3.292}$$

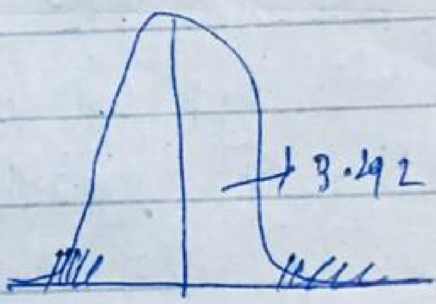
(iii) level of significance - α

$$\alpha = 0.05$$

Critical value -

$\alpha = 0.05$

$\alpha = 3.292$



Decision:-

Null hypothesis is not Accepted -

part # (b)

Given data

Standard deviation = 14.1 for male

= 9.5 for female -

Sample of male = 75

Sample of female = 50

mean of 28 and 33 ppm -

Sol

for male :

Sample = n = 75

mean $\bar{x}$ = 28

δ = 14.1

Assume -

Null hypothesis $H_0 : \mu = 5.4$

Alternate hypothesis - = $H_a : \mu \neq 5.4$

(ii) Test statistic :

$$z = \left| \frac{\bar{x} - \mu}{\delta / \sqrt{n}} \right|$$

$$z = \frac{28 - 5.4}{14.1 / \sqrt{75}}$$

7.07

17

$$\boxed{z = \cancel{0.1850}\ 13.88}$$ for male -

Now for female -

Sample = 50 = n

mean x = 33

δ = 9.5.

Null hypothesis $H_0 = \mu = 5.4$.

Alternative hypothesis = $H_a = \mu \neq 5.4$

Test statistic =

$$z = \frac{\bar{x} - \mu}{s/\sqrt{n}}$$

$$z = \frac{33 - 5.4}{9.5/\sqrt{50}}$$

$$z = \frac{27.6}{9.5/7.07} = z = \frac{27.6}{1.343}$$

$$\boxed{z = 20.55}$$ for ~~fe~~ female -