stat VI

1) $n_1 = 1200$ $\bar{x}_1 = 452$ $\sigma_1 = 212$

$n_2 = 800$ $\bar{x}_2 = 523$ $\sigma_2 = 185$

The null and alternative hypothesis are.

$H_0: \mu_1 - \mu_2 = 0$

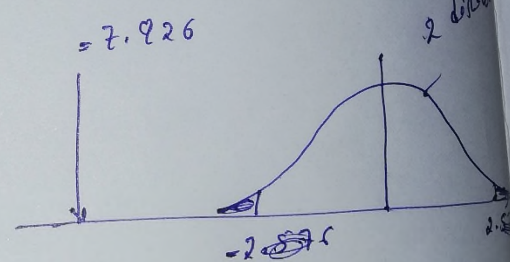
$H_1: \mu_1 - \mu_2 \neq 0.$

The value of test statices is.

$$z = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)_0}{\sqrt{S_1^2/n_1 + S_2^2/n_2}}$$

$$z = \frac{452 - 523}{\sqrt{212^2/1200 + 185/800}}$$

$$z = -7.926$$



The computed value of the z falls in the left hand region for any commonly used α. and the p-value is very small. We conclude that there is a statistically significant difference in average monthy charges between Banglore to chennai and Bangalor to Hosur

2) $n_1 = 100$

$n_2 = 100$

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2) $n_1 = 100$ $x_1 = 308$ $s_1 = 84$

$n_2 = 100$ $x_2 = 254$ $s_2 = 67$

Our null and alternative hypothesis are

$H_0 : ~~u_1 = u_2~~ : u_1 - u_2 \leq 0$

$H_1 : u_1 > u_2$ $u_1 - u_2 \not\leq 0.$

$H_0 : u_1 - u_2 \leq 0.$

$H_1 : u_1 - u_2 > 0.$

The value of test statistics is

$$z = \frac{\bar{x}_1 - \bar{x}_2 - (u_1 - u_2)}{\sqrt{s_1^2 / n_1 + s_2^2 / n_2}}$$

$$= \frac{308 - 254 - 0}{\sqrt{84^2/100 + 67^2/100}} = \frac{54}{\sqrt{115.48}}$$

$=$

$= \underline{5.025}$

The value fall in the non rejection region of our righ-tailed test at any conventional level of significance α.

t-valut.

2.577

a) $n_1 = 15$ $\quad x_1 = 6598$ $\quad s_1 = 844$

$n_2 = 12$ $\quad x_2 = 6870$ $\quad s_2 = 669$

This is one taild test.

$H_0 : u_1 - u_2 \geq 0$

$H_1 : u_1 - u_2 < 0$.

degree of freedom. $= n_1 + n_2 - 2$

$= 15 + 12 - 2$

$= 25$

$$t = \frac{(6870 - 6598)}{\frac{(14)(844)^2 + (11)(669)^2}{25}\left(\frac{1}{15} + \frac{1}{12}\right)}$$

$= 0.91$

* This value of the statstic falls inside the non rejection region for any unusual level of significance.

5) $n_1 = 1000$ $x_1 = 53$ $\hat{p}_1 = 0.53$

$n_2 = 100$ $x_2 = 43$ $\hat{p}_2 = 0.83$

$\Rightarrow H_0 : P_1 - P_2 = 0$

$H_1 : P_1 - P_2 \neq 0.$

$$\hat{p} = \frac{x_1 + x_2}{n_1 + n_2} = \frac{53 + 43}{100 + 100} = \underline{0.48}$$

$$1 - \hat{p} = \underline{0.52}$$

$$z = \frac{\hat{P}_1 - \hat{P}_2}{\sqrt{\hat{p}(1-\hat{p})(1/n_1 + 1/n_2)}}$$

$$= \frac{0.53 - 0.43}{(0.48)(0.52)(0.017 + 0.01)}$$

$= 1.415$

* This value of the test statistics falls in the non rejection region even if we use $\alpha = 0.10$.

6) $n_1 =$

$n_2 =$

$H_0 :$

$H_1 :$

$z =$

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6) $n_1 = 300$ $\quad x_1 = 120$ $\quad \hat{p}_1 = 0.40$

$n_2 = 700$ $\quad x_2 = 140$ $\quad \hat{p}_2 = 0.20$

$H_0 : p_1 - p_2 \leq 0$

$H_1 : p_1 - p_2 > 0.10$

$$z = \frac{\hat{p}_1 - \hat{p}_2 - D}{\hat{p}_1 (1-\hat{p}_1) / n_1 + \hat{p}_2 (1-\hat{p}_2) / n_2}$$

$$= \frac{120/300 - 140/700 - 0.10}{[(120/300)(180/300)]/300 + [(140/700)(560/700)]/700}$$

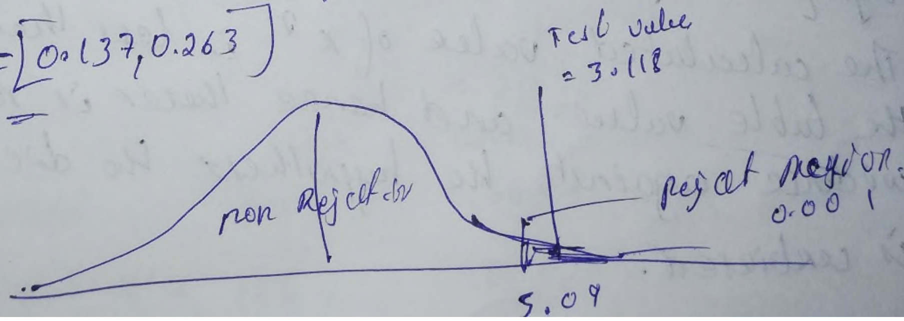
$$= \frac{(0.4 - 0.2) - 0.1}{(0.4)(0.6)/300 + (0.2)(0.8)/700}$$

$= \underline{3.118}$

the value of the test falls in the rejection Region for $\alpha = 0.001$. The p-value is therefore less than 0.001 and the null hypothesis is rejected.

$$0.4 - 0.2 \pm 1.96 \sqrt{\frac{(0.4)(0.6)}{300} + \frac{(0.2)(0.8)}{700}} = 0.2 \pm 1.96$$

$= [0.137, 0.263]$



7) Null hypothesis. Set up the null hypothesis that the die is unbiased.

On the basis of hypothesis that the die is unbiased, we expect each number to turn up. $132/6 = 22$ time.

Apply χ^2-test

O	E	$(O-E)^2$	$\frac{(O-E)^2}{E}$
16	22	36	1.64
20	22	4	0.18
25	22	9	0.41
14	22	64	2.91
29	22	49	2.23
28	22	36	1.64

$$\chi^2 = \Sigma \frac{(O-E)^2}{E} =$$

$$= \underline{9.01}$$

No. of degrees of freedom $= n-1 = 6-1 = 5$

For 5 degrees of freedom at 5% level of significance, the table value of $\chi^2 = 11.07$.

The calculated value of χ^2 is less than the table value. and hence there is no evidence against the hypothesis the die is unbiased.

8) We have :
H_0 : "Gender is independent of voting"
H_1 : "Gender and Voting are dependent.

	Men	Women	
Voted	2792	3591	6386
Didn't vote	1486	2131	3617
	4278	5722	10000.

Expected value (men voted) $= \dfrac{6386 \times 4278}{10000}$

$= 2730.6474$
$= \underline{2731}$

Expected value (women voted) $= \dfrac{6386 \times 5722}{1000} = 3652.352$

$= \underline{3652}$

Expected value (men not voted) $= \dfrac{3617 \times 4278}{10000}$
$= \underline{1547}$

Expected value (women not voted) $= \dfrac{3617 \times 5722}{10000}$

$= \underline{2070}$

	men	women
Voted	2731	3652
Didn't vote	1547	2070

$$x^2 = \frac{(2782-2731)^2}{2731} + \frac{(3591-3652)^2}{3652} + \frac{(1486-1547)^2}{1547} + \frac{(2131-2070)^2}{2070}$$

$$= \underline{6.6}$$

Degrees of freedom $= 1$

$t_{tr} = 3.84$

* Since the chi-square goodness of fit value 6.6 exceeds the critical x^2 (3.84) we will reject the null-hypothesis.

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a) ~~The~~ A Chi-Squared Goodness-of-fit test is appropriate here. The null hypothesis is that there is no preference for any of the candidates. if this is so, we would expect roughly equal number of votes to support each candidate.

Our expected frequencies $100/4 = 25$ per candi.

O	41	19	24	16
E	25	25	25	25
(O-E)	16	-6	-1	-9
$(O-E)^2$	256	36	1	81
$\frac{(O-E)^2}{E}$	10.24	1.44	0.04	3.24

$$\chi^2 = \Sigma \frac{(O-E)^2}{E} = 10.24 + 1.444 + 0.04 + 3.24$$

$$= 14.96$$

degrees of freedom $= k-1 = \underline{3}$

∴ The critical value of chi-squared for 0.05 significance level and 3 d.f is 7.82. Our obtained chi-square value is greater than this, and so we conclude that our obtained value is unlikely to have occurred merely by chance.

10)

age of child	A	B	C	row totals
5-6 years	18	22	20	60
7-8 yer	2	28	40	70
9-10 years	20	10	40	70
Column totals	40	60	100	200

For each above table gives us:

O	18	22	20	2	28	40	20	10	40
E	12	18	30	14	21	35	14	21	35
(O-E)	6	4	-10	-12	7	5	6	-11	5
$(O-E)^2$	36	16	100	144	49	25	36	121	25
$\frac{(O-E)^2}{E}$	3	0.89	3.33	10.29	2.33	0.71	2.57	5.76	0.71

Chi-squared is the sum of these.

$\chi^2 = 29.60$

$d.f = (row-1)*(columns-1) = 2*2 = \underline{4}$

• The critical value of chi-square in the table for a 0.001 significance level and 4 d.f. is 18.46. Our obtained value is bigger than this: Therefor we have a chi-square value which is so large that it would occur by chance only. about

11)

Conform	
not conform	
Column total	

E

(|O-E|-0.5)

(|O-E|-0.5)

$\frac{|O-E|-0.5}{E}$

$\chi^2 =$

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	support	no support	row totals
Conform	18	40	58
not conform	32	10	42
Column totals	50	50	100

E	18	40	32	10
	29	29	21	21
$(\|O-E\|-0.5)$	10.5	10.5	10.5	10.5
$(\|O-E\|-0.5)^2$	110.25	110.23	110.25	110.25
$\frac{\|O-E\|-0.5)^2}{E}$	3.80	3.80	5.25	5.25

$$\chi^2 = \Sigma \frac{(O-E)^2}{E}$$

$$= 18.10$$

d.f. $= (\text{row}-1) \times (\text{colums}-1) = 1 \times 1 = 1$

Our obtained value is bigger than the critical value of chi-squared for a 0.001 significant level.

13)

	Married	Widowed, divorced or Separated	Never married
Employed	679	103	114
Unemployed	63	10	20
Not in labor force	42	18	28

O: 679 103 114 63 10 20

E 654 109 133 68 11 14

O: 42 18 28

E 62 10 13

$$\chi_2 = \frac{(679-654)^2}{654} + \frac{(103-109)^2}{109} + \frac{(114-133)^2}{133} + \frac{(63-68)^2}{68} + \frac{(10-11)^2}{11} + \frac{(20-14)^2}{14} + \frac{(42-62)^2}{62} + \frac{(18-10)^2}{10} + \frac{(28-13)^2}{13}$$

$= 30.96$ with 4 d.f.

looking at table of chi-square distribution with $(3-1)(3-1) = 2 \times 2 = 4$.

since $30.96 >> 13.28$. we conclude from the table that:

$P < 1\%$

so we reject with all confidence. Marital status seems to be related to job status in this own.

8)

The null hypothesis H_0: $X \sim$ Poisson

H_1: X does not follow a Poison distribution

$$\hat{u} = \frac{(32\times 0) + (15\times 1) + (9\times 2) + (4\times 3)}{60}$$

$\hat{u} = 0.75$

$$P_0 = P(X=0) = \frac{e^{-0.75}(0.75)^0}{0!}$$

$= 0.472$

$E_0 = 0.472 \times 60 = 28.32$

$$P_1 = P(X=1) = \frac{e^{-0.75}(0.75)^1}{1!} = 0.354$$

$E_1 = 0.354 \times 60 = 21.24$

$$P_2 = P(X=2) = \frac{e^{-0.75}(0.75)^2}{2!} = 0.133$$

$E_2 = 0.133 \times 60 = 7.98$

$P_3 = P(X \geq 3) = 1 - (P_0 + P_1 + P_2) = 0.041$

$E_3 = 0.041 \times 60 = 2.46$

No. of Pets	Observed Fr.	Expected
0	32	28.32
1	15	21.24
2 or more	9	10.44

$$x^2 = \sum \frac{(O-E)^2}{E}$$

$$= \frac{(32-28.32)^2}{28.32} +$$

$= 2.94$

The degrees of

$k=3$ $p=1$

so. $3-1-1=$

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We conclude

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$$x^2 = \sum \frac{(O-E)^2}{E}$$

$$= \frac{(32-28.32)^2}{28.32} + \frac{(15-21.24)^2}{21.24} + \frac{(13-10.44)^2}{10.44}$$

$$= \underline{2.94}$$

The degrees of freedom is $k-p-1$

$k=3 \quad p=1$.

so. $3-1-1=1$ d.f.

if you look 2.94 table chi-square distribution with $df=1$, we btain a p.value of $0.05 < p < 0.1$.

We conclude that there is no real evidence to suggest the data Do not follow Poison distribution.