Session 16 - Additional Exercise

PS1

$n_1 = 1200 \quad x_1 = 452 \quad s_1 = 212$

$n_2 = 800 \quad x_2 = 523 \quad s_2 = 185$

$\alpha = 0.05$

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

$H_0 : x_1 = x_2$

$H_1 = x_1 \neq x_2$

$$z = \frac{452 - 523}{\sqrt{\frac{(212)^2}{1200} + \frac{(185)^2}{800}}} = \frac{-71}{\sqrt{37.45 + 42.78}}$$

$$= \underline{\underline{-.9795}}$$

for significant level $\alpha = 0.05$ critical vale is ± 1.96

ie z score is less then -1.96 so we fail to reject the null hypothesys. so No of people favorllite b/r dochems and vice versa in a week is same.

PS:2

$n_1 = 100 \quad x_1 = 308 \quad s_1 = 84$

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

$\alpha = .05$

Critical vale $= \pm 1.96$

$H_0 : x_1 = x_2$

$H_0 : x_1 \neq x_2.$

$$z = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}} = \frac{308 - 254}{\sqrt{\frac{(84)^2}{100} + \frac{(62)^2}{100}}}$$

$$= \frac{54}{\sqrt{7056 + 38.44}} = \frac{54}{10.44} = \underline{5.19}$$

As z-score is greater then the critical vale — so we reject the null hypothesys and can say that people preferring duracell is differt for people preferring Energizer.

ps 3

$n_1 = 14 \quad x_1 = .317 \quad s_1 = .12$

$n_2 = 9 \quad x_2 = .21 \quad s_2 = .11 \quad \alpha = .05$

$H_0 = \mu_1 - \mu_2 = 0 \quad df = n_1 + n_2 - 2 = 21$

$H_1 = \mu_1 - \mu_2 \neq 0$

$$t = \frac{(.317 - .210) - 0}{\sqrt{\frac{(13)(.12)^2 + 8(.11)^2}{21}\left(\frac{1}{14} + \frac{1}{9}\right)}}$$

$$= \underline{\underline{2.15}}$$

→ 2.15 is greater than critical value we reject the null hypothesis and can say that average percentage increase in sugar increases in the price of sugar differ when sold at two different places.

ps 4

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

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

$\alpha = .05$

$H_0 : \mu_1 - \mu_2 \geq 0$

$H_1 : \mu_1 - \mu_2 < 0 \quad df = n_1 + n_2 - 2 = 25$

$$t = \frac{(6870 - 6598)}{\sqrt{\frac{(14)(844)^2 + (11)(669)^2}{25}\left(\frac{1}{15} + \frac{1}{12}\right)}} = \underline{\underline{.91}}$$

t score is less than the critical value i.e inside the acceptance region. So we fail to reject the null hypothesis.

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PS. 5

$n_1 = 1000$ $x_1 = 53$ $p_1 = .53$

$n_2 = 100$ $x_2 = 43$ $p_2 = .53$ $\alpha = .5$

$H_0 = p_1 - p_2 = 0$

$H_1 = p_1 - p_2 \neq 0$ $\hat{p} = \frac{x_1 + x_2}{n_1 + n_2} = \frac{53 + 43}{1000 + 100} = .087$

$1 - p = .913$

$$Z = \frac{\hat{p}_1 - \hat{p}_2}{\sqrt{\hat{p}(1-\hat{p})(1/n_1 + 1/n_2)}} = \frac{.53 - .43}{\sqrt{.087 \times .913 \left(\frac{1}{1000} + \frac{1}{100}\right)}}$$

$$= \frac{.1}{\sqrt{.0794 \times .011}} = \frac{.1}{.3006} = .332$$

The test score is less than the critical rele so ~~we~~ ~~the nulltheky~~ we fail to reject the null hypothesis

PS. 6

$n_1 = 300$ $x_1 = 120$ $\hat{p}_1 = .40$

$n_2 = 700$ $x_2 = 140$ $\hat{p}_2 = .20$

$H_0 : p_1 - p_2 \leq .10$

$H_1 : p_1 - p_2 > .10$

$$Z = \frac{\hat{p}_1 - \hat{p}_2 - D}{\sqrt{\hat{p}_1 \times \hat{q}_1 / n_1 + \hat{p}_2 \hat{q}_2 / n_2}}$$

$$= \frac{120/300 - 140/700 - .10}{\sqrt{(120/300)(180/300)/300 + (140/700)(560/700)/700}}$$

$= 3.118$ The test score ~~falls~~ is grater than the critical value so we reject the Null hypothesis

PS 7

	1	2	3	4	5	6
f	16	20	25	14	29	28

Expected outcom = 132/6 = 22 times.

calculate $\sum \frac{(O-E)^2}{E}$ for d.f. = n - 1

$\sum \frac{(O-E)^2}{E} = 9.01$

for 5% signification value critical value in table is 11.07. ∴ calculated value is less than the critical value we can say that the die is unbiased.

PS. 8

	Men	Women
Voted	2792	3591
Not voted	1486	2131

H_0: sex is independent of voting

H_1: sex is dependent on voting.

Total
6383
3617

	M	W	T
Y	2731	3652	6383
N	1547	2070	3617
T	4278	5722	10000

Expected frequency = 6383×4278/1000 = 2731
6383 × 5722/1000 = 3652

$\chi^2 = \sum \frac{(O-e)^2}{e} = \frac{(2792-2731)^2}{2731} + \ldots = 6.6$

df = 2-1 = 1 as the calculated value is higer we have to reject the Null hypothesys. So voting is gender dependent

PS 9

$\chi^2 = 14.96$ df = 3 ~~p = 0.005~~ $p < 0.05$

Ho = ~~say~~ preffer equaly H1: preffer unequally

~~Fe~~ on The critical value for chi-square with .05 significance level, 37.82. The calculated value is greater then ~~the~~ the critical value. So we can say that the voters donot prefer the four candidate quelly.

PS. 10

		Photograph			
Age		A	B	C	
Age	5-6 years	18	22	20	60
	7-8 years	2	28	40	70
	9-10 years	20	10	40	70
	Total	40	60	100	200

$$\sum \frac{(O-E)^2}{E} = 29.60$$ df = 4 $p < .05$

critical value for df = 4 and $p < .05$ is 9.49. we the ~~obtal~~ it is lesser then the obtained value. so we can conclude that there is a significant relationship between age and photograph reference. The valo caem have occured by chance.

PS 11

	support	Not support	T
conform	18	40	58
Not conform	32	10	42
T	50	50	100

$\frac{\Sigma(O-E)^2}{E} = \cancel{18.\ldots}$ 19.87 df = 1 $p < .05$

critical value for $p < .05$ for df 1 = 3.85

∴ The obtained value is bigger than the critical value so we can conclude that there is there is a significant difference b/w the support and no support condition in the frequency with which ~~indi~~ individuals are likely to conform.

PS 12.

	Height short	Tall	T
Leader	12	32	44
follower	22	14	36
unclassifiable	9	6	15
T	43	52	95

$\chi^2 = 10.71$ df = 2 $p < .01$

10.71 is bigger than the critical ~~x~~ χ^2 value for $p < .01$ and df = 2 so we can conclude that there is a relationship between heigh and leadership qualities

~~b3~~ PS. 13

	Married	widowed, divorced or separated	Never Married
Employed	679	103	114
Unemployed	63	10	20
Not in labor force	42	18	25

$$\chi^2 = \sum \frac{(O-E)^2}{E} = \frac{(679-65)^2}{654} \ldots\ldots$$

$$= \underline{\underline{30.96}} \qquad df = \underline{4}$$

∴ calculated value for df 4 and a for 0.05 is 9.49. ~~the~~

since ~~30.91 >~~ 30.91 is greater from calculated value we can say that marital status seems to have same ~~diffe~~ distribution as labor force status. i.e. marital status seems to be related to the labor force.