TRY FOR HW

example 2 done as Z

$$Z = \frac{.90 - .45}{\sqrt{(.6)(.4)\left(\frac{1}{100}+\frac{1}{200}\right)}} = \frac{.45}{.06} = 7.5$$

(example 2)

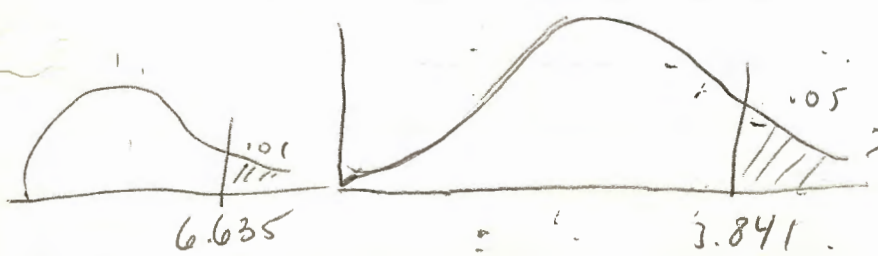
	Mailgram	Letter	
Responded	90	90	180
Did not Respond	10	110	120
	100	200	300

H_0: $P_1 = P_2$

H_1: $P_1 \neq P_2$

60	90	120	90
40	10	80	110

f_o	f_e	$(f_o - f_e)$	$(f_o - f_e)^2$	$(f_o - f_e)^2 / f_e$
90	60	30	900	15.0
10	40	-30	900	22.50
90	120	-30	900	7.50
110	80	30	900	11.25
				56.25



reject H_0

Chi-square Test for Diff. between Proportions of C-populations

4 Ways of Selling Business insurance

	Cold Call	referred Lead	Prelim. impersonal letter	Prelim. Personal letter	
Appt. Made	6	29	11	16	62
No Appt. Made	94	71	89	84	338
	100	100	100	100	400

H_0: $p_1 = p_2 = p_3 = p_4$

H_1: At least one proportion is different from the others.

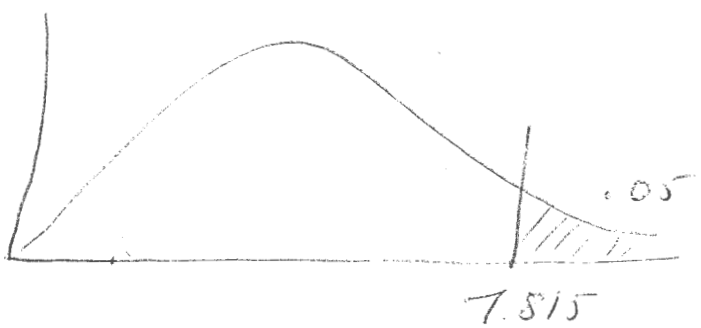
Note: All $f_e \geq 5$

15.5	15.5	15.5	15.5	
6	29	11	16	62
84.5	84.5	84.5	84.5	
94	71	89	84	338
100	100	100	100	400

f_o	f_e	$f_o - f_e$	$(f_o - f_e)^2$	$(f_o - f_e)^2 / f_e$
6	15.5	−9.5	90.25	5.82
29	15.5	13.5	182.25	11.76
11	15.5	−4.5	20.25	1.31
16	15.5	.5	.25	.02
94	84.5	9.5	90.25	1.07
71	84.5	−13.5	182.25	2.16
89	84.5	4.5	20.25	.24
84	84.5	−.5	.25	.00
				22.38

$\chi^2_{(4-1)(2-1)} = 22.38$

3 d.F.



Reject H_0

Chi-Square Test for independence

H_0: Rows and Columns are independent
H_1: Rows and Columns are related

(Example 1) H_0: Social Class + brand Pref. are indep.
H_1: " " " " " are related

		Upper Class	Middle Class	Lower Class	
Brand Preference	Brand A	130	100	70	300
	Brand B	30	400	70	500
	Brand C	20	60	20	100
	Brand D	20	40	40	100
		200	600	200	1000

60 130	180 100	60 70
100 30	300 400	100 70
20 20	60 60	20 20
20 20	60 40	20 40

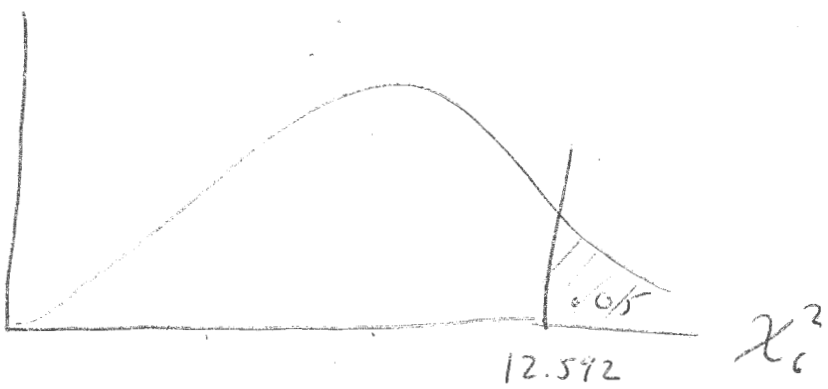
all greater than 5

Already larger than crit. value.

f_o	f_e	$f_o - f_e$	$(f_o - f_e)^2$	$(f_o - f_e)^2 / f_e$
130	60	70	4900	81.67
30	100	−70	4900	49.00
20	20	0	0	0
20	20	0	0	0
100	180	−80	6400	35.56
400	300	100	10000	33.33
60	60	0	0	0
40	60	−20	400	6.67
70	60	10	100	1.67
70	100	−30	900	9.00
20	20	0	0	0
40	20	20	400	20.00
		0		236.90

$\chi^2_{6 \text{ d.f.}} = 236.90$

$(4-1)(3-1) = 6$



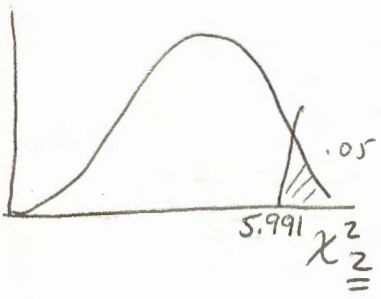
Reject H_0

(example 2)

H_0: Ethnicity and Political Pref are . .
H_1: " " " are related

		nonwhite	white
Politician	Jack Crook	6	17
	Jane Hood	10	45
	Rob Thief	6	23

2 d.f.



	nonwhite	white	
	4.7 / 6	18.3 / 17	23
	11.3 / 10	43.7 / 45	55
	6.0 / 6	23.0 / 23	29
	22	85	107

f_o	f_e	$f_o - f_e$	$(f_o - f_e)^2$	$(f_o - f_e)^2 / f_e$
6	4.7	1.3	1.69	.36
10	11.3	-1.3	1.69	.15
6	6.0	0	0	0
17	18.3	-1.3	1.69	.09
45	43.7	1.3	1.69	.04
23	23.0	0	0	0
		0		.64

Accept H_0

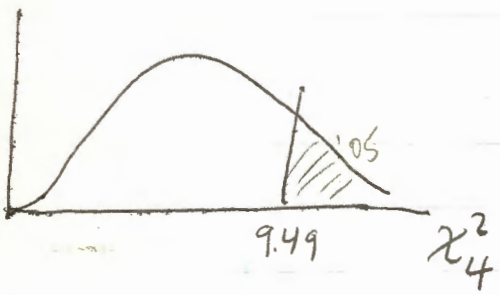
$\alpha = .05$

(example 3)

H_0: Sex & Prog Type Preference are independent
H_1: " " " " are related

Preferred Program Type

	Sex: Men	Sex: Women	
Western	28.7 **32**	21.3 **18**	50
Comedy	17.2 **17**	12.8 **13**	30
Drama	34.5 **27**	25.5 **33**	60
News	15.5 **19**	11.5 **8**	27
Variety	23.0 **24**	17.0 **16**	40
	119	88	207



f_o	f_e	$f_o - f_e$	$(f_o - f_e)^2$	$(f_o - f_e)^2/f_e$
32	28.7	3.3	10.89	.40
17	17.2	-.2	.04	.00
27	34.5	-7.5	56.25	1.63
19	15.5	3.5	12.25	.79
24	23.0	1.0	1.00	.04
18	21.3	-3.3	10.89	.51
13	12.8	.2	.04	.00
33	25.5	7.5	56.25	2.21
8	11.5	-3.5	12.25	1.07
16	17.0	-1.0	1.00	.06
				6.71

Do not Reject

Cramer's Coefficient (Cramer's V)

(Measure of association for contingency table)

Cramer's Coefficient - is a measure of assoc. ranging from 0 (when $\chi^2 = 0$ i.e., perfect indep.) to 1 (computed χ^2 = maximum i.e., perfect relationship).

$$\text{Cramer's coefficient} = \sqrt{\frac{\text{Computed } \chi^2}{\text{Maximum } \chi^2}}$$

$$\text{Maximum } \chi^2 = n(L-1)$$

L = Minimum(r, c)

r = # rows c = # cols

f_o

	SEX: MALE	SEX: FEMALE	
HEAVY	11	10	21
MEDIUM	15	9	24
LIGHT	20	6	26
NON USER	9	29	38
	55	54	109

SPSSX output

$\chi^2 = 19.60$

d.f. = 3

Sig = .0002

Cramer's V = .424

Contingency Coeffic = .39

(Max χ^2 for this problem is $109(2-1) = 109$)

f_e

	Male	Female	
H	10.6	10.4	21
M	12.1	11.9	24
L	13.1	12.9	26
NU	19.2 *	18.8 *	38
	55	54	

* cells with biggest $f_o - f_e$ differences

Chi-Square Goodness of fit Test

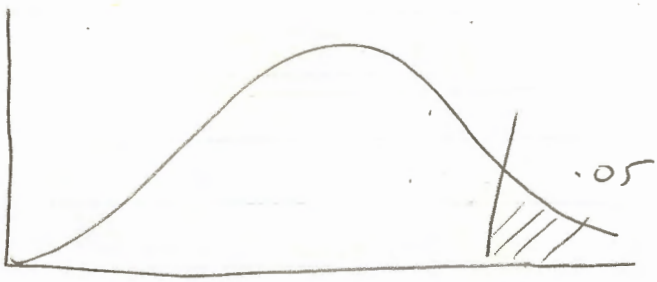
(example 1) Wish to determine whether a die follow a uniform distribution (i.e. is fair)

Ho: Die follow uniform Distribution

Die Tossed 60 times

X	f_o	f_e	$f_o - f_e$	$(f_o - f_e)^2$	$(f_o - f_e)^2/f_e$
1	8	10	-2	4	.4
2	12	10	2	4	.4
3	10	10	0	0	0
4	11	10	1	1	.1
5	12	10	2	4	.4
6	7	10	-3	9	.9
		60	0		2.2

You lose one d.f. because there are 6 (Categories) Classes and you are forcing the total of the expected frequencies to equal the total of the observed frequencies.



Accept H_0

(example 2) H_0: 7 Territories Follow uniform Dist

7 Sales Areas	# of inquiries f_o	f_e	$f_o - f_e$	$(f_o - f_e)^2$	$(f_o - f_e)^2 / f_e$
A	6	10	-4	16	1.6
B	15	10	5	25	2.5
C	7	10	-3	9	.9
D	4	10	-6	36	3.6
E	17	10	7	49	4.9
F	11	10	1	1	.1
G	10	10	0	0	0
	70	70	0		13.6

Reject H_0