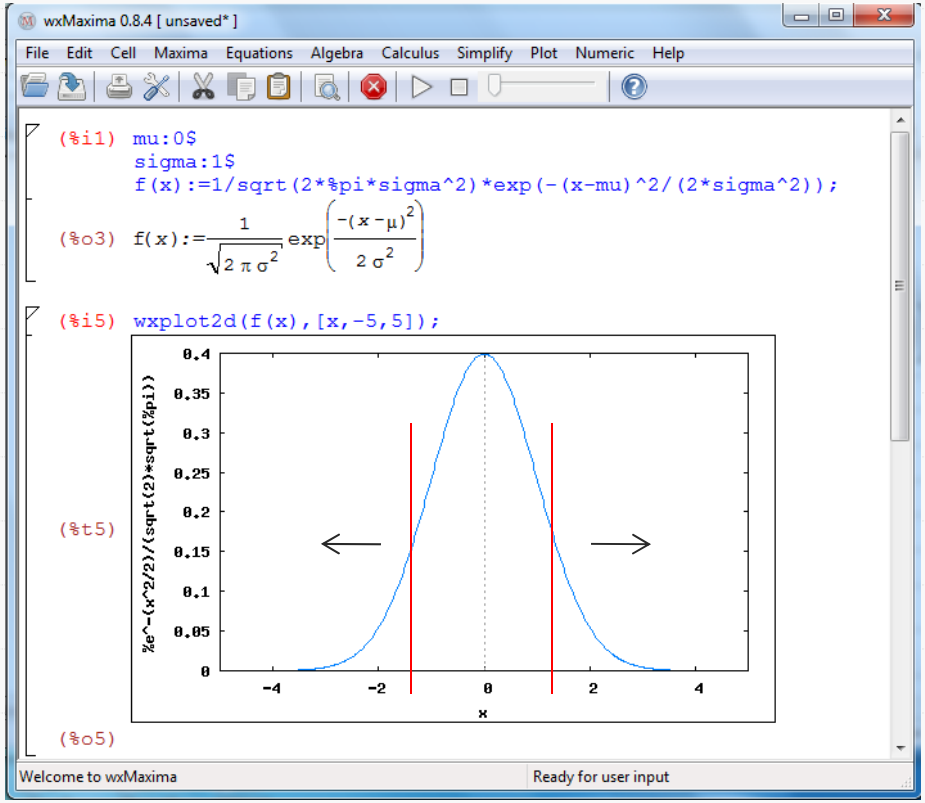
May 26, 2010

- Meaning of the chi-square test
  - Meaning of the significance level
  - Let's think again your survey investigation.

χ^2 Analysis

- The significance level (p)
  - Probability of the deviation from the normal



$$f(x) = \frac{1}{\sqrt{2\pi\sigma^2}} \exp\left(-\frac{(x-\mu)^2}{2\sigma^2}\right)$$

If you have a criterion for deciding the significant deviation, that criterion can be called as a significance level.

One sample χ^2 test

- Chi square Goodness of fit
  - To compare a collection of categorical data with some theoretical expected distribution.

- Example: On Friday, there happens abnormal accident rate. Can you say that?

Date2	Mon	Tue	Wed	Thr	Fri	Sat	Sun	Total
Accident	2	2	1	2	13	3	2	25

http://math.hws.edu/javamath/ryan/ChiSquare.html

χ^2 Analysis

- Significance level (p-value)

Chi squared																									
Degrees of freedom (df)																									
25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	p value
11.52	10.86	10.20	9.54	8.90	8.26	7.63	7.01	6.41	5.81	5.23	4.66	4.11	3.57	3.05	2.56	2.09	1.65	1.24	0.87	0.55	0.30	0.11	0.02	0.00	.99
16.47	15.66	14.85	14.04	13.24	12.44	11.65	10.86	10.09	9.31	8.55	7.79	7.04	6.30	5.58	4.87	4.17	3.49	2.83	2.20	1.61	1.06	0.58	0.21	0.02	.90
18.94	18.06	17.19	16.31	15.44	14.58	13.72	12.86	12.00	11.15	10.31	9.47	8.63	7.81	6.99	6.18	5.38	4.59	3.82	3.07	2.34	1.65	1.01	0.45	0.06	.80
20.87	19.94	19.02	18.10	17.18	16.27	15.35	14.44	13.53	12.62	11.72	10.82	9.93	9.03	8.15	7.27	6.39	5.53	4.67	3.83	3.00	2.19	1.42	0.71	0.15	.70
22.62	21.65	20.69	19.73	18.77	17.81	16.85	15.89	14.94	13.98	13.03	12.08	11.13	10.18	9.24	8.30	7.36	6.42	5.49	4.57	3.66	2.75	1.87	1.02	0.27	.60
24.34	23.34	22.34	21.34	20.34	19.34	18.34	17.34	16.34	15.34	14.34	13.34	12.34	11.34	10.34	9.34	8.34	7.34	6.35	5.35	4.35	3.36	2.37	1.39	0.45	.50
26.14	25.11	24.07	23.03	21.99	20.95	19.91	18.87	17.82	16.78	15.73	14.69	13.64	12.58	11.53	10.47	9.41	8.35	7.28	6.21	5.13	4.04	2.95	1.83	0.71	.40
28.17	27.10	26.02	24.94	23.86	22.77	21.69	20.60	19.51	18.42	17.32	16.22	15.12	14.01	12.90	11.78	10.66	9.52	8.38	7.23	6.06	4.88	3.66	2.41	1.07	.30
30.68	29.55	28.43	27.30	26.17	25.04	23.90	22.76	21.61	20.47	19.31	18.15	16.98	15.81	14.63	13.44	12.24	11.03	9.80	8.56	7.29	5.99	4.64	3.22	1.64	.20
32.28	31.13	29.98	28.82	27.66	26.50	25.33	24.16	22.98	21.79	20.60	19.41	18.20	16.99	15.77	14.53	13.29	12.03	10.75	9.45	8.12	6.74	5.32	3.79	2.07	.15
34.38	33.20	32.01	30.81	29.62	28.41	27.20	25.99	24.77	23.54	22.31	21.06	19.81	18.55	17.28	15.99	14.68	13.36	12.02	10.64	9.24	7.78	6.25	4.61	2.71	.10
34.90	33.71	32.51	31.31	30.10	28.89	27.67	26.45	25.21	23.98	22.73	21.48	20.21	18.94	17.65	16.35	15.03	13.70	12.34	10.95	9.52	8.04	6.49	4.82	2.87	.09
35.47	34.27	33.06	31.85	30.63	29.41	28.18	26.95	25.71	24.46	23.20	21.93	20.66	19.37	18.07	16.75	15.42	14.07	12.69	11.28	9.84	8.34	6.76	5.05	3.06	.08
36.11	34.89	33.68	32.45	31.22	29.99	28.75	27.50	26.25	24.99	23.72	22.44	21.15	19.85	18.53	17.20	15.85	14.48	13.09	11.66	10.19	8.67	7.06	5.32	3.28	.07
36.82	35.60	34.37	33.13	31.89	30.65	29.40	28.14	26.87	25.59	24.31	23.02	21.71	20.39	19.06	17.71	16.35	14.96	13.54	12.09	10.60	9.04	7.41	5.63	3.54	.06
37.65	36.42	35.17	33.92	32.67	31.41	30.14	28.87	27.59	26.30	25.00	23.68	22.36	21.03	19.68	18.31	16.92	15.51	14.07	12.59	11.07	9.49	7.81	5.99	3.84	.05
38.64	37.39	36.13	34.87	33.60	32.32	31.04	29.75	28.44	27.14	25.82	24.49	23.14	21.79	20.41	19.02	17.61	16.17	14.70	13.20	11.64	10.03	8.31	6.44	4.22	.04
39.88	38.61	37.33	36.05	34.76	33.46	32.16	30.84	29.52	28.19	26.85	25.49	24.12	22.74	21.34	19.92	18.48	17.01	15.51	13.97	12.37	10.71	8.95	7.01	4.71	.03
41.57	40.27	38.97	37.66	36.34	35.02	33.69	32.35	31.00	29.63	28.26	26.87	25.47	24.05	22.62	21.16	19.68	18.17	16.62	15.03	13.39	11.67	9.84	7.82	5.41	.02
44.31	42.98	41.64	40.29	38.93	37.57	36.19	34.81	33.41	32.00	30.58	29.14	27.69	26.22	24.73	23.21	21.67	20.09	18.48	16.81	15.09	13.28	11.34	9.21	6.63	.01
52.62	51.18	49.73	48.27	46.80	45.31	43.82	42.31	40.79	39.25	37.70	36.12	34.53	32.91	31.26	29.59	27.88	26.12	24.32	22.46	20.51	18.47	16.27	13.82	10.83	.001
Note. Problems with df>25 would rarely be worked by hand.																									

http://www.sociology.ohio-state.edu/people/ptv/publications/p%20values/p_value_tables.html

Draw a conclusion of your survey

- Establish the assumption of your survey.
- Calculate the chi-square value from the contingency table.
- Calculate the p-value for deciding whether the assumption if right or not.

- Let's present your results to your classmates.