

χ^2 - Test of Homogeneity

(exp. values \rightarrow fill in table same as independence)
show work at least 2 cells

H_0 : The actual color prop. are the same for each type of M&M.

H_a : " " " " are NOT the same for " " " "

$$\chi^2 = \frac{(20 - 15.05)^2}{15.05} + \frac{(18 - 15.05)^2}{15.05} + \dots + \frac{(9 - \cancel{8.2})^2}{7.98}$$

$$\chi^2 = 22.92$$

$$P(\chi^2 > 22.92) = .0111$$

$$df = (6-1)(3-1) = 10$$

* exp ≥ 5

smallest is ~~8.2~~ 7.98 (see table)

* 3 ind (diff. types) of m&m's random samples ^{M&M's} were taken

with a p-value of .0111, this is NOT sign. at .01 level.

Fail to reject H_0 . There is not enough evid. to say the color dist. differs for the 3 types of m&m's

X² - Test for Independence

	E = $\frac{188 \cdot 104}{400}$	cash	Credit	debit	T	E = $\frac{188 \cdot 79}{400}$
Dine-in		34 (48.88)	122 (101.99)	32 (37.13)	188	
Takeout		70 (55.12)	95 (115.01)	47 (41.87)	212	
T		104	217	79	400	

H₀: Method of payment & order type are independent

H_a: " " " " " are not ind.

$$d.f. = (3-1)(2-1) = 2$$

$$X^2 = \frac{(34 - 48.88)^2}{48.88} + \frac{(122 - 101.99)^2}{101.99} + \frac{(32 - 37.13)^2}{37.13} + \frac{(70 - 55.12)^2}{55.12} + \frac{(95 - 115.01)^2}{115.01} + \frac{(47 - 41.87)^2}{41.87}$$

$$X^2 = 17.29$$

$$Pr(X^2 > 17.29) = .0002$$

Cond:

$$* exp. \geq 5$$

(smallest is 37.13)

SRS from pop. of interest:

* says random sample of orders

With a p-value of .0002, this is sign. at .05 level.

Reject H₀.

There is evid that there is an assoc. between method of payment & type of order.

χ^2 -GOF

color	Green	Blue	Purple/Pink	Other	Total
obs	86	21	6	7	120
exp	90	10.8	7.2	12	120
	.75(120)	.09 .09(120)	.06(120)	.10(120)	

H_0 : actual prop. of bee stings for each color is as stated on the website (75% Green, 9% Blue, 6% P/P, 10% other)
 H_a : at least one of the color prop. differs from above.

$$df = 4 - 1 = 3$$

$$\chi^2 = \frac{(86-90)^2}{90} + \frac{(21-10.8)^2}{10.8} + \frac{(6-7.2)^2}{7.2} + \frac{(7-12)^2}{12}$$

$$\chi^2 = 12.09$$

$$Pr(\chi^2 > 12.09) = .0071$$

Cond.

$$\bullet \text{ exp.} \geq 5?$$

Yes, smallest is 7.2
sks from pop. of int?
randomly selected

people stung by
killer bees.

Since the p-value of .0071 is sign at the .01 level, I reject H_0 . There is evid. that the prop. of bee stings for each color is different from the % on the website

2-Prop Z Test

$$\hat{p}_w = \frac{58}{248} = .2339$$

$$\hat{p}_m = \frac{120}{387} = .3101$$

$$\hat{p}_c = \frac{58+120}{248+387} = .2803$$

	W	M	
changed	58	120	178
didn't	190	267	457
	248	387	635

2 independent SRS from pop. of int. :
* problems says random sample of women & random sample of men.
* $n_1 + n_2$ are large enough

comp:

$$n_1 \hat{p}_1 \geq 5$$

$$248 \left(\frac{58}{248} \right) \geq 5$$

$$58 \geq 5$$

$$n_2 (1 - \hat{p}_1) \geq 5$$

$$248 \left(1 - \frac{58}{248} \right) \geq 5$$

$$190 \geq 5$$

$$n_2 (1 - \hat{p}_2) \geq 5$$

$$387 \left(1 - \frac{120}{387} \right) \geq 5$$

$$267 \geq 5$$

$$H_0: p_w = p_m$$

$$H_a: p_w < p_m$$

p = actual prop. who changed political affiliation since the last election.

p_w = women p_m = men

$$z = \frac{.2339 - .3101}{\sqrt{\frac{.2803(1-.2803)}{248} + \frac{.2803(1-.2803)}{387}}} = -2.09$$

$$\Pr(z < -2.09) = .0185$$

(p-value)

with a p-value of .0185, this is sign. at the .05 level.

Reject H_0 . There is convincing evidence that the prop. changing pol. affil. is greater for men than women. (or less for women than men)

2 sample t-test for means

μ_A = actual mean growth (cm) ~~is~~ for all roses that would use fert. A.
 μ_B = " " " " " " " " B.

$$H_0: \mu_B = \mu_A$$

$H_a: \mu_B > \mu_A$ growth is greater for B.

cond.

- * roses were randomly assigned to fert. A or B
- * $n_1 = 87 \geq 30$ $n_2 = 83 \geq 30$

$$t = \frac{13.3 - 12.7}{\sqrt{\frac{2.2^2}{83} + \frac{1.5^2}{87}}} = 2.07$$

$$Pr(t > 2.07) = .0202 \text{ (calc)}$$

$$d.f. = 143.88$$

or use chart for p-value
cons. $df = 82$

with a p-value of .0202, this is sign. at the .05 level. Reject H_0 . There is enough evid. to say that Fert. B results in greater mean growth. (since it's an exp., I can say 'cause') So I recommend B, even though it costs more.