CH 14 Packet

① (a) H_0: $P_{CA} = .52$, $P_A = .27$ $P_M = .13$ $P_B = .08$
H_a: At least one prop is diff from stated/claim

(b) Ex. Count
C: $150(.52) = 78$
A: $150(.27) = 40.5$
M: $150(.13) = 19.5$
B: $150(.08) = 12$

(c) L1=O L2=E $\chi^2 = 6.599$ ✓ pval = .085 ✓ Calc χ^2 GOF

$\frac{(Obs-Exp)^2}{Exp}$

$\frac{(83-78)^2}{78} + \frac{(29-40.2)^2}{40.2} + \frac{(20-19.5)^2}{19.5} + \frac{(18-12)^2}{12}$

$.3205 + 3.1204 + .0128 + 3 = 6.454$

Calculator Pval .015

③ (a) P-val = .061
χ^2cdf: $(4.49, \infty, 5) = .4812$
(b) χ^2cdf$(4.49, \infty, 1) = .0341$

⑤ $df = (4-1) = \boxed{3}$ EV counts all ≥ 5 ✓

Pval = .085 If $\alpha = .05 \rightarrow$ FTR H_0
.015 If $\alpha = .10 \rightarrow$ Reject H_0

⑦ Time spent doing HW is QUANTITATIVE chi sq only for categorical

⑨ 100 ÷ 6 20 each color → 120
H_0: $P_O = .167$ $P_Y = .167$ $P_P = .167$ $P_R = .167$ $P_B = .167$ $P_G = .167$
H_a: At least one color is different

* EV For each = 20 (≥5 ✓) df = 5

$\chi^2 = \frac{(28-20)^2}{20} + \frac{(21-20)^2}{20} + \frac{(16-20)^2}{20} + \frac{(25-20)^2}{20} + \frac{(14-20)^2}{20} + \frac{(16-20)^2}{20} = \boxed{7.9 = \chi^2}$

✓ $\boxed{p = .1618}$ FTR H_0

Insuff. ev to Reject H_0 and support H_a that amounts are different

(10) $n=4344$ $\alpha=.01$
$df=11$

H_0: Astrological signs are distributed equally
H_a: Astrological signs not distributed equally

Exp. Val $=362$ Each sign (Random, Ob >5 ✓)

L1 = Observed
L2 = Expected

χ^2 GOF (L1, L2) $\chi^2 = 36489.9$, $p=0 \Rightarrow$ R H_0

With $p=0 < \alpha(=.01)$ There is suff Ev. to Reject H_0 and support the Alternative that the Astrological signs are not distributed equally.

~~(17)~~ Finish

H_0: $P_L=.20$ $P_{Gt}=.20$ $P_b=.20$ $P_S=.2$ $P_G=.2$
H_a: at least one prop is different from .2

Ecounts $\Rightarrow$ Each $(60)(.2)=12$ $(12>5$ ✓)
$df=4$

(c) Table: $\alpha@.05=9.49$ $\alpha@.01=13.28$
So $\chi^2>9.49$ would provide evidence to reject H_0 at $\alpha=.05$ and $\chi^2>13.28$ at $\alpha=.01$

~~(17)~~ → skip d

Test For homogeneity

(29) H_0: There is no diff in the survey color + the candy color you choose
(31) H_a: There is a diff in the survey color + candy color you choose

(b) Expected Counts Exc > 5 ✓

	Red	Blue	control
Red	8.67	8.67	8.67
Blue	11.33	11.33	11.33

$\frac{(26)(20)}{60}$

(c) $\chi^2 = \chi^2$-test [A] [B]
OB OC
→ CALC

$\chi^2 = 7.29$ $p = .026$

$$\chi^2 = \frac{(13-8.67)^2}{8.67} + \frac{(5-8.67)^2}{8.67} + \frac{(8-8.67)^2}{8.67} + \frac{(7-11.33)^2}{11.33} + \frac{(15-11.33)^2}{11.33} + \frac{(12-11.33)^2}{11.33}$$

$2.16 + 1.55 + .052 + 1.655 + 1.189 + .0396$

$\chi^2 = 6.64$

(1.0359)

at $\alpha = .01$ and $P_{val} = .026$, We Fail to reject H_0 and thus cannot support the alternative that there is a difference in the candy color you choose & the survey color you take

(33) Because we dont have actual counts of travelers in each category - also dont know random + indep.

(35) H_0: The GummyBear Distributions same Name Br vs Store Br.
H_a: The GB distributions are not same for Br Name vs Store Br.

[4] = Data df = 4
χ^2-Test → $\chi^2 = 1.81$ | $P = .769$ ≮ .05 → FTR H_0

For Homogeneity

Condit ★ Random → Indep. rand samples
★ 10% → n = 373 < 10% of all name brand gB
n = 622 < 10% of all Store brand gB
★ Large Counts → exp counts greater than 5

B/c $P > \alpha$ we can not reject H_0 that dist. are same
Insuff. ev. to tell there is a difference in the GB distributions of color btwn store brand + name brand gBs.

(37) H_0: The true proportions of smokers like these who quit for a year are the same for each treatment
H_a: The true proportions of smokers like these who quit for a year are not the same for each treatment

		Treatment				
		NicPatch	Drug	Patch + Drug	Placebo	Total
Outcome	Success	40	74	87	25	226
	failure	204	170	158	135	667
		244	244	245	160	893

df = 3 ⇒ (2-1)(4-1) = 3

$p = 1.26 \times 10^{-7} \Rightarrow 0$

$P = 0 < .05$ → Reject H_0

There is suff. ev. to support the 4 treatments have different ~~prop~~ outcome proportions for those who quit after year

Conditions
- Random - double blind
- 10% → all smokers 893 < 10%
- Exp counts > 5

(41) χ^2 test for independence

Ho: There is no association btwn weekly sauna frequency and suffering SCD in middle aged men in Finland

Ha: There is an association btwn weekly sauna frequency and suffering SCD in middle aged men in Finland

(b) Expected counts

	1 or less	2-3	4+
Yes	49.32	124.18	16.5
No	551.67	1388.8	184.5

Conditions
random
indep
10% rule
Large #'s - EV≥5

$\frac{(190)(601)}{2315} = 35.52$ $\frac{(190)(1513)}{2315} = 124.18$

$\frac{(2125)(601)}{2315} = 551.67$ $\frac{(2125)(1513)}{2315} = 1388.8$

$\frac{(190)(201)}{2315} = 16.5$ $\frac{(2125)(201)}{2315} = 184.5$

χ^2 Test [A] = obs. (input only)
[B] = exp

df = 2 $\chi^2 = 6.03$ Pval = .049 → Reject Ho

Because P-value = .049 < .05 = α, we Reject the Ho. There is convincing evidence that there is an association between weekly sauna frequency and suffering from Sudden Cardiac Death for middle aged men in eastern Finland

(42) **Ho:** There is no association in the opinion about astrology being a science and the degree/education level of a person

Ha: There is an association in the opinion about astrology being a science and the degree/education level of a person

Expected Counts

	Associates	Bach	Masters
Not Scientific	183.59	251.85	103.56
Very or sort of Scientific	50.41	69.15	28.44

χ^2 Test for independ.

[A] - obs $\chi^2 = 10.58$ df = 2

[B] → exp   P = .005 → Reject Ho → write conclusion

tells reader what test you're doing

(45) Conditions → for Chi Squared for independence test

- Random → stated random sample
- ? ✗ Independence → peoples opin. & their own
- 10% → sample 1509 < 10% of tot. pop of US adults
- Large #'s → Exp. Counts ≥ 5

H_0: There is no association between age of a person and their opinion on whether they support new spending Bill by Fed gov...

H_a: There is an association between age of person and their opinion on whether they support new spending Bill by Fed gov...

[A] - observed counts [B] Expected counts

df = 6 $(4-1)(3-1) = 3 \times 2$

χ^2 test: [A] $\chi^2 = 39.75$ (Hqw)

[B] pval = $5.09 \times 10^{-7} \approx 0 \Rightarrow$ Reject H_0

With p-value approx = 0, we can reject the H_0 We have sufficient evidence then, to support the alternative that there is an association Between the age of a person and their opinion on whether the support new Bill by Fed gov that would help undergrads pay for college w/o loan.