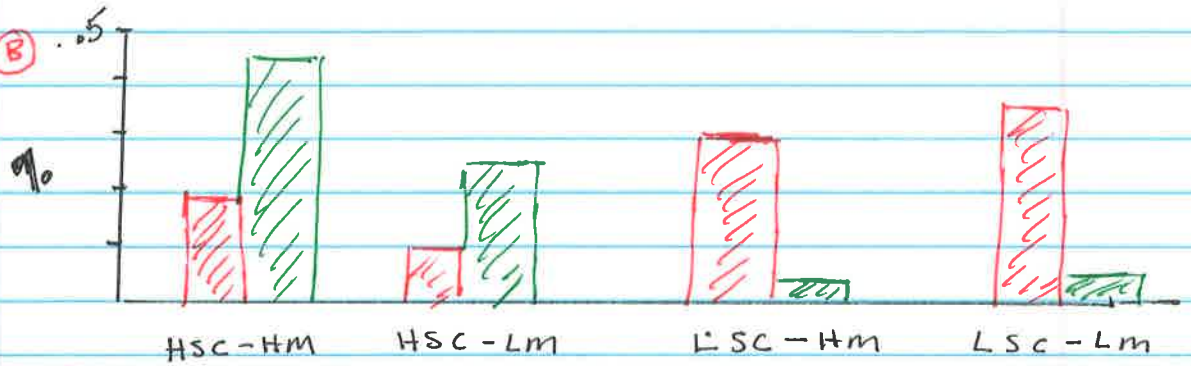
11.2 HW #'s 27, 29, 31, 33, 35

(27) (A) OBSERVED COUNTS FOR SPORTS GOALS

Goal	Female	Male
HSC - Hm	14/67 = .209	31/67 = .463
HSC - Lm	.104	.269
LSC - Hm	.313	.075
LSC - Lm	.373	.194
	.999	1.001

(B)



(C) REVIEWING THE SOCIAL COMPONENT, FEMALES WERE CLASSIFIED AS LOW SOCIAL COMPARISON, WHILE MEN WERE CLASSIFIED MOSTLY AS HIGH SOCIAL COMPARISON.

MEN WERE HEAVILY WEIGHTED IN THE HIGH SOCIAL - HIGH MASTERY GROUP.

WHILE WOMEN WERE FOUND TO BE HEAVILY WEIGHTED IN THE LOW SOCIAL - LOW MASTERY GROUP

(29) [A] H_0: THERE IS NO DIFFERENCE IN THE DISTRIBUTION OF SPORTS GOALS FOR MEN AND WOMEN UNDER GRADUATES

H_A: THERE IS A DIFFERENCE IN GOALS FOR MEN AND WOMEN

[B] EXPECTED COUNTS

GOAL	FEMALES		MALES	TOTALS
HSC-HM	22.5	$\frac{45(67)}{134}$	22.5	45
HSC-LM	12.5	$\frac{25(67)}{134}$	12.5	25
LSC-HM	13.0	$\frac{26(67)}{134}$	13.0	26
LSC-LM	19.0	$\frac{38(67)}{134}$	19.0	38
TOTALS	67		67	134

Calculations are the same for men and women since they had the same sample size.

HOW TO ORGANIZE TABLE:

1. SET UP LIKE OBSERVED COUNTS
2. FIND THE ROW + COLUMN TOTALS
3. Calculate EXPECTED COUNTS = $\frac{(\text{Column total})(\text{row total})}{\text{Total Sample size}}$

[C] χ^2 CONTRIBUTIONS

Goal	Females	males
HSC-HM	3.21	3.21
HSC-LM	2.42	2.42
LSC-HM	4.92	4.92
LSC-LM	1.89	1.89
	12.44	12.44

$\boxed{\chi^2 = 24.88}$

Hand Calculation

$\chi^2 = \frac{(O-E)^2}{E} = \frac{(14-22.5)^2}{22.5}$

USE LISTS TO CHECK CALC'S

L1 = OBSERVED L2 = EXPECTED

L3 = $(L1-L2)^2/L2$

1-VAR STATS [L3] → $\Sigma x = 24.89$

(31) A **CONDITIONS**

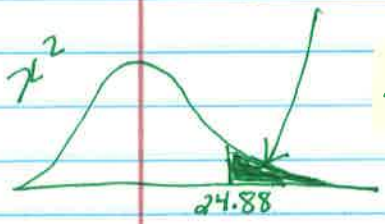
Random – the data came from random samples

INDEPENDENT – since sampling without replacement, we must check the 10% CONDITION. There are more than $67(10) = 670$ men and women college students at a large university

Large Sample size – The expected counts were all at least 5. See the table with the expected counts

B You DO NOT NEED TO USE TABLE C TO find pvalue. Use YOUR CALCOLCTOR

$$\text{pvalue} = P(\chi^2 > 24.88) = .000016$$



$df = (\text{rows} - 1)(\text{Columns} - 1) = (4-1)(2-1) = 3 \cdot 1 = 3$

$\chi^2 cdf(24.88, E99, 3) = 1.6E^{-5}$

C ASSUMING THAT THERE IS NO DIFFERENCE IN THE DISTRIBUTIONS OF GOALS FOR PLAYING SPORTS AMONG MALES AND FEMALES, THE PROBABILITY OF OBSERVING A DIFFERENCE IN DISTRIBUTIONS OF GOALS FOR THE 2 SAMPLES AS LARGE OR LARGER THAN THE ONE FOUND IN THIS STUDY IS ABOUT 2 IN 100,000.

D SINCE THE PVALUE IS SO SMALL, WE REJECT H_0. THERE IS CONVINCING EVIDENCE OF A DIFFERENCE IN THE DISTRIBUTION OF GOALS FOR PLAYING SPORTS AMONG MALE AND FEMALE UNDERGRADS.

33 [A]

OBSERVED

TEMP	HATCH	%	DID NOT HATCH	TOTAL
COLD	16	.59	11	27
NEUTRAL	38	.68	18	56
HOT	75	.72	29	104
TOTAL	129		58	187

[B] EXPECTED COUNTS

TEMP	HATCH	NOT HATCH
COLD	18.6	8.4
NEUTRAL	38.6	17.4
HOT	71.8	32.2
TOTAL	129	58

THE PROPORTION IN EACH GROUP ARE COLD (.59) NEUTRAL (.68), HOT (.72). THE DIFFERENCES SUPPORT THE RESEARCHERS CLAIM THAT THE WARMER THE TEMPERATURE THE HIGHER THE PROPORTION OF HATCHED EGGS

[B] TAKE ADVANTAGE OF CALC TO DO χ^2 TOH. SEE PAGE 705.

① PUT OBSERVED COUNTS IN MATRIX A

② SET (STAT) (TEST) χ^2-TEST FOR MATRICES
OBS - [A]
EXP - [B]

③ PUT EXPECTED COUNTS FROM MATRIX B IN A TABLE (See above)

[B] H_0: There is no difference in the proportion of eggs that hatch based on water temperature

H_A: There is a difference in the proportions

TEST: χ^2 TEST OF HOMOGENEITY

CONDITIONS

Random - the data comes from a randomized experiment.

Independent - due to the random assignment, the 3 groups of eggs can be viewed as independent.

Large Sample - the expected counts are all greater than 5. See the above table for the expected counts.

33B (cont)

Calculations: $df = (3-1)(2-1) = 2$

$\chi^2 = 1.70$

STAT → TESTS → χ^2-Test

pvalue = $P(\chi^2 > 1.70) = .4267$

Conclusion Since the p-value is very large, we fail to reject H_0. We do not have enough evidence to say that different proportions of eggs hatch in different water temperatures.

35 There are several reasons why a χ^2 test can not be used

① The data provided are %'s. You must have observed counts for a χ^2 test

② We do not know if the sample was taken randomly

③ We do not know if the same people could have been counted more than once. Traveling both for leisure one time and another for business.

11.2-DAY2

#'S 45, 49, 51

45

OBSERVED COUNTS

	BUYERS		NON BUYERS	
QUALITY	n	%	n	%
HIGHER	20	.56	29	.30
SAME	7	.19	25	.26
LOWER	9	.25	43	.44
	36	1.00	97	1.00

A

BASED ON THE GRAPH, BUYERS TEND TO BELIEVE RECYCLED COFFEE FILTERS HAVE HIGHER QUALITY. WHILE NON BUYERS BELIEVE THE OPPOSITE AND TEND TO RATE THE QUALITY AS LOWER.

B

H_0: BUYING RECYCLED PRODUCTS IS INDEPENDENT OF QUALITY

H_A: BUYING RECYCLED PRODUCT IS NOT INDEPENDENT OF QUALITY

TEST: CHISQUARE TEST OF INDEPENDENCE $\alpha = .05$

CONDITIONS:

Random: Data came from a random sample

Independent: Since sampling without replacement, we check 10% condition. It's reasonable there are more than 1,330 adults

Large Sample: Looking at the computer output, the row shows the expected counts. All expected counts are greater than 5

45B (Cont)

Calculations $\chi^2 = 7.638$ $df = (3-1)(2-1) = 2$

Pvalue $= P(\chi^2 > 7.638) = .022$

Conclusion Since the pvalue (.022) is less than $\alpha = .05$, we reject H_0. AND Conclude that buying recycled coffee filters is NOT independent of their perceived QUALITY.

⇓

Could also conclude: We have convincing evidence there is an association between Quality perceived and recycled coffee filters

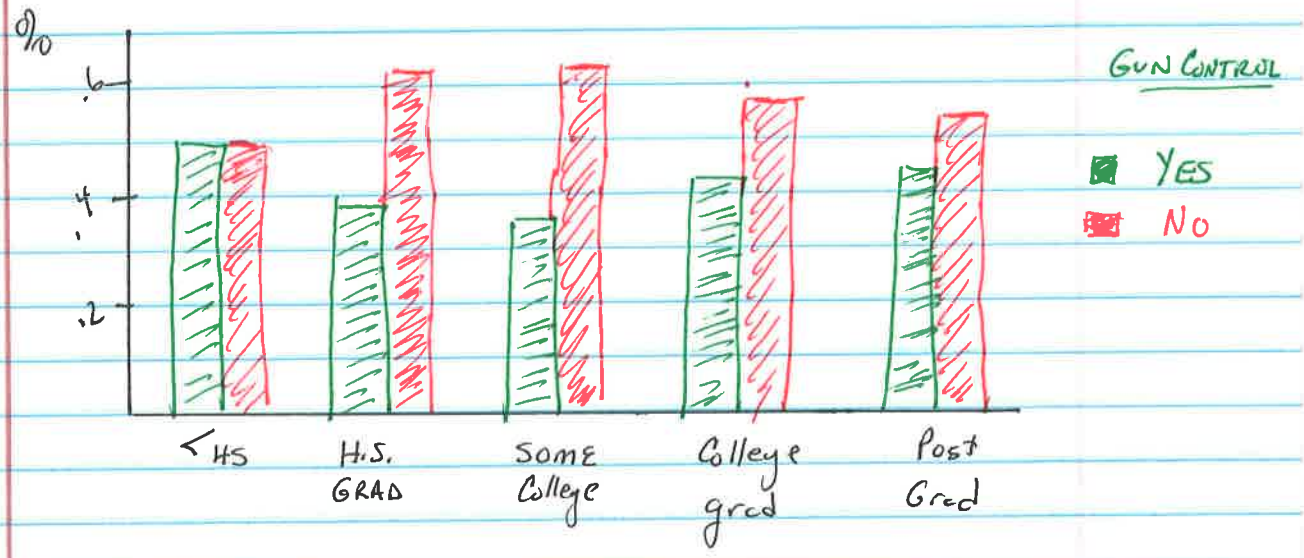
49A

OBSERVED COUNTS

	GUN CONTROL YES		GUN CONTROL NO	
EDUCATION	n	%	n	%
< H.S.	58	.50	58	.50
H.S. GRAD	84	.39	129	.61
some college	169	.37	294	.63
college grad	98	.42	135	.58
post Grad	77	.44	99	.56
	486		715	

EXPECTED COUNTS

GUN Control YES	NO
46.94	69.06
86.19	126.81
187.36	275.64
94.29	138.71
71.22	104.78
486	715



IN EVERY EDUCATION CATEGORY, EXCEPT THE LESS THAN H.S. GROUP, RESPONDENTS SEEM TO OPPOSE A GUN CONTROL LAW.

MAY STATE HYPOTHESIS EITHER WAY

49B

H_0: EDUCATION AND SUPPORT FOR GUN LAW ARE INDEPENDENT

H_A: EDUCATION AND GUN LAW ARE NOT INDEPENDENT

H_0: THERE IS NO ASSOCIATION BETWEEN EDUCATION LEVEL AND SUPPORT OF A GUN LAW

H_A: THERE IS AN ASSOCIATION

TEST: χ^2 TEST FOR INDEPENDENCE OR ASSOCIATION

(IF YOU GET CONFUSED AS TO THE WORDING OF THE CHISQUARE TEST SIMPLY STATE "χ^2 TEST" $\alpha = .05$

CONDITIONS: Random - data came from a random sample

Independent - The sample includes 1,201 people which is less than 10% of U.S. population

Large Sample - See expected counts in the table at the prior page. ALL expected counts are greater than 5 (must list expected counts or provide table)

CALCULATIONS:

* Use Calc - enter data (observed counts) in to 5×2 MATRIX [A]
* (STAT) (TESTS) χ^2-TEST → $\chi^2 = 8.525$ df = 4 $p = .0741$
* Go to MATRIX[B] AND provide expected counts in a table or under conditions

Provide this info under Calculations

$df = (5-1)(2-1) = 4$

$$\chi^2 = \frac{(58-46.94)^2}{46.94} + \cdots + \frac{(99-104.78)^2}{104.78} = 8.525$$

$$\text{pvalue} = P(\chi^2 > 8.525) = .0741$$

49B (cont)

Conclusion: Since the pvalue (.0741) is greater than .05 we fail to reject H_0. (We do not have enough evidence to say that there is an association between educational level and support of a gun law in the population of adults)

Said another way: We can conclude that education level and support of a gun law are independent.

51 A USE χ^2 TEST OF ASSOCIATION / INDEPENDENCE BECAUSE THIS IS A SINGLE RANDOM SAMPLE (χ^2 TEST OF HOMOGENEITY COMPARES SEVERAL SAMPLES OR TREATMENTS). AND SUBJECTS WERE CLASSIFIED BY THEIR GENDER AND ANSWER.

B TEST: χ^2 TEST $\alpha = .05$

H_0: GENDER AND WHERE YOUNG ADULTS LIVE ARE INDEPENDENT (OR HAVE NO ASSOCIATION)

H_A: GENDER AND WHERE THEY LIVE ARE NOT Independent

C CONDITIONS

Random: This was a random simple

Independent: Sampling without replacement. There are more than $4,854(10) = 48,540$ young adults

Large Sample: Reviewing the computer output, all of the expected counts (printed below the observed counts) are all greater than 5.

D $\chi^2 = 11.038$ $df = (4-1)(2-1) = 3$

pvalue = $P(\chi^2 > 11.038) = .012$

Interpretation of pvalue: If gender and place of living are independent, then there is about a 1.2% chance of finding a sample of young adults with as much association or more than this one. This is fairly unlikely.

Conclusion: Since the pvalue (.012) is less than .05, we reject H_0. And conclude that gender and where young adults live are not independent. Indicating there is an association between the 2 variables.