FCS 380 Handouts Part B
Dr. Anne Marenco

Print all pages and bring to class every day

SPSS Statistics

AGE		
N	Valid	1539
	Missing	0
Mean		24.0442
Std. Deviation		5.0010
Range		23.00

AGE

			cumulative
	frequency	valid percent	percent
15	2	.1	.1
16	11	.7	.8
17	29	1.9	2.7
18	66	4.3	7.0
19	125	8.1	15.1
20	166	10.8	25.9
21	177	11.5	37.4
22	158	10.3	47.7
23	164	10.7	58.3
24	102	6.6	65.0
25	78	5.1	70.0
26	74	4.8	74.9
27	58	3.8	78.6
28	42	2.7	81.4
29	38	2.5	83.8
30	44	2.9	86.7
31	28	1.8	88.5
32	38	2.5	91.0
33	31	2.0	93.0
34	27	1.8	94.7
35	29	1.9	96.6
36	16	1.0	97.7
37	13	.8	98.5
38	23	1.5	100.0
Total	1539	100.0	

Statistical Tests

For exercises and the exam for this class, we will use four decimal places for all calculations and three decimal places for final answers. You may use however many decimal places you choose for your calculations for your data, but be consistent.

Variance (S^2) and Standard Deviation (S or SD)

Standard deviation is the average deviation scores from the mean. Variance is the square of the standard deviation; the degree to which scores vary about the group mean.

$$S^2 = \frac{\sum(X - \bar{x})^2}{N - 1}$$

$\sum$= sum of $(X - \bar{x})^2$
X = individual scores
$\bar{x}$ = mean of all scores
N = the number of scores

Chi square ($\chi^{2)}$
Used to examine whether the frequencies that are observed differ from the expected frequencies. Can look at the relationship between two variables or between two or more groups on the same variable.
Can be used with nominal data.

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

E = row total * column total / N

df = (R-1)(C-1)

O = observed frequency
E = expected frequency
R = # of rows
C = # of columns
df = degrees of freedom

It is significant if your chi square is equal to or higher than the critical value in the table. If it is significant there is some relationship between the two variables among those in your sample. If it is not significant, then the distribution of these two variables among your sample was found by chance.

***t*-Tests**

To test whether two groups are statistically different from each other on a certain measure.
1 variable with 2 groups

ex: diet results of males and females
marital satisfaction of males and females
aggression scores of boys and girls
visual appeal of maroon and burgundy

$$t = \frac{\bar{X}_1 - \bar{X}_2}{\sqrt{\frac{S^2_1}{N_1} + \frac{S^2_2}{N_2}}}$$

df=total # of participants - # of groups

Note: the square root sign is over the entire bottom half of the equation

It is significant if the *t*-value you obtained is equal to or higher than the critical value in the table. If it is not significant there is no different between the two groups on the variable of interest. If it is significant, then the two groups differ significantly on the variable of interest. Now check the sign. If it is positive, then group one had higher scores on the variable of interest. If it is negative, then group two had higher scores on the variable of interest.

Correlation coefficients

How strongly are two variables related to each other?
Only linear relationships.
Range -1 to +1

$$r = \frac{N\sum XY - (\sum X)(\sum Y)}{\sqrt{[N\sum X^2 - (\sum X)^2] * [N\sum Y^2 - (\sum Y)^2]}}$$

df = N-2
X = individual scores of variable X
Y = individual scores of variable Y

It is significant if the r-value you obtained is equal to or higher than the critical value in the table. If it is not significant there is no relationship (correlation) between the two variable of interest. If it is significant, then the two variable are correlated and they vary together (as one variable changes, goes up or down, the other variable changes also). Now check the sign. If it is positive, then they vary in the same direction. If it is negative, then they vary in opposite directions. This test only finds linear relationships. Now check the strength.

.00	no correlation
.01-.30	weak correlation
.31-.70	moderate correlation
.71-.99	strong correlation
1.00	perfect correlation

Variance and Standard Deviation Exercise

Case #	X	$\bar{x}$	$(X - \bar{x})$	$(X - \bar{x})^2$
1	4.5			
2	4.0			
3	3.5			
4	5.0			
5	4.5			
6	5.0			
7	5.0			
8	4.5			
9	5.0			
10	4.5			
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$$S^2 = \frac{\sum(X - \bar{x})^2}{N - 1}$$

Crosstabulation Exercise

You have 10 cases with the following responses on their sex and marital status

ID	Sex	Married
1	m	y
2	m	y
3	m	n
4	f	n
5	f	y
6	m	y
7	m	y
8	f	y
9	m	y
10	f	n

Crosstabulation of Marital Status by Sex

		Married		
		yes	no	Total
sex	male			
	female			
	Total			

Don't put the crosstab in the paper, it is your calculation. Display the pertinent percentages in a *proper* table or just discuss a few in the text.

Results

Univariate Demographic Analyses (note to students: analyses is plural, analysis is singular)

This sample had slightly more males (53%) than females (47%) (see Table 1). All of the respondents were high school students with a mean of just over 17 years of age (17.06). While most of the students plan to attend college (60%) or vocational school (13.3%) after graduation, 26.7% plan to work part-time while attending school. (Notice that she has discussed the variables in the order they appear in the table)

Table 1. Univariate Analysis of Demographic Variables, N=15. (Note: the title goes above the table, start two double spaces down from text, single space data in the table, left align text, decimal align numbers, center headings)

	N	%
Sex		
Male	8	53
Female	7	47
Age (mean in years)		17.06
Plans after Graduation		
College only	9	60.0
Vocational school only	2	13.3
College/voc. school & work	4	26.7

Univariate Research Analyses

This study looked at the number of Family and Consumer Science classes that respondents have taken or are planning to take. The mean number of classes was 3.2 (see Table 2). When asked if they would recommend taking Family and Consumer Science classes, the mean recommendation score was 4.27 on a five-point scale, with 1=not recommend and 5=highly recommend (15% did not recommend taking any FCS classes). This mean represents quite a strong recommendation. Those who had taken FCS classes were highly satisfied with the classes they had taken with a mean satisfaction score of 4.85 on a five-point scale, with 1=not at all satisfied and 5=highly satisfied. They were, overall, very satisfied with the classes they had taken.

Table 2. Univariate Analysis of Research Variables, N=15.

	Mean
Number of FCS Classes Taken or Planning to Take	3.20
Recommend Taking FCS Classes	4.27
Satisfaction with FCS Classes Taken	4.85

Note: keep in mind that for this student, the mean was the appropriate statistic for RV3, yours may be something else. Your table two may need to look more like table one with N, and % for RV3

Bivariate Analyses (notice that she has a significant and a non significant test of each type, you only need what is on your syllabus)

A Chi square calculation of the educational and or work plans after graduation by sex was completed. A chi square of 0.16 was obtained and at two degrees of freedom (df) the critical value was 5.991, therefore these results are not significant, meaning that the distribution of plans after graduation by sex was by chance. There is no relationship between educational/work plans and the respondent's sex in this sample.

A Chi square calculation of the recommendation of FCS classes by sex was completed. A chi square of 8.429 was obtained and at three degrees of freedom (df) the critical value was 7.815, therefore these results are significant, meaning that recommendation of FCS classes differs by sex for this sample.

I performed a *t*-Test to determine if males or females were more likely to recommend FCS classes. The *t*-value obtained was 3.75, which, at 13 degrees of freedom (df) was above the critical value of 2.160, and therefore significant, meaning that girls recommended FCS classes more highly than boys. (Females are group one and males are group two in every t-test for this study)

A *t*-Test calculation of the number of Family and Consumer Science classes respondents have taken or are planning to take by sex was completed. The *t*-value obtained was 1.75, which, at 13 degrees of freedom (df) was well below the critical value of 2.160, and therefore not

significant, meaning that there was no difference in the number of classes taken by boys and girls.

A *t*-Test was performed to see if males or females were more satisfied with the FCS classes they had taken. A significant *t*-value of -3.21 was obtained (13 degrees of freedom (df), critical value of 2.160). Males were significantly more satisfied with their FCS classes than the female students were.

A correlation of satisfaction with FCS classes and number of classes taken or planning to take was conducted with a result of .502 which, at 13 degrees of freedom and a critical value of .514 indicates no correlation. Those who have taken or are planning to take more classes are no more likely to be satisfied with these classes.

A correlation of the recommendation of taking FCS classes and number of classes taken or planning to take was conducted with a result of .872 which, at 10 degrees of freedom and a critical value of .576 indicates a strong significant correlation. Those who have taken or are planning to take more classes are more likely to recommend these classes. As can be seen in the scatter plot in Figure 1, the plot points lay in a positive linear shape, as the points representing the values on recommendation score move to higher numbers so do the dots representing number of classes taken.

When I crosstabulate sex and recommendation of taking FCS classes, I find that 86% of females highly recommended taking FCS classes, while only 32% of males recommended these classes so highly.

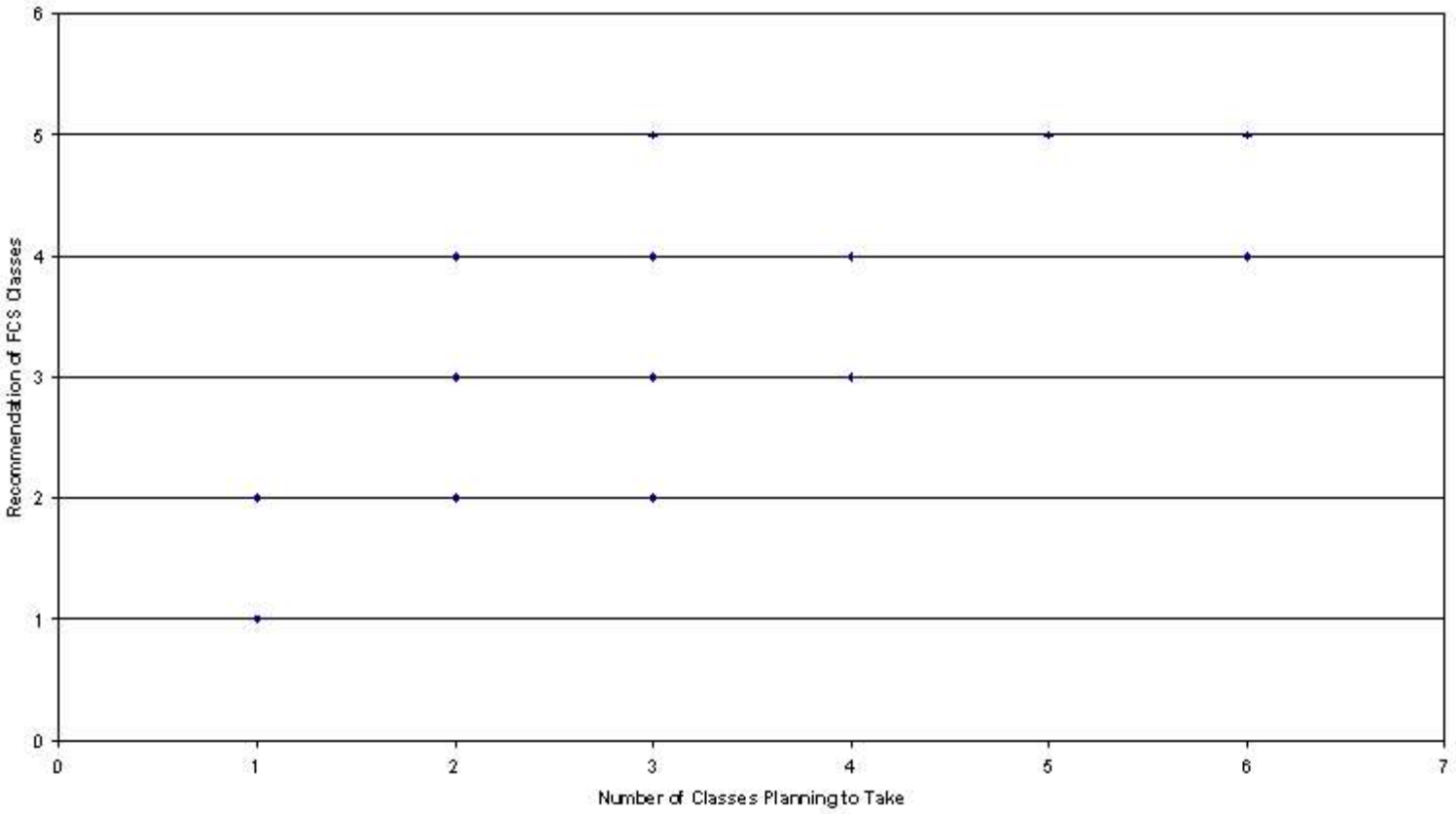

Figure 1. Correlation of classes taken, or planning to take, by recommendation of FCS classes, N=15. (Note: title goes after figure, start the paragraph of text two double spaces after title, only cap first word of phrase. Doesn't need to be a sentence, avoid the obvious like "Scatter plot of the correlation of ...")

Qualitative Analysis

The respondents were also asked a qualitative question regarding the value of Family and Consumer Science classes in the core curriculum. The respondent's opinions supported the importance of such classes. They indicated that FCS classes opened their minds to new ideas, opportunities and career choices. Several recurring themes appeared throughout the respondent's surveys focusing on the extent of personal responsibility, learning new skills, and the ability to make wise choices throughout life. Personal responsibility was enhanced by taking these classes

and students indicated a growth in that area that aided them in coping with other issues not related to school. This tied in with the wise choices theme in that they felt that when they started taking more personal responsibility for their choices, they were able to make better choises for themselves. Many of the students enjoyed the new skills they learned and indicated that these new skills were ones that they could use for the rest of their lives. Some of the skills listed included cooking for themselves and budgeting and balancing a checking account.

note:

- the facts are presented, not interpreted
- 4 subsections
- everything in the tables and figure is discussed
- tables and figure are referred to in the text
- discuss the figure, describe what the reader should notice about it
- Avoid widows, a heading all alone at the bottom of a page and orphans, a last line of text in a section all alone at the top of a page.

Sex and Handedness χ^2 Exercise

		Handedness			
		right	left	ambidexterous	Total
Sex	male	15	30	5	
	female	35	10	5	
	Total				

$$\chi^2 = \sum \frac{(O - E)^2}{E} \qquad E = \frac{\text{row total x column total}}{N} \qquad df = (r-1)(c-1)$$

		Handedness		
		right	left	ambidexterous
Sex	male			
	female			

Critical Values of Chi-Square

Degrees of Freedom	Probability Level		
	.10	.05	.01
1	2.706	3.841	6.635
2	4.605	5.991	9.210
3	6.251	7.815	11.345
4	7.779	9.488	13.277
5	9.236	11.070	15.086
6	10.645	12.592	16.812
7	12.017	14.067	18:475
8	13.362	15.507	20.090
9	14.684	16.919	21.666
10	15.987	18.307	23.209
11	17.275	19.675	24.725
12	18.549	21.026	26.217
13	19.812	22.362	27.688
14	21.064	23.685	29.141
15	22.307	24.996	30.578
16	23.542	26.296	32.000
17	24.769	27.587	33.409
18	25.989	28.869	34.805
19	27.204	30.144	36.191
20	28.412	31.410	37.566

Critical Values of t

df	Significance Level*			
	.05	.025	.01	.005
	.10	.05	.02	.01
1	6.314	12.706	31.821	63.657
2	2.920	4.303	6.965	9.925
3	2.353	3.182	4.541	5.841
4	2.132	2.776	3.747	4.604
5	2.015	2.571	3.365	4.032
6	1.943	2.447	3.143	3.707
7	1.895	2.365	2.998	3.499
8	1.860	2.306	2.896	3.355
9	1.833	2.262	2.821	3.250
10	1.812	2.228	2.764	3.169
11	1.796	2.201	2.718	3.106
12	1.782	2.179	2.681	3.055
13	1.771	2.160	2.650	3.012
14	1.761	2.145	2.624	2.977
15	1.753	2.131	2.602	2.947
16	1.746	2.120	2.583	2.921
17	1.740	2.110	2.567	2.898
18	1.734	2.101	2.552	2.878
19	1.729	2.093	2.539	2.861
20	1.725	2.086	2.528	2.845
21	1.721	2.080	2.518	2.831
22	1.717	2.074	2.508	2.819
23	1.714	2.069	2.500	2.807
24	1.711	2.064	2.492	2.797
25	1.708	2.060	2.485	2.787
26	1.706	2.056	2.479	2.779
27	1.703	2.052	2.473	2.771
28	1.701	2.048	2.467	2.763
29	1.699	2.045	2.462	2.756
30	1.697	2.042	2.457	2.750
40	1.684	2.021	2.423	2.704
60	1.671	2.000	2.390	2.660
120	1.658	1.980	2.358	2.617
∞	1.645	1.960	2.326	2.576

*Use the top significance level when you have predicted a specific directional difference (a onetailed test; e.g., group 1 will be greater than group 2). Use the bottom significance level when you have only predicted that group 1 will differ from group 2 without specifying the direction of the difference (a two-tailed test).

Critical Values of r (Pearson Product-Moment Correlation Coefficient)

Level of Signifacance for Two-Tailed Test

df	*.10*	*.05*	*.01*
1	*.988*	*.997*	*.9999*
2	*.900*	*.950*	*.990*
3	*.805*	*.878*	*.959*
4	*.729*	*.811*	*.917*
5	*.669*	*.754*	*.874*
6	*.622*	*.707*	*.834*
7	*.582*	*.666*	*.798*
8	*.549*	*.632*	*.765*
9	*.521*	*.602*	*.735*
10	*.497*	*.576*	*.708*
11	*.476*	*.553*	*.684*
12	*.458*	*.532*	*.661*
13	*.441*	*.514*	*.641*
14	*.426*	*.497*	*.623*
15	*.412*	*.482*	*.606*
16	*.400*	*.468*	*.590*
17	*.389*	*.456*	*.575*
18	*.378*	*.444*	*.561*
19	*.369*	*.433*	*.549*
20	*.360*	*.423*	*.537*
25	*.323*	*.381*	*.487*
30	*.296*	*.349*	*.449*
35	*.275*	*.325*	*.418*
40	*.257*	*.304*	*.393*
45	*.243*	*.288*	*.372*
50	*.231*	*.273*	*.354*
60	*.211*	*.250*	*.325*
70	*.195*	*.232*	*.303*
80	*.183*	*.217*	*.283*
90	*.173*	*.205*	*.267*
100	*.164*	*.195*	.254

NOTE: The significance level is halved for a one-tailed test

Divorce and Religiousness χ^2 Exercise

	Divorce		
Religious	No	Yes	totals
Not at all	85	25	
Somewhat	520	120	
Very	220	30	
totals			N = 1000

	Divorce	
Religious	No	Yes
Not at all		
Somewhat		
Very		

$$\chi^2 = \sum \frac{(O - E)^2}{E} \qquad E = \frac{\text{row total x column total}}{N} \qquad df = (r-1)(c-1)$$

Discipline Referral Scores Based on Sports Participation *t*-test Exercise (round to 4 decimal places)

Subject #	Intramural	$(X - \bar{x})$	$(X - \bar{x})^2$	Aerobics	$(X - \bar{x})$	$(X - \bar{x})^2$
1	**1**			**3**		
2	**2**			**4**		
3	**2**			**5**		
4	**3**			**5**		
5	**3**			**5**		
6	**3**			**5**		
7	**4**			**6**		
8	**4**			**6**		
9	**4**			**6**		
10	**5**			**7**		
Total						
$(\bar{x})$						
(S^2)						
N						
t						

t-Test of Life Satisfaction of Married Men and Women Exercise (round to 4 decimal places)

Subject #	Men	$(x-\bar{x})$	$(x-\bar{x})^2$	Women	$(x-\bar{x})$	$(x-\bar{x})^2$
1	4.5			5.0		
2	4.0			4.0		
3	3.5			3.5		
4	5.0			5.0		
5	4.5			3.0		
6	5.0			4.5		
7	5.0			3.5		
8	4.5			3.0		
9	5.0			4.5		
10	4.5			5.0		
Total						
$\bar{x}$						
S^2						
N						
t						

t-Test of Life Satisfaction of Single Men and Women Exercise (round to 4 decimal places)

Subject #	Men	$(x-\bar{x})$	$(x-\bar{x})^2$	Women	$(x-\bar{x})$	$(x-\bar{x})^2$
1	2.0			5.0		
2	2.5			5.0		
3	1.5			4.5		
4	1.5			4.5		
5	1.0			4.5		
6	3.0			4.5		
7	2.5			5.0		
8	3.5			4.5		
9	1.0			4.5		
10	2.5			5.0		
Total						
$\bar{x}$						
S^2						
N						
t						

Correlation Coefficient (r) of Travel Experience and Knowledge of the World Exercise (round to 4 decimal places)

Subject	Travel Score (X)	X^2	Knowledge (Y)	Y^2	XY
1	4		10		
2	6		15		
3	7		8		
4	8		9		
5	8		7		
6	12		10		
7	14		15		
8	15		13		
9	15		15		
10	17		14		
$\sum X$		$\sum Y$		$\sum XY$	
$(\sum X)^2$		$(\sum Y)^2$			
	$\sum X^2$		$\sum Y^2$		

Correlation Coefficient (r) of Hours of TV Viewing and Aggression Scores in Six Year Old Children Exercise (round to 4 decimal places)

Subject #	Hours (X)	X^2	Aggression (Y)	Y^2	XY
1	75		2		
2	90		5		
3	50		1		
4	95		4		
5	75		3		
6	85		5		
7	70		2		
8	70		3		
9	60		1		
10	80		4		
$\sum X$		$\sum Y$		$\sum XY$	
$(\sum X)^2$		$(\sum Y)^2$			
	$\sum X^2$		$\sum Y^2$		

2 X 2 Factorial Design of Life Satisfaction by Sex by Marital Status Exercise

Subject #	sex	married	life satisfaction score
1	m	y	10
2	m	y	9
3	m	n	6
4	f	n	9
5	f	y	8
6	m	y	5
7	f	y	6
8	f	y	7
9	m	y	8
10	f	n	10

		Married		marginal means
		yes	no	
Sex	male			
	female			
marginal means				

Plot our example exercise

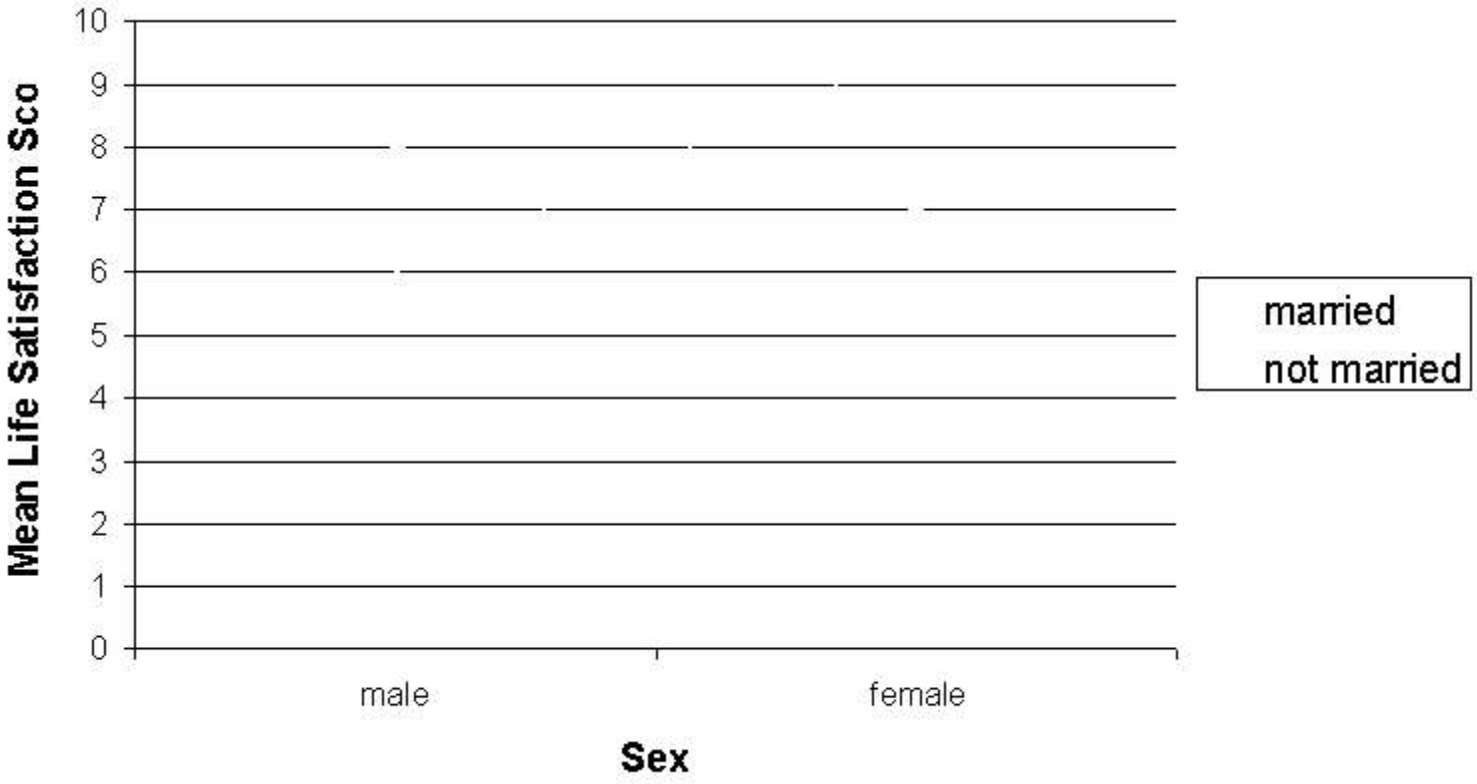

Figure 1. Mean Life Satisfaction Scores by Sex by Marital Status.

Make a statement about what the graph shows

3 x 2 Factorial of Loan Satisfaction by Days Funded by Loan Amount Exercise

Subject #	Days Funded	Loan Amount	Loan Satisfaction (1-6)
1	<25	98k	6
2	<25	403k	4
3	<25	128k	5
4	<25	216k	6
5	>25	502k	3
6	>25	75k	3
7	>25	99k	2
8	>25	302k	3
9	>25	425k	5
10	>25	294k	4

		Loan Amount			marginals
		1=<100k	2=100-400k	3=>400k	
Days Funded	1=<25				
	2=>25				
marginals					

Graph and make a statement.

2 x 2 Factorial Design - Vitamin C in Vegetables by Cooking Method Exercise

Subject #	Vegetable	Cooking Method	Vitamin C Retention (100-400)
1	broccoli	boil	220
2	broccoli	steam	308
3	broccoli	boil	231
4	broccoli	boil	209
5	broccoli	steam	329
6	broccoli	steam	317
7	spinach	steam	398
8	spinach	boil	104
9	spinach	boil	128
10	spinach	steam	375
11	spinach	boil	117
12	spinach	steam	382

		Cooking Method		marginals
		boil	steam	
Vegetable	broccoli			
	spinach			
marginals				

Graph and make a statement.

Factorial Design of Mean Times Children Play With Toys of the Other Sex by Sex and Ratio of Same-Sex to Other-Sex Peers Exercise

		Ratio of Same-Sex to Other-Sex Peers			marginal
		1:1	2:1	3:1	
Sex	male	5	3	1	
	female	5	5.3	5.2	
marginal					

Here are the interaction means, calculate the marginals, graph, and make a statement.