Appendix 13

A13.1 Equal-variances t-test of $\mu_1 - \mu_2$

$$H_0 : (\mu_1 - \mu_2) = 0$$

$$H_1 : (\mu_1 - \mu_2) < 0$$

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{s_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

	A	B	C
1	t-Test: Two-Sample Assuming Equal Variances		
2			
3		*This Year*	*3 Years Ago*
4	Mean	8.29	10.36
5	Variance	8.13	8.43
6	Observations	100	100
7	Pooled Variance	8.28	
8	Hypothesized Mean Difference	0	
9	df	198	
10	t Stat	-5.09	
11	P(T<=t) one-tail	0.0000	
12	t Critical one-tail	1.6526	
13	P(T<=t) two-tail	0.0000	
14	t Critical two-tail	1.9720	

t = –5.09, p-value = 0. There is overwhelming evidence to conclude that there has been a decrease over the past three years.

A13.2 a z-test of $p_1 - p_2$ (case 1)

$$H_0 : (p_1 - p_2) = 0$$

$$H_1 : (p_1 - p_2) > 0$$

$$z = \frac{(\hat{p}_1 - \hat{p}_2)}{\sqrt{\hat{p}(1 - \hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

	A	B	C	D	E
1	**z-Test of the Difference Between Two Proportions (Case 1)**				
2					
3		**Sample 1**	**Sample 2**	**z Stat**	**2.83**
4	**Sample proportion**	0.4336	0.2414	**P(Z<=z) one-tail**	**0.0024**
5	**Sample size**	113	87	**z Critical one-tail**	**1.6449**
6	**Alpha**	0.05		**P(Z<=z) two-tail**	**0.0047**
7				**z Critical two-tail**	**1.9600**

z = 2.83, p-value = .0024. There is enough evidence to infer that customers who see the ad are more likely to make a purchase than those who do not see the ad.

b Equal-variances t-test of $\mu_1 - \mu_2$

$$H_0: (\mu_1 - \mu_2) = 0$$

$$H_1: (\mu_1 - \mu_2) > 0$$

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{s_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

	A	B	C
1	t-Test: Two-Sample Assuming Equal Variances		
2			
3		*Ad*	*No Ad*
4	Mean	97.38	92.01
5	Variance	621.97	283.26
6	Observations	49	21
7	Pooled Variance	522.35	
8	Hypothesized Mean Difference	0	
9	df	68	
10	t Stat	0.90	
11	P(T<=t) one-tail	0.1853	
12	t Critical one-tail	1.6676	
13	P(T<=t) two-tail	0.3705	
14	t Critical two-tail	1.9955	

t = .90, p-value = .1853. There is not enough evidence to infer that customers who see the ad and make a purchase spend more than those who do not see the ad and make a purchase.

c z-estimator of p

$$\hat{p} \pm z_{\alpha/2}\sqrt{\frac{\hat{p}(1-\hat{p})}{n}}$$

	A	B	C	D	E
1	**z-Estimate of a Proportion**				
2					
3	**Sample proportion**	0.4336	**Confidence Interval Estimate**		
4	**Sample size**	113	**0.4336**	±	**0.0914**
5	**Confidence level**	0.95	**Lower confidence limit**		**0.3423**
6			**Upper confidence limit**		**0.5250**

We estimate that between 34.23% and 52.50% of all customers who see the ad will make a purchase.

d t-estimator of μ

$$\bar{x} \pm t_{\alpha/2}\frac{s}{\sqrt{n}}$$

	A	B	C	D
1	**t-Estimate: Mean**			
2				
3				*Ad*
4	Mean			97.38
5	Standard Deviation			24.94
6	LCL			90.22
7	UCL			104.55

We estimate that the mean amount spent by customers who see the ad and make a purchase lies between $90.22 and $104.55.

A13.3 t-test of μ_D

$$H_0: \mu_D = 0$$

$$H_1: \mu_D > 0$$

$$t = \frac{\bar{x}_D - \mu_D}{s_D / \sqrt{n_D}}$$

	A	B	C
1	t-Test: Paired Two Sample for Means		
2			
3		*Before*	*After*
4	Mean	381.00	373.12
5	Variance	39001	40663
6	Observations	25	25
7	Pearson Correlation	0.96	
8	Hypothesized Mean Difference	0	
9	df	24	
10	t Stat	0.70	
11	P(T<=t) one-tail	0.2438	
12	t Critical one-tail	1.7109	
13	P(T<=t) two-tail	0.4876	
14	t Critical two-tail	2.0639	

t = .70, p-value = .2438. There is not enough evidence to conclude that the equipment is effective.

A13.4 Frequency of accidents: z -test of $p_1 - p_2$ (case 1)

$$H_0: (p_1 - p_2) = 0$$

$$H_1: (p_1 - p_2) > 0$$

$$z = \frac{(\hat{p}_1 - \hat{p}_2)}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

	A	B	C	D	E
1	**z-Test of the Difference Between Two Proportions (Case 1)**				
2					
3		**Sample 1**	**Sample 2**	**z Stat**	**0.47**
4	**Sample proportion**	0.0840	0.0760	**P(Z<=z) one-tail**	**0.3205**
5	**Sample size**	500	500	**z Critical one-tail**	**1.6449**
6	**Alpha**	0.05		**P(Z<=z) two-tail**	**0.6410**
7				**z Critical two-tail**	**1.9600**

z = .47, p-value = .32053. There is not enough evidence to infer that ABS-equipped cars have fewer accidents than cars without ABS.

Severity of accidents Equal-variances t-test of $\mu_1 - \mu_2$

$$H_0: (\mu_1 - \mu_2) = 0$$

$$H_1: (\mu_1 - \mu_2) > 0$$

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{s_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

	A	B	C
1	t-Test: Two-Sample Assuming Equal Variances		
2			
3		*No ABS*	*ABS*
4	Mean	2075	1714
5	Variance	450,343	390,409
6	Observations	42	38
7	Pooled Variance	421,913	
8	Hypothesized Mean Difference	0	
9	df	78	
10	t Stat	2	
11	P(T<=t) one-tail	0.0077	
12	t Critical one-tail	1.6646	
13	P(T<=t) two-tail	0.0153	
14	t Critical two-tail	1.9908	

Estimate of the difference between two means (equal-variances)

	A	B	C	D	E	F
1	**t-Estimate of the Difference Between Two Means (Equal-Variances)**					
2						
3		**Sample 1**	**Sample 2**	**Confidence Interval Estimate**		
4	**Mean**	2075	1714	**360.48**	±	**290**
5	**Variance**	450,343	390,409	**Lower confidence limit**		**71**
6	**Sample size**	42	38	**Upper confidence limit**		**650**
7	**Pooled Variance**	**421,913**				
8	**Confidence level**	0.95				

We estimate that the mean repair cost for non-ABS-equipped cars will be between \$71 and \$650 more than the mean repair cost for ABS-equipped cars.

A13.5 Equal-variances t-test of $\mu_1 - \mu_2$

$$H_0 : (\mu_1 - \mu_2) = 0$$

$$H_1 : (\mu_1 - \mu_2) < 0$$

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{s_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

	A	B	C
1	t-Test: Two-Sample Assuming Equal Variances		
2			
3		*Discount*	*No Discount*
4	Mean	13.06	18.22
5	Variance	30.26	38.13
6	Observations	50	50
7	Pooled Variance	34.20	
8	Hypothesized Mean Difference	0	
9	df	98	
10	t Stat	-4.41	
11	P(T<=t) one-tail	0.0000	
12	t Critical one-tail	1.6606	
13	P(T<=t) two-tail	0.0000	
14	t Critical two-tail	1.9845	

t = –4.41, p-value = 0. There is enough evidence to infer that the discount plan works.

A13.6 Speeds: Equal-variances t-test of $\mu_1 - \mu_2$

$$H_0 : (\mu_1 - \mu_2) = 0$$

$$H_1 : (\mu_1 - \mu_2) > 0$$

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{s_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

	A	B	C
1	t-Test: Two-Sample Assuming Equal Variances		
2			
3		*Speeds Before*	*Speeds After*
4	Mean	31.74	31.42
5	Variance	4.50	4.41
6	Observations	100	100
7	Pooled Variance	4.45	
8	Hypothesized Mean Difference	0	
9	df	198	
10	t Stat	1.07	
11	P(T<=t) one-tail	0.1424	
12	t Critical one-tail	1.6526	
13	P(T<=t) two-tail	0.2849	
14	t Critical two-tail	1.9720	

t = 1.07, p-value = .1424. There is not enough evidence to infer that speed bumps reduce speeds.

Proper stops: Equal-variances t-test of $\mu_1 - \mu_2$

$$H_0 : (\mu_1 - \mu_2) = 0$$

$$H_1 : (\mu_1 - \mu_2) < 0$$

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{s_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

	A	B	C
1	t-Test: Two-Sample Assuming Equal Variances		
2			
3		*Stops Before*	*Stops After*
4	Mean	7.82	7.98
5	Variance	1.83	1.84
6	Observations	100	100
7	Pooled Variance	1.83	
8	Hypothesized Mean Difference	0	
9	df	198	
10	t Stat	-0.84	
11	P(T<=t) one-tail	0.2021	
12	t Critical one-tail	1.6526	
13	P(T<=t) two-tail	0.4042	
14	t Critical two-tail	1.9720	

t = –.84, p-value = .2021. There is not enough evidence to infer that speed bumps increase the number of proper stops.

A13.7 t-estimator of μ

$$\bar{x} \pm t_{\alpha/2}\frac{s}{\sqrt{n}}$$

	A	B	C	D
1	**t-Estimate: Mean**			
2				
3				*PSI*
4	Mean			4.20
5	Standard Deviation			1.93
6	LCL			3.93
7	UCL			4.46

LCL = 3.93, UCL = 4.46. We estimate that on average tires are between 3.93 and 4.46 pounds per square inch below the recommended amount.

Tire life: LCL = 100(3.93) = 393, UCL = 100(4.46) = 446. We estimate that the average tire life is decreased by between 393 and 446 miles.

Gasoline consumption: LCL = .1(3.93) = .393, UCL = .1(4.46) = .446. We estimate that average gasoline consumption increases by between .393 and .446 gallons per mile.

A13.8 t-test of μ_D

$$H_0: \mu_D = 0$$

$$H_1: \mu_D > 0$$

$$t = \frac{\bar{x}_D - \mu_D}{s_D / \sqrt{n_D}}$$

	A	B	C
1	t-Test: Paired Two Sample for Means		
2			
3		*Before*	*After*
4	Mean	28.94	26.22
5	Variance	61.45	104.30
6	Observations	50	50
7	Pearson Correlation	0.87	
8	Hypothesized Mean Difference	0	
9	df	49	
10	t Stat	3.73	
11	P(T<=t) one-tail	0.000	
12	t Critical one-tail	1.677	
13	P(T<=t) two-tail	0.000	
14	t Critical two-tail	2.010	

t = 3.73, p-value = .0002. There is enough evidence to infer that the law discourages bicycle use.

A13.9 z -test of $p_1 - p_2$ (case 1)

$$H_0: (p_1 - p_2) = 0$$

$$H_1: (p_1 - p_2) > 0$$

$$z = \frac{(\hat{p}_1 - \hat{p}_2)}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

	A	B	C	D
1	**z-Test: Two Proportions**			
2				
3			*Cardizem*	*Placebo*
4	Sample Proportions		0.084	0.0797
5	Observations		607	301
6	Hypothesized Difference		0	
7	z Stat		0.22	
8	P(Z<=z) one tail		0.4126	
9	z Critical one-tail		1.6449	
10	P(Z<=z) two-tail		0.8252	
11	z Critical two-tail		1.9600	

z = .22, p-value = .4126. There is not enough evidence to indicate that Cardizem users are more likely to suffer headache and dizziness side effects than non-users.

A13.10 t-test of μ

$$H_0: \mu = 200$$
$$H_1: \mu > 200$$

$$t = \frac{\bar{x} - \mu}{s / \sqrt{n}}$$

	A	B	C	D
1	**t-Test: Mean**			
2				
3				*Pedestrians*
4	Mean			209.13
5	Standard Deviation			60.01
6	Hypothesized Mean			200
7	df			39
8	t Stat			0.96
9	P(T<=t) one-tail			0.1711
10	t Critical one-tail			1.6849
11	P(T<=t) two-tail			0.3422
12	t Critical two-tail			2.0227

t = .96, p-value = .1711. There is not enough evidence to infer that the franchiser should build on this site.

A13.11 Unequal-variances t-test of $\mu_1 - \mu_2$

$$H_0: (\mu_1 - \mu_2) = 0$$

$$H_1: (\mu_1 - \mu_2) > 0$$

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

	A	B	C
1	t-Test: Two-Sample Assuming Unequal Variances		
2			
3		*Quit*	*Did not quit*
4	Mean	2.04	0.72
5	Variance	2.05	1.40
6	Observations	259	1626
7	Hypothesized Mean Difference	0	
8	df	316	
9	t Stat	14.06	
10	P(T<=t) one-tail	0.0000	
11	t Critical one-tail	1.6497	
12	P(T<=t) two-tail	0.0000	
13	t Critical two-tail	1.9675	

t = 14.06, p-value = 0. There is enough evidence to infer that quitting smoking results in weight gains.

A13.12 F-test of σ_1^2 / σ_2^2

$$H_0 : \sigma_1^2 / \sigma_2^2 = 1$$

$$H_1 : \sigma_1^2 / \sigma_2^2 > 1$$

$$F = \frac{s_1^2}{s_2^2}$$

	A	B	C
1	F-Test Two-Sample for Variances		
2			
3		*Brand A*	*Brand B*
4	Mean	145.95	144.78
5	Variance	16.45	4.25
6	Observations	100	100
7	df	99	99
8	F	3.87	
9	P(F<=f) one-tail	0.0000	
10	F Critical one-tail	1.3941	

F = 3.87, p-value = 0. There is overwhelming evidence to infer that Brand B is superior to Brand A.

A13.13 a z-test of $p_1 - p_2$ (case 1) (Success = 2)

$$H_0 : p_1 - p_2 = 0$$

$$H_1 : p_1 - p_2 \neq 0$$

$$z = \frac{(\hat{p}_1 - \hat{p}_2)}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

	A	B	C	D
1	**z-Test: Two Proportions**			
2				
3			*Male most*	*Male less*
4	Sample Proportions		0.5962	0.8077
5	Observations		52	52
6	Hypothesized Difference		0	
7	z Stat		-2.36	
8	P(Z<=z) one tail		0.0092	
9	z Critical one-tail		1.6449	
10	P(Z<=z) two-tail		0.0184	
11	z Critical two-tail		1.96	

z = –2.36, p-value = .0184. There is enough evidence that men's choices are affected by the attractiveness of women's pictures

b z-test of $p_1 - p_2$ (case 1) (Success = 2)

$$H_0: p_1 - p_2 = 0$$

$$H_1: p_1 - p_2 \neq 0$$

$$z = \frac{(\hat{p}_1 - \hat{p}_2)}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

	A	B	C	D
1	**z-Test: Two Proportions**			
2				
3			*Female most*	*Female less*
4	Sample Proportions		0.7885	0.8269
5	Observations		52	52
6	Hypothesized Difference		0	
7	z Stat		-0.50	
8	P(Z<=z) one tail		0.3094	
9	z Critical one-tail		1.6449	
10	P(Z<=z) two-tail		0.6188	
11	z Critical two-tail		1.96	

z = –.50, p-value = .6188. There is not enough evidence to infer that women's choices are affected by the attractiveness of men's pictures.

A13.14 z-test of $p_1 - p_2$ (case 1)

$$H_0: p_1 - p_2 = 0$$

$$H_1: p_1 - p_2 > 0$$

$$z = \frac{(\hat{p}_1 - \hat{p}_2)}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

	A	B	C	D
1	**z-Test: Two Proportions**			
2				
3			*Exercisers*	*Watchers*
4	Sample Proportions		0.4250	0.3675
5	Observations		400	400
6	Hypothesized Difference		0	
7	z Stat		1.66	
8	P(Z<=z) one tail		0.0482	
9	z Critical one-tail		1.6449	
10	P(Z<=z) two-tail		0.0964	
11	z Critical two-tail		1.9600	

z = 1.66, p-value = .0482. There is evidence to infer that exercisers are more likely to remember the sponsor's brand name than those who only watch.

A13.15 a z-test of p

$H_0: p = 104{,}320/425{,}000 = .245$

$H_1: p > .245$

$$z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}}$$

	A	B	C	D
1	**z-Test: Proportion**			
2				
3				*Deliver*
4	Sample Proportion			0.2825
5	Observations			400
6	Hypothesized Proportion			0.245
7	z Stat			1.74
8	P(Z<=z) one-tail			0.0406
9	z Critical one-tail			1.6449
10	P(Z<=z) two-tail			0.0812
11	z Critical two-tail			1.9600

z = 1.74, p-value = .0406. There is enough evidence to indicate that the campaign will increase home delivery sales.

b z-test of p

$H_0: p = 110{,}000/425{,}000 = .259$

$H_1: p > .259$

$$z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}}$$

	A	B	C	D
1	**z-Test: Proportion**			
2				
3				*Deliver*
4	Sample Proportion			0.2825
5	Observations			400
6	Hypothesized Proportion			0.259
7	z Stat			1.07
8	P(Z<=z) one-tail			0.1417
9	z Critical one-tail			1.6449
10	P(Z<=z) two-tail			0.2834
11	z Critical two-tail			1.9600

z = 1.07, p-value = .1417. There is not enough evidence to conclude that the campaign will be successful.

A13.16 t-tests of μ_D

a $H_0 : \mu_D = 40$

$H_1 : \mu_D > 40$

$$t = \frac{\bar{x}_D - \mu_D}{s_D / \sqrt{n_D}}$$

	A	B	C
1	t-Test: Paired Two Sample for Means		
2			
3		*SAT after*	*SAT before*
4	Mean	1235	1162
5	Variance	37970	28844
6	Observations	40	40
7	Pearson Correlation	0.94	
8	Hypothesized Mean Difference	40	
9	df	39	
10	t Stat	2.98	
11	P(T<=t) one-tail	0.0024	
12	t Critical one-tail	1.6849	
13	P(T<=t) two-tail	0.0049	
14	t Critical two-tail	2.0227	

t = 2.98, p-value = .0024. There is enough evidence to conclude that the ETS claim is false.

b $H_0 : \mu_D = 110$

$H_1 : \mu_D < 110$

$$t = \frac{\bar{x}_D - \mu_D}{s_D / \sqrt{n_D}}$$

	A	B	C
1	t-Test: Paired Two Sample for Means		
2			
3		*SAT after*	*SAT before*
4	Mean	1235	1162
5	Variance	37970	28844
6	Observations	40	40
7	Pearson Correlation	0.94	
8	Hypothesized Mean Difference	110	
9	df	39	
10	t Stat	-3.39	
11	P(T<=t) one-tail	0.0008	
12	t Critical one-tail	1.6849	
13	P(T<=t) two-tail	0.0016	
14	t Critical two-tail	2.0227	

t = –3.39, p-value = .0008. There is enough evidence to conclude that the Kaplan claim is also false.

A13.17a t-test of μ

$$H_0 : \mu = 1{,}000$$
$$H_1 : \mu < 1{,}000$$

$$t = \frac{\bar{x} - \mu}{s / \sqrt{n}}$$

	A	B	C	D
1	**t-Test: Mean**			
2				
3				*Potatoes*
4	Mean			985.3
5	Standard Deviation			49.2
6	Hypothesized Mean			1000
7	df			49
8	t Stat			-2.11
9	P(T<=t) one-tail			0.0198
10	t Critical one-tail			1.6766
11	P(T<=t) two-tail			0.0396
12	t Critical two-tail			2.0096

T = −2.11; p - value = .0198. There is enough evidence to infer that the supplier is cheating him.

b t-estimator of μ

$$\bar{x} \pm t_{\alpha/2} \frac{s}{\sqrt{n}}$$

	A	B	C	D
1	**t-Estimate: Mean**			
2				
3				*Potatoes*
4	Mean			985.3
5	Standard Deviation			49.2
6	LCL			971.3
7	UCL			999.3

Estimate of the total

LCL = 15,000 (971.3) = 14,569,500

UCL = 15,000(999.3) = 14,989,500

Case A13.1 California Verbal Learning Test (CVLT) scores

Equal-variances t-test of $\mu_1 - \mu_2$

$$H_0 : (\mu_1 - \mu_2) = 0$$

$$H_1 : (\mu_1 - \mu_2) > 0$$

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{s_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

	A	B	C
1	t-Test: Two-Sample Assuming Equal Variances		
2			
3		*User*	*Nonuser*
4	Mean	71.53	69.66
5	Variance	82.64	49.71
6	Observations	58	47
7	Pooled Variance	67.93	
8	Hypothesized Mean Difference	0	
9	df	103	
10	t Stat	1.16	
11	P(T<=t) one-tail	0.1246	
12	t Critical one-tail	1.6598	
13	P(T<=t) two-tail	0.2491	
14	t Critical two-tail	1.9833	

t = 1.16, p-value = .1246.

Logical Memory Test (LMT) score

$$H_0 : (\mu_1 - \mu_2) = 0$$

$$H_1 : (\mu_1 - \mu_2) > 0$$

$$t = \frac{(\bar{x}_1 - \bar{x}_2) - (\mu_1 - \mu_2)}{\sqrt{s_p^2\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

	A	B	C
1	t-Test: Two-Sample Assuming Equal Variances		
2			
3		*User*	*Nonuser*
4	Mean	57.67	56.64
5	Variance	27.24	28.98
6	Observations	58	47
7	Pooled Variance	28.02	
8	Hypothesized Mean Difference	0	
9	df	103	
10	t Stat	1.00	
11	P(T<=t) one-tail	0.1609	
12	t Critical one-tail	1.6598	
13	P(T<=t) two-tail	0.3218	
14	t Critical two-tail	1.9833	

t = 1.00, p-value = .1609.

Conclusion of both tests: There is not enough evidence to conclude that HRT helps improve cognitive performance among women over 75.

Case A13.2 a z-estimator of p

	A	B
1	**z-Estimate: Proportion**	
2		*Aware*
3	Sample Proportion	0.9717
4	Observations	283
5	LCL	0.9524
6	UCL	0.9910

Total: LCL = 836,200(.9524) = 796,397, UCL = 836,200(.9910) = 828,674

b z-estimator of p

	A	B
1	**z-Estimate: Proportion**	
2		*Modify*
3	Sample Proportion	0.6466
4	Observations	283
5	LCL	0.5910
6	UCL	0.7023

Total: LCL = 836,200(.5910) = 494,194, UCL = 836,200(.7023) = 587,263

c z-test of $p_1 - p_2$ (case 1)

$H_0: p_1 - p_2 = 0$

$H_1: p_1 - p_2 < 0$

$$z = \frac{(\hat{p}_1 - \hat{p}_2)}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

	A	B	C	D
1	**z-Test: Two Proportions**			
2				
3			*LSES*	*HSES*
4	Sample Proportions		0.1521	0.6732
5	Observations		447	153
6	Hypothesized Difference		0	
7	z Stat		-12.32	
8	P(Z<=z) one tail		0	
9	z Critical one-tail		1.6449	
10	P(Z<=z) two-tail		0	
11	z Critical two-tail		1.96	

z = –12.32, p-value = 0. There is enough evidence to conclude that women in the HSES group are more aware than are women in the LSES group.

d z-test of $p_1 - p_2$ (case 1)

$H_0: p_1 - p_2 = 0$

$H_1: p_1 - p_2 < 0$

$$z = \frac{(\hat{p}_1 - \hat{p}_2)}{\sqrt{\hat{p}(1-\hat{p})\left(\frac{1}{n_1} + \frac{1}{n_2}\right)}}$$

	A	B	C	D
1	**z-Test: Two Proportions**			
2				
3			*LSES*	*HSES*
4	Sample Proportions		0.1588	0.4641
5	Observations		447	153
6	Hypothesized Difference		0	
7	z Stat		-7.67	
8	P(Z<=z) one tail		0	
9	z Critical one-tail		1.6449	
10	P(Z<=z) two-tail		0	
11	z Critical two-tail		1.96	

z = –7.67, p-value = 0. There is enough evidence to conclude that women in the HSES group are more likely to use HRT than are women in the LSES group.

Case A13.3 a z-test of p (success = 1, vote "No")

$$H_0 : p = .5$$

$$H_1 : p > .5$$

$$z = \frac{\hat{p} - p}{\sqrt{\frac{p(1-p)}{n}}}$$

	A	B	C	D
1	**z-Test: Proportion**			
2				
3				*Planned vote*
4	Sample Proportion			0.5382
5	Observations			641
6	Hypothesized Proportion			0.5
7	z Stat			1.94
8	P(Z<=z) one-tail			0.0265
9	z Critical one-tail			1.6449
10	P(Z<=z) two-tail			0.0530
11	z Critical two-tail			1.9600

z = 1.94, p-value = .0265. There is evidence to infer that if the referendum were held on the day of the poll, the majority of Quebec would vote to remain in Canada.

b z-estimator $p_1 - p_2$ (success = 2, vote "Yes")

$$(\hat{p}_1 - \hat{p}_2) \pm z_{\alpha/2}\sqrt{\frac{\hat{p}_1(1-\hat{p}_1)}{n_1} + \frac{\hat{p}_2(1-\hat{p}_2)}{n_2}}$$

	A	B	C	D
1	**z-Estimate: Two Proportions**			
2				
3			*Francophone*	*Anglophone*
4	Sample Proportions		0.5553	0.0794
5	Observations		515	126
6				
7	LCL		0.4123	
8	UCL		0.5397	

LCL = .4123, UCL = .5397. We estimate that the difference between French-speaking and English-speaking Quebecers in their support for separation lies between 41.23% and 53.97%.