ANSWERS CHAPTER 12

THINK IT OVER

think it over

TIO 12.1: One sample does not influence the other.

TIO 12.2: Because we are looking at 'equal to' and 'not equal to'.

TIO 12.3:

H_0: $\mu_1 - \mu_2 \leq D_0$
H_1: $\mu_1 - \mu_2 > D_0$ two-tailed
H_0: $\mu_1 - \mu_2 = D_0$
H_1: $\mu_1 - \mu_2 \neq D_0$ one-tailed
H_0: $\mu_1 - \mu_2 \geq D_0$
H_1: $\mu_1 - \mu_2 < D_0$

TIO 12.4: There is no difference between incomes. The investigation therefore is pointless.

TIO 12.5: You would get positive values.

TIO 12.6: No answer required.

TIO 12.7: p_1 says that 9% of doughnuts from factory 1 are probably bad and p_2 says that 7.5% from factory 2 are probably bad based on the samples taken. The point estimate is the value we use to represent the difference between a range of samples, if we had taken lots of different samples. It is the value we guess will be the difference between the means of lots of samples.

TIO 12.8: Is the quality of the doughnuts in each factory the same? We can be 95% confident that if we took lots of samples from both factories, the difference between the means of the quality of the doughnuts would be within a range of ±5.4% of each other. If this tolerance is acceptable, then the factories are producing similar quality doughnuts.

EXERCISES

1. (a) $H_0 : \mu_1 - \mu_2 \geq 0$, $H_1 : \mu_1 - \mu_2 < 0$.
    (b) −1.56.
    (c) 87 *df*, between 0.1 and 0.05.
    (d) Reject null and conclude health service salaries are lower.

2. Margin of error = 39, upper limit = 284, lower limit = 205.

3.

Mean factory A	=AVERAGE(A2:A125)
Pop SD	200
Mean factory B	=AVERAGE(B2:B125)
Pop SD	100
Margin of error	=1.96*(SQRT((E3^2/124)+(E7^2/124)))
Lower limit	=(E2–E6)–E9
Upper limit	=(E2–E6)+E9

4.

drugs.xlsx - Microsoft Excel

	A	B	C	D	E	F	G	H	I	J
1	Drug A	Drug B	Difference							
2	38	14	24	No of samples A		80	Mean of diff	-21	Margin of error	9.24217
3	38	33	5	No of samples B		80	SD of differe	31.3182	Lower confidence	-30.50
4	24	35	-11						Upper confidence	-12.02
5	38	58	-20	t-Test: Paired Two Sample for Means						
6	38	36	2							
7	39	26	13			Variable 1	Variable 2			
8	13	21	-8	Mean		24.838	46.1			
9	36	18	18	Variance		206.037	885.078			
10	10	40	-30	Observations		80.000	80			
11	16	65	-49	Pearson Correlation		0.129				
12	43	84	-41	Hypothesized Mean Difference		0.000				
13	29	10	19	df		79.000				
14	41	36	5	t Stat		-6.072				
15	10	2	8	P(T<=t) one-tail		0.000				
16	4	51	-47	t Critical one-tail		2.374				
17	19	10	9	P(T<=t) two-tail		0.000				
18	4	17	-13	t Critical two-tail		2.640				
19	8	32	-24							
20	7	21	-14							
21	15	5	10							
22	45	81	-36							

drugs.xlsx - Microsoft Excel (Show Formulas view)

	C	D	E	F	G	H	I
1	Difference						
2	=A2-B2	No of samples A	=COUNT(B2:B101)	Mean of differences	=AVERAGE(C2:C81)	Margin of error	=E18*G3/SQRT(E2)
3	=A3-B3	No of samples B	=COUNT(B2:B81)	SD of differences	=STDEV.S(C2:C81)	Lower confidence	=G2-I2
4	=A4-B4					Upper confidence	=G2+I2
5	=A5-B5	t-Test: Paired Two Sample for Means					
6	=A6-B6						
7	=A7-B7			Variable 1	Variable 2		
8	=A8-B8	Mean	24.8375	46.1			
9	=A9-B9	Variance	206.036550632911	885.078481012658			
10	=A10-B10	Observations	80	80			
11	=A11-B11	Pearson Correlation	0.129130152129992				
12	=A12-B12	Hypothesized Mean Difference	0				
13	=A13-B13	df	79				
14	=A14-B14	t Stat	-6.07243228913185				
15	=A15-B15	P(T<=t) one-tail	2.07627518646637E-08				
16	=A16-B16	t Critical one-tail	2.37448159693697				
17	=A17-B17	P(T<=t) two-tail	4.15255037293275E-08				
18	=A18-B18	t Critical two-tail	2.63950462745322				
19	=A19-B19						
20	=A20-B20						
21	=A21-B21						
22	=A22-B22						

5.

*Output1 [Document1] - IBM SPSS Statistics Viewer

Paired Samples Statistics

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	Drug A	24.84	80	14.354	1.605
	Drug B	46.10	80	29.750	3.326

Paired Samples Correlations

		N	Correlation	Sig.
Pair 1	Drug A & Drug B	80	.129	.254

Paired Samples Test

		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	99% Confidence Interval of the Difference Lower	Upper			
Pair 1	Drug A - Drug B	-21.263	31.318	3.501	-30.505	-12.020	-6.072	79	.000

IBM SPSS Statistics Processor is ready