



UNIVERSITI TUN HUSSEIN ONN MALAYSIA

**FINAL EXAMINATION
SEMESTER I
SESSION 2019/2020**

COURSE NAME : EDUCATIONAL DATA REASONING
COURSE CODE : BBD 30402
PROGRAM CODE : BBA / BBB / BBC/ BBD / BBE / BBF /
BBG
EXAMINATION DATE : DECEMBER 2019 / JANUARY 2020
DURATION : 2 HOURS
INSTRUCTION : ANSWER ALL QUESTIONS

TERBUKA

THIS QUESTION PAPER CONSISTS OF **FOURTEEN (14)** PAGES

Q1 An Education Faculty has recently opened a resource centre at the faculty and is available to students from 8am to 8pm Sunday to Thursday. Table Q1(a) shows the frequency of the resource centre on a particular week.

Table Q1(a)

Day	Sunday	Monday	Tuesday	Wednesday	Thursday
Number of users	121	87	87	91	114

- (a) The Dean would like to find out if the number of students using the resource centre is the same
- (i) Develop the null and alternative hypotheses to help the Dean in conducting this study. (4 marks)
 - (ii) State the appropriate statistical tests to test the hypotheses in Q1(a)(i). Give two (2) reasons for the selection. (3 marks)
 - (iii) Test at 5% level, is the frequency of students use the resource centre each of the five days of the week is the same? (9 marks)
- (b) Table Q1(b) shows the SPSS output for the association between academic performance and place of origin.

Table Q1(b)

Place of origin * Academic performance Crosstabulation						
		Academic performance			Total	
		Low	Moderate	High		
Place of origin	Urban	Count 20	42	35	97	
	Expected Count	31.9	38.9	26.1	97.0	
Rural	Count	35	25	10	70	
	Expected Count	23.1	28.1	18.9	70.0	
Total		Count 55	67	45	167	
		Expected Count	55.0	67.0	45.0	167.0

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	18.409 ^a	2	.000
Likelihood Ratio	18.829	2	.000
Linear-by-Linear Association	17.784	1	.000
N of Valid Cases	167		

a. 0 cells (.0%) have expected count less than 5. The minimum expected count is 18.86.

TERBUKA

- (i) What is the statistical test being used to analyse the data? (1 marks)
- (ii) Develop the null and the alternative hypothesis based on Q1(b). (4 marks)
- (iii) What is your conclusion based on the results in Table Q1(b). (4 marks)

Q2 A study was carried out to determine the correlation between the number of hours spent on computers per week (X) with the score they obtained in a specialised eyesight test (Y). A sample set of data is obtained after the interviewing a number of respondents as shown in Table Q2. Assume that the data is normally distributed.

Table Q2

Respondent	A	B	C	D	E	F
X	12	14	16	18	20	22
Y	100	70	86	49	60	50

- (a) Plot a scatter diagram to illustrate the relationship between the number of hours spent on computers per week (X) with the score they obtained in a specialised eyesight test (Y). (5 marks)
- (b) What can you conclude on the relationship between these variables by referring to the scatter diagram? (4 marks)
- (c) Suggest a suitable statistical test of this study. Give two (2) reasons. (3 marks)
- (d) Compute the statistical tests stated in Q2(c). (10 marks)
- (e) What is your conclusion based on Q2 (d)? (3 marks)

Q3. A lecturer wants to investigate if using collaboration has an effect on test score in the Educational Psychology class he taught. The Pre-test score before the collaboration was introduced in teaching & learning and the post-test score after the collaboration was introduced in teaching & learning are shown as in Table Q3. Assume that the scores are not normally distributed.

Table Q3

Student	Pre-test	Post-test
A	76	92
B	54	67
C	81	85
D	75	77
E	93	98
F	70	43
G	85	82
H	66	85
I	79	71

TERBUKA

- (a) What is the suitable method for analysing the data? Give two reasons. (3 marks)
- (b) State the null and alternative hypotheses. (4 marks)
- (c) At the $\alpha = 0.05$ level of significance, test the hypotheses. (15 marks)
- (d) What can you conclude from the results? (3 marks)

Q4 (a) Table Q4a shows the SPSS results for a single t-test.

Table Q4(a)

One-Sample Statistics				
	N	Mean	Std. Deviation	Std. Error Mean
write writing score	200	52.7750	9.47859	67024

One-Sample Test						
	Test Value = 50					
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
write writing score	4.140	199	.000	2.77500	1.4533	4.0967

- (i) When is single t-test used? (5 marks)
 - (ii) Based on the results in Table Q4(a) what can you conclude? (5 marks)
- (b) Table Q4(b) shows the SPSS results of same 200 students in a rural school who has taken both the writing and the reading test.
- (i) Develop the null and alternative hypotheses from the results if you want to compare if there is any differences between the mean score of both the test. (5 marks)
 - (ii) State the appropriate statistical test to test the hypotheses in Q4(b)(i). Give two reasons. (5 marks)
 - (iii) Based on the results in Table Q4(b) what can you conclude? (5 marks)

TERBUKA

Table Q4

Paired Samples Statistics				
	Mean	N	Std. Deviation	Std. Error Mean
Pair 1 write writing score	52.7750	200	9.47859	67024
read reading score	52.2300	200	10.25294	72499

Paired Samples Correlations			
	N	Correlation	Sig.
Pair 1 write writing score & read reading score	200	.597	.000

Paired Samples Test									
		Paired Differences					t	df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	write writing score - read reading score	.54500	8.88667	.62838	-.69414	1.78414	.867	199	.387

- END OF QUESTION -

TERBUKA

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2019/2020 PROGRAMME CODE : BBA/BBB/BBC/BBD/BBE/BBF/BBG
 COURSE NAME : EDUCATIONAL DATA REASONING COURSE CODE : BBD 30402

 χ^2 Distribution

Degrees of freedom	0.05	0.01
1	3.84	6.63
2	5.99	9.21
3	7.81	11.34
4	9.49	13.28
5	11.07	15.09
6	12.59	16.81
7	14.07	18.48
8	15.51	20.09
9	16.92	21.67
10	18.31	23.21
11	19.68	24.72
12	21.03	26.22
13	22.36	27.69
14	23.68	29.14
15	25.00	30.58
16	26.30	32.00
17	27.59	33.41
18	28.87	34.81
19	30.14	36.19
20	31.41	37.57
21	32.67	38.93
22	33.92	40.29
23	35.17	41.64
24	36.42	42.98
25	37.65	44.31
26	38.89	45.64
27	40.11	46.96
28	41.34	48.28
29	42.56	49.59
30	43.77	50.89
40	55.76	63.69
50	67.50	76.15
60	79.08	88.38
70	90.53	100.43
80	101.88	112.33
90	113.15	124.12
100	124.34	135.81

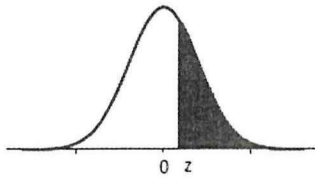
TERBUKA

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2019/2020 PROGRAMME CODE : BBA/BBB/BBC/BBD/BBE/BBF/BBG
 COURSE NAME : EDUCATIONAL DATA REASONING COURSE CODE : BBD 30402

Probabilities Associated with Values as Extreme as Observed Value of Z in the Normal Curve of distribution

Read values of Z to one decimal place down the left hand column, *Column z*. Read across Row z for values to two decimal places. The probabilities contained in the table are *one-tailed*. For two-tailed tests, multiply by 2.



Examples

The probability of a $Z \geq 0.14$ on a one-tailed test is $p = 0.4443$.

The probability of a $Z \geq 1.98$ on a two-tailed test is $p = 2 \times (0.0239) = 0.0478$

<i>z</i>	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641
0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233

TERBUKA

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2019/2020 PROGRAMME CODE : BBA/BBB/BBC/BBD/BBE/BBF/BBG
 COURSE NAME : EDUCATIONAL DATA REASONING COURSE CODE : BBD 30402

Probabilities Associated with Values as Extreme as Observed Value of z in the Normal Curve of Distribution (continued)

z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
3.2	0.0007									
3.3	0.0005									
3.4	0.0003									
3.5	0.00023									
3.6	0.00016									
3.7	0.00011									
3.8	0.00007									
3.9	0.00005									
4.0	0.00003									

TERBUKA

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2019/2020 PROGRAMME CODE : BBA/BBB/BBC/BBD/BBE/BBF/BBG
 COURSE NAME : EDUCATIONAL DATA REASONING COURSE CODE : BBD 30402

Critical Values of T In the Wilcoxon Test for Two Correlated Samples

	Levels of significance			
	One-tailed test			
	0.05	0.025	0.01	0.001
Sample size	Two-tailed test			
	0.1	0.05	0.02	0.002
$N = 5$	$T \leq 0$			
6	2	0		
7	3	2	0	
8	5	3	1	
9	8	5	3	
10	10	8	5	0
11	13	10	7	1
12	17	13	9	2
13	21	17	12	4
14	25	21	15	6
15	30	25	19	8
16	35	29	23	11
17	41	34	27	14
18	47	40	32	18
19	53	46	37	21
20	60	52	43	26
21	67	58	49	30
22	75	65	55	35
23	83	73	62	40
24	91	81	69	45
25	100	89	76	51
26	110	98	84	58
27	119	107	92	64
28	130	116	101	71
30	151	137	120	86
31	163	147	130	94
32	175	159	140	103
33	187	170	151	112

Source: Adapted from Table 6.5, Ray Meddis, *Statistical Handbook for Non-Statisticians*, London: McGraw-Hill, 1975, p.113, with the kind permission of the author and publisher.

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2019/2020 PROGRAMME CODE : BBA/BBB/BBC/BBD/BBE/BBF/BBG
 COURSE NAME : EDUCATIONAL DATA REASONING COURSE CODE : BBD 30402

t Distribution

d.f.	Level of significance for one-tailed test			
	0.05	0.025	0.01	0.005
	Level of significance for two-tailed test			
	0.10	0.05	0.02	0.01
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

TERBUKA

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2019/2020 PROGRAMME CODE : BBA/BBB/BBC/BBD/BBE/BBF/BBG
COURSE NAME : EDUCATIONAL DATA REASONING COURSE CODE : BBD 30402

Spearman Rank Correlation Coefficient Values

N	Significance level (one-tailed test)	
	0.05	0.01
4	1.000	
5	0.900	1.000
6	0.829	0.943
7	0.714	0.893
8	0.643	0.833
9	0.600	0.783
10	0.564	0.746
12	0.506	0.712
14	0.456	0.645
16	0.425	0.601
18	0.399	0.564
20	0.377	0.534
22	0.359	0.508
24	0.343	0.485
26	0.329	0.465
28	0.317	0.448
30	0.306	0.432

TERBUKA

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2019/2020 PROGRAMME CODE : BBA/BBB/BBC/BBD/BBE/BBF/BBG
 COURSE NAME : EDUCATIONAL DATA REASONING COURSE CODE : BBD 30402

Table of Critical Values for Pearson's r

df	Level of Significance for a One-Tailed Test					
	.10	.05	.025	.01	.005	.0005
	Level of Significance for a Two-Tailed Test					
	.20	.10	.05	.02	.01	.001
1	0.951	0.988	0.997	0.9995	0.9999	0.99999
2	0.800	0.900	0.950	0.980	0.990	0.999
3	0.687	0.805	0.878	0.934	0.959	0.991
4	0.608	0.729	0.811	0.882	0.917	0.974
5	0.551	0.669	0.755	0.833	0.875	0.951
6	0.507	0.621	0.707	0.789	0.834	0.925
7	0.472	0.582	0.666	0.750	0.798	0.898
8	0.443	0.549	0.632	0.715	0.765	0.872
9	0.419	0.521	0.602	0.685	0.735	0.847
10	0.398	0.497	0.576	0.658	0.708	0.823
11	0.380	0.476	0.553	0.634	0.684	0.801
12	0.365	0.457	0.532	0.612	0.661	0.780
13	0.351	0.441	0.514	0.592	0.641	0.760
14	0.338	0.426	0.497	0.574	0.623	0.742
15	0.327	0.412	0.482	0.558	0.606	0.725
16	0.317	0.400	0.468	0.542	0.590	0.708
17	0.308	0.389	0.456	0.529	0.575	0.693
18	0.299	0.378	0.444	0.515	0.561	0.679
19	0.291	0.369	0.433	0.503	0.549	0.665
20	0.284	0.360	0.423	0.492	0.537	0.652
21	0.277	0.352	0.413	0.482	0.526	0.640
22	0.271	0.344	0.404	0.472	0.515	0.629
23	0.265	0.337	0.396	0.462	0.505	0.618
24	0.260	0.330	0.388	0.453	0.496	0.607
25	0.255	0.323	0.381	0.445	0.487	0.597
26	0.250	0.317	0.374	0.437	0.479	0.588
27	0.245	0.311	0.367	0.430	0.471	0.579
28	0.241	0.306	0.361	0.423	0.463	0.570
29	0.237	0.301	0.355	0.416	0.456	0.562
30	0.233	0.296	0.349	0.409	0.449	0.554
40	0.202	0.257	0.304	0.358	0.393	0.490
60	0.165	0.211	0.250	0.295	0.325	0.408
120	0.117	0.150	0.178	0.210	0.232	0.294
∞	0.057	0.073	0.087	0.103	0.114	0.146

Adapted from Appendix 2 (Critical Values of r) using the square root of $[r^2/(r^2 + df)]$
 Note: Critical values for Infinite df actually calculated for df= 500.

TERBUKA

FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2019/2020 PROGRAMME CODE : BBA/BBB/BBC/BBD/BBE/BBF/BBG
 COURSE NAME : EDUCATIONAL DATA REASONING COURSE CODE : BBD 30402

Mann-Whitney U Test Values (Two-Tailed Test)

Equal sample sizes

n	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
0.05	-	-	-	0	2	5	8	13	17	23	30	37	45	55	64	75	87	99	113	127	142	158	175	192	211
0.01	-	-	-	-	0	2	4	7	11	16	21	27	34	42	51	60	70	81	93	105	118	133	148	164	180
n	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50
0.05	230	250	272	294	317	341	365	391	418	445	473	503	533	564	596	628	662	697	732	769	806	845	884	924	965
0.01	198	216	235	255	276	298	321	344	369	394	420	447	475	504	533	564	595	627	660	694	729	765	802	839	877

n_L = larger sample size ; n_s = smaller sample size

	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	n_L n_s	0.05	
2	-	-	-	-	-	0	0	0	0	1	1	1	1	1	2	2	2	2	3	3	3	3	3	3	2		
3	-	-	0	1	1	2	2	3	3	4	4	5	5	6	6	7	7	8	8	9	9	10	10	10	3		
4	-	-	1	2	3	4	4	5	6	7	8	9	10	11	11	12	13	14	15	16	17	17	18	18	4		
5	-	-	-	3	5	6	7	8	9	11	12	13	14	15	17	18	19	20	22	23	24	25	27	5			
6	-	-	0	1	6	8	10	11	13	14	16	17	19	21	22	24	25	27	29	30	32	33	35	6			
7	-	-	0	1	3	10	12	14	16	18	20	22	24	26	28	30	32	34	36	38	40	42	44	7			
8	-	-	1	2	4	6	15	17	19	22	24	26	29	31	34	36	38	41	43	45	48	50	53	8			
9	-	0	1	3	5	7	9	20	23	26	28	31	34	37	39	42	45	48	50	53	56	59	62	9			
10	-	0	2	4	6	9	11	13	26	29	33	36	39	42	45	48	52	55	58	61	64	67	71	10			
11	-	0	2	5	7	10	13	16	18	33	37	40	44	47	51	55	58	62	65	69	73	76	80	11			
12	-	1	3	6	9	12	15	18	21	24	41	45	49	53	57	61	65	69	73	77	81	85	89	12			
13	-	1	3	7	10	13	17	20	24	27	31	50	54	59	63	67	72	76	80	85	89	94	98	13			
14	-	1	4	7	11	15	18	22	26	30	34	38	59	64	69	74	78	83	88	93	98	102	107	14			
15	-	2	5	8	12	16	20	24	29	33	37	42	46	70	75	80	85	90	96	101	106	111	117	15			
16	-	2	5	9	13	18	22	27	31	36	41	45	50	55	81	86	92	98	103	109	115	120	126	16			
17	-	2	6	10	15	19	24	29	34	39	44	49	54	60	65	93	99	105	111	117	123	129	135	17			
18	-	2	6	11	16	21	26	31	37	42	47	53	58	64	70	75	106	112	119	125	132	138	145	18			
19	0	3	7	12	17	22	28	33	39	45	51	57	63	69	74	81	87	119	126	133	140	147	154	19			
20	0	3	8	13	18	24	30	36	42	48	54	60	67	73	79	86	92	99	134	141	149	156	163	20			
21	0	3	8	14	19	25	32	38	44	51	58	64	71	78	84	91	98	105	112	150	157	165	173	21			
22	0	4	9	14	21	27	34	40	47	54	61	68	75	82	89	96	104	111	118	125	166	174	182	22			
23	0	4	9	15	22	29	35	43	50	57	64	72	79	87	94	102	109	117	125	132	140	183	192	23			
24	0	4	10	16	23	30	37	45	52	60	68	75	83	91	99	107	115	123	131	139	147	155	201	24			
25	0	4	10	17	24	32	39	47	55	63	71	79	87	96	104	112	121	129	138	146	155	163	172	25			
0.01	n_L	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	27	25	n_s	

Source: Table 5.3, of Neave, H. R., Statistics Tables. London: George Allen & Unwin, 1978, p. 53, with the permission of the author and publisher



FINAL EXAMINATION

SEMESTER / SESSION : SEM I / 2019/2020 PROGRAMME CODE : BBA/BBB/BBC/BBD/BBE/BBF/BBG
 COURSE NAME : EDUCATIONAL DATA REASONING COURSE CODE : BBD 30402

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$$

$$s = \sqrt{\frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n-1}}$$

$$r_{ab} = \frac{\sum_{i=1}^n [(x_{ai} - \bar{x}_a)(x_{bi} - \bar{x}_b)]}{ns_a s_b}$$

$$r_s = 1 - \frac{6 \sum D^2}{n^3 - n}$$

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

$$r_p = \left[\frac{N \sum XY - (\sum X)(\sum Y)}{\sqrt{(N \sum X^2 - (\sum X)^2)} \sqrt{(N \sum Y^2 - (\sum Y)^2)}} \right]$$

$$r = \frac{SP}{\sqrt{SS_x SS_y}}$$

$$r_s = 1 - \frac{6 \sum d^2}{n(n^2 - 1)}$$

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

$$t = r \sqrt{\frac{(n-2)}{1-r^2}}$$

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

$$U_2 = n_1 n_2 + \frac{n_2(n_2+1)}{2} - R_2$$

$$U_1 = n_1 n_2 + \frac{n_1(n_1+1)}{2} - R_1$$

$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{S_1^2}{n_1} + \frac{S_2^2}{n_2}}}$$

$$t = \frac{\bar{x}_1 - \bar{x}_2}{S_D}, S_D = \frac{S_d}{\sqrt{n}}$$

$$t = \frac{S m_1 - S m_2}{s_p \sqrt{\frac{1}{S n_1} + \frac{1}{S n_2}}}$$

$$s_p = \sqrt{\frac{(S n_1 - 1) S d_1^2 + (S n_2 - 1) S d_2^2}{S n_1 + S n_2 - 2}}$$

$$v = S n_1 + S n_2 - 2$$

$$t = \frac{(\bar{X}_1 - \bar{X}_2) - (\mu_1 - \mu_2)}{S_{\bar{X}_1 - \bar{X}_2}} = \frac{\bar{X}_1 - \bar{X}_2}{S_{\bar{X}_1 - \bar{X}_2}}$$

TERBUKA