UNIVERSITY OF SWAZILAND

FACULTY OF EDUCATION

DEPARTMENT OF EDUCATIONAL FOUNDATIONS AND MANAGEMENT

FOR

FACULTY OF EDUCATION

POSTGRADUATE CERTIFICATE IN EDUCATION (PGCE) Full -Time

SUPPLEMENTARY EXAMINATION PAPER – JANUARY 2016

COURSE CODE	:	EFM 515
TITLE OF PAPER	:	EDUCATIONAL RESEARCH
TIME ALLOWED	:	THREE HOURS
INSTRUCTIONS	:	1. THIS PAPER IS DIVIDED INTO **TWO SECTIONS** (**A** AND **B**). ANSWER **ANY TWO** QUESTIONS FROM EACH SECTION **2.** UTILISE THE ATTACHED STATISTICAL FORMULAS AND TABLES WHERE NECESSARY.
TOTAL MARKS	:	100

THIS PAPER IS NOT TO BE OPENED UNTIL PERMISSION TO DO SO HAS BEEN GRANTED BY THE INVIGILATOR.

SECTION A

1. Discuss any five key ethical considerations when conducting an educational research **Total: 25 marks**

2. Examine any four random sampling methods showing how they can be used in educational research. **Total: 25 marks**

3. Explain the following research components and show how they are related:

(a) Statement of the problem **(6 marks)**

(b) Research questions **(6 marks)**

(c) Research hypothesis **(6 marks)**

(d) Research design **(7 marks)**

[Total: 25 marks]

SECTION B

4. Table 1 below is a data set of marks obtained by 10 O'Level pupils in Maths and Physics In-Class tests.

Student	A	B	C	D	E	F	G	H	I	J
Mathematics (X)	62	71	72	62	74	83	54	78	67	57
Physics (Y)	63	61	51	62	58	48	75	57	60	75

(a) Calculate the median of the Mathematics marks **(1 mark)**

(b) Locate the mode of Physics marks **(1 mark)**

(c) Calculate the mean of the Mathematics marks **(1 mark)**

(d) Compute the mean of the physics marks **(1 mark)**

(e) Find the standard deviation of the Physics marks **(4 marks)**

(f) Suppose the standard deviation of the Mathematics is 9.29, determine the subject in which student D did better **(2 marks).**

(g) Give any **two** advantages and **two** disadvantages of using the mean to explain students' performance **(4 marks).**

(h) From the data given in **Table 1** above:

(i). Compute Spearman rank order correlation coefficient and comment on it **(5 marks).**

Table 2: A data set of marks obtained by 10 O'level pupils in Maths and Physics tests.

PUPIL	A	B	C	D	E	F	G	H	I	J
MATHS	80	60	72	47	62	75	64	58	72	70
PHYSICS	78	61	70	52	60	75	65	60	70	70

(j). Carry out a t-test at 1% significance level to determine if there is a difference between the students' performance in Mathematics and in Physics **(5 marks).**

[Total: 25 marks]

5. **Table 3 below is a data set of marks obtained by 10 PGCE students in Educational Psychology and Sociology of Education In-Class tests.**

Student	A	B	C	D	E	F	G	H	I	J
Educational Psychology (X)	62	71	72	62	74	83	54	78	67	57
Sociology of Education (Y)	63	61	51	62	58	48	75	57	60	75

5.a. Calculate the median of the Educational Psychology marks **(4 marks)**

5.b. Locate the mode of Sociology of Education marks **(4 marks)**

5.c. Calculate the mean of the Educational Psychology marks **(4 marks)**

5.d. Compute the mean of the Sociology of Education marks **(4 marks)**

5.e. Find the standard deviation of the Sociology of Education marks **(4 marks)**

5.f. Suppose the standard deviation of the Educational Psychology is 9.29, determine the subject in which student D did better **(5 marks)**

Total 25 marks

6. (a). Define the following terms:

i. Mean **(1 mark)**

ii. Mode **(1 mark)**

iii. median **(1 mark)**

b). The following is a list of test marks for the final year students studying education at the University of Swaziland in their statistics course. The highest possible mark for the test is 10.

10 3 4 9 9 3 1 0 5 6 5 5 3 7 9 8 7

Find the

i. mode of the marks obtained **(1 mark)**

ii. the range of the marks obtained **(1 mark)**

iii. the mean of the marks obtained **(1mark)**

C). Find the inter-quartile range using the following procedure

i. First calculate the lower quartile using $(\mathbf{n}+1)/4$ **(1 mark)**

ii. Second, calculate the upper quartile using $3\times(\mathbf{n}+1)/4$ **(1 mark)**

iii. Finally calculate the inter-quartile range **(1 mark)**

Note that **n** is the number of students and that the above formulas give us the positions of the quartiles not the values of the quartiles

d). i. The following table gives the number of Grade 10 pupils taking each of the five subjects geography, Afrikaans, English and science

Table 4 showing the number of Grade 10 pupils taking each of the five subjects geography, Afrikaans, English and science

Subject	Frequency
Geography	10
Afrikaans	15
English	25
Science	15

Copy and complete the following frequency table using the data given in Table 4

Subject	Frequency	Percentage	Cumulative percentage
Geography	10		
Afrikaans	15		
English	25		
Science	15		

[4 marks]

ii. Represent the information in the table that you completed in a pie chart using the columns "subject" and "percentage" **[4 marks]**

e. Suppose we have 8 students in a class and the grades of their assignment are as follows

72 6 93 51 77 43 88 and 96

i). What is the mean mark in this class? **[2 marks]**

ii). What is the median mark? **[2 marks]**

iii). What is the variance and the standard deviation of these marks? **[3 marks]**

iv). What does the value of the standard deviation that you obtained mean? **[2 marks]**

Total 25 marks

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STATISTICAL FORMULAE

Sample Variance: $S^2 = \frac{\sum(x-\bar{x})^2}{n-1}$

Sample Standard Deviation: $s = \sqrt{\frac{\sum(x-\bar{x})^2}{n-1}}$

Product moment correlation coefficient:

$$r_{xy} = \frac{n\sum xy - \sum x \sum y}{\sqrt{[n\sum x^2 - (\sum x)^2][n\sum y^2 - (\sum y)^2]}}$$

Spearman's rank order correlation coefficient: $rho = 1 - \frac{6\sum d^2}{n(n^2-1)}$

Chi-squared Test Statistic: $x^2 = \sum \frac{(0-E)^2}{E}$

Z-score: $z = \frac{x-\bar{x}}{s}$

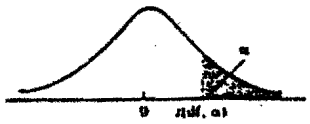
Standardisation: $z = \frac{u-\mu}{\sigma}$ **Where Z ~N(0,1)**

T-score: $T = 50 + 10\left(\frac{x-\bar{x}}{s}\right)$

Student t-test: $t = \frac{\sqrt{(n-1)\sum d}}{\sqrt{n\sum d^2 - (\sum d)^2}}$

Table 2 Critical values of Student's t distribution

The entries in this table are the critical values for Student's t for an area of α in the right-hand tail. Critical values for the left-hand tail are found by symmetry

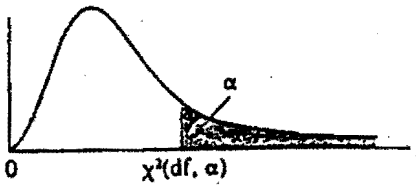


	Amount of α in One-tail					
df	0.25	0.10	0.05	0.025	0.01	0.005
1	1.000	3.08	6.31	12.7	31.8	63.7
2	0.816	1.89	2.92	4.30	6.97	9.92
3	0.765	1.64	2.35	3.18	4.54	5.84
4	0.741	1.53	2.13	2.78	3.75	4.60
5	0.727	1.48	2.02	2.57	3.37	4.03
6	0.718	1.44	1.94	2.45	3.14	3.71
7	0.711	1.42	1.89	2.36	3.00	3.50
8	0.706	1.40	1.86	2.31	2.90	3.36
9	0.703	1.38	1.83	2.26	2.82	3.25
10	0.700	1.37	1.81	2.23	2.76	3.17
11	0.697	1.36	1.80	2.20	2.72	3.11
12	0.695	1.36	1.78	2.18	2.68	3.05
13	0.694	1.35	1.77	2.16	2.65	3.01
14	0.692	1.35	1.76	2.14	2.62	2.98
15	0.691	1.34	1.75	2.13	2.60	2.95
16	0.690	1.34	1.75	2.12	2.58	2.92
17	0.689	1.33	1.74	2.11	2.57	2.90
18	0.688	1.33	1.73	2.10	2.55	2.88
19	0.688	1.33	1.73	2.09	2.54	2.86
20	0.687	1.33	1.72	2.09	2.53	2.85
21	0.686	1.32	1.72	2.08	2.52	2.83
22	0.686	1.32	1.72	2.07	2.51	2.82
23	0.685	1.32	1.71	2.07	2.50	2.81
24	0.685	1.32	1.71	2.06	2.49	2.80
25	0.684	1.32	1.71	2.06	2.49	2.79
26	0.684	1.32	1.71	2.06	2.48	2.78
27	0.684	1.31	1.70	2.05	2.47	2.77
28	0.683	1.31	1.70	2.05	2.47	2.76
29	0.683	1.31	1.70	2.05	2.46	2.76
z	0.674	1.28	1.65	1.96	2.33	2.58

NOTE: For $df \geq 30$, the critical value $t(df, \alpha)$ is approximated by $z(\alpha)$, given in the bottom row of table.

Table 3 Critical values of the χ^2 distribution

The entries in this table are the critical values for chi square for which the area to the right under the curve is equal to α.



	Amount of α in Right-hand Tail									
df	0.995	0.990	0.975	0.950	0.900	0.100	0.050	0.025	0.010	0.005
1	0.0000393	0.000157	0.000982	0.00393	0.0158	2.71	3.84	5.02	6.65	7.88
2	0.0100	0.0201	0.0506	0.103	0.211	4.61	6.00	7.38	9.21	10.6
3	0.0717	0.115	0.216	0.352	0.584	6.25	7.82	9.35	11.4	12.9
4	0.207	0.297	0.484	0.711	1.0636	7.78	9.50	11.1	13.3	14.9
5	0.412	0.554	0.831	1.15	1.61	9.24	11.1	12.8	15.1	16.8
6	0.676	0.872	1.24	1.64	2.20	10.6	12.6	14.5	16.8	18.6
7	0.990	1.24	1.69	2.17	2.83	12.0	14.1	16.0	18.5	20.3
8	1.34	1.65	2.18	2.73	3.49	13.4	15.5	17.5	20.1	22.0
9	1.73	2.09	2.70	3.33	4.17	14.7	17.0	19.0	21.7	23.6
10	2.16	2.56	3.25	3.94	4.87	16.0	18.3	20.5	23.2	25.2
11	2.60	3.05	3.82	4.58	5.58	17.2	19.7	21.9	24.7	26.8
12	3.07	3.57	4.40	5.23	6.30	18.6	21.0	23.3	26.2	28.3
13	3.57	4.11	5.01	5.90	7.04	19.8	22.4	24.7	27.7	29.8
14	4.07	4.66	5.63	6.57	7.79	21.1	23.7	26.1	29.1	31.3
15	4.60	5.23	6.26	7.26	8.55	22.3	25.0	27.5	30.6	32.8
16	5.14	5.81	6.91	7.96	9.31	23.5	26.3	28.9	32.0	34.3
17	5.70	6.41	7.56	8.67	10.1	24.8	27.6	30.2	33.4	35.7
18	6.26	7.01	8.23	9.39	10.9	26.0	28.9	31.5	34.8	37.2
19	6.84	7.63	8.91	10.1	11.7	27.2	30.1	32.9	36.2	38.6
20	7.43	8.26	9.59	10.9	12.4	28.4	31.4	34.2	37.6	40.0
21	8.03	8.90	10.3	11.6	13.2	29.6	32.7	35.5	39.0	41.4
22	8.64	9.54	11.0	12.3	14.0	30.8	33.9	36.8	40.3	42.8
23	9.26	10.2	11.0	13.1	14.9	32.0	35.2	38.1	41.6	44.2
24	9.89	10.9	12.4	13.9	15.7	33.2	36.4	39.4	43.0	45.6
25	10.5	11.5	13.1	14.6	16.5	34.4	37.7	40.7	44.3	46.9
26	11.2	12.2	13.8	15.4	17.3	35.6	38.9	41.9	45.6	48.3
27	11.8	12.9	14.6	16.2	18.1	36.7	40.1	43.2	47.0	49
28	12.5	13.6	15.3	16.9	18.9	37.9	41.3	44.5	48.3	51.0
29	13.1	14.3	16.1	17.7	19.8	39.1	42.6	45.7	49.6	52.3
30	13.8	15.0	16.8	18.5	20.6	40.3	43.8	47.0	50.9	53.7
40	20.7	22.2	24.4	26.5	29.1	51.8	55.8	59.3	63.7	66.8
50	28.0	29.7	32.4	34.8	37.7	63.2	67.5	71.4	76.2	79.5
60	35.5	37.5	40.5	43.2	46.5	74.4	79.1	83.3	88.4	92.0
70	43.3	45.4	48.8	51.8	55.3	85.5	90.5	95.0	100.0	104.0
80	51.2	53.5	57.2	60.4	64.3	96.6	102.0	107.0	112.0	116.0
90	59.2	61.8	65.7	69.1	73.3	108.0	113.0	118.0	124.0	128.0
100	67.3	70.1	74.2	77.9	82.4	114.0	124.0	130.0	136.0	140.0

5% Significance level.

Degrees of Freedom for Denominator	Degrees of Freedom for Numerator																		
	1	2	3	4	5	6	7	8	9	10	12	15	20	24	30	40	60	120	∞
1	161	200	216	225	230	234	237	239	241	242	244	246	248	249	250	251	252	253	254
2	18.5	19.0	19.2	19.2	19.3	19.3	19.4	19.4	19.4	19.4	19.4	19.4	19.4	19.5	19.5	19.5	19.5	19.5	19.5
3	10.1	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66	8.64	8.62	8.59	8.57	8.55	8.53
4	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86	5.80	5.77	5.75	5.72	5.69	5.66	5.63
5	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.62	4.56	4.53	4.50	4.46	4.43	4.40	4.37
6	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.94	3.87	3.84	3.81	3.77	3.74	3.70	3.67
7	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.51	3.44	3.41	3.38	3.34	3.30	3.27	3.23
8	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.22	3.15	3.12	3.08	3.04	3.01	2.97	2.93
9	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.01	2.94	2.90	2.86	2.83	2.79	2.75	2.71
10	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.85	2.77	2.74	2.70	2.66	2.62	2.58	2.54
11	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.72	2.65	2.61	2.57	2.53	2.49	2.45	2.40
12	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.62	2.54	2.51	2.47	2.43	2.38	2.34	2.30
13	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.53	2.46	2.42	2.38	2.34	2.30	2.25	2.21
14	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.53	2.46	2.39	2.35	2.31	2.27	2.22	2.18	2.13
15	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.48	2.40	2.33	2.29	2.25	2.20	2.16	2.11	2.07
16	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.42	2.35	2.28	2.24	2.19	2.15	2.11	2.06	2.01
17	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.38	2.31	2.23	2.19	2.15	2.10	2.06	2.01	1.96
18	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.34	2.27	2.19	2.15	2.11	2.06	2.02	1.97	1.92
19	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.31	2.23	2.16	2.11	2.07	2.03	1.98	1.93	1.88
20	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.28	2.20	2.12	2.08	2.04	1.99	1.95	1.90	1.84
21	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.25	2.18	2.10	2.05	2.01	1.96	1.92	1.87	1.81
22	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.23	2.15	2.07	2.03	1.98	1.94	1.89	1.84	1.78
23	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.20	2.13	2.05	2.01	1.96	1.91	1.86	1.81	1.76
24	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.18	2.11	2.03	1.98	1.94	1.89	1.84	1.79	1.73
25	4.24	3.39	2.99	2.76	2.60	2.49	2.40	2.34	2.28	2.24	2.16	2.09	2.01	1.96	1.92	1.87	1.82	1.77	1.71
30	4.17	3.32	2.92	2.69	2.53	2.42	2.33	2.27	2.21	2.16	2.09	2.01	1.93	1.89	1.84	1.79	1.74	1.68	1.62
40	4.08	3.23	2.84	2.61	2.45	2.34	2.25	2.18	2.12	2.08	2.00	1.92	1.84	1.79	1.74	1.69	1.64	1.58	1.51
60	4.00	3.15	2.76	2.53	2.37	2.25	2.17	2.10	2.04	1.99	1.92	1.84	1.75	1.70	1.65	1.59	1.53	1.47	1.39
120	3.92	3.07	2.68	2.45	2.29	2.18	2.09	2.02	1.96	1.91	1.83	1.75	1.66	1.61	1.55	1.50	1.43	1.35	1.25
∞	3.84	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.75	1.67	1.57	1.52	1.46	1.39	1.32	1.22	1.00