UNIVERSITY OF SWAZILAND

DEPARTMENT OF GEOGRAPHY, ENVIRONMENTAL SCIENCE AND PLANNING

FINAL EXAMINATION PAPER MAY 2014

B.SC., B.A., BASS & B.ED

TITLE OF PAPER: STATISTICAL GEOGRAPHY

COURSE NUMBER: GEP 223

TIME ALLOWED: THREE (3) HOURS

INSTRUCTIONS:

1. ANSWER THREE (3) QUESTIONS
2. QUESTION 1 IS COMPULSORY.
3. CHOOSE TWO (2) QUESTIONS FROM SECTION B
4. WHERE APPROPRIATE ILLUSTRATE YOUR ANSWERS WITH EXAMPLES.
5. ALL WORKING AND/OR CALCULATIONS MUST BE SHOWN.
6. YOU WILL BE PROVIDED WITH GRPAH PAPERS AND TABLES FOR CRITICAL VALUES AND SIGNIFICANCE LEVELS.

ALLOCATION OF MARKS: QUESTION ONE (1) CARRIES 40 MARKS WHILE THE REST CARRY 30 MARKS EACH

THIS PAPER SHOULD NOT BE OPENED UNTIL PERMISSION IS GRANTED BY THE INVIGILATOR

SECTION A: COMPULSORY

QUESTION 1

Table 1 below shows hypothetical rainfall in millimetres and the yield of maize in bags per hectare.

(a) Draw a scatter plot of the data (5 marks)
(b) Draw the least squares regression line (15 marks)

(c) Compute the Pearson's correlation coefficient (r) (15 marks)

(d) Interprete the value of the r obtained in (c) above (5 marks)

(40 Marks)

Table 1 Rainfall in millimetres and the yield per hectare

Field No.	Rainfall (mm)	Yield per hectare	Field No.	Rainfall (mm)	Yield per hectare
1.	12.9	62.5	11.	8.5	45.2
2.	7.2	28.7	12.	17.2	78.4
3.	11.3	52.2	13.	30.4	99.8
4.	18.6	80.6	14.	12.6	54.2
5.	8.8	41.6	15.	7.8	32.4
6.	10.3	44.5	16.	16.2	75.2
7.	15.9	71.3	17.	10.2	48.9
8.	13.1	54.4	18.	25.1	87.1
9.	22.4	84.6	19.	22.6	79.0
10.	21.6	81.9	20.	24.4	82.1

Source: Hypothetical

SECTION B: ANSWER ANY TWO QUESTIONS

QUESTION 2

(a) Identify three (3) geographical problems where participant observation would be a suitable technique for data collection. (18 marks)

(a) Discuss the disadvantages of using secondary data in a research. (12 marks)

(30 Marks)

QUESTION 3

The Ministry of Education has commissioned consultants to undertake a survey aimed at determining the relationship between age and weight of students in high schools in Swaziland. Due to financial constraints, the Ministry of Education and Training is unable to cover all the schools in the country, thus covering only ten (10) schools in the Hhohho district.

(a) Justify why this is not a representative sample of high schools in the country.

(15 marks)

(b) With data provided in table 2, which shows the age and weight of students from Nkhaba High School one of the selected schools in the Hhohho district, calculate the Spearman Rank Correlation Coefficient.

(15 marks)

(30 Marks)

Table 2 Age and weight of students from Nkhaba High School

Student No.	Age	Weight
1.	18	64
2.	17	60
3.	20	68
4.	17	61
5.	19	66
6.	16	63
7.	14	58
8.	19	65
9.	13	54
10.	15	60
11.	18	64
12.	11	52
13.	17	58
14.	18	60
15.	15	57

QUESTION 4

Table 3 shows some hypothetical figures on water holding capacity for two sites at Malkerns Research station. The null hypothesis (H_0) states that there is no real difference in the water holding capacity between the two sites. If there is any difference, then this might be due to the way the random samples of the soils have been taken. The alternative hypothesis (H_1) states that site A actually has higher water holding capacity than site B. The significance level has been set at 0.05.

(a) Assuming the samples are from two independent variables X (site A) and Y (site B). Apply a student's t-test for independent samples to determine whether you should reject H_0 in favour of H_1. (12 marks)

(b) Again, let us assume the sample values given in table 2, X for site A and Y for site B are paired. Apply the student's t-test for independent samples to determine whether you should reject or accept the H_0 in favour of H_1. (10 marks)

(c) Comment on the answers in (a) and (b) above (4 marks)

(d) Identify the situations in which the student's t-test can be used (4 marks)

(30 Marks)

Table 3 Water Holding Capacity at Malkerns Research station

Samples from Site A (variable x)	Samples from Site B (variable y)
91	82
72	80
62	99
85	20
71	25
86	54
58	50
29	46
45	70
101	58
88	102
61	44
83	76
74	55
80	60

Source: Hypothetical

QUESTION 5

Using relevant examples, explain how the following procedures and data types differ from each other.

(a) Parametric and non-parametric tests (6 marks)
(b) Probability sampling and non-probability sampling (6 marks)
(c) Nominal and ordinal data (6 marks)
(d) Grouped and ungrouped data (6 marks)
(e) Primary and secondary data (6 marks)

(30 marks)

C9 Critical Values of Spearman's Rank Correlation Coefficient r_s

Degrees of freedom	Significance level (one-tailed) 0.05	0.025	0.01	0.005
	Significance level (two-tailed) 0.1	0.05	0.02	0.01
4	1.000			
5	0.900	1.000	1.000	
6	0.829	0.886	0.943	1.000
7	0.714	0.786	0.893	0.929
8	0.643	0.738	0.833	0.881
9	0.600	0.683	0.783	0.833
10	0.564	0.648	0.745	0.794
11	0.523	0.623	0.736	0.818
12	0.497	0.591	0.703	0.780
13	0.475	0.566	0.673	0.745
14	0.457	0.545	0.646	0.716
15	0.441	0.525	0.623	0.689
16	0.425	0.507	0.601	0.666
17	0.412	0.490	0.582	0.645
18	0.399	0.476	0.564	0.625
19	0.388	0.462	0.549	0.608
20	0.377	0.450	0.534	0.591
21	0.368	0.438	0.521	0.576
22	0.359	0.428	0.508	0.562
23	0.351	0.418	0.496	0.549
24	0.343	0.409	0.485	0.537
25	0.336	0.400	0.475	0.526
26	0.329	0.392	0.465	0.515
27	0.323	0.385	0.456	0.505
28	0.317	0.377	0.448	0.496
29	0.311	0.370	0.440	0.487
30	0.305	0.364	0.432	0.478
35	0.282	0.336	0.399	0.442
40	0.263	0.314	0.373	0.413
45	0.248	0.296	0.351	0.388
50	0.235	0.280	0.332	0.368
55	0.224	0.267	0.317	0.351
60	0.214	0.255	0.303	0.335
65	0.206	0.245	0.291	0.322
70	0.198	0.236	0.280	0.310
75	0.191	0.228	0.271	0.300
80	0.185	0.221	0.262	0.290
85	0.180	0.214	0.254	0.281
90	0.174	0.208	0.247	0.273
95	0.170	0.202	0.240	0.266
100	0.165	0.197	0.234	0.259

Reject H_0 if calculated value of r_s is **greater than** the critical value at the chosen significance level (in absolute terms).

For degrees of freedom greater than 30 other critical values can be found from the following relationship:

$$r_s = z\sqrt{1/(n-1)}$$

where r_s is the critical value of r_s, n is the number of individuals in the data set (the degrees of freedom), and z is the appropriate critical value of a standard normal deviate (from Appendix C10). For a two-tailed test at the 0.01 level the appropriate value of z is 2.576, so the critical value of r_s with 72 degrees of freedom is:

$$2.576\sqrt{1/(72-1)} = 2.576\sqrt{0.014}$$
$$= 2.576 \times 0.119$$
$$= 0.306$$

C10 Critical Values of a Standard Normal Deviate z

	Significance level (one-tailed) 0.1	0.05	0.01	0.005	0.001
z	1.282	1.645	2.326	2.576	3.090
−z	−1.282	−1.645	−2.326	−2.576	−3.090
	Significance level (two-tailed) 0.1	0.05	0.01	0.005	0.001
z	1.645	1.960	2.576	2.813	3.291
−z	−1.645	−1.960	−2.576	−2.813	−3.291

C8 Critical Values of Pearson's Product-Moment Correlation Coefficient r

Degrees of freedom	Significance level (one-tailed) 0.05	0.025	0.01	0.005
	Significance level (two-tailed) 0.1	0.05	0.02	0.01
1	0.9877	0.9969	0.9995	0.9999
2	0.900	0.950	0.980	0.990
3	0.805	0.878	0.934	0.959
4	0.729	0.811	0.882	0.917
5	0.669	0.755	0.833	0.875
6	0.622	0.707	0.789	0.834
7	0.582	0.666	0.750	0.798
8	0.549	0.632	0.716	0.765
9	0.521	0.602	0.685	0.735
10	0.497	0.576	0.658	0.708
11	0.476	0.553	0.634	0.684
12	0.458	0.532	0.612	0.661
13	0.441	0.514	0.592	0.641
14	0.426	0.497	0.574	0.623
15	0.412	0.482	0.558	0.606
16	0.400	0.468	0.543	0.590
17	0.389	0.456	0.529	0.575
18	0.378	0.444	0.516	0.561
19	0.369	0.433	0.503	0.549
20	0.360	0.423	0.492	0.537
25	0.323	0.381	0.445	0.487
30	0.296	0.349	0.409	0.449
35	0.275	0.325	0.381	0.418
40	0.257	0.304	0.358	0.393
45	0.243	0.288	0.338	0.372
50	0.231	0.273	0.322	0.354
60	0.211	0.250	0.295	0.325
70	0.195	0.232	0.274	0.302
80	0.183	0.217	0.257	0.283
90	0.173	0.205	0.242	0.267
100	0.164	0.195	0.230	0.254

Reject H_0 if calculated value of r is **greater than** critical value at chosen significance level (in absolute terms).

C4 Critical Values of Student's t

Degrees of freedom	Significance level (one-tailed) 0.05	0.025	0.01	0.005	0.0005
	Significance level (two-tailed) 0.1	0.05	0.02	0.01	0.001
1	6.31	12.71	31.82	63.66	636.62
2	2.92	4.30	6.97	9.93	31.60
3	2.35	3.18	4.54	5.84	12.92
4	2.13	2.78	3.75	4.60	8.61
5	2.01	2.57	3.37	4.03	6.86
6	1.94	2.45	3.14	3.71	5.96
7	1.89	2.37	3.00	3.50	5.41
8	1.86	2.31	2.90	3.35	5.04
9	1.83	2.26	2.82	3.25	4.78
10	1.81	2.23	2.76	3.17	4.59
11	1.80	2.20	2.72	3.11	4.44
12	1.78	2.18	2.68	3.05	4.32
13	1.77	2.16	2.65	3.01	4.22
14	1.76	2.15	2.62	2.98	4.14
15	1.75	2.13	2.60	2.95	4.07
16	1.75	2.12	2.58	2.92	4.01
17	1.74	2.11	2.57	2.90	3.97
18	1.73	2.10	2.55	2.88	3.92
19	1.73	2.09	2.54	2.86	3.88
20	1.73	2.09	2.53	2.85	3.85
21	1.72	2.08	2.52	2.83	3.82
22	1.72	2.07	2.51	2.82	3.79
23	1.71	2.07	2.50	2.81	3.77
24	1.71	2.06	2.49	2.80	3.75
25	1.71	2.06	2.49	2.79	3.73
26	1.71	2.06	2.48	2.78	3.71
27	1.70	2.05	2.47	2.77	3.69
28	1.70	2.05	2.47	2.76	3.67
29	1.70	2.05	2.46	2.76	3.66
30	1.70	2.04	2.46	2.75	3.65
40	1.68	2.02	2.42	2.70	3.55
60	1.67	2.00	2.39	2.66	3.46
120	1.66	1.98	2.36	2.62	3.37
∞	1.65	1.96	2.33	2.58	3.29

Reject H_0 if calculated value of t is **greater than** critical value at chosen significance level.