

2901/305
STATISTICS
November 2022
Time: 3 hours



THE KENYA NATIONAL EXAMINATIONS COUNCIL
DIPLOMA IN SECRETARIAL STUDIES

STATISTICS

3 hours

INSTRUCTIONS TO CANDIDATES

*This paper consists of SEVEN questions.
Answer any FIVE questions in the answer booklet provided.
All questions carry equal marks.
Candidates should answer the questions in English.*

This paper consists of 7 printed pages.

Candidates should check the question paper to ascertain that all the pages are printed as indicated and that no questions are missing.



4. (a) Differentiate between each of the following types of sets.

- (i) Finite set and infinite set;
- (ii) Empty set and universal set.

(8 marks)

(b) The following information shows the distribution of marks scored by students in an examination:

Marks	Number of Students
0 - 10	2
10 - 20	7
20 - 30	15
30 - 40	25
40 - 50	45
50 - 60	32
60 - 70	15
70 - 80	9

Calculate the:

- (i) harmonic mean;
- (ii) mode;
- (iii) median.

(12 marks)

2. (a) Explain **four** reasons that make it necessary to use sampling in the collection of data.

(8 marks)

- (b) The following are the monthly sales of a company for the year 2019.

<u>Month</u>	<u>Sales (Ksh.million)</u>
January	25
February	23
March	27
April	40
May	32
June	33
July	43
August	37
September	36
October	46
November	20
December	30

- (i) Using three period moving averages, determine the trend values.
 (ii) Based on the results in (i) above, comment on the trend in the sales. (12 marks)

- (a) Explain five advantages of interview method in the collection of data. (10 marks)

- (b) The following information shows the input-output relationship between two sectors; Manufacturing and Agriculture, in a country.

-Input - output technological co-efficient matrix: $(A) = \begin{pmatrix} 0.16 & 0.25 \\ 0.1 & 0.125 \end{pmatrix}$

-New final demand matrix $(D) = \begin{pmatrix} 700 \\ 800 \end{pmatrix}$

Determine the total output that must be produced by each sector in order to meet the new demand.

(10 marks)

4. (a) Explain six uses of index number in business decision making. (12 marks)

- (b) The sales manager of a company claims that their daily sales increases after sales person's training. Before the training the sales were at an average of Ksh.100,000 per sales person. A sample of 25 sales persons were picked at random after the training and the average sales per sales person were found to be Ksh.150,000 per sales person, with a standard deviation of Ksh.1,500.

Test the manager's claim at 5% significance level. (8 marks)



5. (a) Outline **four** properties of a good measure of dispersion. (8 marks)
- (b) George has received Ksh.4,200,000 upon retirement. He has the following available investment options:
- Option 1:** Invest in a mutual fund that pays 12% compound interest per annum, compounded half yearly for 3 years.
- Option 2:** Invest in an investment company that pays 15% simple interest for 3 years.
- Option 3:** Invest Ksh.1,400,000 at the beginning of each year for 3 years, in an account paying compound interest of 10% per annum.
- (i) Calculate the amount under each investment option at the end of each investment period.
- (ii) Based on the results in (i) above, advise George on the best option to invest in. (12 marks)

6. (a) With the aid of scatter diagrams, explain each of the following types of correlation:
- (i) Positive correlation;
- (ii) Negative correlation;
- (iii) No correlation;
- (iv) Curvilinear correlation. (8 marks)

- (b) A company uses material TX in the production process. The following information relates to the company's inventory policy:

	<u>Minimum</u>	<u>Normal</u>	<u>Maximum</u>
Lead time (in days)	8	11	14
Demand in units (days)	60	90	120

The company's Economic Order Quantity (EOQ) is 500 units. The safety stock level of the company is 180 units.

- (i) Calculate the:
- (I) re-order level;
- (II) minimum stock level;
- (III) maximum stock level.
- (ii) State **two** factors that determine the re-order level. (12 marks)



7. (a) The following information shows the revenue earned and the corresponding expenses incurred in the manufacture of a product in a company.

Expenses (Ksh '000') (X)	Revenue (Ksh '000,000) (Y)
40	70
29	56
41	84
30	72
32	40
15	60
10	25
24	42
30	35

- (i) Determine the regression equation of: Y on X;
- (ii) Using the equation in (i) above, estimate the revenue earned when expenses incurred are Ksh 20,000. (10 marks)

- (b) A box contains 12 blue balls and 9 green balls. Two balls are picked at random, one at a time, without replacement.

- (i) Present this information using a probability tree diagram;
- (ii) From the tree diagram in (i) above, determine the :
- (I) probability that the two balls picked are of the same colour.
- (II) probability of picking a blue ball and a green ball.

(10 marks)



Critical Values of the t - Distribution

df (v)	Level of significance for two-tailed test						
	0.2	0.1	0.05	0.02	0.01	0.005	0.001
	20%	10%	5%	2%	1%	0.5%	0.1%
1	3.077684	6.313752	12.706205	31.820516	63.65741	127.321336	636.619249
2	1.885618	2.919986	4.302653	6.964557	9.924843	14.089047	31.599055
3	1.637744	2.353363	3.182446	4.540703	5.840909	7.453319	12.923979
4	1.533206	2.131847	2.776445	3.746947	4.604095	5.597568	8.610302
5	1.475884	2.015048	2.570582	3.364930	4.032143	4.773341	6.868827
6	1.439756	1.943180	2.446912	3.142668	3.707428	4.316827	5.958816
7	1.414924	1.894579	2.364624	2.997952	3.499483	4.029337	5.407883
8	1.396815	1.859548	2.306004	2.896459	3.355387	3.832519	5.041305
9	1.383029	1.833113	2.262157	2.821438	3.249836	3.689662	4.780913
10	1.372184	1.812461	2.228139	2.763769	3.169273	3.581406	4.586894
11	1.363430	1.795885	2.200985	2.718079	3.105807	3.496614	4.436979
12	1.356217	1.782288	2.178813	2.680998	3.054540	3.428444	4.317791
13	1.350171	1.770933	2.160369	2.650309	3.012276	3.372468	4.220832
14	1.345030	1.761310	2.144787	2.624494	2.976843	3.325696	4.140454
15	1.340606	1.753050	2.131450	2.602480	2.946713	3.286039	4.072765
16	1.336757	1.745884	2.119905	2.583487	2.920782	3.251993	4.014996
17	1.333379	1.739607	2.109816	2.566934	2.898231	3.222450	3.965126
18	1.330391	1.734064	2.100922	2.552380	2.878440	3.196574	3.921646
19	1.327728	1.729133	2.093024	2.539483	2.860935	3.173725	3.883406
20	1.325341	1.724718	2.085963	2.527977	2.845340	3.153401	3.849516
21	1.323188	1.720743	2.079614	2.517648	2.831360	3.135206	3.819277
22	1.321237	1.717144	2.073873	2.508325	2.818756	3.118824	3.792131
23	1.319460	1.713872	2.068658	2.499867	2.807336	3.103997	3.767627
24	1.317836	1.710862	2.063999	2.492159	2.796939	3.090514	3.745399
25	1.316345	1.708141	2.059539	2.485107	2.787436	3.078199	3.725144
26	1.314972	1.705618	2.055529	2.478630	2.778715	3.066909	3.706612
27	1.313703	1.703268	2.051830	2.472660	2.770683	3.056520	3.689592
28	1.312527	1.701131	2.048407	2.467140	2.763262	3.046929	3.673906
29	1.311434	1.699127	2.045230	2.462021	2.756386	3.038047	3.659405
30	1.310415	1.697261	2.042272	2.457262	2.749996	3.029798	3.645959
31	1.309464	1.695519	2.039513	2.452824	2.744042	3.022118	3.633456
32	1.308573	1.693889	2.036933	2.448678	2.738481	3.014949	3.621802
33	1.307737	1.692360	2.034515	2.444794	2.733277	3.008242	3.610913
34	1.306952	1.690924	2.032244	2.441150	2.728394	3.001954	3.600716
35	1.306212	1.689572	2.030108	2.437723	2.723806	2.996047	3.591147
40	1.303077	1.683851	2.021075	2.423257	2.704459	2.971171	3.550966
45	1.300649	1.679427	2.014103	2.412116	2.689585	2.952079	3.520251
50	1.298714	1.675905	2.008559	2.403272	2.677793	2.938964	3.496013
60	1.295821	1.670649	2.000298	2.390119	2.660283	2.914553	3.460200
70	1.293763	1.666914	1.994437	2.380807	2.647905	2.898734	3.435015
80	1.292224	1.664125	1.990063	2.373868	2.638691	2.886972	3.416337
90	1.291029	1.661961	1.986674	2.368497	2.631565	2.877884	3.401935
100	1.290075	1.660234	1.983971	2.364217	2.625891	2.870652	3.390491
120	1.288646	1.657651	1.979930	2.357825	2.617421	2.859865	3.373454
df (v)	10%	5%	2.5%	1%	0.5%	0.25%	0.05%
	0.1	0.05	0.025	0.01	0.005	0.0025	0.0005
Level of significance for one-tailed test							



Table B: Present Value of an Annuity of Sh. 1 Per Period for n Periods:

$$PVFA_{r,n} = \sum_{t=1}^n \frac{1}{(1+r)^t} = \frac{1 - \frac{1}{(1+r)^n}}{r}$$

Number of payments	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	12%	14%	15%	16%	18%	20%	24%	28%	32%
1	0.9901	0.9804	0.9709	0.9615	0.9524	0.9434	0.9346	0.9259	0.9174	0.9091	0.8929	0.8772	0.8698	0.8621	0.8475	0.8333	0.8065	0.7813	0.7576
2	1.9704	1.9416	1.9135	1.8861	1.8594	1.8334	1.8080	1.7833	1.7591	1.7355	1.6929	1.6467	1.6257	1.6052	1.5666	1.5278	1.4588	1.3918	1.3215
3	2.9410	2.8839	2.8286	2.7751	2.7232	2.6730	2.6243	2.5771	2.5313	2.4869	2.4018	2.3216	2.2832	2.2459	2.1743	2.1055	1.9813	1.8694	1.7663
4	3.9020	3.8077	3.7171	3.6289	3.5430	3.4601	3.3792	3.3012	3.2257	3.1527	3.0372	2.9137	2.8550	2.7982	2.6901	2.5857	2.4043	2.2410	2.0857
5	4.8534	4.7135	4.5797	4.4518	4.3295	4.2124	4.1002	3.9927	3.8897	3.7908	3.6046	3.4331	3.3372	3.2743	3.1272	2.9906	2.7454	2.5220	2.3452
6	5.7985	5.6014	5.4172	5.2421	5.0757	4.9173	4.7665	4.6228	4.4858	4.3553	4.1114	3.8887	3.7845	3.6847	3.4876	3.3255	3.0205	2.7594	2.5342
7	6.7282	6.4720	6.2303	6.0021	5.7864	5.5834	5.3930	5.2064	5.0330	4.8634	4.5638	4.2883	4.1504	4.0306	3.8115	3.6048	3.2423	2.9370	2.6775
8	7.6467	7.2325	7.0197	6.7327	6.4632	6.2098	5.9713	5.7466	5.5348	5.3349	4.9676	4.6708	4.4873	4.3436	4.0778	3.8372	3.4212	3.0756	2.7860
9	8.5560	8.1622	7.9881	7.6353	7.3079	7.0017	6.7152	6.4465	6.1952	5.9519	5.3282	4.9464	4.7116	4.6065	4.2039	4.0310	3.5655	3.1842	2.8601
10	9.4573	8.9826	8.8302	8.4109	8.1109	7.8217	7.5526	7.3011	7.0577	6.8214	6.0502	5.2181	5.0188	4.9332	4.4941	4.1925	3.6819	3.2889	2.9204
11	10.3678	9.7868	9.6528	9.1795	8.9064	8.6489	8.4065	8.1787	7.9542	7.7423	6.8302	5.8427	5.6237	5.5527	5.0286	4.7271	4.1755	3.7351	3.3276
12	11.2851	10.6153	10.5040	10.0050	9.7051	9.4133	9.1388	8.8801	8.6356	8.4047	7.3506	6.3181	6.0891	6.0281	5.4132	5.1115	4.5191	4.1387	3.7604
13	12.2107	11.4662	11.3791	10.8531	10.5251	10.1986	9.9008	9.6221	9.3526	9.0917	7.9906	6.9181	6.6891	6.6281	5.9332	5.6315	5.0001	4.6687	4.3209
14	13.1451	12.3493	12.2879	11.7454	11.3914	11.0398	10.7211	10.4224	10.1326	9.8517	8.7146	7.6021	7.3731	7.3121	6.5372	6.2355	5.5741	5.2827	4.9604
15	14.0885	13.2518	13.2057	12.6507	12.2817	11.9141	11.5784	11.2647	10.9630	10.6743	9.4912	8.3527	8.1237	8.0627	7.2078	6.9061	6.2147	5.9533	5.6504
16	15.0419	14.1752	14.1451	13.5801	13.2001	12.8201	12.4664	12.1347	11.8230	11.5243	10.2952	9.1367	8.9077	8.8467	7.9218	7.6201	6.8987	6.6673	6.3844
17	16.0053	15.1018	15.0857	14.5107	14.1207	13.7307	13.3570	13.0053	12.6736	12.3549	11.0808	9.8923	9.6633	9.6023	8.6274	8.3257	7.5743	7.3629	7.0800
18	16.9787	16.0002	15.9901	15.4051	15.0051	14.6101	14.2324	13.8767	13.5350	13.2063	11.8962	10.6807	10.4517	10.3907	9.3658	9.0641	8.2927	8.0913	7.8184
19	17.9621	17.0007	17.0001	16.4051	16.0001	15.6051	15.2324	14.8827	14.5410	14.2063	12.8602	11.6207	11.3917	11.3307	10.2658	9.9641	9.1727	8.9713	8.7084
20	18.9555	18.0001	18.0001	17.4051	17.0001	16.6051	16.2324	15.8827	15.5410	15.2063	13.8202	12.5407	12.3117	12.2507	11.1458	10.8441	10.0327	9.8313	9.5684
25	22.6232	20.5235	20.5235	19.9235	19.5235	19.1235	18.7668	18.4321	18.1074	17.7927	16.3122	15.0927	14.8637	14.8027	13.6678	13.3661	12.5207	12.3193	12.0564
30	25.8077	22.2865	22.2865	21.6865	21.2865	20.8865	20.5498	20.2251	19.9104	19.6057	18.0852	16.8257	16.5967	16.5357	15.3508	15.0491	14.1743	13.9729	13.7100
40	32.8347	27.3555	27.3555	26.7555	26.3555	25.9555	25.6288	25.3141	25.0094	24.7147	23.1142	21.8147	21.5857	21.5247	20.2848	19.9831	19.0783	18.8769	18.6140
50	39.1961	31.4236	31.4236	30.8236	30.4236	30.0236	29.6969	29.3822	29.0775	28.7828	27.1142	25.7647	25.5357	25.4747	24.1748	23.8731	22.9283	22.7269	22.4640
60	44.9550	34.7898	34.7898	34.1898	33.7898	33.3898	33.0631	32.7484	32.4437	32.1490	30.4204	28.9709	28.7419	28.6809	27.3210	27.0193	26.0445	25.8431	25.5802

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