PIONEER INTERNATIONAL UNIVERSITY

THE DEGREE OF BACHELOR OF EDUCATION

UNIT CODE: MATH 1113

UNIT TITLE: PROBABILITY AND STATISTICS 1

END OF SEMESTER EXAMINATION

DATE: APRIL, 2022 Time: 2 HOURS

INSTRUCTIONS

1. Answer question **ONE (1)**and any other **TWO (2)** questions
2. Show all your workings
3. Scientific Calculators and non-programmable calculators may be used

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1. (a) Differentiate between Descriptive Statistics and Inferential Statistics (**4** *marks*)

   (b) If $Z \sim N(0,1)$, find the value of t for which

   i. P(Z$\leq t$) = 0.3446 (**2** *marks*)

   ii. P(Z$\gg t$) = 0.4026 (**2** *marks*)

   iii. P(-t$\leq z \leq t$) = 0.9505 (**2** *marks*)

   (c) The following table gives probability distribution of marks obtained by some students.

Range of marks	5-9	10-14	15-19	20-24	25-29	30-34
Probability	0.093	0.1163	0.186	0.2326	0.2093	0.1628

   What is the probability that a randomly picked student from this class scored

   i. More than 24 marks? (**2** *marks*)

   ii. Between 12 and 24.5 marks? (**2** *marks*)

   (d) Ten teenagers were asked how many hours they sleep at night and their responses recorded. 9,3,4,2,9,5,8,4,7,4. Compute the least number of sleeping hours for the top 20% of the teenagers. (**3** *marks*)

   (e) Given the frequency table below

x	13	14	15	16	17
f	2	5	13	7	3

   Compute

   i. The mean and (**3** *marks*)

   ii. The standard deviation (**4** *marks*)

   (f) Emily hits 60% of her free throws in basketball games. She had 25 free throws in last weekâs game.

   i. What is the expected number and the standard deviation of Emilyâs hit ? (**4** *marks*)

   ii. Suppose Emily had 7 free throws in yesterdayâs game.What is the probability that she made at least 5 hits? (**2** *marks*)

2. (a) The table below gives the total number of hours (X) in a day spent by a number of salesmen in marketing a certain product and the corresponding total sales (Y in thousands) due to the salesmen.

x	1	2	3	4	5	6	7
y	9.8	11.3	12.2	13.2	14.1	14.5	16.1

i. Calculate the Pearson's product moment correlation coefficient between number of hours and total sales

ii. Fit a regression equation of the form $Y = a + bX$ to this data

iii. Use the equation in (3(b)ii) above to predict the total sales at $x = 4.5$, hours and $x = 10.5$ hours hence identify with a reason which of the predicted estimates is more reliable. (**15** *marks*)

(b) The following are the yearly percentages profits made by a company in six successive years; 52.22, 46.59, 21.36, 30.17 22.87 17.77

i. Giving a reason, state the appropriate type of mean to be used to determine the percentage profit made by the company in the last six months.

ii. Determine the percentage profit made by the company in the last six months. (**5** *marks*)

3. (a) For the given data: 9, 3, 4, 2, 9, 5, 8, 4, 7, 4, calculate

i. The Mean (**2** *marks*)

ii. The Median (**2** *marks*)

iii. The Interquartile range (**3** *marks*)

iv. The Mean Absolute Deviation (**3** *marks*)

v. The sixth decile (**2** *marks*)

vi. The eightieth percentile (**2** *marks*)

(b) Data is collected in various forms. Identify the various categorization/classification of data variables and give specific examples of such variables (**6** *marks*)

4. (a) Let X be a random variable representing the amount of water in litres used (lavatory, drinking and hand washing) by an individual University staff per day. Suppose that $X \sim N(37, 7.76)$ and that a sample of size 60 is taken from this distribution.
Find the probability that if a staff member is randomly picked from the sample, he/she consumes between 36.6 and 39.3 litres (**4** *marks*)

(b) The data below shows the salaries in thousands of shillings earned by employees of Etone Corporation.

Salary ('000)	Number of workers(f)
20-29	50
30-39	69
40-49	70
50-59	90
60-69	52
70-79	40
80-89	11

Calculate the 10th - 90th (computed as ninetieth minus tenth percentile) (**6** *marks*)

(c) The following table gives probability distribution of amount of money in Ksh withdrawn from an MPESA shop on a certain day.

Amount (x)	1300	1500	2000	2300	2500	3000
P(X =x)	0.102	0.1429	0.2245	0.2041	0.1837	0.1429

What is the probability that a randomly picked person from the population deposits

i. More than Ksh. 2300 ?
ii. At least Kshs. 2000?
iii. Between Kshs. 1500 and Kshs. 2500?
iv. What is the expected value and the standard deviation? (**10** *marks*)

Standard Normal Probabilities

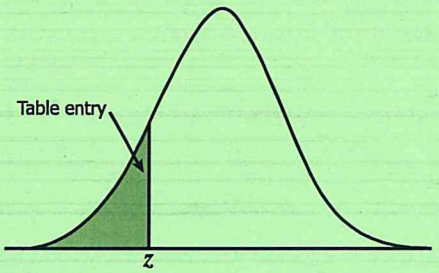

Table entry for z is the area under the standard normal curve to the left of z.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
−3.4	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0003	.0002
−3.3	.0005	.0005	.0005	.0004	.0004	.0004	.0004	.0004	.0004	.0003
−3.2	.0007	.0007	.0006	.0006	.0006	.0006	.0006	.0005	.0005	.0005
−3.1	.0010	.0009	.0009	.0009	.0008	.0008	.0008	.0008	.0007	.0007
−3.0	.0013	.0013	.0013	.0012	.0012	.0011	.0011	.0011	.0010	.0010
−2.9	.0019	.0018	.0018	.0017	.0016	.0016	.0015	.0015	.0014	.0014
−2.8	.0026	.0025	.0024	.0023	.0023	.0022	.0021	.0021	.0020	.0019
−2.7	.0035	.0034	.0033	.0032	.0031	.0030	.0029	.0028	.0027	.0026
−2.6	.0047	.0045	.0044	.0043	.0041	.0040	.0039	.0038	.0037	.0036
−2.5	.0062	.0060	.0059	.0057	.0055	.0054	.0052	.0051	.0049	.0048
−2.4	.0082	.0080	.0078	.0075	.0073	.0071	.0069	.0068	.0066	.0064
−2.3	.0107	.0104	.0102	.0099	.0096	.0094	.0091	.0089	.0087	.0084
−2.2	.0139	.0136	.0132	.0129	.0125	.0122	.0119	.0116	.0113	.0110
−2.1	.0179	.0174	.0170	.0166	.0162	.0158	.0154	.0150	.0146	.0143
−2.0	.0228	.0222	.0217	.0212	.0207	.0202	.0197	.0192	.0188	.0183
−1.9	.0287	.0281	.0274	.0268	.0262	.0256	.0250	.0244	.0239	.0233
−1.8	.0359	.0351	.0344	.0336	.0329	.0322	.0314	.0307	.0301	.0294
−1.7	.0446	.0436	.0427	.0418	.0409	.0401	.0392	.0384	.0375	.0367
−1.6	.0548	.0537	.0526	.0516	.0505	.0495	.0485	.0475	.0465	.0455
−1.5	.0668	.0655	.0643	.0630	.0618	.0606	.0594	.0582	.0571	.0559
−1.4	.0808	.0793	.0778	.0764	.0749	.0735	.0721	.0708	.0694	.0681
−1.3	.0968	.0951	.0934	.0918	.0901	.0885	.0869	.0853	.0838	.0823
−1.2	.1151	.1131	.1112	.1093	.1075	.1056	.1038	.1020	.1003	.0985
−1.1	.1357	.1335	.1314	.1292	.1271	.1251	.1230	.1210	.1190	.1170
−1.0	.1587	.1562	.1539	.1515	.1492	.1469	.1446	.1423	.1401	.1379
−0.9	.1841	.1814	.1788	.1762	.1736	.1711	.1685	.1660	.1635	.1611
−0.8	.2119	.2090	.2061	.2033	.2005	.1977	.1949	.1922	.1894	.1867
−0.7	.2420	.2389	.2358	.2327	.2296	.2266	.2236	.2206	.2177	.2148
−0.6	.2743	.2709	.2676	.2643	.2611	.2578	.2546	.2514	.2483	.2451
−0.5	.3085	.3050	.3015	.2981	.2946	.2912	.2877	.2843	.2810	.2776
−0.4	.3446	.3409	.3372	.3336	.3300	.3264	.3228	.3192	.3156	.3121
−0.3	.3821	.3783	.3745	.3707	.3669	.3632	.3594	.3557	.3520	.3483
−0.2	.4207	.4168	.4129	.4090	.4052	.4013	.3974	.3936	.3897	.3859
−0.1	.4602	.4562	.4522	.4483	.4443	.4404	.4364	.4325	.4286	.4247
−0.0	.5000	.4960	.4920	.4880	.4840	.4801	.4761	.4721	.4681	.4641

Standard Normal Probabilities

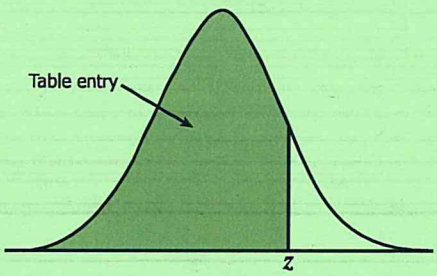

Table entry for z is the area under the standard normal curve to the left of z.

z	.00	.01	.02	.03	.04	.05	.06	.07	.08	.09
0.0	.5000	.5040	.5080	.5120	.5160	.5199	.5239	.5279	.5319	.5359
0.1	.5398	.5438	.5478	.5517	.5557	.5596	.5636	.5675	.5714	.5753
0.2	.5793	.5832	.5871	.5910	.5948	.5987	.6026	.6064	.6103	.6141
0.3	.6179	.6217	.6255	.6293	.6331	.6368	.6406	.6443	.6480	.6517
0.4	.6554	.6591	.6628	.6664	.6700	.6736	.6772	.6808	.6844	.6879
0.5	.6915	.6950	.6985	.7019	.7054	.7088	.7123	.7157	.7190	.7224
0.6	.7257	.7291	.7324	.7357	.7389	.7422	.7454	.7486	.7517	.7549
0.7	.7580	.7611	.7642	.7673	.7704	.7734	.7764	.7794	.7823	.7852
0.8	.7881	.7910	.7939	.7967	.7995	.8023	.8051	.8078	.8106	.8133
0.9	.8159	.8186	.8212	.8238	.8264	.8289	.8315	.8340	.8365	.8389
1.0	.8413	.8438	.8461	.8485	.8508	.8531	.8554	.8577	.8599	.8621
1.1	.8643	.8665	.8686	.8708	.8729	.8749	.8770	.8790	.8810	.8830
1.2	.8849	.8869	.8888	.8907	.8925	.8944	.8962	.8980	.8997	.9015
1.3	.9032	.9049	.9066	.9082	.9099	.9115	.9131	.9147	.9162	.9177
1.4	.9192	.9207	.9222	.9236	.9251	.9265	.9279	.9292	.9306	.9319
1.5	.9332	.9345	.9357	.9370	.9382	.9394	.9406	.9418	.9429	.9441
1.6	.9452	.9463	.9474	.9484	.9495	.9505	.9515	.9525	.9535	.9545
1.7	.9554	.9564	.9573	.9582	.9591	.9599	.9608	.9616	.9625	.9633
1.8	.9641	.9649	.9656	.9664	.9671	.9678	.9686	.9693	.9699	.9706
1.9	.9713	.9719	.9726	.9732	.9738	.9744	.9750	.9756	.9761	.9767
2.0	.9772	.9778	.9783	.9788	.9793	.9798	.9803	.9808	.9812	.9817
2.1	.9821	.9826	.9830	.9834	.9838	.9842	.9846	.9850	.9854	.9857
2.2	.9861	.9864	.9868	.9871	.9875	.9878	.9881	.9884	.9887	.9890
2.3	.9893	.9896	.9898	.9901	.9904	.9906	.9909	.9911	.9913	.9916
2.4	.9918	.9920	.9922	.9925	.9927	.9929	.9931	.9932	.9934	.9936
2.5	.9938	.9940	.9941	.9943	.9945	.9946	.9948	.9949	.9951	.9952
2.6	.9953	.9955	.9956	.9957	.9959	.9960	.9961	.9962	.9963	.9964
2.7	.9965	.9966	.9967	.9968	.9969	.9970	.9971	.9972	.9973	.9974
2.8	.9974	.9975	.9976	.9977	.9977	.9978	.9979	.9979	.9980	.9981
2.9	.9981	.9982	.9982	.9983	.9984	.9984	.9985	.9985	.9986	.9986
3.0	.9987	.9987	.9987	.9988	.9988	.9989	.9989	.9989	.9990	.9990
3.1	.9990	.9991	.9991	.9991	.9992	.9992	.9992	.9992	.9993	.9993
3.2	.9993	.9993	.9994	.9994	.9994	.9994	.9994	.9995	.9995	.9995
3.3	.9995	.9995	.9995	.9996	.9996	.9996	.9996	.9996	.9996	.9997
3.4	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9997	.9998