UNIVERSITI KUALA LUMPUR
BUSINESS SCHOOL

FINAL EXAMINATION
OCTOBER 2024 SEMESTER

COURSE CODE	:	**EGB10103**
COURSE NAME	:	**ECONOMIC STATISTICS 1**
PROGRAMME NAME	:	**BACHELOR OF SCIENCE (HONS) IN ANALYTICAL ECONOMICS**
DATE	:	**6 FEBRUARY 2025**
TIME	:	**2.00 PM – 5.00 PM**
DURATION	:	**3 HOURS**

INSTRUCTIONS TO CANDIDATES

1. **Please CAREFULLY read the instructions given in the question paper.**
2. **This question paper has information printed on both sides of the paper.**
3. This question paper consists of **FIVE (5) Questions.**
4. Answer **ALL** questions.
5. Please write your answers on the answer booklet provided.
6. All questions must be answered in **English** (any other language is not allowed).
7. **This question paper must not be removed from the examination hall.**

THERE ARE FIVE (5) PAGES OF QUESTIONS, INCLUDING THIS PAGE.

(Total: 100 marks)

Question 1

(a) Determine the meaning of random variables.

(3 marks)

(b) Lists 3 examples on continuous random variables.

(3 marks)

(c) A salesman estimates that for each visit to a customer, the probability of a successful sale is 0.4. Calculate the probability of obtaining three sales if the salesman calls on 7 customers.

(3 marks)

(d) Calculate the probability of getting at least 5 times head-on tossing an unbiased coin for 6 times by using the binomial distribution.

(4 marks)

(e) A fair coin is tossed 10 times, what are the probability of getting exactly 6 heads and at least six heads.

(7 marks)

Question 2

(a) A man can send an email on average 2 emails per hour. Calculate the probability that the man sends no email in a given hour.

(3 marks)

(b) Calculate the standard deviation of the Poisson distribution given the number of trials as 50 and probability of failure as 0.3.

(4 marks)

(c) A small voting district has 101 female voters and 95 male voters. A random sample of 10 voters is drawn. Determine the probability exactly 7 of the voters will be female.

(4 marks)

(d) A manufacturer claims that only 10% of his machines require repair within one year. Calculate the probability of 5 repairs from 20 machines. Use the Binomial formula to determine the probability of 5 repairs (i.e. successes) in 20 trials of the experiment.

(4 marks)

(e) Suppose Harry Potter and Ron Weasley are on the Hogwarts Express, and Harry buys a box of Bertie Bott's every flavor bean from the lunch trolley. Let's assume this box contains ten beans flavors. There are six tasty flavors and four yucky flavors. Harry decides to share the box with his friend Ron. So, Ron reaches in and randomly selects five beans and eats them. Determine the chance that Ron chooses the two yucky flavors.

(5 marks)

Question 3

(a) Let Z be a standard normal random variable, and determine the following probabilities.

i. Probability that Z is less than 0.63.

(2 marks)

ii. Probability that Z is between –0.84 and 0.93.

(2 marks)

(b) In the 2008 Wimbledon tennis tournament, Rafael Nadal averaged 115 miles per hour (mph) on his first serves. Assume that the distribution of his first serve speeds is Normal with a mean of 115 mph and a standard deviation of 6 mph.

i. Calculate proportion of his first serves would you expect to exceed 120 mph.

(3 marks)

ii. Determine the percent of Rafael Nadal's first serves are between 100 and 110 mph.

(3 marks)

(c) Many country have programs for assessing the skills of students in English Language. Malaysian University English Test (MUET) is one such program. In a recent year 76,531 first year Malaysian university students took the exam. The mean score was 572 and the standard deviation was 51. Assuming that these scores are approximately normally distributed.

i. Give the z-score for a student who received a score of 600.

(2 marks)

ii. Determine the proportion of students who have scores less than 600. Determine the proportion of students who have scores greater than or equal to 600. Sketch the relationship between these two calculations using pictures of Normal curves.

(5 marks)

iii. Calculate the score needed to be in the top 5%.

(3 marks)

Question 4

(a) A random variable X is normally distributed with $\mu = 50$ and $\sigma^2 = 25$. Determine the probability that it will lie between 0 and 40.

(3 marks)

(b) The scores made by candidates in a certain test are normally distributed with mean 500 and standard deviation 100:

i. Calculate the percent of the candidates received scores greater than 700.

(3 marks)

ii. Calculate the percent of the candidates received scores less than 400.

(3 marks)

(c) The Monday morning queuing times, in minutes, in a X Bank is modelled by a Normal distribution with mean 15 and standard deviation 4 .

i. Determine the minimum time, correct to the nearest minute, for which at most 10% of the customers have to queue.

(3 marks)

ii. Determine the probability that a randomly chosen customer will have to queue between 12 and 20 minutes.

(4 marks)

iii. Calculate the probability that the customer has to queue for more than 25 minutes.

(4 marks)

Question 5

(a) The waiting time at a bus stop is uniformly distributed between 1 and 12 minute.

i. Determine the probability density function.

(2 marks)

ii. Calculate the probability that the rider waits 8 minutes or less.

(3 marks)

(b) In a certain Binomial distribution with probability of success, p = 0.2 and number of trials n = 30. By using the normal approximation to binomial distribution, compute the probability of getting 5 successes.

(6 marks)

(c) The time spent waiting between events is often modeled using the exponential distribution. For example, suppose that an average of 30 customers per hour arrive at a store and the time between arrivals is exponentially distributed.

i. On average, determine how many minutes elapse between two successive arrivals.

(2 marks)

ii. After a customer arrives, calculate the probability that it takes less than one minute for the next customer to arrive.

(3 marks)

iii. After a customer arrives, calculate the probability that it takes more than five minutes for the next customer to arrive.

(4 marks)

END OF EXAMINATION PAPER

FORMULAS AND STATISTICAL TABLE

NORMAL DISTRIBUTION

$$z = \frac{X - \mu}{\sigma}$$

$$\text{Standard error of the mean} = \frac{s}{\sqrt{n}}$$

$$\left(\bar{x} - a\frac{\sigma}{\sqrt{n}}, \bar{x} + a\frac{\sigma}{\sqrt{n}} \right) \text{where}$$

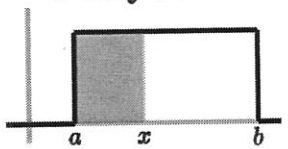
$$a = 1.96 / 1.645 / 2.58$$

Probability Distributions

Ace Tutors

Continuous

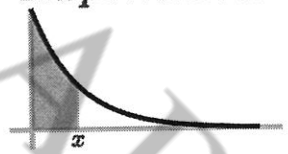
Uniform



$$\mu = \frac{a+b}{2} \qquad \sigma = \sqrt{\frac{(b-a)^2}{12}}$$

$$P(X < x) = \frac{x-a}{b-a}$$

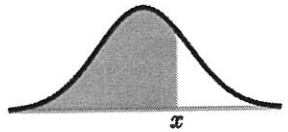
Exponential



$$\mu = \frac{1}{\gamma} \qquad \sigma = \frac{1}{\gamma}$$

$$P(X < x) = 1 - e^{-\gamma x}$$

Normal



$$z = \frac{x-\mu}{\sigma}$$

$P(X < x) \Rightarrow$ Use Z-Chart

Key

- γ = *rate parameter*
- z = *z-score*
- p = *probability of success*
- n = *# of trials*
- N = *population size*
- K = *# of success states*

Discrete

Binomial

$$\mu = n \cdot p \qquad \sigma = \sqrt{n \cdot p \cdot (1-p)}$$

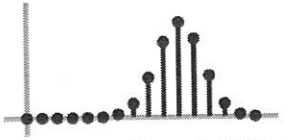
$$P(X = x) = \binom{n}{x} p^x (1-p)^{n-x}$$

Geometric

$$\mu = \frac{1}{p} \qquad \sigma = \frac{\sqrt{1-p}}{p}$$

$$P(X = x) = (1-p)^{x-1} p$$

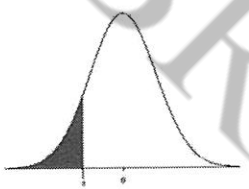
Hypergeometric



$$\mu = n\frac{K}{N} \qquad \sigma = \sqrt{n\frac{K(N-K)(N-n)}{N^2(N-1)}}$$

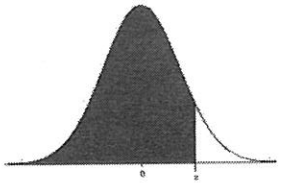
$$P(X = x) = \frac{\binom{K}{x}\binom{N-K}{n-x}}{\binom{N}{n}}$$

Table of Standard Normal Probabilities for Negative Z-scores



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
-3.4	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0003	0.0002
-3.3	0.0005	0.0005	0.0005	0.0004	0.0004	0.0004	0.0004	0.0004	0.0004	0.0003
-3.2	0.0007	0.0007	0.0006	0.0006	0.0006	0.0006	0.0006	0.0005	0.0005	0.0005
-3.1	0.0010	0.0009	0.0009	0.0009	0.0008	0.0008	0.0008	0.0008	0.0007	0.0007
-3.0	0.0013	0.0013	0.0013	0.0012	0.0012	0.0011	0.0011	0.0011	0.0010	0.0010
-2.9	0.0019	0.0018	0.0018	0.0017	0.0016	0.0016	0.0015	0.0015	0.0014	0.0014
-2.8	0.0026	0.0025	0.0024	0.0023	0.0023	0.0022	0.0021	0.0021	0.0020	0.0019
-2.7	0.0035	0.0034	0.0033	0.0032	0.0031	0.0030	0.0029	0.0028	0.0027	0.0026
-2.6	0.0047	0.0045	0.0044	0.0043	0.0041	0.0040	0.0039	0.0038	0.0037	0.0036
-2.5	0.0062	0.0060	0.0059	0.0057	0.0055	0.0054	0.0052	0.0051	0.0049	0.0048
-2.4	0.0082	0.0080	0.0078	0.0075	0.0073	0.0071	0.0069	0.0068	0.0066	0.0064
-2.3	0.0107	0.0104	0.0102	0.0099	0.0096	0.0094	0.0091	0.0089	0.0087	0.0084
-2.2	0.0139	0.0136	0.0132	0.0129	0.0125	0.0122	0.0119	0.0116	0.0113	0.0110
-2.1	0.0179	0.0174	0.0170	0.0166	0.0162	0.0158	0.0154	0.0150	0.0146	0.0143
-2.0	0.0228	0.0222	0.0217	0.0212	0.0207	0.0202	0.0197	0.0192	0.0188	0.0183
-1.9	0.0287	0.0281	0.0274	0.0268	0.0262	0.0256	0.0250	0.0244	0.0239	0.0233
-1.8	0.0359	0.0351	0.0344	0.0336	0.0329	0.0322	0.0314	0.0307	0.0301	0.0294
-1.7	0.0446	0.0436	0.0427	0.0418	0.0409	0.0401	0.0392	0.0384	0.0375	0.0367
-1.6	0.0548	0.0537	0.0526	0.0516	0.0505	0.0495	0.0485	0.0475	0.0465	0.0455
-1.5	0.0668	0.0655	0.0643	0.0630	0.0618	0.0606	0.0594	0.0582	0.0571	0.0559
-1.4	0.0808	0.0793	0.0778	0.0764	0.0749	0.0735	0.0721	0.0708	0.0694	0.0681
-1.3	0.0968	0.0951	0.0934	0.0918	0.0901	0.0885	0.0869	0.0853	0.0838	0.0823
-1.2	0.1151	0.1131	0.1112	0.1093	0.1075	0.1056	0.1038	0.1020	0.1003	0.0985
-1.1	0.1357	0.1335	0.1314	0.1292	0.1271	0.1251	0.1230	0.1210	0.1190	0.1170
-1.0	0.1587	0.1562	0.1539	0.1515	0.1492	0.1469	0.1446	0.1423	0.1401	0.1379
-0.9	0.1841	0.1814	0.1788	0.1762	0.1736	0.1711	0.1685	0.1660	0.1635	0.1611
-0.8	0.2119	0.2090	0.2061	0.2033	0.2005	0.1977	0.1949	0.1922	0.1894	0.1867
-0.7	0.2420	0.2389	0.2358	0.2327	0.2296	0.2266	0.2236	0.2206	0.2177	0.2148
-0.6	0.2743	0.2709	0.2676	0.2643	0.2611	0.2578	0.2546	0.2514	0.2483	0.2451
-0.5	0.3085	0.3050	0.3015	0.2981	0.2946	0.2912	0.2877	0.2843	0.2810	0.2776
-0.4	0.3446	0.3409	0.3372	0.3336	0.3300	0.3264	0.3228	0.3192	0.3156	0.3121
-0.3	0.3821	0.3783	0.3745	0.3707	0.3669	0.3632	0.3594	0.3557	0.3520	0.3483
-0.2	0.4207	0.4168	0.4129	0.4090	0.4052	0.4013	0.3974	0.3936	0.3897	0.3859
-0.1	0.4602	0.4562	0.4522	0.4483	0.4443	0.4404	0.4364	0.4325	0.4286	0.4247
-0.0	0.5000	0.4960	0.4920	0.4880	0.4840	0.4801	0.4761	0.4721	0.4681	0.4641

Table of Standard Normal Probabilities for Positive Z-scores



z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986
3.0	0.9987	0.9987	0.9987	0.9988	0.9988	0.9989	0.9989	0.9989	0.9990	0.9990
3.1	0.9990	0.9991	0.9991	0.9991	0.9992	0.9992	0.9992	0.9992	0.9993	0.9993
3.2	0.9993	0.9993	0.9994	0.9994	0.9994	0.9994	0.9994	0.9995	0.9995	0.9995
3.3	0.9995	0.9995	0.9995	0.9996	0.9996	0.9996	0.9996	0.9996	0.9996	0.9997
3.4	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9997	0.9998

Note that the probabilities given in this table represent the area to the LEFT of the z-score.
The area to the RIGHT of a z-score = 1 – the area to the LEFT of the z-score