CONFIDENTIAL

UNIVERSITI KUALA LUMPUR
BUSINESS SCHOOL

FINAL EXAMINATION
JULY 2025 SEMESTER

COURSE CODE	:	**EIB11103**
COURSE NAME	:	**BUSINESS STATISTICS**
PROGRAMME NAME	:	**BACHELOR OF BUSINESS ADMINISTRATION (HONS)**
DATE	:	**18 SEPTEMBER 2025**
TIME	:	**9.00AM – 12.00PM**
DURATION	:	**3 HOURS**

INSTRUCTIONS TO CANDIDATES

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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 answers 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.**
8. Present and future tables and formulas has been appended for your reference.

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

INSTRUCTION: Answer ALL questions.
Please use the answer booklet provided.

Question 1

(a) A company promises to respond to customer support emails within 4 hours on average. The response time is modeled as an exponential distribution.

(i) Find the probability that a customer receives a response in less than 2 hours. (3 marks)

(ii) Find the probability that the response time exceeds 6 hours. (3 marks)

(iii) Find the probability that the response time is between 3 hours and 6 hours. (4 marks)

(b) A bank rounds a customer's service time to the nearest minute for billing. Actual service time is uniformly distributed between 2.5 and 7.5 minutes. Compute the probability:

(i) That a customer is billed for more than 6 minutes. (3 marks)

(ii) That a customer is billed for less than 3.5 minutes. (3 marks)

(iii) Find the mean and standard deviation. (4 marks)

Question 2

(a) A factory produces energy drinks with a fill volume that has a population mean of 355 ml and a standard deviation of 5 ml. You take a random sample of 36 cans.

(i) What is the best point estimate of the population mean?

(1 mark)

(ii) What is the standard error of the sample mean?

(2 marks)

(iii) What is the probability that the sample mean is less than 353.5 ml?

(3 marks)

(iv) What is the probability that the sample mean is more than 352.6 ml but less than 357.2 ml?

(4 marks)

(b) A company knows that 75% of its customers are satisfied with their yearly bonuses. A random sample of 120 customers is selected. Assume that the information follows a normal distribution.

(i) What is the standard error of the sample proportion?

(3 marks)

(ii) What is the probability that the sample proportion more than 80% of the sample is satisfied?

(3 marks)

(iii) What is the probability that the sample proportion is between 70% and 80% of the sample is satisfied?

(4 marks)

Question 3

(a) A regional manager at a retail chain wants to estimate the average transaction amount across their stores. From a sample of 60 purchases, the average transaction was RM56.20 with a standard deviation of RM8.10. By using 99% confidence level:

(i) Calculate the margin of error.

(3 marks)

(ii) Construct a 95% confidence interval for the interval for the true average transaction value. Interpret your result.

(5 marks)

(b) A human resource specialist is investigating potential salary differences between two departments: Marketing and Finance, within a large consulting firm. A random sample of 35 employees from the Finance department reveals an average annual salary of RM61,200 with a sample standard deviation of RM4,300. From the Marketing department, a sample of 40 employees shows an average annual salary of RM58,000 with a standard deviation of RM5,100.

(i) Construct a 95% confidence interval for the difference in population means between Marketing and Finance department.

(6 marks)

(ii) Calculate a 99% confidence interval for the difference in population means between Marketing and Finance department.

(4 marks)

(iii) Interpret the results in (b)(ii).

(2 marks)

Question 4

(a) A university claims that students enrolled in online statistics course perform equal or less than students in the physical classes, with a historical average test score of 78 out of 100. An education researcher believes that online students may actually be performing better. A random sample of 50 online students has an average score of 80, and the population standard deviation is known to be 6 points. Assume that the distribution is approximately normally distributed. Test at the 5% significance level whether the university's claim is true, by answering the following questions.

(i) State the appropriate null and alternative hypotheses.

(2 marks)

(ii) Calculate the test statistics.

(3 marks)

(iii) Calculate the critical value and state the decision rule.

(3 marks)

(iv) Interpret the result.

(2 marks)

(b) A health researcher wants to examine whether there is a difference in vaccine acceptance rates between young adults (ages 18 – 29) and middle-aged adults (ages 30 – 49). Out of a sample of 350 young adults, 245 agreed to be vaccinated, while 310 out of 400 middle-aged adults did the same. Level of significance, $\alpha = 0.05$.

	Young adults (ages 18 – 29)	**Middle-aged adults (ages 30 – 49)**
x	245	312
n	350	400

(i) State the appropriate null and alternative hypotheses.

(2 marks)

(ii) Calculate the test statistics.

(3 marks)

(iii) Calculate the p-value and state the decision rule.

(3 marks)

(iv) Interpret the result.

(2 marks)

Question 5

(a) An automotive engineer collects data on several cars to examine how weight affects fuel efficiency (miles per gallon):

Car	Weight (lbs)	Miles per gallon (mpg)
A	2,000	40
B	2,500	37
C	3,000	32
D	3,500	28
E	4,000	25

(i) Draw a scatter plot.

(3 marks)

(ii) Compute the correlation coefficient.

(4 marks)

(iii) Find the least squares regression line.

(4 marks)

(b) The following table shows the number of units produced by a manufacturing company and the total production cost (in \$1000s):

Units Produced	Total cost
100	220
150	260
200	290
250	330
300	370

(i) Identify the independent and dependent variable.

(2 marks)

(ii) Calculate the regression equation line.

(5 marks)

(iii) Predict the production cost when the unit produced is 480.

(2 marks)

END OF EXAMINATION PAPER

FORMULAS AND STATISTICAL TABLE

PROBABILITY DISTRIBUTIONS

Uniform distribution:

$$P(x) = \frac{1}{(b-a)} \; if \; a \le x \le b \; and \; 0 \; elsewhere$$

$$\mu = \frac{a+b}{2}$$

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

Normal distribution:

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

$$z = \frac{\bar{x}-\mu}{\sigma/\sqrt{n}}$$

Exponential distribution:

$$P(arrival\ time < x) = 1 - e^{-\lambda x}$$

$$P(arrival\ time > x) = e^{-\lambda x}$$

Standard error:

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}}, \; \sigma_{\bar{p}} = \sqrt{\frac{pq}{n}}$$

ESTIMATIONS

Point estimation:

$$\bar{x} = \frac{\sum x}{n}$$

$$s^2 = \frac{\sum(x-\bar{x})^2}{n-1} \; @ \; s^2 = \frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1}$$

$$s = \sqrt{\frac{\sum(x-\bar{x})^2}{n-1}} \; @ \; s = \sqrt{\frac{\sum x^2 - \frac{(\sum x)^2}{n}}{n-1}}$$

$$\hat{p} = \frac{x}{n}$$

Sample size:

$$n = \left(\frac{z\sigma}{E}\right)^2$$

$$n = \frac{(z)^2 pq}{E^2}$$

Confidence intervals (two populations):

$$CI = (\bar{x}_1 - \bar{x}_2) \pm t\alpha_{/2}\left(\sqrt{\frac{s_1{}^2}{n_1} + \frac{s_2{}^2}{n_2}}\right)$$

$$df = \frac{\left(\frac{s_1{}^2}{n_1} + \frac{s_2{}^2}{n_2}\right)^2}{\frac{1}{n_1-1}\left(\frac{s_1{}^2}{n_1}\right)^2 + \frac{1}{n_2-1}\left(\frac{s_2{}^2}{n_2}\right)^2}$$

Margin of error:

$$E = Z_{\frac{\alpha}{2}}\frac{\sigma}{\sqrt{n}}, \; E = t_{\frac{\alpha}{2}}\frac{s}{\sqrt{n}}$$

$$E = z_{\frac{\alpha}{2}}\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$$

Confidence interval:

$$CI = \bar{x} \pm z\alpha_{/2}\left(\frac{\sigma}{\sqrt{n}}\right)$$

$$CI = \bar{x} \pm t\alpha_{/2,df}\left(\frac{s}{\sqrt{n}}\right)$$ where df = n - 1

$$CI = \bar{p} \pm z\alpha_{/2}\sqrt{\frac{\bar{p}(1-\bar{p})}{n}}$$

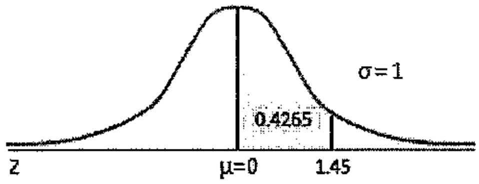
Confidence intervals (two populations):

$$CI = (\bar{x}_1 - \bar{x}_2) \pm z\alpha_{/2}\left(\sqrt{\frac{\sigma_1{}^2}{n_1} + \frac{\sigma_2{}^2}{n_2}}\right)$$

$$CI = (\hat{p}_1 - \hat{p}_2) \pm z\alpha_{/2}\left(\sqrt{\frac{\hat{p}_1\hat{q}_1}{n_1} + \frac{\hat{p}_2\hat{q}_2}{n_2}}\right)$$

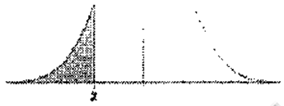
Areas Under the One-Tailed Standard Normal Curve

This table provides the area between the mean and some Z score.
For example, when Z score = 1.45 the area = 0.4265.



Z	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09
0.0	0.0000	0.0040	0.0080	0.0120	0.0160	0.0199	0.0239	0.0279	0.0319	0.0359
0.1	0.0398	0.0438	0.0478	0.0517	0.0557	0.0596	0.0636	0.0675	0.0714	0.0753
0.2	0.0793	0.0832	0.0871	0.0910	0.0948	0.0987	0.1026	0.1064	0.1103	0.1141
0.3	0.1179	0.1217	0.1255	0.1293	0.1331	0.1368	0.1406	0.1443	0.1480	0.1517
0.4	0.1554	0.1591	0.1628	0.1664	0.1700	0.1736	0.1772	0.1808	0.1844	0.1879
0.5	0.1915	0.1950	0.1985	0.2019	0.2054	0.2088	0.2123	0.2157	0.2190	0.2224
0.6	0.2257	0.2291	0.2324	0.2357	0.2389	0.2422	0.2454	0.2486	0.2517	0.2549
0.7	0.2580	0.2611	0.2642	0.2673	0.2704	0.2734	0.2764	0.2794	0.2823	0.2852
0.8	0.2881	0.2910	0.2939	0.2967	0.2995	0.3023	0.3051	0.3078	0.3106	0.3133
0.9	0.3159	0.3186	0.3212	0.3238	0.3264	0.3289	0.3315	0.3340	0.3365	0.3389
1.0	0.3413	0.3438	0.3461	0.3485	0.3508	0.3531	0.3554	0.3577	0.3599	0.3621
1.1	0.3643	0.3665	0.3686	0.3708	0.3729	0.3749	0.3770	0.3790	0.3810	0.3830
1.2	0.3849	0.3869	0.3888	0.3907	0.3925	0.3944	0.3962	0.3980	0.3997	0.4015
1.3	0.4032	0.4049	0.4066	0.4082	0.4099	0.4115	0.4131	0.4147	0.4162	0.4177
1.4	0.4192	0.4207	0.4222	0.4236	0.4251	0.4265	0.4279	0.4292	0.4306	0.4319
1.5	0.4332	0.4345	0.4357	0.4370	0.4382	0.4394	0.4406	0.4418	0.4429	0.4441
1.6	0.4452	0.4463	0.4474	0.4484	0.4495	0.4505	0.4515	0.4525	0.4535	0.4545
1.7	0.4554	0.4564	0.4573	0.4582	0.4591	0.4599	0.4608	0.4616	0.4625	0.4633
1.8	0.4641	0.4649	0.4656	0.4664	0.4671	0.4678	0.4686	0.4693	0.4699	0.4706
1.9	0.4713	0.4719	0.4726	0.4732	0.4738	0.4744	0.4750	0.4756	0.4761	0.4767
2.0	0.4772	0.4778	0.4783	0.4788	0.4793	0.4798	0.4803	0.4808	0.4812	0.4817
2.1	0.4821	0.4826	0.4830	0.4834	0.4838	0.4842	0.4846	0.4850	0.4854	0.4857
2.2	0.4861	0.4864	0.4868	0.4871	0.4875	0.4878	0.4881	0.4884	0.4887	0.4890
2.3	0.4893	0.4896	0.4898	0.4901	0.4904	0.4906	0.4909	0.4911	0.4913	0.4916
2.4	0.4918	0.4920	0.4922	0.4925	0.4927	0.4929	0.4931	0.4932	0.4934	0.4936
2.5	0.4938	0.4940	0.4941	0.4943	0.4945	0.4946	0.4948	0.4949	0.4951	0.4952
2.6	0.4953	0.4955	0.4956	0.4957	0.4959	0.4960	0.4961	0.4962	0.4963	0.4964
2.7	0.4965	0.4966	0.4967	0.4968	0.4969	0.4970	0.4971	0.4972	0.4973	0.4974
2.8	0.4974	0.4975	0.4976	0.4977	0.4977	0.4978	0.4979	0.4979	0.4980	0.4981
2.9	0.4981	0.4982	0.4982	0.4983	0.4984	0.4984	0.4985	0.4985	0.4986	0.4986
3.0	0.4987	0.4987	0.4987	0.4988	0.4988	0.4989	0.4989	0.4989	0.4990	0.4990
3.1	0.4990	0.4991	0.4991	0.4991	0.4992	0.4992	0.4992	0.4992	0.4993	0.4993
3.2	0.4993	0.4993	0.4994	0.4994	0.4994	0.4994	0.4994	0.4995	0.4995	0.4995
3.3	0.4995	0.4995	0.4995	0.4996	0.4996	0.4996	0.4996	0.4996	0.4996	0.4997
3.4	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4997	0.4998
3.5	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998	0.4998
3.6	0.4998	0.4998	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.7	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.8	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999	0.4999
3.9	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000	0.5000

Standard Normal Cumulative Probability Table



Cumulative probabilities for NEGATIVE z-values are shown in the following table:

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

B.5 Student's *t* Distribution (*concluded*)

	Confidence Intervals, *c*					
	80%	90%	95%	98%	99%	99.9%
	Level of Significance for One-Tailed Test, α					
df	0.10	0.05	0.025	0.01	0.005	0.0005
	Level of Significance for Two-Tailed Test, α					
	0.20	0.10	0.05	0.02	0.01	0.001
71	1.294	1.667	1.994	2.380	2.647	3.433
72	1.293	1.666	1.993	2.379	2.646	3.431
73	1.293	1.666	1.993	2.379	2.645	3.429
74	1.293	1.666	1.993	2.378	2.644	3.427
75	1.293	1.665	1.992	2.377	2.643	3.425
76	1.293	1.665	1.992	2.376	2.642	3.423
77	1.293	1.665	1.991	2.376	2.641	3.421
78	1.292	1.665	1.991	2.375	2.640	3.420
79	1.292	1.664	1.990	2.374	2.640	3.418
80	1.292	1.664	1.990	2.374	2.639	3.416
81	1.292	1.664	1.990	2.373	2.638	3.415
82	1.292	1.664	1.989	2.373	2.637	3.413
83	1.292	1.663	1.989	2.372	2.636	3.412
84	1.292	1.663	1.989	2.372	2.636	3.410
85	1.292	1.663	1.988	2.371	2.635	3.409
86	1.291	1.663	1.988	2.370	2.634	3.407
87	1.291	1.663	1.988	2.370	2.634	3.406
88	1.291	1.662	1.987	2.369	2.633	3.405

	Confidence Intervals, *c*					
	80%	90%	95%	98%	99%	99.9%
	Level of Significance for One-Tailed Test, α					
df	0.10	0.05	0.025	0.01	0.005	0.0005
	Level of Significance for Two-Tailed Test, α					
	0.20	0.10	0.05	0.02	0.01	0.001
89	1.291	1.662	1.987	2.369	2.632	3.403
90	1.291	1.662	1.987	2.368	2.632	3.402
91	1.291	1.662	1.986	2.368	2.631	3.401
92	1.291	1.662	1.986	2.368	2.630	3.399
93	1.291	1.661	1.986	2.367	2.630	3.398
94	1.291	1.661	1.986	2.367	2.629	3.397
95	1.291	1.661	1.985	2.366	2.629	3.396
96	1.290	1.661	1.985	2.366	2.628	3.395
97	1.290	1.661	1.985	2.365	2.627	3.394
98	1.290	1.661	1.984	2.365	2.627	3.393
99	1.290	1.660	1.984	2.365	2.626	3.392
100	1.290	1.660	1.984	2.364	2.626	3.390
120	1.289	1.658	1.980	2.358	2.617	3.373
140	1.288	1.656	1.977	2.353	2.611	3.361
160	1.287	1.654	1.975	2.350	2.607	3.352
180	1.286	1.653	1.973	2.347	2.603	3.345
200	1.286	1.653	1.972	2.345	2.601	3.340
∞	1.282	1.645	1.960	2.326	2.576	3.291