INTI International College Penang

FINAL

Alternative Assessment

(COVER PAGE)

Session	:	**April 2021**
Programme	:	Foundation in Science (CFSI)
Course	:	**STA1202: Statistics**
Date of Examination	:	29 July 2021 (Thursday)
Time	:	9:00am - 11:30am Reading Time : Nil
Duration	:	2 Hours + 30 minutes uploading time
Special Instructions	:	

This paper consists of **FOUR (4)** questions. Answer **ALL** questions.

All questions carry equal marks.

Materials permitted :

Non-Programmable Scientific Calculator

Materials provided :

Formula Booklet 1, Graph Paper

Examiner(s)	:	**Ms. Ng Ci Xiang**
Chief Moderator	:	Ms. Nurul Asyima Zulkeflee

*This paper consists of **7** printed pages, including the cover page.*

INTI INTERNATIONAL COLLEGE PENANG

FOUNDATION IN SCIENCE (CFSI)
STA1202: STATISTICS
FINAL ALTERNATIVE ASSESSMENT: APRIL 2021 SESSION

Instruction: This paper consists of **FOUR (4)** questions. Answer **ALL** questions. All questions carry equal marks.

Question 1

(a) A typing test is taken by 111 people. The numbers of typing errors they make in the test are summarized in the table below.

Number of typing errors	1 – 5	6 – 20	21 – 35	36 – 60	61 – 80
Frequency	24	9	21	15	42

(i) Draw a histogram on graph paper to represent this information. (4 marks)

(ii) State which class contains the lower quartile and which class contains the upper quartile. Hence find the greatest possible value of the interquartile range. (3 marks)

(b) A fair spinner *A* has edges numbered 1, 2, 3, 3. A fair spinner *B* has edges numbered –3, –2, –1, 1. Each spinner is spun. The number on the edge that the spinner comes to rest on is noted. Let *X* be the product of the numbers for the two spinners.

(i) Copy and complete the table showing the possible values of *X*. (3 marks)

		Spinner *A*			
		1	2	3	3
Spinner *B*	–3				
	–2				
	–1				
	1				

(ii) Draw up a table showing the probability distribution of *X*. (3 marks)

(iii) Find *Var*(*X*). (3 marks)

(iv) Find the probability that *X* is odd, given that *X* is negative. (3 marks)

(c) The weights of 220 sausages are summarised in the following table.

Weight (grams)	<20	<30	<40	<45	<50	<60	<70
Cumulative frequency	0	20	50	100	160	210	220

(i) On graph paper, draw a cumulative frquency curve represent this set of data. (3 marks)

(ii) Use your graph to estimate the number of sausages that weighed between 35 g and 55g. (3 marks)

Question 2

(a) As part of a data collection exercise, members of a certain school year group were asked how long they spent on their Mathematics homework during one particular week. The times are given to the nearest 0.1 hour. The results are displayed in the following table.

Time spent (t hours)	$0.1 \leqslant t \leqslant 0.5$	$0.6 \leqslant t \leqslant 1.0$	$1.1 \leqslant t \leqslant 2.0$	$2.1 \leqslant t \leqslant 3.0$	$3.1 \leqslant t \leqslant 4.5$
Frequency	11	15	18	30	21

Calculate the standard deviation of the time spent of their Mathematics homework by members of this year group. (5 marks)

(b) In a group of students, $\frac{3}{5}$ of the total students are male. The proportion of male students who like the fried noodles from canteen is $\frac{3}{4}$ and the proportion of female students who like the fried noodles from canteen is $\frac{1}{5}$.

(i) Construct a tree diagram to show this information. (2 marks)

(ii) One student is chosen at random. Find the probability that the student chosen is either female, or likes the fried noodles from canteen, or both. (3 marks)

(iii) Calculate the probability that the student selected dislikes the fried noodles from the canteen. (2 marks)

(iv) Showing your working, determine whether the events "the student chosen is female" and "the student chosen likes the fried noodles from canteen" are independent. (3 marks)

(c) A clinic deals only with flu vaccinations. The number of patients arriving every 15 minutes is modelled by the random variable X with distribution $Po(4.8)$.

(i) State one assumptions required for the Poisson model to be valid. (1 mark)

(ii) Find the probability that at least 1 patient will arrive in a 20-minute period. (3 marks)

(iii) Find the probability that more than 2 but at most 7 of the patients will arrive in a 10-minute period. (3 marks)

(iv) The number of patients arriving every 10 minutes for another clinic which also deals only with flu vaccinations is $Po(\lambda)$. It is known that the probability that no patient arrive in a 10-minute period is 0.2725. Find λ. (3 marks)

Question 3

(a) A survey was made of the journey times of 63 people who cycle to work in a certain town. The results are summarised in the following cumulative frequency table.

Journey time (minutes)	$\leqslant 10$	$\leqslant 25$	$\leqslant 45$	$\leqslant 60$	$\leqslant 80$
Cumulative frequency	0	18	50	59	63

(i) Copy and complete the table below. (4 marks)

Class boundaries	frequency	width	frequency density	mid - point
0 – 10 10 – 25 : :				

(ii) State the shape or distribution of this set of survey data. (1 mark)

(iii) Calculate the standard deviation. (3 marks)

(iv) Calculate the median by using the formula:

$$m = L_m + \left[\frac{\frac{1}{2}\left(\sum f\right) - F_{m-1}}{f_m} \right] c$$

(2 marks)

(b) A fair eight-sided die has faces marked 1, 2, 3, 4, 5, 6, 7, 8. The score when the die is thrown is the number of the face the die lands on. The die is thrown twice.

* Event *R* is "one of the scores is exactly 4 greater than the other score".
* Event *S* is "the sum of the scores is more than 14".

(i) Find the probability of *R*. (3 marks)

(ii) Find the probability of *S*. (3 marks)

(iii) Determine whether events *R* and *S* are mutually exclusive. Justify your answer. (2 marks)

(iv) Find $P(R \mid S)$. (2 marks)

(c) The times taken by a garage to fit a tow bar onto a car have a normal distribution with mean *m* hours and standard deviation 0.35 hours. It is found that 5% of times taken are less than 0.9 hours.

(i) Find the value of *m*. (3 marks)

The times in hours taken by another garage to fit a tow bar onto a car have the distribution $N(\mu, \sigma^2)$ where $\mu = 2.3\sigma$.

(ii) Find the probability that it takes more than 1.5μ hours to fit a tow bar onto a randomly chosen car at this garage. (2 marks)

Question 4

(a) Events *A* and *B* are such that $P(A) = 0.3$, $P(B) = 0.8$ and $P(A \text{ and } B) = 0.4$. Find

(i) $P(A' \cap B')$ (3 marks)

(ii) $P(A' \cap B)$ (2 marks)

(b) Biscuits are sold in packets of 18. There is a constant probability that any biscuits is broken, independently of other biscuits. The mean number of broken biscuits in a packet has been found to be 6.3.

(i) Find the probability that a packet contains more than two but at most five broken biscuits. (4 marks)

The packets of 18 biscuits are packed into cartons. Each carton contains 12 packets.

(ii) Find the probability that all packets in a carton have 50% of the biscuits in it broken, leave your answer in the form of $a \times 10^{-b}$ where a is a 3 significant figures number and b is an integer. (3 marks)

(iii) Find that probability that at least one packet in a carton contains two or less broken biscuits. (3 marks)

(c) In a normal distribution with mean μ and standard deviation σ, $P(X < 3.6) = 0.5$ and $P(X > 2.8) = 0.6554$.

(i) State the value of μ, and calculate the value of σ. (4 marks)

(ii) Find $P(2.8 < X < 3.6)$. (2 marks)

(iii) If seven observations are taken at random from this distribution, find the probability that at least two observations are less than 2.8. (4 marks)

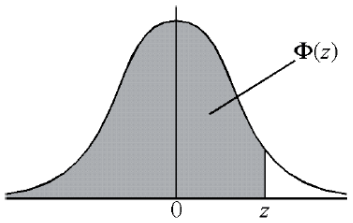
~ The End ~

THE NORMAL DISTRIBUTION FUNCTION

If Z has a normal distribution with mean 0 and variance 1 then, for each value of z, the table gives the value of $\Phi(z)$, where

$$\Phi(z) = \mathrm{P}(Z \le z) .$$

For negative values of z use $\Phi(-z) = 1 - \Phi(z)$.



z	0	1	2	3	4	5	6	7	8	9	1	2	3	4	5	6	7	8	9
											ADD								
0.0	0.5000	0.5040	0.5080	0.5120	0.5160	0.5199	0.5239	0.5279	0.5319	0.5359	4	8	12	16	20	24	28	32	36
0.1	0.5398	0.5438	0.5478	0.5517	0.5557	0.5596	0.5636	0.5675	0.5714	0.5753	4	8	12	16	20	24	28	32	36
0.2	0.5793	0.5832	0.5871	0.5910	0.5948	0.5987	0.6026	0.6064	0.6103	0.6141	4	8	12	15	19	23	27	31	35
0.3	0.6179	0.6217	0.6255	0.6293	0.6331	0.6368	0.6406	0.6443	0.6480	0.6517	4	7	11	15	19	22	26	30	34
0.4	0.6554	0.6591	0.6628	0.6664	0.6700	0.6736	0.6772	0.6808	0.6844	0.6879	4	7	11	14	18	22	25	29	32
0.5	0.6915	0.6950	0.6985	0.7019	0.7054	0.7088	0.7123	0.7157	0.7190	0.7224	3	7	10	14	17	20	24	27	31
0.6	0.7257	0.7291	0.7324	0.7357	0.7389	0.7422	0.7454	0.7486	0.7517	0.7549	3	7	10	13	16	19	23	26	29
0.7	0.7580	0.7611	0.7642	0.7673	0.7704	0.7734	0.7764	0.7794	0.7823	0.7852	3	6	9	12	15	18	21	24	27
0.8	0.7881	0.7910	0.7939	0.7967	0.7995	0.8023	0.8051	0.8078	0.8106	0.8133	3	5	8	11	14	16	19	22	25
0.9	0.8159	0.8186	0.8212	0.8238	0.8264	0.8289	0.8315	0.8340	0.8365	0.8389	3	5	8	10	13	15	18	20	23
1.0	0.8413	0.8438	0.8461	0.8485	0.8508	0.8531	0.8554	0.8577	0.8599	0.8621	2	5	7	9	12	14	16	19	21
1.1	0.8643	0.8665	0.8686	0.8708	0.8729	0.8749	0.8770	0.8790	0.8810	0.8830	2	4	6	8	10	12	14	16	18
1.2	0.8849	0.8869	0.8888	0.8907	0.8925	0.8944	0.8962	0.8980	0.8997	0.9015	2	4	6	7	9	11	13	15	17
1.3	0.9032	0.9049	0.9066	0.9082	0.9099	0.9115	0.9131	0.9147	0.9162	0.9177	2	3	5	6	8	10	11	13	14
1.4	0.9192	0.9207	0.9222	0.9236	0.9251	0.9265	0.9279	0.9292	0.9306	0.9319	1	3	4	6	7	8	10	11	13
1.5	0.9332	0.9345	0.9357	0.9370	0.9382	0.9394	0.9406	0.9418	0.9429	0.9441	1	2	4	5	6	7	8	10	11
1.6	0.9452	0.9463	0.9474	0.9484	0.9495	0.9505	0.9515	0.9525	0.9535	0.9545	1	2	3	4	5	6	7	8	9
1.7	0.9554	0.9564	0.9573	0.9582	0.9591	0.9599	0.9608	0.9616	0.9625	0.9633	1	2	3	4	4	5	6	7	8
1.8	0.9641	0.9649	0.9656	0.9664	0.9671	0.9678	0.9686	0.9693	0.9699	0.9706	1	1	2	3	4	4	5	6	6
1.9	0.9713	0.9719	0.9726	0.9732	0.9738	0.9744	0.9750	0.9756	0.9761	0.9767	1	1	2	2	3	4	4	5	5
2.0	0.9772	0.9778	0.9783	0.9788	0.9793	0.9798	0.9803	0.9808	0.9812	0.9817	0	1	1	2	2	3	3	4	4
2.1	0.9821	0.9826	0.9830	0.9834	0.9838	0.9842	0.9846	0.9850	0.9854	0.9857	0	1	1	2	2	2	3	3	4
2.2	0.9861	0.9864	0.9868	0.9871	0.9875	0.9878	0.9881	0.9884	0.9887	0.9890	0	1	1	1	2	2	2	3	3
2.3	0.9893	0.9896	0.9898	0.9901	0.9904	0.9906	0.9909	0.9911	0.9913	0.9916	0	1	1	1	1	2	2	2	2
2.4	0.9918	0.9920	0.9922	0.9925	0.9927	0.9929	0.9931	0.9932	0.9934	0.9936	0	0	1	1	1	1	1	2	2
2.5	0.9938	0.9940	0.9941	0.9943	0.9945	0.9946	0.9948	0.9949	0.9951	0.9952	0	0	0	1	1	1	1	1	1
2.6	0.9953	0.9955	0.9956	0.9957	0.9959	0.9960	0.9961	0.9962	0.9963	0.9964	0	0	0	0	1	1	1	1	1
2.7	0.9965	0.9966	0.9967	0.9968	0.9969	0.9970	0.9971	0.9972	0.9973	0.9974	0	0	0	0	0	1	1	1	1
2.8	0.9974	0.9975	0.9976	0.9977	0.9977	0.9978	0.9979	0.9979	0.9980	0.9981	0	0	0	0	0	0	0	1	1
2.9	0.9981	0.9982	0.9982	0.9983	0.9984	0.9984	0.9985	0.9985	0.9986	0.9986	0	0	0	0	0	0	0	0	0

Critical values for the normal distribution

If Z has a normal distribution with mean 0 and variance 1 then, for each value of p, the table gives the value of z such that

$$\mathrm{P}(Z \le z) = p .$$

p	0.75	0.90	0.95	0.975	0.99	0.995	0.9975	0.999	0.9995
z	0.674	1.282	1.645	1.960	2.326	2.576	2.807	3.090	3.291