

INTI
International College Penang

FINAL
Examination Paper

(COVER PAGE)

Session : April 2019

Programme : Foundation In Science (CFSI)

Course : **STA1202: Statistics**

Date of Examination : 28 July 2019 (Sunday)

Time : 2:00PM – 4:00PM Reading Time : Nil

Duration : 2 Hours

Special Instructions :

This paper consists of **SIX (6)** questions. Answer any **FIVE (5)** questions in the answer booklet provided. All questions carry equal marks.

Materials permitted :

Non-Programmable Scientific Calculator

Materials provided :

Formula Booklet 1, Graph Paper

Examiner(s) : **Ng Ci Xiang**

Moderator : **Dr. Ch'ng Pei Eng**

This paper consists of 8 printed pages, including the cover page.

INTI INTERNATIONAL COLLEGE PENANG

FOUNDATION IN SCIENCE (CFSI)
 STA1202: STATISTICS
 FINAL EXAMINATION: APRIL 2019 SESSION

Instruction: This paper consists of **SIX (6)** questions. Answer any **FIVE (5)** questions in the answer booklet provided. All questions carry equal marks.

Question 1

(a) Events A and B are such that $P(A) = \frac{8}{15}$, $P(B) = \frac{7}{12}$ and $P(A \text{ and } B) = \frac{1}{3}$.

(i) State, giving a reason whether events A and B are independent. (2 marks)

(ii) Find $P(B | A')$. (2 marks)

(b) The table below shows the waiting time of a group of bus passengers.

Waiting time (minutes)	$0 \leq x < 3$	$3 \leq x < 6$	$6 \leq x < 9$	$9 \leq x < 12$	$12 \leq x < 15$
Number of passengers	48	63	20	26	13

(i) Find the values of $\sum fx$ and $\sum fx^2$. (4 marks)

(ii) Find the mean and the standard deviation. (3 marks)

(iii) Calculate the median by using the formula:

$$m = L_m + \left[\frac{\frac{1}{2}(\sum f) - F_{m-1}}{f_m} \right] c \quad (4 \text{ marks})$$

(c) The number of telephone calls received through a certain extension has a mean 2 every minute. Find the probability that the number of calls received through that extension is

(i) exactly 3 in a minute, (2 marks)

(ii) not more than 3 in a period of 150 seconds. (3 marks)

Question 2

- (a) For each of the following, state whether it is a discrete or a continuous variable.
- (i) The number of the students sleeping in the Statistics class. (1 mark)
 - (ii) The time taken to wake up in the morning. (1 mark)
- (b) (i) Given that $X \sim N(30,100)$, find the value of a for which $P(X < a) = 0.005$. (3 marks)
- (ii) If X is a random variable which follows a normal distribution with mean 1.2 and standard deviation 0.4, find $P(1.15 \leq X \leq 1.25)$. (4 marks)
- (c) The probability that Mary taking tuition for Statistics is 0.3. If Mary takes tuition, the probability that she will pass the Statistics paper is 0.8. If Mary does not take tuition, the probability that she will pass the Statistics paper is 0.6.
- (i) Draw a tree diagram to show all the possible outcomes. (4 marks)
 - (ii) Find the probability that Mary passes the Statistics paper. (3 marks)
 - (iii) Given that Mary passes the Statistics paper. Find the probability that she takes tuition. (4 marks)

Question 3

(a) Suppose $X = \{1, 2, 3\}$ and $Y = \{2, 4, 6\}$. An element x is selected from X and an element y is selected from Y .

(i) Copy and complete the following possibility space diagram for the product of x and y . (3 marks)

$X \backslash Y$	2	4	6
1			
2			
3			

(ii) Based on the results in (i), copy and complete the following probability distribution table of W where W is the product of x and y . (3 marks)

w	2	4	6	8	12	18
$P(W = w)$						

(iii) Find $E(W)$. (2 marks)

(iv) Find the standard deviation of W . (2 marks)

(b) The time taken by Ali to walk to school from his house is normally distributed with a mean of 30 minutes, and a standard deviation of 5 minutes.

(i) Calculate the probability that Ali will be late for school if he leaves home 27 minutes before school starts. (3 marks)

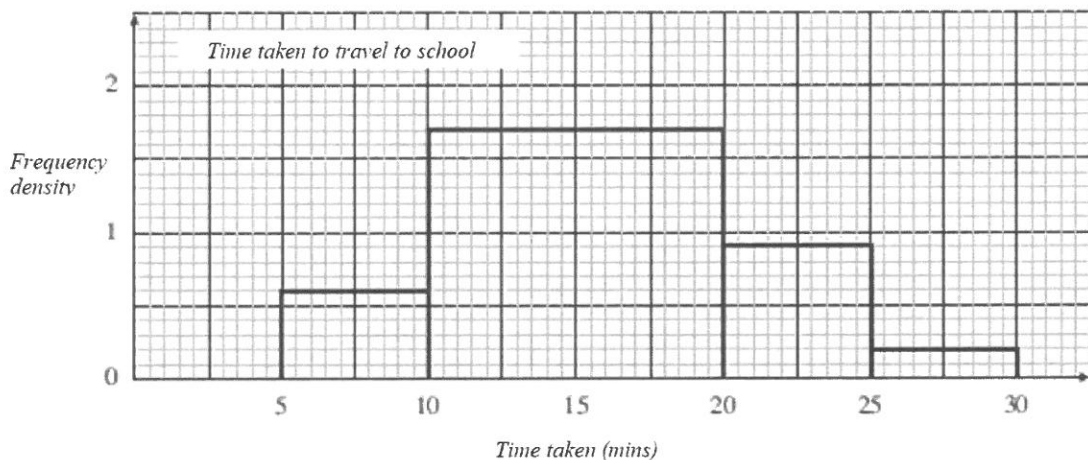
The school bell rings twice every morning. The first bell rings at 7:20 am and the second at 7:25am.

(ii) If Ali leaves home at 6:55 am, find the probability that Ali arrives at school after the first bell but before the second bell rings. (3 marks)

(iii) Ali wishes to arrive at school before the first bell rings. What is the time that Ali should leave his home if he wishes to achieve this at a probability of 0.95? (4 marks)

Question 4

- (a) In Penang 22% of families own a dishwasher.
- (i) Find the probability that, of 15 families chosen at random from Penang, between 4 and 6 inclusive own a dishwasher. (2 marks)
 - (ii) Another random sample of 10 families are taken. Find the probability that not more than 2 families own a dishwasher. (2 marks)
 - (iii) State the value of $E(X)$ and $Var(X)$ when the size of a random sample is 20. (2 marks)
 - (iv) The probability that a least one family own a dishwasher from a random sample of n families is more than 0.85. Find the smallest value of n . (4 marks)
- (b) Jennifer collected data on the length of time it took her to travel to school. She drew the histogram below.



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

Class boundaries	width	Frequency density	Frequency	Mid-point
5 – 10				
10 – 20				
⋮				
⋮				

- (ii) For how many days the data were collected? (1 mark)
- (iii) Estimate the mean for the data. (3 marks)
- (iv) Calculate the probability that the time taken to travel to school on a particular day is less than the 20 minutes. (2 marks)

Question 5

- (a) Three thousand students in a college are categorized according to their weight and family income. The number of students who are from high income family and overweight doubled the number of students from a medium income family and overweight.

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

	Underweight	Normal Weight	Overweight	Total
Low income	800		200	
Medium income		400		1000
High income				800
Total	1300		800	3000

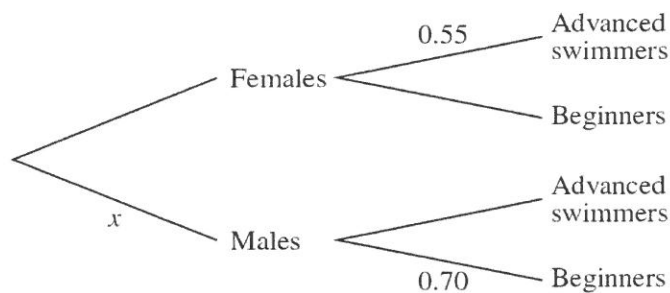
- (ii) Find the probability that a randomly selected student is from a high income family and overweight. (2 marks)
- (iii) Find the probability that a student who is selected at random is from a low income family, given that he/she is underweight. (3 marks)
- (iv) Find the probability that three students selected at random, one from each category income, are from the same category of weight. (4 marks)
- (b) The number of train accidents happened in a country per half a year has a mean 1.5. Find the probability that the number of train accidents happened in this country is
- (i) exactly 2 in half a year. (2 marks)
- (ii) not more than 4 in 21 months. (3 marks)
- (iii) State the value of mean and variance of the number of train accidents happened in a period of 2.5 years. (2 marks)

Question 6

- (a) The time taken, t seconds, by 1140 people to solve a puzzle are summarized in the table.

Time (t seconds)	$0 \leq t < 20$	$20 \leq t < 40$	$40 \leq t < 60$	$60 \leq t < 100$	$100 \leq t < 140$
Number of people	320	280	220	220	100

- (i) Draw, on graph paper, a histogram to illustrate this information, and state the distribution of the data. (5 marks)
- (ii) Calculate an estimate of the mean and the standard deviation. (5 marks)
- (b) The members of a swimming club are classified either as 'Advanced swimmers' or 'Beginners'. The proportion of members who are male is x , and the proportion of males who are Beginners is 0.7. The proportion of females who are Advanced swimmers is 0.55. This information is shown in the tree diagram.



For a randomly chosen member, the probability of being an Advanced swimmer is the same as the probability of being a Beginner.

- (i) Find x . (2 marks)
- (ii) Given that a randomly chosen member is an Advanced swimmer, find the probability that the member is male. (3 marks)
- (c) (i) Find $P(2 < X \leq 5)$ when $X \sim B(8, 0.25)$. (2 marks)
- (ii) Find $P(X > 4)$ when $X \sim Po(8.025)$. (3 marks)

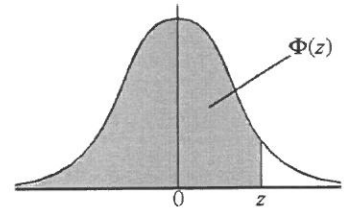
~ The End ~

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

$$\Phi(z) = P(Z \leq z).$$

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



z	0	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

$$P(Z \leq z) = p.$$

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