## THE OPEN UNIVERSITY OF SRI LANKA

B.Sc. /B.Ed. Degree Programme, Continuing Education Programme

APPLIED MATHEMATICS-LEVEL 05

ADU5318 - Biostatistics

FINAL EXAMINATION 2020/2021

**Duration: Two Hours.** 

Date: 21.03.2022

Time: 1.30p.m-3.30 p.m.

## Instructions:

- This question paper consists of 06 questions. Answer only four questions.
- Statistical Tables are provided in the Appendix. When reading values, you may use the closest degrees of freedom given in the table.
- In all tests, use the significance level as 0.05.
- If the random number table (Appendix) is to be used, you are required to clearly indicate how to read the values and as an illustration present three values that you read.
- Non-programmable calculators are permitted.
- 1. A resercher claims that in a newly improved variety of tomatoe plants, the mean time for fruits to be ready for harvesting after flowering, is less than 40 days. On a sample of 30 plants, the researcher found that the sample mean and sample standard deviation of the times for fruits to be ready for harvesting after flowering are 38.2 and 4.4 respectively.
  - i) Clearly describing your notation, write down the null and the alternative hypotheses you would examine to test the validity of the researcher's claim.
  - ii) Using an appropriate statistical test, examine the validity of the researcher's claim using a 5% significance level and clearly state the findings in relation to this study.
  - iii) Clearly state the assumptions needed for the test carried out in part (ii).
  - iv) Explain the following terms in relation to this study:
    - a) Type I error
    - b) Significance level

2. A medical practitioner is interested in comparing the effets of three cough syrups say CS1, CS2 and CS3. Two methods of drug administration are to be tested with each syrup, which are one tea spoon each after breakfast and dinner and one tea spoon after dinner only. Ninety five persons suffering from cough and are already using one of the cough syrups have volunteered to participate in the study. Among them, 25 use CS1, 35 use CS2 and the rest use CS3. The medical practitioner decided to continue with the drug that the participants use and assign a drug administration method. All participants were willing to take the drug as assigned by the medical practitioner.

Suppose that the medical practitioner seeks your advice to design this study.

- i) Clearly describe how you advise the medical practitioner to design this study. If you use the random number table, clearly state how you read the values.
- ii) Suppose the users of cough syrup CS1 are much younger to the users of the other two drugs. Will this cause sampling errors, non-sampling errors or neither? Give reasons for your answer.
- iii) Is this an observational study or an experimental study? Give reasons for your answer.
- iv) Explain the following terms in relation to this study.
  - a) replicate
  - b) confounding
  - c) interaction
- 3. The following table summarises the yield of paddy per acre, measured to the nearest bushel, of a group of farmers selected for a research study.

Yield (bushels per acre)	Number of farmers
15 – 19	5
20 – 24	16
25 - 29	48
30 – 34	36
35 – 39	5

- i) Calculate the sample mean and explain what it measures in relation to this study.
- ii) Calculate the sample median.

- iii) Based on the measures calculated in parts (i) and (ii), what can you say about the distribution of the data?
- iv) Construct a suitable graph that can be used to find the percentiles of the data.
- v) Using the graph constructed in part (iv), find the 10<sup>th</sup> percentile and explain what it measures in relation to this study.
- 4. The management of a hospital wants to assess the satisfaction of persons regarding the facilities available. The data are to be collected on two days from persons attending the eye clinic, diabetic clinic and the wellness clinic. From past experience, on each day, the hospital expects around 300, 600 and 300 persons for the eye clinic, diabetic clinic and the wellness clinic respectively. Resources are available to sample 200 persons for data collection on each day. Around 60% of persons attending each clinic are females and the researcher suspects gender differences in their opinion on facilities.
  - i) Suggest a suitable sampling design. You need to clearly explain how you sample the persons.
  - ii) State the data type as nominal, ordinal, interval or ratio in each of the following variables:
    - a) Type of clinic recorded using codes: 1: Eye clinic; 2: Diabetic clinic: 3: Wellness clinic
    - b) Gender of the person attending the clinic
    - c) Age of the person recorded as 1: less than 20 years; 2: 21 to 30 years; 3: 31 to 40 years; 4: above 40 years
    - d) Weight of the person recorded to the nearest kilogram
  - iii) State whether each of the following statements is true or false.
    - a) Bias can be reduced by increasing the sample size.
    - b) Non-sampling error cannot occur in a census.

5. The following table summarises the lengths of medicinal plants four weeks after planting in plots receiving one of the two fertilizers (A and B).

Length (cm)	Number of plants that received							
	Fertilizer A	Fertilizer B						
6 – 8	5	7						
9 - 11	8	20						
12 – 14	· 23	32						
15 – 17	36	16						
18 – 20	24	6						
21 – 23	10	3						

Based on the data summarized in the table, the researcher is interested in examining how the lengths of plants receiving the two fertilizers differ with respect to the mean length and dispersion.

- i) Consider the plants that received Fertilizer A.
  - a) Calculate the relative frequency corresponding to the third-class interval and explain what it measures in relation to this study.
  - b) Estimate the percentage of plants with lengths exceeding 17cm.
  - c) Calculate the sample median an explain what it measures in relation to this study.
- ii) Construct a suitable graph that is appropriate to compare how the lengths of plants receiving the two fertilizers differ with respect to the central tendency and dispersion.
- iii) Clearly state all the findings from the graph constructed in part (ii).
- 6. A production process of nails is said to be in satisfactory condition if the percentage of defectives produced is at most 3%. The management samples nails to find out whether the production process is in satisfactory condition, whether there is a difference in the performance of the two production crews and how the performance has changed over time. The following table presents the data collected from the two production crews over a period of two years.

De	escription	Jan	May	Aug.	Jan	June	Oct	Jan	Sep
		2006	2006	2006	2007	2007	2007	2008	2008
Crew	No. of nails sampled	107	184	102	109	111	97	81	98
	No. of defectives	2	3	2	3	2	1	1	2
Crew	No. of nails sampled	201	210	190	109	220	164	208	185
2	No. of defectives	4	4	3	3	5	4	6	4

- a) Construct a suitable graphical summary to meet the objectives of the management.
- b) Clearly state the findings from the graphical summary constructed in part (i).
- c) Briefly explain the following terms in relation to this study.
  - i) parameter
  - ii) estimate
  - iii) sampling unit

\*\*\*\*\*\* Copyrights reserved \*\*\*\*\*\*

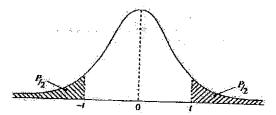
## Appendix I

ш

ස්වුඩක්වී / වාසුප්සිය සුවලන අංක වැඩිවක්ම වඩා කිවු උපරිමයක් ලැබේ.

மாணாக்கவின் 7 பரம்பல சுயாதீனப்படி அதினிக்கையில் ஒடுங்கும்

The Student's t Distribution
Narrows with increasing degrees of freedom (d.f.)



/ වාහප්තියේ /P තම පුතිගතයක් ~/ හා #/ පුරාසයට පිවතින් පිහිටීමට අවශා / හි අගයයන් විවිධ පුවලක අංකවලට පහස විගුකර ඇත.

Bis out communicate, incomércalis criviales also et égib et égib Camidic e cien, sis grétale desprésable d'égits l'aim Correspondè gégélappe Bis l'Ougresbach Commile, numberdressés sectionness (Gégéla: Commi

This table gives the values of  $\ell$  for which a particular percentage,  $P_{\ell}$  of the Student's  $\ell$  distribution lies outside the range  $-\ell$  to  $+\ell$ . Those values of  $\ell$  are tabulated for various degrees of freedom.

P - 50% 20% 10% 5% 1% 1% 0.2% 0.1%

			4.					
නුවලනා	_							
MIRE WAY	ĺ							
Degrees of								
freedom	ł							
1	1.00	1.00						
	1	3.08	6.31	12.7	31.8	63.7	318	્ર 637
2	0.82	1.89	2.92	4.30	6.96	9.92	22.3	31.6
3	0.76	1,64	2.35	3.18	4.54	5.84	10.2	129
. 4	0.74	1.53	2.13	2.78	3,75	4.60	7.17	8.61
5	0.73	1.48	2.02	2.57	3.36	4.03	5.89	6.87
	١.							,
6	0.72	1.44	1.94	2,45	3.14	3.71	5.21	5.96
7	0.71	L42	1,89	2.36	3.00	3.50	4.79	5.41
8	0.71	1.40	1.86	2.31	2.90	3.36	4.50	5.04
9	0.70	1.38	1.83	2.26	2.82	3.25	4.30	4.78
10	0.70	1.37 -	1.81	2.23	2.76	3.17	4.14	4.59
					10	3.17	4, [4	4.39
12	0.70	1.36	1.78	2.18	2.68	3.05	3.93	
15	0.69	1.34	1.75	2.13	2.60			4.32
- 20	0.69	1.32	1.72	2.09		2.93	3.73	4.07
24	0.68	1.32			2.53	2.85	3.55	3.85
30	0.68		1.71	2.06	2.49	2,80	3.47	3.75
		1.31	1.70	2.04	2.46	2.75	3.39	3.65
40	0.68	1.30	1.68	2.02	2.42	2.70	3.31	3.55
60	0.68	1.30	1.67	2.00	2.39	2.66	3.23	3.46
∞	0.67	1.28	1.64	1.96	2.33	2.58	3.09	3,29

Appendix II

	,	: :		35	42.00									-		1					F. 27.
23	VI	11		1	- ::				පසමග	ාව	¢-m	Đα		\$1. P	2		4	-		- *	4
		7		و				.15	es (10 to a	ล้ากษ	a est	r.eh									
					2.			-						r.	•					er ing	50 A/C
	•								Kand	om i	Vumb	ers .			•						
:		4		,				4 2			-2-	4			<b>37</b> 76					أنف ش	
	- 60	00	.35	14	40	32	-	51		38		24		63		55		32 84		12 93	
	28	34	84	00	17	85		77		73		14	99	67	18	69		9 88		18 01	
	66	24	78	36	-31	53		61		57	73. 7	75		36	18	68		4 06		3 61	7 - 1 july 25
	95	02	41	71	12	68	44	61	26.	)9	84	53	62	43	2772	06		19 47		8 98	
	6 26		71	89	01	81	85	93	81	13	4,7	79 <sub>6</sub> .	80	42	71,	18		3 36	1	50 <b>L</b> 7.	
•		- Same							•				٠.		121 1		- 1	år i .			
	37	159	77	23	18	75	74	03	07	24	35	09.	20	95	49	272	<b>\$</b>	8 24		58 34 17 27	
	37			16_	43	21	0,8	60	57	20	85	23	50	10	11	15	्रो	3 65	) (	7 27	
	16		00	.34	9E	78	78	10	31 1	01	39	20,	66	57	43	77	8	(I 69		50 67	-
11.	70		-60	75	81	16	38	25	75	97	61	IJ.	.53	16	62	17.	٠, {	3 43		8 81	
	76		28	65	74	36	09	79	97	13	08	15	70	52	85	09		9 15		4 59	
				الريارية			4.			100			100			-	٠.:				
	56	44	43	89	24	12	68	15	90	99 .	06	94	57	25	. 55	į4	ć	(2 80	, (	4 82	
	40		90	57	18	92	26	65	61	94	35	65		6l	60	75	Ś	3 46		9 43	_
٠,	19	5 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	69	67	46	12	55	09	84	13	99	01	11	66	96	95	*	2 17	A 4	3 25	
	29		36	16	85		86	51	53	77	12	40	79	08	77	17		8 93		3 37	
	73	4.7	55	86	66	51	77	58		86	88	53	48	54	33	75		59 85	. (	3 15	
	1,50		E-12	- 1		• • •	• •		704	71 1	1.				AL FR				٠.		
,	71	27	89	59	58	56	48	00	23	24	39	46	28	88	25	76		29 70		7 05	100
	19	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	19	11	54	15	50	48	46	"The		40 - 5	04	76	88	59		X 85		5 02	
	76		15	90	. 04	19		47	3.5	70	4 4 Same	69	13	02	14	23		22 86		2 20	
	20	11.70	03	02	15	00	53	41		80		70	21	64	77	31	37	50 72	8	7 36	2.00 - 30
	ίο	. 1967 A. A.		96		16	67			71		26		57	25	85	and the second	16 23		2 86	$E = \mathbb{R}$
	v		. Vilation	<b>第</b> 字	14. J. F. K.	4.3		ورور والآوي		(***) *	Sec.	- 1.	50°,	. /2	7 D	A47		eran eran eran. Franska eran	s,		er Out of the
	1.	na Tig	-44					٠.٠	₹.	4 -			a All		- 45	4	1.1	3,3%	en engli	جو برنفرين	
	•								1 7 7	5.	10.20	77		11		÷ .		37	10 M	12.	
C	- ZEST	V. C. SAN	के दिल्ला इंटर		THE SHE	- Cal	endry records			1.5	73	15.20	300	de Hilliam	7345			a-15/3	energe Programme	engeweren	وإخداد
	250		9 (5-79) W <b>H</b> EV	Seller VAR			ಆರ್. ಆರ್.	المحسدة			73° ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' ' '	1 5 5 15 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1 2 1	MAN T	nyggyman Signas - sig		, . ,	juris Jasi	20 (V)			
			. #1/	41	20	84	स्मापकात्रक <b>8</b> 1	21	92	100	4	. 955			0		05	8.	23	'n	\$ 60
- Q	88	85	22	80	25	18	85	35	- 44	04	3	40		02 8	7	74	05 57	1	24	1	C 1 5 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7 7
	88 49	85 55	22 88	80 89	25 99	18 78	85 56	35 55	44 -60	04 90	3' 1'	40 37			7		7.75		24	0	66
	88 49 91	85 55 20	22	80	25 99 31	18 78 06	85 56 49	35	44 -60 80	04	3	40 37		02 8	7 8	74 62	57	8 9	24 1 00 1 99	0	66 82
	88 49	85 55	22 88	80 89	25 99	18 78	85 56	35 55	44 -60	04 90	3' 1'	40 37 34	( 	02 8 46 4	7 8	74 62 69	57 98	8	24 1 00 1 99	0) 0)	} 66 1 82 7 14
	88 49 91	85 55 20	22 88 11	80 89 42	25 99 31 63	18 78 06	85 56 49	35 55 78	44 -60 80 08	04 90 44	3 1 2	40 37 34 05	( 	02 <b>8</b> 46 4 44 8	7 8	74 62 69	57 98 04	8 9	24 1 00 1 99	0 01 1	} 66 1 82 7 14
	88 49 91	85 55 20	22 88 11	80 89 42	25 99 31	18 78 06	85 56 49	35 55 78	44 -60 80	04 90 44	3 1 2	40 37 34 05	ि () १५, - ११ १	02 <b>8</b> 46 4 44 8	7 8 6	74 62 69	57 98 04 98	8 9	24 00 99 01	0 01 1	66 8 82 7 14 5 05
	88 49 91 04	83 55 20 13	22 88 11 62	80 89 42 00	25 99 31 63	18 78 06 28	85 56 49 70	35 55 78 48	44 -60 80 08	04 90 44 72	3; 1; 2; 3;	40 37 34 05		02 8 46 4 44 8 57 0	7 8 6	74 62 69 04	57 98 04 98	1 9 2	24 00 99 91 58	0 0 1 5 3	66 8 82 7 14 5 05 ) 18
	88 49 91 04	83 55 20 13 46	22 88 11 62 36	80 89 42 00	25 99 31 63 38	18 78 06 28	85 56 49 70 80	35 55 78 48 69	44 60 80 08	90 44 72 71	3; 12, 22, 37, 83,	40 37 34 05 22 24	ि - १ १ - १ १ १	02 8 46 4 44 8 57 0 66 2 01 6	7 8 8 6	74 62 69 04	57 98 04 98	8 9 2:	24 000 99 01 58 52	0) 1 3( 3(	66 1 82 7 14 5 05 1 18 1 91
- S	88 49 91 04 30 08	85 55 20 13 46 04	22 88 11 62 36 59	80 89 42 00 61 13	25 99 31 63 38 90	18 78 06 28 95 88	85 56 49 70 80 89	35 55 78 48 69 85	60 80 80 80 84	90 44 72 71 57	3: 12: 22: 32: 8: 0:	40 37 34 05 22 24 61	1 - 4 1 - 1 1 - 1 1 - 1	02 8 46 4 44 8 57 0 66 2 01 6 36 5	7 8 6 3	74 62 69 04 13	57 98 04 98 01 99 28	5 2 2 5 20	24 0 00 99 01 58 32 48	3( 3( 3( 44	66 82 7 14 65 05 05 05 0 18 6 9 1 42
	88 49 91 04 30 68 05	85 55 20 13 46 04 44	22 88 11 62 36 59 40	80 89 42 00 61 13 09 28	25 99 31 63 38 90 21	18 78 06 28 95 88 47	85 56 49 70 80 89 12	35 55 78 48 69 85 50	60 80 08 80 80 84 97	94 90 44 72 71 57 69	3; 12; 22; 32; 33; 60; 15;	40 37 34 05 22 24 61 42		02 8 46 4 44 8 57 0 66 2 01 6 36 5 41 1	7 8 8 6 3 0 0	74 62 69 04 13 33 71 48	57 98 04 98 01 99 28 06	51 20 21 20 20 10	24 00 99 01 58 52 48 68	3( 3( 44	66 6 82 7 13 5 05 9 18 9 9 1 1 42 1 56
	88 99 91 04 30 08 05 38	85 55 20 13 46 04 44 66	22 88 11 62 36 59 40 94	80 89 42 00 61 13 09 28	25 99 31 63 38 90 21 74	18 78 06 28 95 88 47 07	85 56 49 70 80 89 12 98	35 55 78 48 69 85 50 11	60 80 08 80 84 97 61	94 90 44 72 71 57 69 05	3; 12; 22; 32; 8; 0; 13; 24;	40 37 34 05 22 24 61 42		02 8 46 4 44 8 57 0 66 2 01 6 36 5 41 1	7 8 8 6 3 0 0	74 62 69 04 13 33	57 98 04 98 01 99 28	5 2 2 5 20	24 0 00 99 01 58 3 52 48 6 68	3( 3( 3( 44	66 6 82 7 13 5 05 9 18 9 9 1 1 42 1 56
	88 19 91 04 30 08 05 38 27	85 55 20 13 46 04 44 66 10	22 88 11 62 36 59 40 94 66	80 89 42 00 61 13 09 28 30	25 99 31 63 38 90 21 74 35	18 78 06 28 95 88 47 07	85 56 49 70 80 89 12 98	35 55 78 48 69 85 50 11	80 80 84 97 61 43	04 90 44 72 71 57 69 05 87	3: 1: 2: 3: 3: 8: 0: 1: 2: 4:	40 37 34 05 22 24 61 42 67	ि - व् स्व स्व स्व व (	02 8 46 4 44 8 57 0 66 2 01 6 36 5 41 1 04 2	7 8 8 6 3 0 0 8 6	74 62 69 04 13 33 71 48 09	57 98 04 98 01 99 28 06 43	5   20 97 27 20 97 10	24 00 00 99 01 58 52 48 68 44	30 30 30 30 30 44 43 37	66 682 14 5 05 18 9 9 9 42 1 56 1 87
	88 49 91 04 30 68 05 38 27 69	85 53 20 13 46 04 44 66 10	22 88 11 62 36 59 40 94 66	80 89 42 00 61 13 09 28 30	25 99 31 63 38 90 21 74	18 78 06 28 95 88 47 07 45	85 56 49 70 80 89 12 98 51	35 55 78 48 69 85 50 11 78	60 80 08 80 84 97 61	90 44 72 71 57 69 05 87	3: 1: 22 3: 3: 8: 0: 1: 24 44	40 37 34 05 22 24 61 42 67 05	ि - व् स्व - स्व - स्व स् - स्व - स् - स्व - स् - स् - स् - स् - स् - स् - स् - स्	02 8 46 4 44 8 57 0 66 2 01 6 36 5 41 1 04 2	7 8 8 6 3 0 0 8 6 4	74 62 69 04 13 33 71 48 09 24	57 98 04 98 01 99 28 06 43	51 20 27 20 92 16 54	24 0 00 99 01 58 52 48 68 44 07	30 30 30 30 44 43 37	F 66 3 82 1 14 5 05 1 18 9 1 1 42 1 56 7 87 1 01
	88 49 91 04 30 88 05 38 27 69 45	85 55 20 13 46 04 44 66 10 48	22 88 11 62 36 59 40 94 66	80 89 42 00 61 13 09 28 30 28	25 99 31 63 38 90 21 74 35	18 78 06 28 95 88 47 07 45 88 51	85 56 49 70 80 89 12 98 51	35 78 48 69 85 50 11 78 07 52	80 80 84 97 61 43	90 44 72 71 57 69 05 87 75 79	33 12 22 32 32 85 01 19 24 44	40 37 34 05 22 24 61 42 67 05 75	는 생 수 있는 생 수 있는 사람들이 되었다. 	02 8 46 4 44 8 57 0 66 2 01 6 36 5 41 1 04 2 33 0 98 7	7 8 8 6 3 0 0 8 6 4	74 62 69 04 13 33 71 48 09 24 68	57 98 04 98 01 99 28 06 43 61 69	5) 20 21 20 92 10 54	24 0 00 99 01 58 52 48 68 44 07 20	30 30 30 30 44 43 37	7 66 3 82 1 14 5 05 1 18 9 1 7 42 1 56 7 87 1 01 1 89
	88 49 91 04 30 08 05 38 27 69 45	\$5 55 20 13 46 04 44 66 10 48 30	22 88 11 62 36 59 40 94 66 90 79 24	89 42 00 61 13 09 28 30 28 17 25	25 99 31 63 38 90 21 74 35 50 16 51	18 78 06 28 95 88 47 07 45 88 51 15	85 56 49 70 80 89 12 98 51 12 77 38	35 78 48 69 85 50 11 78 07 52 65	80 80 84 97 61 43 52 09	94 90 44 72 71 57 69 05 87 75 79 86	33 12 22 35 85 01 19 24 44 39 05	40 37 34 05 22 24 61 42 67 05 75 06	는 사용 등 등 등 등 등 등 등 등 등 등 등 등 등 등 등 등 등 등	02 8 46 4 44 8 57 0 66 2 01 6 36 5 41 1 04 2 33 0 98 7 24 7	7 88 6 3 0 0 8 6 4 9	74 62 69 04 13 71 48 09 24 68 81	57 98 04 98 01 99 28 06 43 61 69 03	51 20 27 20 20 20 20 20 20 20 20 20 20 20 20 20	58 52 52 53 52 53 54 54 54 54 54 54 54 54 54 54 54 54 54	01 50 30 30 50 44 43 37 43 14	7 06 82 14 5 05 05 05 0 18 1 91 42 1 56 7 87 1 89 76
	88 89 91 04 30 08 05 38 27 69 45 91 28	\$5 55 20 13 46 04 44 66 10 48 30 15 47	22 88 11 62 36 59 40 94 66 90 79 24 25	80 89 42 00 61 13 09 28 30 28 17 25 08	25 99 31 63 38 90 21 74 35 50 16 51 90	18 78 06 28 95 88 47 07 45 88 51 15 04	85 56 49 70 80 89 12 98 51 12 77 38 98	35 55 78 48 69 85 50 11 78 07 52 65 79	60 80 80 84 97 61 43 52 09 38	94 90 44 72 71 57 69 05 87 75 79 86 82	35 32 32 32 33 85 01 19 24 44 44 35 05 24 74	40 37 34 05 22 24 61 42 67 05 75 06 44		02 846 444 8 857 0 666 2 01 6 536 5 41 1 04 2 33 0 98 7 7 52 6	7 88 6 3 0 0 8 6 4 9 9	74 62 69 04 13 33 71 48 69 24 68 81 98	57 98 04 98 01 99 28 06 43 69 03 65	51 20 27 20 20 20 20 20 20 20 20 20 20 20 20 20	58 52 52 53 52 54 56 68 68 68 68 68 68 68 68 68 68 68 68 68	30 30 30 30 30 44 43 37 43 44 44 44 44 44 44 44 44 44 44 44 44	F 66 3 82 7 14 5 05 0 18 0 91 0 42 1 56 7 87 1 89 1 76 2 33
	88 49 91 04 30 08 05 38 27 69 45	\$5 55 20 13 46 04 44 66 10 48 30	22 88 11 62 36 59 40 94 66 90 79 24	89 42 00 61 13 09 28 30 28 17 25	25 99 31 63 38 90 21 74 35 50 16 51	18 78 06 28 95 88 47 07 45 88 51 15	85 56 49 70 80 89 12 98 51 12 77 38	35 78 48 69 85 50 11 78 07 52 65	80 80 84 97 61 43 52 09	94 90 44 72 71 57 69 05 87 75 79 86	33 12 22 35 85 01 19 24 44 39 05	40 37 34 05 22 24 61 42 67 05 75 06 44		02 8 46 4 44 8 57 0 66 2 01 6 36 5 41 1 04 2 33 0 98 7 24 7	7 88 6 3 0 0 8 6 4 9 9	74 62 69 04 13 71 48 09 24 68 81	57 98 04 98 01 99 28 06 43 61 69 03	51 20 27 20 20 20 20 20 20 20 20 20 20 20 20 20	58 52 52 53 52 54 68 68 68 68 68 68 68 68 68 68 68 68 68	01 50 30 30 50 44 43 37 43 14	F 66 3 82 7 14 5 05 0 18 0 91 0 42 1 56 7 87 1 89 1 76 2 33
	88 89 91 64 30 88 83 38 27 69 45 91 28 66	85 55 20 13 46 04 44 66 10 48 30 47 23	222 88 1162 36 59 40 94 66 90 79 24 25 48	89 42 00 61 13 09 28 30 28 17	25 99 31 63 38 90 21 74 35 50 16 51 90 70	18 78 06 28 95 88 47 07 45 88 51 15 04 55	85 56 49 70 80 89 12 98 51 12 77 38 98 87	355 78 48 69 85 50 11 78 07 52 63 79 58	44 60 80 88 80 84 97 61 43 52 09 38 93 76	94 90 44 72 71 57 69 05 87 75 86 82 81	35 12 22 35 85 01 19 24 44 39 09 74 92	40 37 34 05 22 24 61 42 67 05 75 06 44 32		02 8 46 4 46 4 46 4 46 4 46 4 46 4 46 4 46	7 8 8 6 3 0 0 8 6 4 9 9 6 8	74 62 69 64 13 33 71 48 09 24 68 81 98 69	57 98 04 98 01 99 28 06 43 61 69 90	91 20 92 16 52 91 18 43 34	24 1 00 1 99 9 01 58 52 48 6 68 6 44 07 20 83 36 71	0 0 30 30 30 44 43 37 43 44 42 42 42 43	1 66 82 1 14 55 05 1 8 87 1 56 7 87 1 1 89 1 76 2 33 3 55
2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	88 49 91 04 30 68 05 38 27 69 45 91 28 66 20	85 55 20 13 46 04 44 66 10 13 13 47 23	222 88 1162 36 59 40 94 66 90 24 25 48 62	89 42 00 61 13 09 28 30 28 17 65	25 99 31 63 38 90 21 74 35 50 16 51 90 70	78 78 06 28 95 88 47 07 45 88 51 15 04 55	85 56 49 70 80 89 12 98 51 12 77 38 98 87	35 55 78 48 69 85 50 11 78 07 52 63 79 58	44 60 80 88 84 97 61 43 52 09 38 93 76	94 90 44 72 71 57 69 05 87 75 79 86 82 81	35 12 22 35 85 01 15 24 4- 35 05 24 74 92	40 37 34 05 22 24 61 42 67 05 75 06 44 32		02 8 46 4 46 4 44 8 57 0 66 2 01 6 36 5 41 1 04 2 33 0 98 7 52 6 12 7	7 8 6 3 0 0 8 6 4 9 9 6 8 8 3	74 62 69 64 13 33 71 48 69 24 68 81 98 69 01	57 98 04 98 01 99 28 06 43 61 69 03 65 90	51 20 92 16 52 16 54 34 65	24 7 00 7 00 7 01 58 52 24 48 68 68 68 68 68 68 68 68 68 6	00 00 30 30 44 43 37 43 14 61 41 18	F 66 82 1 14 5 05 1 8 1 9 1 1 4 2 1 5 6 7 8 7 1 1 8 9 1 7 6 1 3 3 3 3 5 5 1 5 1
- S	88 49 91 04 30 68 05 38 27 69 45 91 28 66 20 83	85 55 20 13 46 04 44 66 10 30 15 47 23	22 88 11 62 36 59 40 40 66 90 24 25 48 62 45	89 42 00 61 13 09 28 30 28 17 25 08 17 65 20	25 99 31 63 38 90 21 74 35 50 16 51 90 70 89 06	78 78 06 28 95 88 47 07 45 88 51 15 04 55	85 56 49 70 80 89 12 98 51 12 77 38 98 87	35 55 78 48 69 85 50 11 78 07 52 63 79 58 57 59 59	443 80 88 84 97 61 43 52 09 38 93 76	94 90 44 72 71 57 69 05 87 75 79 86 82 81	33 12 22 33 8: 01 12 24 4- 4- 35 09 7- 92	407 374 344 345 346 346 346 347 347 347 347 347 347 347 347		02 846 444 857 0 666 2 666 6 6 6 6 6 6 6 6 6 6 6 6 6 6	7 8 6 3 0 0 8 6 4 9 9 6 8 8 3 4	74 62 69 94 13 33 71 48 99 24 68 81 98 69 01 69	57 98 04 98 01 99 28 06 43 61 69 03 65 90 08 67	51 20 92 10 54 91 14 34 65 20 22	244 900 999 91 91 91 91 91 91 91 91 91 91 91 91	0: 0: 30: 36: 44: 43: 43: 44: 41: 42: 18: 61:	1 66 82 7 14 6 05 18 91 42 1 56 7 87 87 6 01 89 76 33 8 55 8 51 33
- P	88 49 91 04 30 08 05 38 27 69 45 91 28 66 20 83 55	85 55 20 13 46 04 44 66 10 13 47 23 98 75 56	22 88 11 62 36 59 40 40 66 90 79 24 25 48 62 45 09	89 42 00 61 13 09 28 30 28 17 25 08 17 65 20 38	25 59 31 63 38 90 21 74 35 50 16 51 90 70 89 96 05	18 78 06 28 95 88 47 07 45 88 51 15 04 55	85 56 49 70 80 89 91 98 51 12 77 38 98 87	35 78 48 69 85 50 11 78 07 52 63 79 58 57 93 72	44 60 80 88 84 97 61 43 52 09 38 93 76 60 13	94 90 44 72 71 57 69 05 87 75 79 86 82 81	35 122 35 85 01 10 22 44 35 05 24 74 92	1 40 37 34 1 05 22 24 61 1 42 1 67 75 76 64 44 32 17 72 92		02 8 46 44 8 464 8 8 57 0 66 2 66 6 2 6 6 6 6 6 6 6 6 6 6 6 6 6	7 8 8 6 3 0 0 8 6 4 9 9 6 8 8 3 4 4 5	74 62 69 94 13 37 48 69 24 68 81 69 01 69 29	57 98 98 01 99 28 06 43 61 69 03 65 90 08 67 91	51 20 92 10 52 91 11 43 34 65 20 20 20 20 20 20 20 20 20 20 20 20 20	244 100 100 100 100 100 100 100 100 100 1	0: 0: 30: 30: 44: 43: 37: 44: 45: 46: 47: 18: 61: 75:	66 62 14 56 7 87 6 18 89 1 76 18 33 55 1 33 19
2 0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	88 49 91 04 30 08 05 38 27 69 45 91 28 66 20 83 55 60	85 55 26 13 46 04 44 66 10 47 23 98 75 56 30	22 88 11 62 36 59 40 94 66 90 79 24 25 48 62 45 98 81	89 42 00 61 13 09 28 30 28 17 65 20 38 40	25 99 31 63 38 90 21 74 35 50 16 51 90 70 89 06 05 01	18 78 06 28 95 88 47 07 45 88 51 15 04 55 10 84 16 12	85 56 49 70 80 89 12 98 51 12 77 38 98 87 06 17 14 27	35 78 48 69 85 50 11 78 07 52 63 79 58 57 93 72 25	60 80 80 88 80 84 97 61 43 52 93 76 60 13 64 55	94 90 44 72 71 57 69 05 87 75 78 86 82 81 70 43 69 41	33 12 22 32 32 85 01 15 24 44 35 05 74 92 63 06 91	407 373 344 353 364 361 361 361 361 361 361 361 361	1	02 8 46 44 8 8 464 8 8 666 2 2 6 66 2 2 6 7 7 8 8 7 7 8 8 8 7 7 8 8 8 8 8 8 8 8	78866 3000866 499968 34555	74 62 69 04 13 33 71 48 69 24 68 81 98 69 29 46	57 98 04 98 01 99 28 06 43 61 69 03 65 90 08 67 91 55	\$1 20 97 120 97 16 16 50 18 43 34 65 20 22 24 24 55	244 1000 1000 1000 1000 1000 1000 1000 1	0; 0; 30; 30; 44; 43; 37; 49; 41; 42; 18; 18; 61; 73; 67;	66 62 14 15 15 15 15 15 15 15 15 15 15 15 15 15
1	88 49 91 04 30 08 05 38 27 69 45 91 28 66 20 83 55	85 55 20 13 46 04 44 66 10 13 47 23 98 75 56	22 88 11 62 36 59 40 40 66 90 79 24 25 48 62 45 09	89 42 00 61 13 09 28 30 28 17 25 08 17 65 20 38	25 59 31 63 38 90 21 74 35 50 16 51 90 70 89 96 05	18 78 06 28 95 88 47 07 45 88 51 15 04 55	85 56 49 70 80 89 91 98 51 12 77 38 98 87	35 78 48 69 85 50 11 78 07 52 63 79 58 57 93 72	60 80 80 88 80 84 97 61 43 52 93 76 60 13 64 55	94 90 44 72 71 57 69 05 87 75 79 86 82 81	35 122 35 85 01 10 22 44 35 05 24 74 92	407 373 344 353 364 361 361 361 361 361 361 361 361	1	02 8 46 44 8 464 8 8 57 0 66 2 66 6 2 6 6 6 6 6 6 6 6 6 6 6 6 6	78866 3000866 499968 34555	74 62 69 04 13 33 71 48 69 24 68 81 98 69 29 46	57 98 98 01 99 28 06 43 61 69 03 65 90 08 67 91	51 20 92 10 52 91 11 43 34 65 20 20 20 20 20 20 20 20 20 20 20 20 20	244 100 100 100 100 100 100 100 100 100 1	0; 0; 30; 30; 44; 43; 37; 49; 41; 42; 18; 18; 61; 73; 67;	66 62 14 56 7 87 6 18 89 1 76 18 33 55 1 33 19
	88 49 91 04 30 88 05 38 27 69 45 91 28 66 20 83 55 56 05	85 55 20 13 46 04 44 66 10 48 30 15 47 23 98 75 66 30 73	22 88 11 62 36 59 40 94 66 90 24 25 48 62 45 09 81 31	89 42 00 61 13 09 28 30 28 17 25 65 20 38 40 10	25 99 31 63 38 90 21 74 35 50 16 51 90 70 89 96 05 05 01 04	18 78 06 28 95 88 47 07 45 88 51 10 84 16 12 69	85 56 49 70 80 89 12 98 51 12 77 38 98 87 06 17 14 27 21	35 78 48 69 85 50 111 78 07 52 63 79 58 57 93 72 25 01	60 80 88 84 97 61 43 52 93 76 60 13 64 55 53	94 90 44 72 71 57 69 05 87 75 79 86 82 81 70 41 59	33 12 22 33 8: 8: 01 19 24 44 39 24 74 92 63 02 02 02 01 16	40° 40° 40° 40° 40° 40° 40° 40° 40° 40°	· · · · · · · · · · · · · · · · · · ·	02 8 46 44 8 8 46 44 8 8 57 0 66 2 60 6 6 6 6 6 6 6 6 6 6 6 6 6 6 6	788866 3000866 499688 345556	74 62 69 64 13 33 71 48 69 24 68 81 98 69 29 46 79	57 98 04 98 01 99 28 06 43 61 69 03 65 90 08 67 91 55 94	99 22 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5 5	244 100 100 100 100 100 100 100 100 100 1	0: 0: 30: 30: 30: 42: 43: 43: 44: 42: 18: 61: 72: 67: 39:	1 66 1 82 1 14 5 05 1 87 1 42 1 56 7 87 1 1 89 1 76 2 33 3 55 3 51 1 39 1 703 7 69
2	88 49 91 04 30 80 80 38 27 69 45 91 28 66 20 83 55 60 95	85 55 20 13 46 04 44 66 10 48 30 15 47 23 98 75 56 30 75 30 75	22 88 11 62 36 59 40 94 66 90 24 25 48 62 45 09 81 31	80 89 42 00 61 13 92 8 30 28 17 25 08 17 65 20 66	25 99 31 63 38 90 21 74 35 50 16 51 90 70 89 06 05 01 04 76	18 78 06 28 95 88 47 45 88 51 15 04 55 10 84 16 12 69 86	85 56 49 70 80 89 91 98 51 12 77 78 98 87 06 17 14 27 21 30	355 78 48 69 85 50 11 78 07 52 65 79 58 79 58 72 25 01	60 80 88 80 84 97 61 43 52 93 76 60 13 64 55 55 53	94 90 44 72 71 57 69 05 86 82 81 70 43 69 41 59	33 12 32 32 33 83 83 91 92 44 92 63 92 91 16	40 40 32 34 42 42 42 42 42 42 42 42 42 42 42 42 42	1	02 8 46 44 8 8 44 8 8 57 0 66 2 6 6 6 6 6 6 6 6 6 6 6 6 6 6 7 7 10 8 8 7 7 10 12 8 8 9 14 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	78886 3000866 49968 3445556 7	74 62 69 64 13 33 71 48 69 24 68 81 98 69 29 46 79 45	57 98 04 98 01 99 28 06 43 61 69 03 65 90 08 67 91 55 94	90 22 32 32 32 32 32 34 34 34 65 20 22 24 59 90 90 90 90 90 90 90 90 90 90 90 90 90	244 1 000 1 01 1 58 2 48 3 68 4 44 1 07 2 20 1 83 1 71 1 87 77 1 38 1 27 24 33 33	00 00 30 30 44 43 37 45 41 41 41 41 41 41 41 41 41 41 41 41 41	66 82 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	88 49 91 04 30 80 80 38 27 69 45 91 28 66 20 83 55 60 60 60 71	85 55 20 13 46 04 44 66 10 15 47 23 98 75 56 30 73 27 02	222 88 11 62 36 59 40 40 66 90 79 24 25 48 62 48 62 49 40 40 40 40 40 40 40 40 40 40 40 40 40	80 89 42 00 61 13 99 28 30 28 17 25 65 20 86 10 66 61	25 99 31 63 38 90 21 74 35 50 16 51 90 70 89 06 05 01 04 76 97	18 78 06 28 95 88 47 45 88 51 15 04 55 10 84 16 12 69 86 19	85 56 49 70 80 89 81 12 77 38 88 87 06 17 14 27 21 30 77	355 78 48 69 85 50 11 78 07 52 63 79 58 79 58 79 50 11 19 09	60 80 80 84 97 61 43 52 99 38 93 76 60 64 55 53	90 444 72 71 57 69 90 87 75 79 86 82 81 70 43 69 41 59	33 122 33 83 83 13 24 44 39 09 27 74 92 63 02 01 16	40 40 42 44 42 44 44 44 44 44 44 44 44 44 44		02 8 46 44 8 8 66 7 7 6 6 6 7 8 6 6 6 7 8 6 6 7 8 6 6 7 8 6 6 7 8 6 6 7 8 6 6 7 8 6 6 7 8 6 6 8 6 8	78886 300866 49968 344556 74	74 62 69 14 13 33 71 48 69 24 68 81 98 69 29 46 79 45 98	57 98 04 98 01 99 28 06 43 66 90 08 67 91 20	90 22 35 55 20 92 18 34 34 34 36 52 20 22 22 24 59 94 94 94 94 94 94 94 94 94 94 94 94 94	244 1 00 00 1 582 1 582 1 582 1 583 1 571 1 38 1 77 1 38 1 27 1 24 33 1 21 1 21 1 21 1 21 1 21 1 21 1	00 00 30 30 44 43 37 43 44 42 42 42 43 61 75 67 67 88	66 82 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
	88 49 91 04 30 88 80 538 27 69 45 91 28 66 20 83 55 60 05	85 55 20 13 46 04 44 66 10 13 47 23 98 75 56 30 73 27 02 28	222 88 11 62 36 59 40 40 66 90 79 24 25 48 62 40 81 31 24 71 35	89 42 00 61 13 09 28 30 28 17 25 65 20 38 40 10 66 61 19	25 99 31 63 38 90 21 74 35 50 16 51 90 70 89 96 95 91 94 97 97 98	18 78 06 28 95 88 47 07 45 88 51 10 84 16 12 69 86 19 23	85 56 49 70 80 89 12 77 38 98 87 06 17 14 27 21 30 77 14	35 78 48 69 85 50 11 78 07 52 63 79 57 93 72 25 01	443 80 88 84 97 61 43 52 09 38 93 76 60 13 64 55 53 47 83 90	90 444 72 71 57 69 90 86 82 81 70 43 69 41 59 05 31 33	33 122 33 85 61 15 124 44 39 09 24 74 92 63 64 91 16	40 40 42 44 42 44 44 44 44 44 44 44 44 44 44		02 8 46 44 8 8 66 7 7 8 66 8 66 8 66 8 66	788866 3000866 499668 3445566 7466	74 62 69 14 13 33 71 48 69 24 68 81 98 69 45 98 45 98 82	57 98 04 98 01 99 806 43 669 03 65 90 08 67 91 20 80	91 188 20 20 20 20 20 20 20 20 20 20 20 20 20	244 1 99 99 99 99 99 99 99 99 99 99 99 99 9	0: 0: 30: 36: 44: 43: 37: 43: 14: 18: 61: 73: 67: 88: 02:	6 6 82 7 14 5 6 7 87 6 7 87 6 9 6 9 9 0 7 9 6 9 9 0 7
	88 99 04 30 90 91 91 91 91 91 91 91 91 91 91	85 55 20 13 46 04 44 66 10 15 47 23 98 75 56 30 73 27 02	222 88 11 62 36 59 40 40 66 90 79 24 25 48 62 48 62 49 40 40 40 40 40 40 40 40 40 40 40 40 40	89 42 00 61 13 9 28 30 28 17 25 817 65 20 38 40 10 66 61 19 49	25 99 31 63 38 90 21 74 35 50 16 51 90 70 89 06 05 01 04 76 97 28 44	18 78 06 28 95 88 47 45 88 51 15 04 55 10 84 16 12 69 86 19	85 56 49 70 80 89 98 51 12 77 38 98 87 06 17 14 27 21 30 77 14 01	355 78 48 69 85 50 11 78 07 52 63 79 58 79 58 79 50 11 19 09	60 80 88 80 84 97 61 43 52 09 38 93 76 60 13 64 55 53	90 444 72 71 57 69 90 86 87 75 79 86 82 81 70 43 69 41 59 05 31 33	33 12 22 32 33 83 60 13 24 44 35 90 92 63 91 16	40 40 42 44 42 44 44 44 44 44 44 44 44 44 44		02 8 46 44 8 8 66 7 7 6 6 6 7 8 6 6 6 7 8 6 6 7 8 6 6 7 8 6 6 7 8 6 6 7 8 6 6 7 8 6 6 7 8 6 6 8 6 8	78886 300886 499688 345556 74655	74 62 69 04 13 33 71 48 69 24 68 81 98 69 29 45 98 82	57 98 04 98 01 99 28 69 43 61 69 69 67 91 55 94 91 20 80 24	91 188 20 20 20 20 20 20 20 20 20 20 20 20 20	244 1 00 00 1 582 1 582 1 582 1 583 1 571 1 38 1 77 1 38 1 27 1 24 33 1 21 1 21 1 21 1 21 1 21 1 21 1	0: 0: 30: 36: 44: 43: 37: 43: 14: 18: 61: 73: 67: 88: 02:	66 82 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1