

**Time - 3 Hour****M-70**

The question paper contains 7 printed pages. Use of **graph sheets** is permitted in the exam.

Attempt any 5 questions. All questions carry equal marks.

- Q1. Explain the various quantitative and statistical techniques which could be used to solve problems pertaining to rural research and help in taking the managerial decisions. **(14)**
- Q2. (a) The following set of numbers represent marks obtained by forty employees in an achievement test.

10	17	15	22	11	16	19	24	29	18
25	26	32	14	17	20	23	27	30	12
15	18	24	36	18	15	21	28	33	38
34	13	10	16	20	22	29	29	23	31

Tabulate the data in a frequency distribution table. Draw the histogram and frequency polygon on a graph sheet. **(6)**

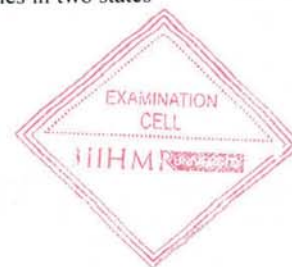
- (b) The number of people who visited in a departmental store over a thirty-day period were counted and a frequency distribution table was generated as shown below:

Class Interval	Frequency (f)
0 - 10	1
10 - 20	2
20 - 30	3
30 - 40	5
40 - 50	6
50 - 60	9
60 - 70	4

Find out the 'less than' and 'more than' type of cumulative frequency and its *ogive*. Also indicate the median on the graph sheet. **(8)**

- Q3. The following table shows the profits earned by 75 Agribusiness Companies in two states of India.

Profit (Rs. Crore)	No. of Agribusiness Companies	
	State A	State B
20 – 30	12	8
30 – 40	26	28
40 – 50	27	30
50 – 60	10	9



Find the mean, median, mode, 6th decile and 75th percentile of profits for each state.

(14)

- Q4. The following table shows the IQ (x) and the Mark (y) obtained by 10 students in an Quantitative Techniques examination.

IQ (x)	145	100	100	112	138	133	123	116	127	106
Mark(y)	75	35	52	36	80	90	71	54	52	55

Draw the scatter diagram. Estimate the Regression Equation to estimate mark of student, for a known IQ.

Consider an eleventh student, whose IQ is known to be 126, but through illness was unable to take the examination. Predict the mark for that student.

(14)

- Q5. Two examiners at a chrysanthemum show award percentage marks to the six entries in a particular class as follow:-

Entry	1	2	3	4	5	6
Examiner A	85	81	78	70	66	60
Examiner B	80	90	84	55	75	65

Calculate the correlation coefficient between these two set of marks.

Each examiner now ranks the entries in accordance with the marks he has awarded. Calculate the rank correlation coefficient.

(14)

- Q6. (a) Find the area under the standard normal curve (Explain through neat curve):

- (i). Pr (z negative)
- (ii). Pr ($0.4 \leq z \leq 1.7$)
- (iii). Pr ($-0.4 \leq z \leq 1.7$)
- (iv). Pr ($-1.7 \leq z \leq 0.4$)
- (v). Pr ($0.4 \leq z < \infty$)
- (vi). Pr ($-1.96 \leq z \leq 1.96$)

(1 x 6)

(b) Assume that the mean height of students is an exact normal distribution with a mean 68.22 inches and a variance of 10.8 inches. How many students in a college of 1000 students would you expect to be over six foot tall? (8)

Q7. (a) The time taken by customers browsing in a boutique to decide to make a purchase has been found to be normally distributed with a mean of 16 minutes and standard deviation of 8 minutes.

What is the probability that a customer when randomly surveyed will take

(i). between 10 and 12 minutes to make a purchase?

(ii). more than 15 minutes?

(iii). less than 5 minutes?

(iv). between 2 and 24 minutes? (6)

(b) A car manufacturer wants to estimate the mileage of a new model of car. From past experience with similar models, the manufacturer believes the kilometre per litre standard deviation is 5. A random sample of 100 runs of new model yields a sample mean of 20 kilometres per litre.

Construct a 90 % and 95 % confidence interval for the population mean.

Illustrate your answer with diagrams of the probability distribution showing the limits you have calculated. (8)

Q8. Raju restaurant has been having average sales of 500 tea cups per day. Because of the devopment of bus stand nearby, it expects to increase its sales. During the first 12 days, the daily sales were as under:

550,570,490,615,505,580,570,460,600,580,530,526

On the basis of this sample information, can one conclude that Raju Restaurant's sales have increased? Use 5 per cent level of significance. (14)

Q9. During a recent campaign to recruit new blood donors, a sample of 956 prospective donors were tested for Blood Group Type O, A, B or AB (Factor One) and whether the donors were Rhesus Positive or Negative (Factor Two). The following contingency table gives the observed frequency obtained for each of the combination of the levels of the two-factor classification.

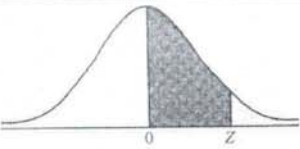
Blood Group Type	Rhesus	
	+	-
O	336	57
A	361	46
B	95	19
AB	34	8

Examine the data for evidence for the presence of an association between the two factors (Blood Group Type and Rhesus + / -). (14)



Students can use following tables in answering the questions

Table 1: Areas of the Standard Normal Distribution, probability that a standard normal random variable is between 0 and Z (the shaded area)



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									
4.0	0.49997									
4.5	0.499997									
5.0	0.4999997									
6.0	0.499999999									

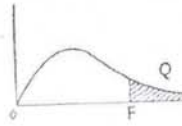


Table 2: Critical Values of Student's t-Distribution

d.f.	Level of significance for two-tailed test					d.f.
	0.20	0.10	0.05	0.02	0.01	
	Level of significance for one-tailed test					
	0.10	0.05	0.025	0.01	0.005	
1	3.078	6.314	12.706	31.821	63.657	1
2	1.886	2.920	4.303	6.965	9.925	2
3	1.638	2.353	3.182	4.541	5.841	3
4	1.533	2.132	2.776	3.747	4.604	4
5	1.476	2.015	2.571	3.365	4.032	5
6	1.440	1.943	2.447	3.143	3.707	6
7	1.415	1.895	2.365	2.998	3.499	7
8	1.397	1.860	2.306	2.896	3.355	8
9	1.383	1.833	2.262	2.821	3.250	9
10	1.372	1.812	2.228	2.764	3.169	10
11	1.363	1.796	2.201	2.718	3.106	11
12	1.356	1.782	2.179	2.681	3.055	12
13	1.350	1.771	2.160	2.650	3.012	13
14	1.345	1.761	2.145	2.624	2.977	14
15	1.341	1.753	2.731	2.602	2.947	15
16	1.337	1.746	2.120	2.583	2.921	16
17	1.333	1.740	2.110	2.567	2.898	17
18	1.330	1.734	2.101	2.552	2.878	18
19	1.328	1.729	2.093	2.539	2.861	19
20	1.325	1.725	2.086	2.528	2.845	20
21	1.323	1.721	2.080	2.518	2.831	21
22	1.321	1.717	2.074	2.508	2.819	22
23	1.319	1.714	2.069	2.500	2.807	23
24	1.318	1.711	2.064	2.492	2.797	24
25	1.316	1.708	2.060	2.485	2.787	25
26	1.315	1.706	2.056	2.479	2.779	26
27	1.314	1.703	2.052	2.473	2.771	27
28	1.313	1.701	2.048	2.467	2.763	28
29	1.311	1.699	2.045	2.462	2.756	29
Infinity	1.282	1.645	1.960	2.326	2.576	Infinity



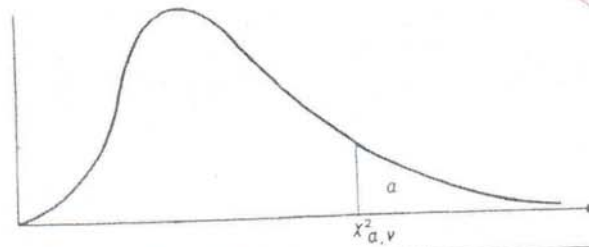
Table 3: Percentage points of the F-distribution, one tail



Q%	ν_1	1	2	3	4	5	6	7	8	9	10	12	15	20	24	∞
1	161.4	199.5	215.7	224.6	230.2	234.0	236.8	238.9	240.5	241.9	243.9	246.0	248.0	249.1	254.3	
5	4052	5000	5403	5625	5764	5859	5928	5982	6022	6056	6086	6117	6149	6181	6235	6366
10	18.51	19.00	19.16	19.25	19.30	19.33	19.35	19.37	19.38	19.40	19.41	19.43	19.45	19.45	19.50	
50	96.50	99.00	99.17	99.25	99.30	99.33	99.36	99.37	99.39	99.40	99.42	99.43	99.45	99.46	99.50	
95	10.13	9.55	9.28	9.12	9.01	8.94	8.89	8.85	8.81	8.79	8.74	8.70	8.66	8.64	8.53	
99	34.12	30.82	29.46	28.71	28.24	27.91	27.67	27.49	27.35	27.23	27.05	26.87	26.69	26.60	26.13	
99.5	7.71	6.94	6.59	6.39	6.26	6.16	6.09	6.04	6.00	5.96	5.91	5.86	5.80	5.77	5.63	
99.9	21.20	18.00	16.69	15.98	15.52	15.21	14.98	14.80	14.66	14.55	14.37	14.20	14.02	13.93	13.46	
99.95	6.61	5.79	5.41	5.19	5.05	4.95	4.88	4.82	4.77	4.74	4.68	4.62	4.56	4.53	4.36	
99.99	16.26	13.27	12.06	11.39	10.97	10.67	10.46	10.29	10.16	10.05	9.89	9.72	9.55	9.47	9.02	
99.995	5.99	5.14	4.76	4.53	4.39	4.28	4.21	4.15	4.10	4.06	4.00	3.94	3.87	3.84	3.67	
99.999	13.75	10.92	9.78	9.15	8.75	8.47	8.26	8.10	7.98	7.87	7.72	7.56	7.40	7.31	6.88	
99.9995	5.59	4.74	4.35	4.12	3.97	3.87	3.79	3.73	3.68	3.64	3.57	3.51	3.44	3.41	3.23	
99.9999	12.25	9.55	8.45	7.85	7.46	7.19	6.99	6.84	6.72	6.62	6.47	6.31	6.16	6.07	5.65	
99.99995	5.32	4.46	4.07	3.84	3.69	3.58	3.50	3.44	3.39	3.35	3.28	3.22	3.15	3.12	2.93	
99.99999	11.26	8.65	7.59	7.01	6.63	6.37	6.18	6.03	5.91	5.81	5.67	5.52	5.36	5.28	4.86	
99.999995	5.12	4.26	3.86	3.63	3.48	3.37	3.29	3.23	3.18	3.14	3.07	3.01	2.94	2.90	2.71	
99.999999	10.56	8.02	6.99	6.42	6.06	5.80	5.61	5.47	5.35	5.26	5.11	4.96	4.81	4.73	4.31	
99.9999995	4.96	4.10	3.71	3.48	3.33	3.22	3.14	3.07	3.02	2.98	2.91	2.85	2.77	2.74	2.54	
99.9999999	10.04	7.56	6.55	5.99	5.64	5.39	5.20	5.06	4.94	4.85	4.71	4.56	4.41	4.33	3.91	
99.99999995	4.84	3.98	3.59	3.36	3.20	3.09	3.01	2.95	2.90	2.85	2.79	2.72	2.65	2.61	2.40	
99.99999999	9.65	7.21	6.22	5.67	5.32	5.07	4.89	4.74	4.63	4.54	4.40	4.25	4.10	4.02	3.60	
99.999999995	4.75	3.89	3.49	3.26	3.11	3.00	2.91	2.85	2.80	2.75	2.69	2.62	2.54	2.51	2.30	
99.999999999	9.33	6.93	5.95	5.41	5.06	4.82	4.64	4.50	4.39	4.30	4.16	4.01	3.86	3.78	3.36	
99.9999999995	4.67	3.81	3.41	3.18	3.03	2.92	2.83	2.77	2.71	2.67	2.60	2.53	2.46	2.42	2.21	
99.9999999999	9.07	6.70	5.74	5.21	4.86	4.62	4.44	4.30	4.19	4.10	3.96	3.82	3.66	3.59	3.17	
99.99999999995	4.60	3.74	3.34	3.11	2.96	2.85	2.76	2.70	2.65	2.60	2.54	2.48	2.40	2.33	2.29	
99.99999999999	8.86	6.51	5.56	5.04	4.69	4.46	4.28	4.14	4.03	3.94	3.80	3.66	3.51	3.43	3.00	
99.999999999995	4.54	3.68	3.29	3.06	2.90	2.79	2.71	2.64	2.59	2.54	2.49	2.42	2.35	2.28	2.24	
99.999999999999	8.68	6.36	5.42	4.89	4.56	4.32	4.14	4.00	3.89	3.80	3.67	3.52	3.37	3.29	2.87	
99.9999999999995	4.49	3.63	3.24	3.01	2.85	2.74	2.66	2.59	2.54	2.49	2.42	2.35	2.28	2.24	2.01	
99.9999999999999	8.53	6.23	5.29	4.77	4.44	4.20	4.03	3.89	3.78	3.69	3.55	3.41	3.26	3.18	2.75	
99.99999999999995	4.45	3.59	3.20	2.96	2.81	2.70	2.61	2.55	2.49	2.45	2.38	2.31	2.23	2.19	1.96	
99.99999999999999	8.40	6.11	5.18	4.67	4.34	4.10	3.93	3.79	3.68	3.59	3.46	3.31	3.16	3.08	2.65	
99.999999999999995	4.41	3.55	3.16	2.93	2.77	2.66	2.58	2.51	2.46	2.41	2.34	2.27	2.19	2.15	1.92	
99.999999999999999	8.29	6.01	5.09	4.58	4.25	4.01	3.84	3.71	3.60	3.51	3.37	3.23	3.08	3.00	2.57	
99.9999999999999995	4.38	3.52	3.13	2.90	2.74	2.63	2.54	2.48	2.42	2.38	2.31	2.23	2.16	2.11	1.88	
99.9999999999999999	8.18	5.93	5.01	4.50	4.17	3.94	3.77	3.63	3.52	3.43	3.30	3.15	3.00	2.92	2.49	
99.99999999999999995	4.35	3.49	3.10	2.87	2.71	2.60	2.51	2.45	2.39	2.35	2.28	2.20	2.12	2.08	1.84	
99.99999999999999999	8.10	5.85	4.94	4.43	4.10	3.87	3.70	3.56	3.45	3.37	3.23	3.09	2.94	2.86	2.42	
99.999999999999999995	4.32	3.47	3.07	2.84	2.68	2.57	2.49	2.42	2.37	2.32	2.25	2.18	2.10	2.05	1.81	
99.999999999999999999	8.02	5.78	4.87	4.37	4.04	3.81	3.64	3.51	3.40	3.31	3.17	3.03	2.88	2.80	2.36	
99.9999999999999999995	4.30	3.44	3.05	2.82	2.66	2.55	2.46	2.40	2.34	2.30	2.23	2.15	2.07	2.03	1.78	
99.9999999999999999999	7.95	5.72	4.82	4.31	3.99	3.76	3.59	3.45	3.35	3.26	3.12	2.98	2.83	2.75	2.31	
99.99999999999999999995	4.28	3.42	3.03	2.80	2.64	2.53	2.44	2.37	2.32	2.27	2.20	2.13	2.05	2.01	1.76	
99.99999999999999999999	7.88	5.66	4.76	4.26	3.94	3.71	3.54	3.41	3.30	3.21	3.07	2.93	2.78	2.70	2.26	
99.999999999999999999995	4.26	3.40	3.01	2.78	2.62	2.51	2.42	2.36	2.30	2.25	2.18	2.11	2.03	1.98	1.73	
99.999999999999999999999	7.82	5.61	4.72	4.22	3.90	3.67	3.50	3.36	3.26	3.17	3.03	2.89	2.74	2.66	2.21	
99.9999999999999999999995	4.24	3.00	2.60	2.37	2.21	2.10	2.01	1.94	1.88	1.83	1.75	1.67	1.57	1.52	1.00	
99.9999999999999999999999	6.63	4.61	3.78	3.32	3.02	2.80	2.64	2.51	2.41	2.32	2.18	2.04	1.88	1.79	1.00	



Table 4: Percentage points of the Chi-Square distribution

Percentage points of the χ^2 distribution

α	.995	.99	.975	.95	.50	.20	.10	.05	.025	.01	.005
v											
1	0.000	0.0002	0.001	0.0039	0.45	1.64	2.71	3.84	5.02	6.63	7.88
2	0.010	0.020	0.051	0.103	1.39	3.22	4.61	5.99	7.38	9.21	10.60
3	0.072	0.115	0.216	0.352	2.37	4.64	6.25	7.81	9.35	11.34	12.84
4	0.207	0.30	0.484	0.71	3.36	5.99	7.78	9.49	11.14	13.28	14.86
5	0.412	0.55	0.831	1.15	4.35	7.29	9.24	11.07	12.83	15.09	16.75
6	0.676	0.87	1.24	1.64	5.35	8.56	10.64	12.59	14.45	16.81	18.55
7	0.989	1.24	1.69	2.17	6.35	9.80	12.02	14.07	16.01	18.40	20.28
8	1.34	1.65	2.18	2.73	7.34	11.03	13.36	15.51	17.53	20.09	21.95
9	1.73	2.09	2.70	3.33	8.34	12.24	14.68	16.92	19.02	21.67	23.59
10	2.16	2.56	3.25	3.94	9.34	13.44	15.99	18.31	20.48	23.21	25.19
11	2.60	3.05	3.82	4.57	10.34	14.63	17.28	19.68	21.92	24.72	26.76
12	3.07	3.57	4.40	5.23	11.34	15.81	18.55	21.03	23.34	26.22	28.30
13	3.57	4.11	5.01	5.89	12.34	16.98	19.81	22.36	24.74	27.69	29.82
14	4.07	4.66	5.63	6.57	13.34	18.15	21.06	23.68	26.12	29.14	31.32
15	4.60	5.23	6.26	7.26	14.34	19.31	22.31	25.00	27.49	30.58	32.80
16	5.14	5.81	6.91	7.96	15.34	20.47	23.54	26.30	28.85	32.00	34.27
17	5.70	6.41	7.56	8.67	16.34	21.61	24.77	27.59	30.19	33.41	35.72
18	6.26	7.02	8.23	9.39	17.34	22.76	25.99	28.87	31.53	34.81	37.16
19	6.84	7.63	8.91	10.12	18.34	23.90	27.20	30.14	32.85	36.19	38.58
20	7.43	8.26	9.59	10.85	19.34	25.04	28.41	31.41	34.17	37.57	40.00
21	8.03	8.90	10.28	11.59	20.34	26.17	29.62	32.67	35.48	38.93	41.40
22	8.64	9.54	10.98	12.34	21.34	27.30	30.81	33.92	36.78	40.29	42.80
23	9.26	10.20	11.69	13.09	22.34	28.43	32.01	35.17	38.08	41.64	44.18
24	9.89	10.86	12.40	13.85	23.34	29.55	33.20	36.42	39.36	42.98	45.56
25	10.52	11.52	13.12	14.61	24.34	30.68	34.38	37.65	40.65	44.31	46.93
26	11.16	12.20	13.84	15.38	25.34	31.79	35.56	38.89	41.92	45.64	48.29
27	11.81	12.88	14.57	16.15	26.34	32.91	36.74	40.11	43.19	46.96	49.64
28	12.46	13.57	15.31	16.93	27.34	34.03	37.92	41.34	44.46	48.28	50.99
29	13.12	14.26	16.05	17.71	28.34	35.14	39.09	42.56	45.72	49.59	52.34
30	13.79	14.95	16.79	18.49	29.34	36.25	40.26	43.77	46.98	50.89	53.67
40	20.71	22.16	24.43	26.51	39.34	47.27	51.81	55.76	59.34	63.69	66.77
50	27.99	29.71	32.36	34.76	49.33	58.16	63.17	67.50	71.41	76.15	79.49
60	35.53	37.48	40.48	43.19	59.33	68.97	74.40	79.08	83.30	88.38	91.95
70	43.28	45.44	48.76	51.74	69.33	79.71	85.53	90.53	95.02	100.43	104.2
80	51.17	53.54	57.15	60.39	79.33	90.41	96.58	101.88	106.63	112.33	116.3
90	59.20	61.75	65.65	69.13	89.33	101.05	107.57	113.15	118.14	124.12	128.3
100	67.33	70.06	74.22	77.93	99.33	111.67	118.50	124.34	129.56	135.81	140.2