



# Practice Set – VII

Sub: Statistical Methods & Data Analysis (MA 231)

1. Each day, the United States Customs Service has historically intercepted about \$28 million in contraband goods being smuggled into the country, with a standard deviation of \$16 million per day. On 64 randomly chosen days in 1992, the U.S. customs Service intercepted an average of \$30.3 million in contraband goods. Does this sample indicate (at a 5% sig. level) that the Customs Commissioner should be concerned that smuggling has increased above its historic level?
2. Before the 1973 oil embargo and subsequent increases in the price of crude oil, gasoline usage in the United States had grown at a seasonally adjusted rate of 0.40 percent per month, with a standard deviation of 0.10 percent per month. In 15 randomly chosen months between 1975 and 1985, gasoline usage grew at an average rate of only 0.33 percent per month. At a 0.01 level of significance, can you conclude that the growth in the use of gasoline had decreased as a result of the embargo and its consequences?
3. Indian Theaters knows that a certain hit movie ran an average of 84 days in each city, and the corresponding standard deviation was 10 days. The manager of the *Indian Film Development Department* was interested in comparing the movie's popularity in Mumbai with that in all of Indian's other theaters. He randomly chose 75 theaters in Mumbai and found that they ran the movie an average of 81.5 days. At a 1% sig. level, test the hypothesis whether there was a significant difference in the length of the picture's run between theaters in Mumbai and all of Indian's other theaters.
4. For a sample of 60 women taken from a population of over 5,000 enrolled in a weight reducing program at a nationwide chain of health spas, the sample mean diastolic blood pressure is 101 and the sample standard deviation is 42. At a sig. level of 0.02, on average, did the women enrolled in the program have diastolic blood pressure that exceeds the value of 75?
5. Picosoft, Ltd., a supplier of operating system software for personal computers, was planning the initial public offering of its stock in order to raise sufficient working capital to finance the development of a radically new, seventh-generation integrated system. With current earnings of \$1.61 a share, Picosoft and its underwriters were contemplating an offering price of \$21, or about 13 times earnings. In order to check the appropriateness of this price, they randomly chose seven publicly traded software firms and found that their average price/ earnings ratio was 11.6, and the sample standard deviation was 1.3. At  $\alpha = 0.02$ , can Picosoft conclude that the stocks of publicly traded software firms have an average P/E ratio that is significantly different from 13?
6. A certain stimulus administered to each of 12 patients resulted in the following increases of blood pressure: 5, 2, 8, -1, 3, 0, -2, 1, 5, 0, 4, 6. Can it be concluded that the stimulus will in general be accompanied by an increase in blood pressure? Take 5% sig. level.
7. The data-processing department at LIC of India has installed new color video display terminals to replace the monochrome units it previously used. The 95 operators trained to use the new machines averaged 7.2 hours before achieving a satisfactory level of performance. Their sample variance was 16.2 squared hours. Long experience with operators on the old monochrome terminals showed that they averaged 8.1 hours on the machines before their performances were satisfactory. At a 0.01 sig. level, should the supervisor of the department conclude that the new terminals are easier to learn to operate?

8. A telescope manufacturer wants its telescopes to have standard deviations in resolution to be significantly below 2 when focusing on objects 500 light-years away. When a new telescope is used to focus on an object 500 light-years away 30 times, the sample standard deviation turns out to be 1.46. Should this telescope be sold? Test your hypotheses at 1% sig. level.
9. The population score of 10-yr. old children in a psychological performance test is known to have a S.D. 5.2. If a random sample of size 20 shows a mean of 16.9 & S.D. 5.8. At 5% sig. level, verify the information that the population S.D. is 5.2.
10. The manufacturer of a power supply is interested in variability in output voltage. He has tested 12 units, chosen at random, with the following results:  
5.34 5.65 4.76 5.00 5.55 5.54 5.07 5.35 5.44 5.25 5.35 4.61  
At a 5% sig. level, test the hypothesis that  $\sigma^2 = 0.5$ .
11. Microsoft estimated last year that 35% of potential software buyers were planning to wait to purchase the new operating system until an upgrade had been released. After an advertising campaign to re-assure the public, Microsoft surveyed 3,000 people and found 950 who were still skeptical. At the 5% sig. level, can the company conclude the proportion of skeptical people has decreased?
12. A researcher claims that at least 10% of all football helmets have manufacturing flaws that could potentially cause injury to the wearer. A sample of 200 helmets revealed that 19 helmets obtained such defects. Does this finding support the researcher's claim? Use 0.01 sig. level.
13. Microsoft has designed a new operating system that will revolutionize the computing industry. The only problem is, the company expects the average amount of time required to learn the software to be 124 hours. Even though this is a long educational time, the company is truly concerned with the variance of the learning time. Preliminary data indicate the variance is 171 hours squared. Recent testing of 25 people found an average learning time of 123 hours and a sample variance of 196.5 hours squared. Do these data indicate the variability in learning time is different from the previous estimate? Test at a 0.02 sig. level.
14. Zee Tv is interested in the number of people who tune in to their two popular reality shows Sa Re Ga Ma Pa and Dance India Dance; more importantly, the company is very concerned in the variability in the number of people who watch the shows. Advertisers want consistent viewers in hopes that consistent prolonged advertising will help to sell a product. Data are given below (in millions of viewers) for the past few months.  
**Sa Re Ga Ma Pa:** 57.4 62.6 54.6 52.4 60.5 61.8 71.4 67.5 62.6 58.4  
**Dance India Dance:** 64.5 58.2 39.5 24.7 40.2 41.6 38.4 33.6 34.4 37.8  
Test at a 0.10 sig. level whether the variability is the same between the two populations.
15. The arrival rate of customers at the loan counter of a branch bank appears to follow Poisson distribution. The observed frequencies of arrival rates (number of arrivals per hour) are summarized as shown below:

Period (i)	Arrival rate (X)	Observed frequency (O)
1	0	2
2	1	6
3	2	18
4	3	12
5	4	8
6	5	3
7	6	1

Check whether the given data follow Poisson distribution with mean 2.62, using chi-square goodness-of-fit test at a significance level of 0.05.

16. Dr. S. Agarwal (MS, DNB), mentor and hospital administrator of Lucknow Hospital, has examined past records from 210 randomly selected 8-hour shifts to determine the frequency with which the hospital treats fractures. The numbers of days in which zero, one, two, three, four, or five or more patients with broken bones were treated were 25, 55, 65, 35, 20, and 10, respectively. At the 0.05 level of significance, can we reasonably believe that the incidence of broken-bone cases follows a Poisson distribution with  $\lambda = 2$ ? Use chi-square goodness-of-fit test.
17. From the following data, find whether there is any significant linking in the habit of drinking soft drinks among categories of employees. Use 5% sig. level.

Soft drinks	Clerks	Teachers	Officers
Pepsi	10	25	65
Thums Up	15	30	65
Fanta	50	60	30

18. A survey analyzing the relationship between newspapers read and occupational class was undertaken. A sample of newspaper readers was asked to name the newspaper they read and to state whether they are a blue-collar worker, a white-collar worker or a professional. The following data were generated.

Newspapers	Blue-Collar Worker	White-Collar Worker	Professional
Newspaper A	27	29	33
Newspaper B	18	43	51
Newspaper C	38	15	24
Newspaper D	37	21	18

Can we infer that occupational class and newspaper read are related? Use 5% sig. level.

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