Practice Questions on T-test, Z-test and Chi-Square Test

1. A random sample size of 10 was taken from a normal population, whose variance is known to be 7.056 sq. inches. If the observations are (in inches) 65, 71, 64, 71, 70, 69, 64, 63, 67 and 68, test the hypothesis that the population mean is 69 inches. Also obtain 95% confidence limits for the population mean.
2. Two independent random samples were taken from two normal populations and the following information is given:

	Population I	**Population II**
Sample size	$n_1 = 10$	$n_2 = 12$
Sample mean	$\overline{x_1} = 20$	$\bar{x}_2 = 27$
Population s.d.	$\sigma_1 = 8$	$\sigma_2 = 6$

   Is it likely that the mean of Population I is smaller than that of Population II? (Use 5% level of significance)
3. A random sample of size 20 from aa normal population gives a sample mean of 42 and sample standard deviation of 6. Test the hypothesis that the population mean is 44. Adopt the 5% level of significance.
4. A fertilizer mixing machine is set to give 12 kg of nitrate for every quintal bag of fertilizer Ten 100 kg bag are examined. The percentages of nitrate are: 11, 14, 13, 12, 13, 12, 13, 14, 11, 12. Is there reason to believe that the machine is defective? Value for 9 d.f is 2.262.

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5. A soap manufacturing company was distributing a particular brand of soap through a large number of retail shops. Before a heavy advertisement campaign, the mean sales per week per shop was 140 dozen. After the campaign, a sample of 26 shops was taken and the mean sales was found to be 147 dozen with a standard deviation of 16. Can you consider the advertisement effective?
6. Two types of batteries are tested for their length of life and the following data are obtained:

	No. of Samples	Mean life in Hours	Variance
Type A	9	600	121
Type B	8	640	144

Is there a significant difference in the two means? Value of t for 15 d.f at 5% level is 2.131.

7. A group of 5 patients treated with medicine A weigh 42, 39, 48, 60, 41 kg; a second group of 7 patients from the same Hospital treated with medicine B weigh 38, 42, 56, 64, 68, 69, 62 kg. Do you agree with the claim that medicine B increases the weight significantly? (The value of t at 5% level of significance for 10 d.f is 2.2281).

8. In his experiments on pea-breeding, Abbey obtained the following frequencies of seeds:

Round and Yellow: 315

Wrinkled and Yellow: 101

Round and Green: 108

Wrinkled and Green: 32

Total: 556

Theory predicts that the frequencies should be in the proportions 9:3:3:1. Examine the correspondence between the theory and observations. (Given that 5% value of χ^2 for 3 d.f is 7.815)

9. A random sample of 500 students were classified according to economic condition of their family and according to merit, as shown below:

Merit	Economic Condition			Total
	Rich	Middle Class	Poor	
Meritorious	42	137	61	240
Not Meritorious	58	113	89	260
Total	100	250	1550	500

Test whether the two attributes Merit and Economic Condition are associated or not. (Given, $\chi^2_{0.05} = 5.99$ for 2 d.f).

10. In a survey of 200 boys, of which 75 were intelligent, 40 had skilled fathers while 85 of the unintelligent boys had unskilled fathers. Do these figures support the hypothesis that skilled fathers have intelligent boys?

Intelligence of Son	**Skill of Father**		**Total**
	Skilled	**Unskilled**	
Intelligent	40	35	75
Unintelligent	40	85	125
Total	80	120	200

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