

Practice Questions – Hypothesis Testing

- 1) A manufacturer of electronic kits has found that the mean time required for novices to assemble its new circuit tester is 3 hours with a standard deviation of 0.2 hours. A consultant has developed a new instructional booklet that he claims will reduce the time an inexperienced kit builder will need to assemble the device. In a test of the effectiveness of the new booklet, 15 novices require a mean of 2.9 hours to complete the job. Assuming the population of time is normally distributed and using 5% level of significance, should we conclude that the new booklet is effective?

- 2) A manufacturer claims that the average lifetime of his electric light bulbs is 2000 hours. A random sample of 64 bulbs was tested and the lifetime x was recorded in those. The results obtained as follows:

$$\sum x = 127802$$

$$\sum (x - \bar{x})^2 = 9694.6$$

Is there any significance evidence at the 5% level of significance to say that the manufacturer is over-estimating the lifetime of bulbs? Assume that the distribution of the lifetime of a bulb is normal.

- 3) The heights of a random sample of 6 policemen from a certain force in USA were found to be 176, 180, 179, 181, 183, and 179. The height of a random sample of 11 policemen from a certain force in UK gave a mean height of 181cm and standard deviation of 5.4cm. Test at 5% level, the hypothesis that USA policemen are shorter than UK policemen. Assume that the heights of policemen in both forces are distributed as normal and have different population variances.

- 4) A company attempts to evaluate the potential for a new bonus plan by selecting a random sample of 5 salespersons to use the bonus plan for a trial period. The weekly sales volume before and after implementing the bonus plan are shown below

	Weekly sales	
Salesperson	Before	After
1	15	18
2	12	14
3	18	19
4	15	18
5	16	18

At 5% level of significance test whether the bonus plan will result in an increase in the population mean weekly sales.

- 5) A theory predicts that the probability of an event is 0.4. The theory is tested experimentally and, from 400 independent trials the event occurred 140 times. Is the number of occurrences significantly less than the predicted by the theory? Carry out the test at 1% level of significance.

- 6) A random sample of 400 men and 600 women were asked whether they would like some brand of soap. 200 men and 325 women were in favor of his brand. Test the hypothesis that the proportion of men and women in favor of that brand are same against that they are not at 5% level of significance.
- 7) For randomly selected adults, IQ scores are normally distributed with standard deviation of 15. The sample of 24 randomly selected college officers resulted in IQ scores having a standard deviation of 10. Test the claim that IQ scores for college officers with a same as a general population use a 1% level of significance.

- 8) Sample data were collected in a study of calcium supplement and effects on blood pressure. A placebo and a calcium group began the study with measures of blood pressure. At 2% level of significance test the claim that two sample group come from populations to the same standard deviation.

Placebo –	124.6	96.5	106.1	107.2	118.1	120.4	113.6	104.8	116.3	128.8
	123.1	108.5	122.5							
Calcium –	129.1	102.7	114.7	104.4	109.6	108.0	106.6	113.2	123.4	118.1
	120.9	116.3	127.7	124.3	121.4					

- 9) A sample of size 100 is taken from a normal population with unknown μ and known variance 36. An investigator wishes to test the hypothesis,

$$H_0: \mu = 65 \quad \text{and} \quad H_1: \mu > 65$$

And his decisions based on the following criteria.

Accept H_0 if $\bar{x} \leq 66.5$

Reject H_0 if $\bar{x} > 66.5$

- Find the probability of type I error.
- If he used H_1 if $\mu = 67.9$ as the alternative hypothesis, find the probability that he makes type II error.
- On which critical value should be decides for a sample mean if he wants,

$$P[\text{type I error}] = P[\text{type II error}]$$