1. Suppose a manufacturer claims that the mean lifetime of a light bulb is at least 10,000 hours. In a sample of 30 light bulbs, it was found that they only last 9,900 hours on average. Assuming the population standard deviation to be 120 hours, at 0.05 significance level, can we reject the claim by the manufacturer?

2. Suppose a car manufacturer claims a model gets at least 25 mpg. A consumer group asks 10 owners of this model to calculate their mpg and the mean value was 22 with a standard deviation of 1.5. Is the manufacturer's claim supported at 95%confidence level.

3. An outbreak of Salmonella-related illness was attributed to ice cream produced at a certain factory. Scientists measured the level of Salmonella in 9 randomly sampled batches of ice cream. The levels (in MPN/g) were: *0.593 0.142 0.329 0.691 0.231 0.7930.519 0.392 0.418.* Is there evidence that the mean level of Salmonella in the ice cream is greater than 0.3 MPN/g.

4. A study was performed to test whether cars get better mileage on premium gas than on regular gas. Each of 10 cars was first filled with either regular or premium gas, decided by a coin toss, and the mileage for that tank was recorded. The mileage was recorded again for the same cars using the other kind of gasoline. Test to determine whether cars get significantly better mileage with premium gas.

   Reg : 16, 20, 21, 22, 23, 22, 27, 25, 27, 28.

   Prem : 19, 22, 24, 24, 25, 25, 26, 26, 28, 32.

5. Do people have a preference for movie type?

   There are four categories of movies: comedy, horror, drama and science fiction. Let us say, we assumed a simple uniform distribution, where each category is liked by 25% of the people. Now we need to test how good our guess is:

	Comedy	Horror	Drama	Science fiction	
Observed	35	30	20	15	n=100

6. A survey is conducted by a gaming company that makes three video games. It wants to know if the preference of game depends on the gender of the player. Total number of participants is 1000. Here is the survey result

	Game A	Game B	Game C	Total
Male	200	150	50	400
Female	250	300	50	600
Total	450	450	100	1000

a. State the null hypothesis and alternate hypothesis.

b. Calculate the degrees of freedom.

c. Does men's preference is different from women's preference? Check with 0.05 level of significance.

7. Laptop computer maker uses battery packs supplied by two companies, A and B. While both brands have the same average battery life between charges (LBC), the computer maker seems to receive more complaints about shorter LBC than expected for battery packs supplied by company B. The computer maker suspects that this could be caused by higher variance in LBC for Brand B. To check that, ten new battery packs from each brand are selected, installed on the same models of laptops, and the laptops are allowed to run until the battery packs are completely discharged. The following are the observed LBCs in hours.
Brand A = 3.2, 3.4, 2.8, 3, 3, 3, 2.8, 2.9, 3, 3

Brand B = 3, 3.5, 2.9, 3.1, 2.3, 2, 3, 2.9, 3, 4.1

Test, at the 10% level of significance, whether the variance of both the brands are similar.

8. Suppose you want to check whether a coin is biased or unbiased with the following hypothesis.

Ho : p = 0.5 vs H1 = 0.8
where p is the probability of head in a single toss of a coin. You have decided that if you find more than 7 heads in 10 tosses, you will reject the null hypothesis.
i) What is Type-I error of your test ?
ii) What is the Type-II error ?
iii) What is the power of your test ?