

# Engineering Mathematics II (ED 121)

## Homework 7

Release Date: 3.03.2024

Due Date: 10.03.2024

1. A random sample of 40 engineers was selected from among the large number employed by a corporation engaged in seeking new sources of petroleum. The hours worked in a particular week were determined for each engineer selected. These data had a mean of 46 hours and a standard deviation of 3 hours. For that particular week, estimate the mean hours worked for all engineers in the corporation, with a 95% confidence coefficient.
2. An important property of plastic clays is the per- cent of shrinkage on drying. For a certain type of plastic clay, 45 test specimens showed an aver- age shrinkage percentage of 18.4 and a standard deviation of 1.2. Estimate the true average percent of shrinkage for specimens of this type in a 98% confidence interval.
3. The blood cholesterol levels of a population of workers have mean 202 and standard deviation 14.
  - (a) If a sample of 36 workers is selected, approximate the probability that the sample mean of their blood cholesterol levels will lie between 198 and 206.
  - (b) Repeat(a)for a sample size of 64.
4. The fracture strengths of a certain type of glass average 14 (in thousands of pounds per square inch) and have a standard deviation of 2.
  - (a) What is the probability that the average fracture strength for 100 randomly selected pieces of this glass exceeds 14.5?
  - (b) Find an interval that includes the average fracture strength for 100 randomly selected pieces of this glass with probability 0.95.
5. Suppose a random sample of size  $n = 25, 50$ , and 100 is drawn from a population having the exponential probability density function with mean 10. For this model,  $s = 10$  too. Find an interval  $(a, b)$  for each  $n$  such that  $P(a \leq X \leq b) = 0.95$ .
6. A certain machine that is used to fill bottles with soda has been observed over a long period of time, and the variance in the amounts filled is found to be approximately  $\sigma^2 = 1$  sq. ounce. However, the mean amount filled  $\mu$  depends on an adjustment that may change from day to day, or from operator to operator.
  - (a) If 25 observations on the amount dispensed (in ounces) are taken on a given day (all with the same machine setting), find the probability that the sample mean will be within 0.3 ounces of the true population mean for that setting.
  - (b) How many observations should be taken in the sample so that the sample mean will be within 0.3 ounces of the population mean with probability 0.95?

7. From a random sample of 36 New Delhi civil service personnel, the mean age and the sample standard deviation were found to be 40 years and 4.5 years respectively. Construct a 95 per cent confidence interval for the mean age of civil servants in New Delhi.
8. Given the five pairs of points  $(x, y)$  shown in table below

$x$	4	0	-2	3	1
$y$	5	0	0	6	3

what is the line of the form  $y = x + b$  best fits the data by method of least squares?