PES University, Bangalore

(Established under Karnataka Act No. 16 of 2013)

UE19CS203 – STATISTICS FOR DATA SCIENCE

Unit - 3 - Probability Distributions

Question Bank - SOLVED

Factors Affecting Margin of Error

Exercise for Section 5.1

1. In a sample of 80 ten-penny nails, the average weight was 1.56 g and the standard deviation was 0.1 g.

    a) How many nails must be sampled so that a 95% confidence interval specifies the mean to within ±0.01 g?
    b) Approximately how many nails must be sampled so that a 98% confidence interval will specify the mean to within ±0.01 g?

[Text Book Exercise – Section 5.1 – Q. No. 9 – Pg. No. 336]
Solution:

a) $X = 1.56$, $s = 0.1$, $n = 80$
$z_{.025} = 1.96$. $1.96(0.1/\sqrt{n}) = 0.01$, so $n = 385$.

b) $z_{.01} = 2.33$. $2.33(0.1/\sqrt{n}) = 0.01$, so $n = 543$.

2. A 95% confidence interval for a population mean is computed from a sample of size 400. Another 95% confidence interval will be computed from a sample of size 100 drawn from the same population.

    Choose the best answer to fill in the blank: The interval from the sample of size 400 will be approximately _____ as the interval from the sample of size 100.

    a. One-eighth as wide
    b. One-fourth as wide
    c. One-half as wide
    d. The same width
    e. Twice as wide
    f. Four times as wide
    g. Eight times as wide

[Text Book Exercise – Section 5.1 – Q. No. 20 – Pg. No. 337]

Solution:

(iii) One-half as wide. The ratio of the widths is equal to the ratio of the standard deviations of the sample mean, which is

$$\frac{\sigma/\sqrt{400}}{\sigma/\sqrt{100}} = \sqrt{100/400} = 1/2$$