1. For the following situations, find the mean and standard deviation of the sample mean $\bar{X}$, i.e., $\mu_{\bar{X}}, \sigma_{\bar{X}}$.

(a) $\mu = 23.5, \sigma^2 = 4.00, n = 4$
(b) $\mu = 23.5, \sigma^2 = 4.00, n = 25$
(c) $\mu = 23.5, \sigma^2 = 4.00, n = 64$
(d) $\mu = 23.5, \sigma^2 = 4.00, n = 100$
(e) Compare $\sigma_{\bar{X}}$ from (a) - (d) and report your conclusions.

2. A sample of 100 is selected from a population with mean $\mu = 100$ and $\sigma = 20.0$.

(a) Describe the sampling distribution of the sample mean $\bar{X}$.
(b) Find $P(\bar{X} > 105)$.
(c) Find $P(100 < \bar{X} < 105)$.
(d) Find $P(98 < \bar{X} < 104)$.

3. According to the U.S. Department of Energy, the average price of unleaded regular gasoline sold at service stations throughout the nation is $1.23$ per gallon with a standard deviation of $0.16$. A random sample of 45 stations is selected and the pump prices for unleaded gasoline are recorded. Find the probability that the sample mean price:

(a) exceeds $1.28$ per gallon,
(b) is less than $1.19$ per gallon,
(c) is between $1.20$ and $1.27$ per gallon,

4. Almost all medical schools in the U. S. require students to take the Medical College Admission Test (MCAT). Suppose that the test scores follow a normal distribution with mean 25.0 and standard deviation 6.5.

(a) One student is selected at random, what is the probability that the student’s score is between 20 and 30?
(b) A random sample of 36 students is selected, what is the probability that their mean score is between 20 and 30?