Exercise Set VI.1

1. (6.4) Given a normal distribution with $\mu = 30$ and $\sigma = 6$, find
   (a) The normal-curve area to the right of $x = 17$;
   (b) The normal-curve area to the left of $x = 22$;
   (c) The normal-curve area between $x = 32$ and $x = 41$;
   (d) The value of a: that has 80% of the normal-curve area to the left;
   (e) The two values of x that contain the middle 75% of the normal-curve area.

2. (6.9) A soft-drink machine is regulated so that it discharges an average of 200 milliliters per cup. If the amount of drink is normally distributed with a standard deviation equal to 15 milliliters,
   (a) What fraction of the cups will contain more than 224 milliliters?
   (b) What is the probability that a cup contains between 191 and 209 milliliters?
   (c) How many cups will probably overflow if 230-milliliter cups are used for the next 1000 drinks?
   (d) Below what value do we get the smallest 25% of the drinks?

Exercise Set VI.2

3 (6.12) In the November 1990 issue of Chemical Engineering Progress, a study discussed the percent purity of oxygen from a certain supplier. Assume that the mean was 99.61 with a standard deviation of 0.08. Assume that the distribution of percent purity was approximately normal.

  (a) What percentage of the purity values would you expect to be between 99.5 and 99.7?

  (b) What purity value would you expect to exceed exactly 5% of the population?

4 (6.13) The average life of a certain type of small motor is 10 years with a standard deviation of 2 years. The manufacturer replaces free all motors that fail while under guarantee. If he is willing to replace only 3% of the motors that fail, how long a guarantee should he offer? Assume that the lifetime of a motor follows a normal distribution.

Exercise Set VI.3

5 (6.17) The tensile strength of a certain metal component, is normally distributed with a mean 10,000 kilograms per square centimeter and a standard deviation of 100 kilograms per square centimeter. Measurements are recorded to the nearest 50 kilograms per square centimeter.

  (a) What proportion of these components exceed 10,150 kilograms per square centimeter in tensile strength?
  (b) If specifications require that all components have tensile strength between 9800 and 10,200 kilograms per square centimeter inclusive, what, proportion of pieces would we expect to scrap?

6 (6.23) Evaluate $P(1 \leq X \leq 4)$ for a binomial variable with n = 15 and p = 0.2 by using

  (a) Table A.1 in the Appendix;
  (b) The normal-curve approximation.

7 (6.26) A process yields 10% defective items. If 100 items are randomly selected from the process, what is the probability that the number of defectives

  (a) exceeds 13?
  (b) is less than 8?

Exercise Set VI.4

8 (6.40) In a certain city, the daily consumption of water (in millions of liters) follows approximately a gamma distribution with $\alpha = 2$ and $\beta = 3$. If the daily capacity of that city is 9 million liters of water, what is the probability that on any given day the water supply is inadequate?

9 (6.46) The life, in years, of a certain type of electrical switch has an exponential distribution with an average life $\beta = 2$. If 100 of these switches are installed in different systems, what is the probability that at most 30 fail during the first year?

10 (6.54) Rate data often follow a lognormal distribution. Average power usage (dB per hour) for a particular company is studied and is known to have a lognormal distribution with parameters $\mu = 4$ and $\sigma = 2$. What is the probability that the company uses more than 270 dB during any particular hour?