

Solution

Requirement check We can use the normal distribution if the original population is normally distributed or $n > 30$. The sample size of $n = 36$ is greater than 30, so we can approximate the sampling distribution of \bar{x} with a normal distribution. ✓

The parameters of this normal distribution are as follows:

$$\mu_{\bar{x}} = \mu = 12.00 \text{ (by assumption)}$$

$$\sigma_{\bar{x}} = \frac{\sigma}{\sqrt{n}} = \frac{0.11}{\sqrt{36}} = 0.018333$$

Figure 6-18 shows the shaded area (see the small region in the right tail of the graph) corresponding to the probability we seek. Having already found the parameters that apply to the distribution shown in Figure 6-18, we can now find the shaded area by using the same procedures developed in Section 6-3.

If using technology, the shaded area in Figure 6-18 is 0.0000 when rounded to four decimal places. If using Table A-2, we first find the z score as shown here:

$$z = \frac{\bar{x} - \mu_{\bar{x}}}{\sigma_{\bar{x}}} = \frac{12.19 - 12.00}{0.018333} = 10.36$$

Referring to Table A-2, we find that $z = 10.36$ is off the chart, but for values of z above 3.49, we use 0.9999 for the cumulative left area. We therefore conclude that the shaded region in Figure 6-18 is 0.0001.

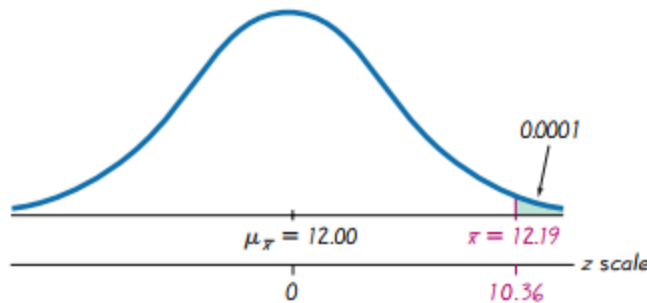


Figure 6-18 Distribution of Amounts of Coke

Interpretation

The result shows that if the mean amount in Coke cans is really 12.00 oz, then there is an extremely small probability of getting a sample mean of 12.19 oz or greater when 36 cans are randomly selected. Because we did obtain such a sample mean, there are two possible explanations: (1) Either the population mean really is 12.00 oz and the sample represents a chance event that is extremely rare; or (2) the population mean is actually greater than 12.00 oz. Because the probability is so close to 0, it seems more reasonable to conclude that the population mean is greater than 12.00 oz. It appears that Coke cans are being filled with more than 12.00 oz. However, the sample mean of 12.19 oz suggests that the mean amount of overfill is very small. It appears that the Coca-Cola company has found a way to ensure that very few cans have less than 12 oz while not wasting very much of their product.

