If using Table A-2, search for an area of 0.9500 *in the body* of the table. (The area of 0.9500 shown in Figure 6-14 is a cumulative area from the left, and that is exactly the type of area listed in Table A-2.) The area of 0.9500 is between the Table A-2 areas of 0.9495 and 0.9505, but there is an asterisk and footnote indicating that an area of 0.9500 corresponds to $z = 1.645$.

Step 3: With $z = 1.645$, $\mu = 69.5$ in., and $\sigma = 2.4$ in., we can solve for x by using Formula 6-2:

$$z = \frac{x - \mu}{\sigma} \quad \text{becomes} \quad 1.645 = \frac{x - 69.5}{2.4}$$

The result of $x = 73.448$ in. can be found directly or by using the following version of Formula 6-2:

$$x = \mu + (z \cdot \sigma) = 69.5 + (1.645 \cdot 2.4) = 73.448 \text{ in.}$$

Step 4: The solution of $x = 73.4$ in. (rounded) in Figure 6-14 is reasonable because it is greater than the mean of 69.5 in.

Interpretation

An aircraft cabin height of 73.4 in. (or 6 ft 1.4 in.) would allow 95% of men to fit without bumping their heads. It follows that 5% of men would *not* fit without bending. The safety and comfort of passengers are factors suggesting that it might be wise to use a design with a higher ceiling.

Example 4 Ability Grouping

Some educators argue that all students are served better if they are separated into groups according to their abilities. Assume that students are to be separated into a group with IQ scores in the bottom 30%, a second group with IQ scores in the middle 40%, and a third group with IQ scores in the top 30%. The Wechsler Adult Intelligence Scale yields an IQ score obtained through a test, and the scores are normally distributed with a mean of 100 and a standard deviation of 15. Find the Wechsler IQ scores that separate the three groups.

Solution

Step 1: We begin with the graph shown in Figure 6-15. We have entered the mean of 100, and we have identified the x values separating the lowest 30% and the highest 30%.

Step 2: To use technology, refer to the instructions at the end of this section. Technology will show that the values of x in Figure 6-15 are 92.1 and 107.9 when rounded.

If using Table A-2, we must work with cumulative areas from the left. For the leftmost value of x, the cumulative area from the left is 0.3, so search for an area of 0.3000 *in the body* of the table to get $z = -0.52$ (which corresponds to the closest area of 0.3015). For the rightmost value of x, the cumulative area from the left is 0.7, so search for an area of 0.7000 *in the body* of the table to get $z = 0.52$ (which corresponds to the closest area of 0.6985). Having found the two z scores, we now proceed to convert them to IQ scores.