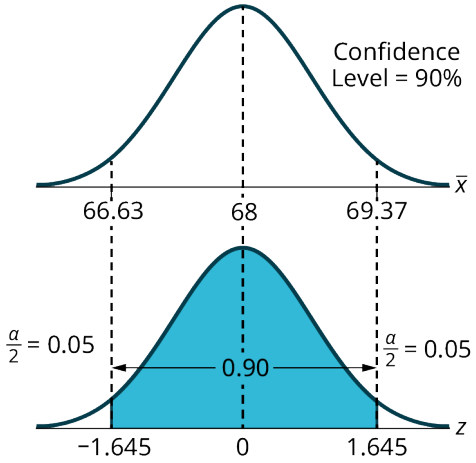

Figure 8.3

The solution is shown step by step:

The formula for a confidence interval for an unknown population mean assuming we know the population standard deviation is:

$$\overline{X} - Z_\alpha\left(\frac{\sigma}{\sqrt{n}}\right) \leq \mu \leq \overline{X} + Z_\alpha\left(\frac{\sigma}{\sqrt{n}}\right)$$

For a 90% confidence interval, visualize an area of 0.90 centered under the normal curve (See Figure 8.3). The remaining area for the two tails of the normal distribution is then 0.10, which indicates that the area in the left tail is one-half of 0.10, which is 0.05. The corresponding z-score that cuts off an area of 0.05 in the left tail is 1.645.

In this example we are given that the population standard deviation $\sigma = 3$.

We are also given that the sample size n = 36 and the sample mean $\overline{X} = 68$.

Substituting these values in the confidence interval formula results in the following:

$$\overline{X} - Z_\alpha\left(\frac{\sigma}{\sqrt{n}}\right) \leq \mu \leq \overline{X} + Z_\alpha\left(\frac{\sigma}{\sqrt{n}}\right)$$

$$68 - 1.645\left(\frac{3}{\sqrt{36}}\right) \leq \mu \leq 68 + 1.645\left(\frac{3}{\sqrt{36}}\right)$$

$$68 - 0.8225 \leq \mu \leq 68 + 0.8225$$

$$67.1775 \leq \mu \leq 68.8225$$

We estimate with 90% confidence that the true population mean exam score for all statistics students is between 67.18 and 68.82.

Solution

USING THE TI-83, 83+, 84, 84+ CALCULATOR

Press STAT and arrow over to TESTS.
Arrow down to `7:ZInterval`.
Press ENTER.
Arrow to `Stats` and press ENTER.
Arrow down and enter three for σ, 68 for $\overline{x}$, 36 for n, and .90 for `C-level`.
Arrow down to `Calculate` and press ENTER.
The confidence interval is (to three decimal places)(67.178, 68.822).