EBM and construct the confidence interval. We need to find the value of $z$ that puts an area equal to the confidence level (in decimal form) in the middle of the standard normal distribution $Z \sim N(0, 1)$.

The confidence level, $CL$, is the area in the middle of the standard normal distribution. $CL = 1 - \alpha$, so $\alpha$ is the area that is split equally between the two tails. Each of the tails contains an area equal to $\frac{\alpha}{2}$.

The z-score that has an area to the right of $\frac{\alpha}{2}$ is denoted by $z_{\frac{\alpha}{2}}$.

For example, when $CL = 0.95$, $\alpha = 0.05$ and $\frac{\alpha}{2} = 0.025$; we write $z_{\frac{\alpha}{2}} = z_{0.025}$.

The area to the right of $z_{0.025}$ is 0.025 and the area to the left of $z_{0.025}$ is $1 - 0.025 = 0.975$.

$z_{\frac{\alpha}{2}} = z_{0.025} = 1.96$, using a calculator, computer or a standard normal probability table.

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

`invNorm(0.975, 0, 1) = 1.96`

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**NOTE**

Remember to use the area to the LEFT of $z_{\frac{\alpha}{2}}$; in this chapter the last two inputs in the invNorm command are 0, 1, because you are using a standard normal distribution $Z \sim N(0, 1)$.

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## Writing the Interpretation

The interpretation should clearly state the confidence level ($CL$), explain what population parameter is being estimated (here, a **population mean**), and state the confidence interval (both endpoints). "We estimate with ___% confidence that the true population mean (include the context of the problem) is between ___ and ___ (include appropriate units)."

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**EXAMPLE 8.2**

Suppose scores on exams in statistics are normally distributed with an unknown population mean and a population standard deviation of three points. A random sample of 36 scores is taken and gives a sample mean (sample mean score) of 68. Find a confidence interval estimate for the population mean exam score (the mean score on all exams).

**Problem**

Find a 90% confidence interval for the true (population) mean of statistics exam scores.

**Solution**
- You can use technology to calculate the confidence interval directly.
- The first solution is shown step-by-step.
- The second solution uses the TI-83, 83+, and 84+ calculators.