Learning Objectives

• Use the standard normal distribution table (Table 1 in the Appendix) to calculate the probability that an individual will have a value of a normally-distributed variable above or below any value or between two values.
• Compute any percentile in the normal distribution.

Distribution of IQ in the US Population
Computing areas under a normal curve

You Try It!
What is the probability that someone in the US population has an IQ between 96 and 115?

The Answer

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The Answer

\[ Z_{96} = (96-100)/16 = -0.25 \quad \text{Probability } Z < -0.25 = 0.4013 \quad \text{[Prob IQ < 96]} \]
\[ Z_{115} = (115-100)/16 = 0.3125 \quad \text{Probability } Z < 0.3125 = 0.6217 \quad \text{[Prob IQ < 115]} \]

Therefore, the probability that the IQ of any individual in the US is between 96 and 115 is 0.6217 - 0.4013 = 0.2204 or about 22%.
Computing Percentiles in the Normal Distribution

What is the 85 percentile of IQ in the United States?
[same as asking what IQ score do 85% of the individuals in the United States score less than]

1. To answer this question, we first look up the Z-score corresponding to an area of .8500. This is closest to 1.04 in Table 1 of the Appendix.

2. We then calculate x, knowing Z, \( \mu \) and \( \sigma \). Formula: \( Z = \frac{x - \mu}{\sigma} \)

3. Rearranging this formula, we get \( x = Z \sigma + \mu = (1.04)(16) + 100 = 116.64 \) or 117. Therefore, 85% of US citizens have an IQ less than 117.

You Try It!

What is the 73rd percentile of IQ in the United States?
The Answer

What is the Z-score corresponding to an area of .73? The closest Z-score corresponding to this area is 0.61.

Transform z back into x:

\[ X = Z \sigma + \mu = (.61)(16) + 100 = 109.76 \text{ or } 110 \]

So the 73rd percentile is approximately 110.