3. Assume that bicep girth (the distance around the bicep) in the human population is normally distributed with mean 31 cm and standard deviation 4 cm.

In the following questions, give your answer to two decimal places (e.g., 35.23%).

(a) A person has bicep girth 22 centimeters. What percentile does this correspond to?

**Solution:** 22 corresponds to z-score \( (22 - 31)/4 = -2.25 \). Looking at the table, this is the 1.22 percentile.

(b) What percentage of people have bicep girth between 31 and 35 cm?

**Solution:** These correspond to z-scores 0 and 1, which correspond to percentiles 50 and 84.13. Thus the percentage of people with bicep girth in this range is 84.13% - 50% = 34.13%.

(c) What percentage of people have bicep girth bigger than 35 cm?

**Solution:** 35 cm corresponds to percentile 84.13. So, the portion of the population with bicep girth greater than 35 is 100 - 84.13 = 15.87 percent

(d) Wilmer’s goal is to work out until his bicep is bigger than 95% of the population’s. How big would it need to be for this to be true?

**Solution:** Looking at the chart, the 95th percentile occurs somewhere between z-score 1.64 and 1.65. Let’s say it happens at 1.645. (According to R, a more accurate value is 1.644854.)

To find what bicep girth corresponds to a z-score of 1.645, we solve

\[
1.645 = \frac{x - 31}{4}
\]

and get \( x = 37.58 \). So Wilmer needs his bicep to be 37.58 cm.