Rainfall in Ithaca, NY: follows a normal distribution with a yearly average of 35" with a standard deviation of 1..25". Find the following probabilities and other such questions:

$$X \sim N(\mu, \sigma) ==> X \sim N(35,1.25)$$

$$z = \frac{X - \mu}{\sigma}$$

1. Probability that rain is less than 34": $P(X < 34) = P\left(Z < \frac{34-35}{1.25}\right) = P(Z < -0.8) = 0.212 = 21.2\%$ z=-.8, LT
   http://www.statdistributions.com/normal?z=-0.8&tail=3
   OR
   z-score: 34 (is argument), mean=35, stddev=1.25, LT
   http://www.statdistributions.com/normal?z=34&mean=35&sd=1.25&tail=3
2. Probability than there is more than 36" rain
   $P(X > 36) = P\left(Z > \frac{36 - 35}{1.25}\right) = P(Z > 0.8) = 0.212 = 21.2\%$
   z=.8, RT http://www.statdistributions.com/normal?z=0.8&tail=2
3. Probability that there is less than 20" of rain: $P(X < 20) \approx 0\ (= 0)$
   z=20, mean=35, stddev=1.25, LT
   http://www.statdistributions.com/normal?z=20&mean=35&sd=1.25&tail=3

   $z = \frac{20-35}{1.25} = -12$ Occasionally you will get an extreme value (z-score); check your math and if you are still getting the same answer, then it is correct. Extremes can happen
4. What is the amount of rain for the 10% of smallest rainfall amount. Since the area (percent) we want is the smallest 10% (bottom 10%). This is area to the left. Find the zscore that goes with the bottom 10%, then solve for X.
   To get z: p-value: .1, LT: $z = -1.282$ Plug into $z = \frac{X-\mu}{\sigma}$ and solve for X ($X = z\sigma + \mu$)
   http://www.statdistributions.com/normal?p=0.1&tail=3
   $$X = -1.282(1.25) + 35 = 33.3975 \approx 33.4"$$

- To use the above analyses, the distribution MUST be normal
- No sample size required for this
- Mean (μ) and standard deviation (σ) MUST be given
- If you have no idea if the distribution is normal, you cannot use this procedure
- The use of this procedure is for single observation