Class Exercise

1. **Fasting Blood Glucose**
   Clinical data indicates that the fasting blood glucose levels in a specific population of healthy adults are approximately normally distributed with a mean $\mu = 90$ mg/dL and a standard deviation $\sigma = 16$ mg/dL.

   Compute the probability that the average fasting blood glucose level will be greater than 92 mg/dL for:

   a) A randomly selected individual ($n = 1$).

   b) A random sample of $n = 64$ individuals.

   c) A random sample of $n = 512$ individuals.

   d) Explain conceptually why the probability of observing a sample mean strictly greater than 92 mg/dL decreases so drastically as the sample size increases.

2. **Genetic Marker Prevalence**
   A specific genetic marker associated with an increased risk of a rare autoimmune condition is known to be present in 15% of a given demographic. A clinical research team selects a random sample of $n = 400$ patients from this demographic. Let X be the number of patients in the sample who carry the genetic marker.

   a) Use the normal approximation to the binomial distribution **with** the appropriate continuity correction to estimate the probability that between 50 and 70 patients (inclusive) carry the marker. That is, estimate $P(50 \leq X \leq 70)$.

   b) Now, let $\hat{p} = X/n$ be the sample proportion of patients carrying the marker. Using the Central Limit Theorem, compute the probability that the sample proportion lies between 0.125 and 0.175. Do **not** use a continuity correction for this part. Compare your result to part (a).