"I know of scarcely anything so apt to impress the imagination as the wonderful form of cosmic order expressed by the [Central Limit Theorem]. The law would have been personified by the Greeks and deified, if they had known of it."

– Sir Francis Galton

Problem 1. (10pt) Your engineering firm has been hired to do quality control analysis for a chip manufacturer. The company requests you analyze their rate of defective chips to minimize any potential harms to their brand. After testing 38 chips, you determine that approximately 4.6% of the chips have some type of minor defect.

(a) Assuming that the average defect rate in the chips is 4.6%, find the probability that a sample of 38 chips contains a defect percentage of less than 4%.

(b) Assuming that the average defect rate in the chips is 4.6%, find the probability that a sample of 38 chips contains a defect percentage of more than 4.5%.

(c) Construct a 97% confidence interval for the true average defect rate in the chips if you find a sample of 38 chips with a defect rate of 6%.

Problem 2. (10pt) A recent news report seems to indicate that approximately 55% of all phone calls in the US are due to some type of spam or scam. The research reported seems to be reliable. Suppose that you take a simple random sample of 1,200 people to ask if the last phone call they received was a scam or spam.

  (a) Find the probability that more than 700 of those phone calls was spam or a scam.

  (b) Find the probability that less than 650 of those phone calls was spam or a scam.

  (c) Find the probability that less than 500 of those phone calls was spam or a spam.

  (d) Find the probability that between 650 and 700 of those phone calls was spam or a scam.