

Problem 4 is for practice

1. The yield strength (ksi) for A 36 grade steel is normally distributed with mean 43 and standard deviation 4.5.
 - (a) What is the probability that the yield strength is at most 40? greater than 60?
 - (b) What yield strength value separates the strongest 75% from the others?
 - (c) what proportion of steel strengths are with 1.5 standard deviations of the mean?
2. Let X be a binomial distribution with parameters $n = 35$ and $p = 0.05$.
 - (a) Use the normal approximation to the binomial to calculate $P(X \leq 2)$
 - (b) Use the Poisson approximation to the binomial to calculate $P(X \leq 2)$
 - (c) Use the normal approximation to the binomial to calculate $P(1 \leq X \leq 3)$
 - (d) Use the Poisson approximation to the binomial to calculate $P(1 \leq X \leq 3)$
3. For a normal rv the probability it is bigger than 3 is given to be 0.1 and also the probability that it is less than -2 is given to be 0.1. What is the probability that it is bigger than 0.5 in absolute value? What is the probability that it is bigger than one in absolute value?
4. An extension of the Exponential distribution to the entire real line is the *Double Exponential* (DE) distribution which has the density

$$f(x) = \frac{\lambda}{2} e^{-\lambda|x|}, \quad -\infty < x < \infty.$$

Compute the mean and the variance of the DE distribution with parameter equal to 2.

5. Suppose the distribution of the amount of contamination in one gallon of water from a source is exponentially distributed (in appropriate units) with parameter $\lambda = 10^3$. Let the threshold below which no contamination can be detected with certainty (limit of detection) be 10^{-4} . If a gallon of water is inspected what is the probability that some contamination will be detected? If 10 buckets of water, is inspected (10 times one gallon each and independently) what is the probability that some contamination will be detected at least 3 times?