Homework 9

ME 240: Fundamentals of Instrumentation & Measurement

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1. In the manufacturing of circuit boards, multiple boards are manufactured and tested on a single base (i.e., metal sheet). Six units of one type of board are manufactured on a single sheet. On average, there are 3 defects per sheet. What is the chance that one will encounter

   (a) (2 points) ten defects in a single sheet?

   (b) (2 points) no defects in a single sheet?

   (c) (2 points) one defect in a single board?

2. In manufacturing steel shelves, the column pieces are cut automatically with a standard deviation of 0.2 in. The average length is 7.25 ft. a Variation in length of 0.3 in can be tolerated.

   (a) (2 points) Calculate the percentage of columns rejected.

   (b) (3 points) If the tolerance remains the same, calculate the standard deviation required to reduce the rejection rate to half its current value.

3. In a test measuring the lifespan of a certain brand of tire, 100 tires are tested. The results shows an average lifetime of 50,000 miles, with a standard deviation of 5000 miles. One hundred thousand of these tires have been sold and are on the road.

   (a) (2 points) After how many miles would you expect 10% of the tires to have worn out?

   (b) (2 points) How many tires are expected to wear out between 60,000 and 70,000 miles?

   (c) (2 points) How many tires are expected to have a lifespan less than 20,000 miles?

   (d) (3 points) What are your major assumptions in these calculations?