University of California, Davis
Department of Biomedical Engineering

Fall 2019	**Probability and Statistics**	**BIM 105**
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Homework Assignment 3, Part 2
Due October 17, 2019
Always show your work.

1. Eight percent of the items in a large lot are defective. A sample of six items is drawn from this lot. Use MATLAB to find the following. Show the code and the output.
   (a) Find the probability that none of the sampled items is defective.
   (b) Find the probability that one or more of the sampled items is defective.
   (c) Find the probability that exactly one of the sampled items is defective.
   (d) Find the probability that fewer than two of the sampled items are defective.

2. Geologists estimate the time since the most recent cooling of a mineral by counting the number of uranium fission tracks on the surface of the mineral. A certain mineral specimen is of such an age that there should be an average of 5 tracks per cm^2 of surface area. Assume the number of tracks in an area follows a Poisson distribution. Let X represent the number of tracks counted in 1 cm^2 of surface area. Use MATLAB to find the following. Show the code and the output.
   (a) $P(X = 7)$
   (b) $P(X \geq 3)$
   (c) $P(2 < X < 7)$
   (d) μ_X
   (e) σ_X^2

3. Suppose that $X \sim N(3, 4)$ (where 4 is the standard deviation). Compute the following using Table A.2 and then using MATLAB.

   (a) $P(X \geq 4)$

   (b) $P(1 \leq X < 7)$

   (c) $P(-1.5 \leq X < 1)$

   (d) $P(-2 \leq X - 3 < 5)$

4. The distance between flaws on a long cable is exponentially distributed with mean 12m. Using the formulas,

   (a) Find the probability that the distance between two flaws is greater than 15m.

   (b) Find the probability that the distance between two flaws is between 8 and 20m.

   (c) Find the median distance.

   (d) Find the standard deviation of the distances.

   (e) Find the 65th percentile of the distances.

5. The file `malaria.csv` contains three columns, `subject`, `age`, and `ab`, which are the results of a random sample of 73 children ages 3–15 from a village in Ghana from an original sample of 100. These 73 were the ones that showed no symptoms of malaria after an 8-month follow-up. The column `ab` is the level of an antibody to the malaria parasite. Make a histogram, a boxplot, and a normal probability plot of the `ab` variable and also of the variable after taking logs. Does the `ab` variable more resemble a normal or a lognormal random variable? Explain.