Binomial and Geometric Worksheet Name _____

1. A manufacturing process produces, on the average, 3% defective items. The company ships 12 items in each box and wishes to guarantee no more than one defective item per box. What is the probability that the box will fail to satisfy the guarantee?

2. Suppose it is known that 80% of the people exposed to the flu virus will contract the flu. Out of a family of six exposed to the virus, what is the probability that:
   a) No one will contract the flu?

   b) All will contract the flu?

   c) Exactly two will get the flu?

   d) At least two will get the flu?

   e) How many would you expect to get the flu? Also find the standard deviation.

3. A person with tuberculosis is given a chest x-ray. Four TB x-ray specialists examined each x-ray independently. If each specialist can detect TB 88% of the time when it is present, what is the probability that exactly three of the specialists will detect the presence of TB?

4. A pharmaceutical lab claims that a drug it produces causes serious side effects in 20 out of every 1000 people on average. To check this claim, a hospital administers the drug to 15 randomly selected people and finds that 3 suffer serious side effects. If the lab's claims are correct, what is the probability of the hospital obtaining the results it did?

5. Suppose X has a geometric distribution with p = 0.7.
   a) Graph p(x) for x = 1, 2, 3, 4.

   b) Compute μ and σ.

6. Suppose X has a geometric distribution with p = 0.1. Find:
   a) P(X = 7) b) P(X = 10) c) P(X ≤ 3) d) P(X > 5)

   e) P(7 ≤ X ≤ 10) f) μ g) σ

7. The most common data collection method in consumer and market research is the telephone survey. A major problem with consumer telephone surveys, however, is nonresponse. How likely are consumers to be at home to take the call and, if at home, how likely are they to take part in the survey? To answer these and other questions, R. A. Kerin and R. A. Peterson directed a study of over 250,000 random-digits dialings of both listed and unlisted telephone numbers across the United States (*Journal of Advertising Research*, Apr./May 1983). The probability of a completed interview was assessed to be 0.084.
    a) What is the probability that five calls must be made before the first completed interview is obtained?

    b) What is the probability that at least five calls must be made before the first completed interview is obtained?

    c) Find the mean number of calls that must be made before the first completed interview is obtained? Find the standard deviation.

8. According to *Engineering News-Record* (Dec. 1, 1983), the District of Columbia is now mandating that at least one-half of all the jobs created by city contracts be filled by local residents. Suppose you want to survey jobs created by city contracts after the mandate was issued to determine the level of compliance with the new law. If in fact only 40% of all jobs created by city contracts are filled by local residents:
    a) What is the expected number of jobs you would have to survey before you find one that has been filled by a local resident?

    b) What is the probability that you will not find a job filled by a local resident until after the fourth job surveyed?

9. A manufacturer uses electrical fuses in an electronic system. The fuses are purchased in large lots and tested sequentially until the first defective fuse is observed. Assume that the lot contains 5% defective fuses.
    a) What is the probability that the first defective fuse will be one of the first five tested?

    b) Find the mean, variance, and standard deviation for X, the number of fuses tested until the first defective fuse is observed.

1. 0.049 **2.** a) 0.000064 b) 0.262 c) 0.01536 d) 0.9984 e) 4.8, 0.98 **3.** 0.327 **4.** 0.0029 **5.** b) 1.429, 0.782 **6.** a) 0.053 b) 0.039 c) 0.271 d) 0.590 e) 0.183 f) 10 g) 9.487 **7.** a) 0.059 b) 0.074 c) 11.9, 11.394 8. a) 2.5 b) 0.1296 9. a) 0.226 b) 20, 380, 19.49