

**Instructions:** Show all work. You may use your calculator rather than compute formulas by hand, but if you do, 'show work' by saying which program you used to obtain the result and what information you entered. Round measures of center to one decimal place more than the data, and variance/standard deviation to two decimal places more than the original data. Round probabilities to three decimal places (or percent plus one decimal place).

1. A manufacturing company wishes to understand why some of their products have been marked defective in the manufacturing process in order to improve the process and reduce the incidence of defective items. 200 defective products from their lines have been collected but not sorted, with each have only one of two possible defects, we'll call them defect A, and defect B, with a ratio of 115:85. If the company needs to analyze at least three examples of defect A, what is the probability that the testers will need to select 6 or more defective products from the pile to obtain the three samples they need for their tests?

$$p = \frac{23}{40}$$

$$r = 3$$

6 or more  $\Rightarrow$  3 or more failures  
negative binomial

$$1 - [P(X=0) + P(X=1) + P(X=2)] =$$

$$1 - [.190109 + .242389 + .206031] =$$

$$= 1 - .63853 = .36147$$

2. Suppose samples of 6 defective products are drawn at random from the scenario above. What is the probability that with any sample of 6, there will be exactly three of defect A and three of defect B?

$$N = 200$$

$$M = 115$$

$$n = 6$$

$$X = 3$$

$$= .29595$$

3. On average, the number of cars that passes under a particular traffic light is 100 cars per hour. What is the probability that at least one car will pass under the light in the next minute?

$$\mu = \frac{100}{60}$$

$$1 - \text{poissonpdf}\left(\frac{100}{60}, 0\right) = 1 - .188875 = .8111$$