

Name:

Date:

PBHL 5013/BIOM 5013 – Collected Homework
Chapter 5

1. Answer to 5.26.

If 12 Harry Potter fans who bought books that year are surveyed, find the following probabilities. $n=12, p=0.60$

- a. At least five of them are 14 or older. 0.943 $P(X \geq 5) = 1 - P(X \leq 4) = 1 - 0.057 = 0.943$
- b. Exactly nine of them are 14 or older. 0.142 $P(X=9) = P(X \leq 9) - P(X \leq 8) = 0.917 - 0.775 = 0.142$
- c. Less than three of them are 14 or older. 0.003 $P(X < 3) = P(X \leq 2) = 0.003$

2. Answer to 5.27

Suppose $n = 4$ new patients represent a random selection from the large set of prospective patients served by the clinic. Find these probabilities. $n=4, p=0.30$

- a. All the patients' bills will eventually have to be forgiven. 0.008 $P(X=4) = P(X \leq 4) - P(X \leq 3) = 1 - 0.992 = 0.008$
- b. One will have to be forgiven. 0.412 $P(X=1) = P(X \leq 1) - P(X \leq 0) = 0.652 - 0.240 = 0.412$
- c. None will have to be forgiven. 0.240 $P(X=0) = 0.240$

3. Answer to 5.28

If the clinic treats 2000 different patients over a period of 1 year, what is the mean (expected) number of debts that have to be forgiven? 600 $\mu = np = 2000(0.30) = 600$

If x is the number of forgiven debts in the group of 2000 patients, find the variance and standard deviation of x .

Variance. 420 $\sigma^2 = npq = 2000(0.30)(0.70) = 420$

Standard deviation. ≈ 20.5 $\sigma = \sqrt{\sigma^2} = \sqrt{420} \approx 20.5$

What can you say about the probability that x will exceed 700? First, let's consider the z -score associated with 700, that is, $z\text{-score} = \frac{700-600}{20.49390153} \approx 4.88$. Since this z -score exceeds 3, it can be considered very unusual implying that the probability that X will exceed 700 is small.

4. Answer to 5.45

If the average number of injuries per year for school-age children is two, what are the probabilities of these events? $\mu = 2$

- a. A child will sustain two injuries during the year. 0.271 $P(X=2) = P(X \leq 2) - P(X \leq 1)$
 $= 0.677 - 0.406$
 $= 0.271$
- b. A child will sustain two or more injuries during the year. 0.594 $P(X \geq 2) = 1 - P(X \leq 1)$
 $= 1 - 0.406$
 $= 0.594$
- c. A child will sustain at most one injury during the year. 0.406 $P(X \leq 1) = 0.406$

5. Answer to 5.46

- a. Calculate the mean and standard deviation for x , the number of injuries per year sustained by a school-age child. $\mu = 2$, $\sigma = \sqrt{\sigma^2} = \sqrt{2} \approx 1.4$
- b. Within what limits would you expect the number of injuries per year to fall?
0 to 4.8 -- This basically corresponds to $\mu \pm 2\sigma$. Note that the calculated result of $\mu - 2\sigma$ is negative, but the smallest possible number of injuries per year is 0.