**HW # 3 @ Applications of Binomial and Poisson Distributions**

**Due Feb 8, 2022**

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An experiment is designed to test the potency of a drug on 20 rats. Previous animal studies have shown that a 10-mg dose of the drug is lethal 5% of the time within the first 4 hours; of the animals alive at 4 hours, 10% will die in the next 4 hours.

(4.42) What is the probability that 3 or more rats will die in the first 4 hours?

(4.43) Suppose 2 rats die in the first 4 hours. What is the probability that 2 or fewer rates will die in the next 4 hours?

(4.44) What is the probability that 0 rats will die in the 8-hour period?

(4.45) What is the probability that 1 rat will die in the 8-hour period?

(4.46) What is the probability that 2 rats will die in the 8-hour period?

(4.47) Can you write a general formula for the probability that x rats will die in the 8-hour period?

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Assume the number of episodes per year of otitis media, a common disease of the middle ear in early childhood, follows a Poisson distribution with parameter episodes per year.

(4.24) Find the probability of getting 3 or more episodes of otitis media in the first 2 years of life.

(4.25) Find the probability of not getting any episodes of otitis media in the first years of life.

**An interesting question in pediatrics is whether the tendency for children to have many episodes of otitis media is inherited in a family.**

(4.26) What is the probability that 2 siblings will both have 3 or more episodes of otitis media in the first 2 years of life?

(4.27) What is the probability that exactly 1 sibling will have 3 or more episodes of otitis media in the first 2 years of life?

(4.28) What is the probability that neither sibling will have 3 or more episodes of otitis media in the first 2 years of life?

(4.29) What is the expected number of siblings in a 2-sibling family who will have 3 or more episodes in the first 2 years of life?