

1. (*4 points*) Suppose that 20% of the University's classrooms are in violation of the fire code. The fire marshall decides to randomly select 8 classrooms for inspection. What is the probability that

a. (*1 pt*) none of the classrooms are in violation of the fire code?

Answer:

$$P(X = 0) = C(8, 0)(.2)^0(.8)^8$$

b. (*1 pt*) only one of the classrooms is in violation of the fire code?

Answer:

$$P(X = 1) = C(8, 1)(.2)^1(.8)^7$$

c. (*2 pts*) at least three of the classrooms are in violation of the fire code?

Answer:

$$P(X \geq 3) = C(8, 1)(.2)^1(.8)^7 + C(8, 1)(.2)^1(.8)^7 + C(8, 1)(.2)^1(.8)^7 + \\ C(8, 1)(.2)^1(.8)^7 + C(8, 1)(.2)^1(.8)^7 + C(8, 1)(.2)^1(.8)^7$$

Also, a shorter way is to recognize that the opposite of $X \geq 3$ is $X < 3$. So you could also write,

$$P(X \geq 3) = 1 - P(X < 3) = 1 - [C(8, 0)(.2)^0(.8)^8 + C(8, 1)(.2)^1(.8)^7 + C(8, 2)(.2)^2(.8)^6]$$

2. (*2 points*) Suppose that 70% of homeowners in a given township cut their lawns with push mowers (as opposed to riding mowers or professional lawn care). From a sample of 100 homeowners, what is the probability that exactly 75 of them cut their lawns with push mowers?

Answer:

$$P(X = 75) = C(100, 75)(.7)^{75}(.3)^{25}$$

3. (2 points) 75% of students have experienced problems with crime on campus. From a sample of 10 students

a. (1 pt) what is the probability that at least 8 of them have experienced crime-related problems on campus?

Answer:

$$P(X \geq 8) = C(10, 8)(.75)^8(.25)^2 + C(10, 9)(.75)^9(.25)^1 + C(10, 10)(.75)^{10}(.25)^0$$

b. (1 pt) what is the expected number of students who have experienced problems with crime on campus?

Answer: For any binomial distribution,

$$E(x) = \mu = np = (10)(.75) = 7.5$$