Assignment 4

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Question 33

To find what is the number of papers needed to maximize profit we need to take the Expected value of each number of papers and then find the maximum value. Let b be the number of papers bought, s the number of papers sold, and r the profit per paper sold.
With the price of buying a paper being 10 cents and the price of selling a paper being 15 cents, the profit per paper sold is 5 cents minus the left over papers. Thus the formula used to find profit is $r = 0.05s - 0.10(b - s)$.
Now we need to multiply the probability of each of the number of papers being sold by the profit per paper sold.
With a binomial distribution of $n = 10$ and $p = \frac{1}{3}$ the Expected value formula is

$$E(X) = \sum_{s=0}^{n} r \cdot \binom{n}{s} p^s (1-p)^{n-s}$$

For $b = 0$ the Expected value is 0
For $b = 1$ the Expected value is 4.740
For $b = 2$ the expected value is 8.185
For $b = 3$ the expected value is 8.700
For $b = 4$ the expected value is 5.315
Clearly the maximum expected value is when $b = 3$.

Question 54

I would use a poisson distribution to model the number of cars abandonded on a highway.

a

No abandonded cars: $P(X = 0) = \frac{e^{-2}2^0}{0!} = e^{-2}$

b

At least two abandonded cars: $P(X \geq 2) = 1 - P(X < 2) = 1 - P(X = 0) - P(X = 1) = 1 - e^{-2} - 2e^{-2} = 1 - 3e^{-2}$

Question 75

$P(X = x) = \binom{9+x}{x}(1/2)^1 0(1/2)^x$

Question 5

$P(X = 0)$ is 1
Since $P(X = 0) = 1 - P(X \neq 0) = 1 - P(X = 1)$ Thus $P(X \neq 0) = P(X = 1)$ and $P(X = 0) + P(X = 1) = 1$
Also $E(X) = 3Var(X) = 3E(X^2) - 3E(X)^2$.
Thus $1P(X = 1) = 3(1P(X = 1^2) - (1P(X = 1))^2)$
Thus $P(X = 1) = 0$
Therefore $P(X = 0) = 1$ and $P(X \neq 0) = 0$