HW 3

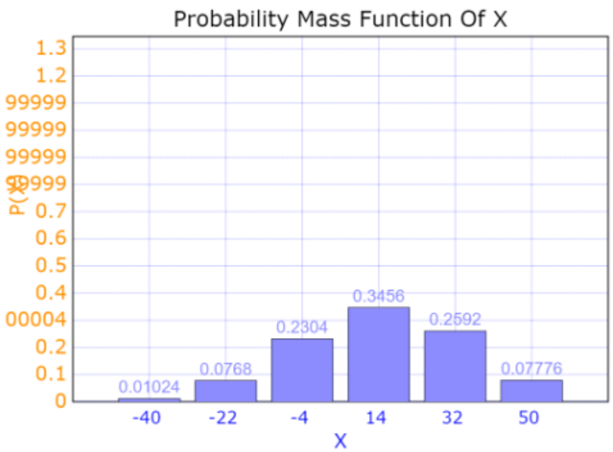
Monday, September 21, 2020 10:01 AM

1:

a)

Any value of X will be given by $PMF_x = \left((10*i) - \left(8(5-i)\right)\right) * (.4)^{5-i} * (.6)^i * \binom{5}{i}$

Where i is the number of crashes



b)

$$E(X) = \sum_{i=0}^{5} (10*i) - \left(8*(5-i)\right) * (.4)^{5-i} * (.6)^i * \binom{5}{i}$$

$= 14$

c)

$$Var(X) = E(X^2) - \left(E(X)\right)^2$$

$$= \sum_{i=0}^{5} \left((10*i) - \left(8*(5-i)\right)\right)^2 * (.4)^{5-i} * (.6)^i * \binom{5}{i} \quad - \quad (14)^2$$

$= 584.8 - (14)^2$

$= 388.8$

d)

$$Y = \#of\ crashes \to binomial\ = \binom{5}{i}(0.4)^{5-i}(0.6)^i$$

$X = \ aY + b$

$10i - 40 + 8i$ *where i is the number of crashes*

$X = 18Y - 40$

e)

$$E(X) = \sum_{Y=0}^{5} (18Y - 40)\binom{5}{Y}(0.4)^{5-Y}(0.6)^Y$$

$= 14$

$$Var(X) = E(X^2) - \left(E(X)\right)^2$$

$$= \sum_{Y=0}^{5} (18Y-40)^2 \binom{5}{Y}(0.4)^{5-Y}(0.6)^Y \ - 196$$

$= 388.8$

The values match

2:

a)

$$E(Y) = E(Y|good)P(good) + E(Y|bad)P(bad)$$
$$= (1.5)(0.3) + (12)(0.7)$$
$$= 8.85$$

b)

$$E(Y^2) = E(Y^2|good)P(good) + E(Y^2|bad)P(bad)$$
$$>E(X^2): X\ is\ Posisson \rightarrow \lambda^2 + \lambda$$
$$= (1.5^2 + 1.5)(0.3) + (12^2 + 12)(0.7)$$
$$= 110.325$$

3:

a)

$$PMFp_x(x\ |X \leq 4) = \frac{P(X = x \cap X \leq 4)}{P(X \leq 4)}$$
$$>P(X \leq 4) = \sum_{i=0}^{4}(0.6)^i(0.4) = 0.92224$$
$$>if\ X > 4 \rightarrow PMF(x) = 0$$

$$= \frac{1}{P(X \leq 4)} * P(X = x)$$

b)

$$E(x) = \frac{1}{P(X \leq 4)}\sum_{i=0}^{4}(0.6)^{i-1}(0.4) = 1$$

c)

$$PMF_x p(X = x) = P(x\ |X \leq 4)P(X \leq 4) + P(x|X > 4)P(X > 4)$$

Use the law of total probability

$$PMFp_x(x|X > 4) = \frac{PMFp_x(X = x) - PMFp_x(x|X \leq 4)P(X \leq 4)}{P(X > 4)}$$