CENG 222 HOMEWORK 2 ANSWERS

Answer 1

a)

$$f(x) = \frac{1}{180 - 60} = \frac{1}{120}$$

b)

$$\mu = \frac{60 + 180}{2} = 120$$

$$\sigma^2 = \frac{(180 - 60)^2}{12} = 1200$$

$$\sigma = 34.64$$

c)

$$(120 - 90)\frac{1}{120} = 0.25$$

d)

$$P(x > 150 | x > 120) = \frac{(x > 150)}{(x > 120)} = \frac{\frac{30}{180}}{\frac{60}{180}} = 0.5$$

Answer 2

a)

$$\mu = np = 500 * 0.02 = 10$$

$$\sigma = \sqrt{np(1 - p)} = \sqrt{500 * 0.2 * 0.98} = 3.13$$

b)

In order to approximate a discrete distribution to normal distribution, we need to use a technique called continuity correction.

This is why we are calculating $P(X < 7.5)$ instead of $P(X < 8)$

$$P(X < 8) = P(z < \frac{7.5 - 10}{3.13}) = P(z < -0.7987)$$

From z table;

$$P(z < -0.7987) \simeq 0.212$$

c)

This is a part where quite a few of you made a mistake, especially the ones who calculated $1 - P(X < 15)$ instead of $P(X > 15)$.

The correct probability to compute here is the $P(X > 15.5)$. Meaning you have to calculate $1 - P(X < 15, 5)$ for the other way. However, some of you went for $1 - P(X < 14.5)$ probably because of the $<$ sign.

$$P(X > 15.5) = P(z < \frac{15.5 - 10}{3.13}) = P(z > -1.7571) \simeq 0.040$$

d)

$$P(6.5 \leq X \leq 14, 5) = P(\frac{6.5 - 10}{3.13}) \leq z \leq \frac{14.5 - 10}{3.13})$$

$$= P(z < 1.43769) - P(z < 1.11821) \simeq 0.793$$

Answer 3

a)

Lightning strikes are a Poisson process. Therefore we will use the exponential distribution.

$$P(T > 1) = 1 - F(1, 1) = 1 - (1 - e^{-1}) = 0.368$$

b)

You should have known that the exponential distribution is memoryless and the events are independent of each other. Let's say you forgot about it, you can still solve the question like this:

$$P(T > 2|T > 1) = \frac{P(T > 2, T > 1) = P(T > 2)}{P(T > 1)}$$

$$P(T > 2|T > 1) = \frac{1 - F(1, 2)}{1 - F(1, 1)} = \frac{(1 - e^{-2})}{(1 - e^{-1})} = 0.368$$