Assignment-6

Answer to the question no 1

a

Yes. ~~it is can be~~ the selection of 10 person can be called a binomial experiment. Cause, we can categorise them in two outcomes, either they have more than \$7000 on their credit card or they don't.

b

We know,

$$f(x) = \binom{n}{x} p^x (1-p)^{(n-x)}$$

$$f(2) = \binom{10}{2} 0.09^2 (1-0.09)^{(10-2)}$$

$= 0.1719$

Ans

here,
$x = 2$
$p = 0.09$ or 9%
$n = 10$
$P(x=2) = f(x) = ?$

c

$$f(0) = \binom{10}{0} 0.09^0 (1-0.09)^{(10-0)}$$

$= 0.389$

Ans.

d

$$P(x \geq 3) = 1 - \{f(0) + f(1) + f(2)\}$$

$$= 1 - (0.3894 + 0.3851 + 0.1714)$$

$$= 0.0541$$

Answer to the question no 2

a

We know,

$$f(x) = \binom{n}{x} p^x (1-p)^{(n-x)}$$

here;

$$P = 0.90$$

a

The probability of a single detection system will detect an attac is 0.90.

b

$$P(x \geq 1) = f(1) + f(2)$$

$$= 0.18 + 0.81$$

$$= 0.99$$

here,

$n = 2$

c

$$P(X \geq 1) = f(1) + f(2) + f(3)$$

$$= 0.027 + 0.243 + 0.729$$

$$= 0.999$$

here,
$n = 3$

d

Yes. I would recommend to use multiple detection systems ∵ ~~to be~~ Cause, the more we are increasing the systems, we are getting more high probability of detected by atleast one system.

Example:

if one system installed, probability of atleast one detection is 0.

if two systems are " , " " " . " " is 0.9

" three " " " , " " " " " " 0.9

[from. a, b, & c]

Answer to the question no 3

a

We know,

$$f(x) = \frac{\binom{n}{x} p^{x} (1-p)^{(n-x)}}{}$$

$$f(12) = \binom{20}{12} 0.5^{12} \times (1-0.5)^{(20-12)}$$

$$= 0.1201$$

b

Probability of not more than 1 people,

$$f(x \leq 1) = f(0) + f(1)$$

$$= 0.954 \times 10^{-6} + 0.0191 \times 10^{-3}$$

$$= 0.02 \times 10^{-3}$$ Ans

c

50% of the population are expected to say the country was in a recession.

Ans

d

We know,

Variance, $\sigma^2 = np(1-p) = n\, 0.5(1-0.5)$

$= 0.25n$

S.D, $\sigma = \sqrt{0.25n}$

here,

~~n = 20~~

$p = 0.5$

Answer to the question no 4

a

Prob. of No arrival at 1 min,

$$f(0) = \frac{10^0 \cdot e^{-10}}{10!} = 0.0454 \times 10^{-3}$$

Ans:

b

Probability of arriving 3 or fewer people in 1 min is,

$$f(x \leq 3) = f(0) + f(1) + f(2) + f(3)$$

$$= 0.00757$$

c

Probability of no arriving in 30 sec is,

Probability in 60 s is 10 passengers

" " 1 s " $\frac{10}{60}$ "

" " 30 s " $\frac{30}{6}$ " = 5 Passenger

$$P(0) = \frac{5^0 e^{-5}}{0!} = 0.0067$$

d

1 min = 10 person

1 sec = $\frac{10}{60}$ "

15 " = $\frac{15}{6}$ " = 2.5 person

So. probability of at least 1 person in 15 sec period is,

$P(x \geq 1) = 1 - f(0)$

$= 1 - 0.082$

$= 0.918$

Ans:

Answer to the question no 5

a

Given,

15 accidents per year

So,

1 year = 15 accidents

1 month = $\frac{15}{12}$ "

= 1.25 accidents

b

Probability of no accident in 1 month period is,

$$f(0) = \frac{1.25^0 e^{-1.25}}{0!} = 0.2865$$

c

Probability of 1 accident in 1 month is,

$$f(1) = \frac{1.25^1 e^{-1.25}}{1!} = 0.3581$$

d

Probability of more than 1 accident in 1 month is

$$P(x>1) = 1-(f(0)+f(1))$$

$$= 1-(0.2865+0.3581)$$

$$= 0.3554$$

Answer to the quation no 6

a

Probability of no off-the-job accidents in 1 year is

$$f(0) = \frac{3^0 e^{-3}}{0!} = 0.0498$$

b

Probability of at least 2 accidents in 1 year is,

$$P(x \geq 2) = 1 - \{f(0) + f(1)\}$$

$$= 0.8009$$

c

1 year $\equiv$ 3 accedents

1 month $\equiv \frac{3}{12}$ "

= 0.25 accidents

d

Probability of no accidents in 6 month period is,

$$f(0) = \frac{0.25^0 e^{-0.25}}{0!} = 0.7788.$$

Answer to the question no 7

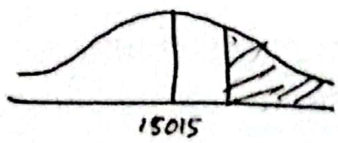
Given,

$\mu = \$15015$

$\sigma = \$3540$

a

$P(x > 18000) = 1 - P(x < 18000)$



$= 1 - P\left(z < \dfrac{18000 - 15015}{3540}\right)$

$= 1 - P(z < 0.84)$

$= 1 - .5636$

$= 0.4364$

b

$P(x < 10000) = P\left(z < \dfrac{18000 - 15015}{3540}\right)$

$= P(z < -1.42)$

$= 0.0778$

d

$$P(x < 14000) = P\left(z < \frac{14000 - 15015}{3540}\right)$$

$$= P(z < -0.29)$$

$$= 0.3859$$

e

$$P(12000 < x < 18000) = P\left(\frac{12000 - 15015}{3540} < z < \frac{18000 - 15015}{3540}\right)$$

$$= P(z < 0.84) - P(z < -0.85)$$

$$= 0.5636 - 0.1977$$

$$= 0.3659$$

Ans: to the ques:. no 8

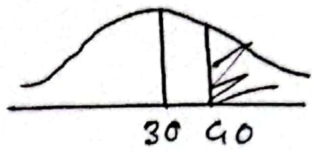
Given,

$\mu = \$30$

$\sigma = \$8.20$

a

$$P(x > 40) = P\left(z > \frac{40-30}{8.2}\right)$$



$$= 1 - P(z < 1.22)$$

$$= 1 - 0.8888$$

$$= 0.1112$$

b

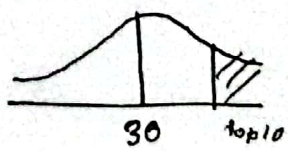
$$P(x < 20) = P\left(z < \frac{20-30}{8.2}\right)$$

$$= P(z < -1.22)$$

$$= 0.1112$$

c

$$P(x > a) = 0.1$$



$$P(x \ngtr a) = 1 - 0.1 = 0.9$$

$$P\left(z < \frac{a-30}{8.2}\right) = P(z < 1.28)$$

$$a = 40.496$$

Ans: to the ques: no 9

Given,

$\mu = \$328$

$\sigma = \$92$

a

$$P(x > 500) = P\left(z > \frac{500-328}{92}\right)$$

$$= P(z > 1.87)$$

$$= P\,1 - P(z \leq 1.87) = 1-0.9693 = 0.0307$$

b

$$P(x < 250) = P\left(z < \frac{250-328}{92}\right)$$

$$= P(z < -0.85) = 0.1977$$

c

$$P(300 < x < 400) = P(-0.30 < x < 0.78)$$

$$= P(z < 0.78) - P\cancel{(-0.30)}(z < -0.30)$$

$$= 0.7794 - 0.3821 = 0.3973$$

d

$$P(x < a) = 0.08$$

$$P(x < a) = P(z < -1.4)$$

$$a = (-1.4 \times 92) + 328$$

$$= 199.2$$