Name : AFIA FAHMIDA.

ID : 2021 01 04 032

Course No : MATH 2101.

Section : A

Year : 2nd

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Ans to the Ques. no. 1

1/a: Standard cured strength,

$$y = 1800 + 1.3x$$

When accelerated strength increases by 1 psi

Now, $y' = 1800 + 1.3(x+1)$

$\therefore$ ~~$y - y$~~ $y' - y = 1800 + 1.3x + 1.3 - 1800 - 1.3x = 1.3$

$\therefore$ Standard cured strength increase by 1.3psi.

1/b: Given, Standard cured strength,

$$y = 1800 + 1.3x$$
$$= 1800 + (1.3 \times 2500) \quad [\because x = 2500 \text{ psi}]$$
$$= 5050 \text{ psi}$$

Ans. to the Ques. no. 2

2/a: Probability of a student taking statistic, chemistry or both,

$$P(S \cup C) = P(S) + P(C) - P(S \cap C)$$
$$= 0.4 + 0.3 - 0.2$$
$$= 0.5 \text{ (Ans)}.$$

2/b: Probability of a student taking neither statistics nor chemistry is,

$P(S \cup C)' = 1 - P(S \cup C)$

$= 1 - 0.5$ [∵ from 'a' we got $P(S \cup C) = 0.5$]

$= 0.5$ (Ans)

2/c: Probability of a student taking only statistics but not chemistry is,

$P(S \cap C') = P(S) \cdot P(C')$

$= 0.4 \times 0.7$

$= 0.28$ (Ans)

Ans. to the Ques. 3

3/a: We know,

$P(X = x) = {}^{n}C_x \, p^x \, (1-p)^{n-x}$

$\Rightarrow P(X = 3) = {}^{12}C_3 (0.1)^3 (1-0.1)^{(12-3)}$

$= 0.085$ (Ans)

Given,
$p = 10\% = 0.1$
$n = 12$
$x = 3$

3/b: $P(x<3) = P(x=0) + P(x=1) + P(x=2)$

$= {}^{12}C_0 \cdot (0.1)^0 \cdot (1-0.1)^{12-0} + {}^{12}C_1 \cdot (0.1)^1 \cdot (1-0.1)^{12-1}$

$+ {}^{12}C_2 \cdot (0.1)^2 \cdot (1-0.1)^{12-2}$.

$= 0.889$ (Ans).

3/c: $P(X=0) = {}^{12}C_0 \cdot (0.1)^0 \cdot (1-0.1)^{12-0}$

$= 0.28$ (Ans).

Ans. to the Ques. 4

4/a: We know, poisson Distribution,

$$P(X=x) = e^{-\lambda} \frac{\lambda^x}{x!};$$

$x = 0, 1, 2, \ldots, \infty$.

$P(X<2) = P(X=0) + P(X=1)$

$= \frac{e^{-3.2} \times (3.2)^0}{0!} + \frac{e^{-3.2} \times (3.2)^1}{1!}$ [$\because \lambda = 3.2$]

$= 0.1712$ (Ans).

$= 17.12\%$

4/b: $P(X>4) = 1 - P(X \leq 4) \ldots\ldots (1)$

Now, $P(X \leq 4) = P(X=0) + P(X=1) + P(X=2) + P(X=3) + P(X=4)$

$= 0.1712 + \frac{e^{-3.2} \times (3.2)^2}{2!} + \frac{e^{-3.2} \times (3.2)^3}{3!} + \frac{e^{-3.2} \times (3.2)^4}{4!}$

$= 0.78 = 78\%$.

For, $P(X>4) = 1 - 0.78$

$= 0.22 = 22\%$ (Ans).

Ans. to the Ques. no. 5

5/a: From the Ques. we got,

mean, $\mu = 12.2$ gm

Standard deviation, $\sigma = 2.8$ gm.

The distribution of weights of impurities is a bell shaped one, which means normal distribution. So, $z = \frac{x-\mu}{\sigma}$

$$P(x < 10) = P\left(\frac{x-\mu}{\sigma} < \frac{10-12.2}{2.8}\right)$$

$$= P(z < -0.7857).$$

$$= 0.216. = 21.6\ \%.$$

5/b: $P(x > 15) = P\left(z > \frac{15 - 12.2}{2.8}\right)$

$= P(z > 1)$

$= 1 - P(z \leq 1)$

$= 1 - 0.8413$

$= 0.1587 = 15.87\%$.

5/c: $P(12 < x < 15) = P\left(\frac{12 - 12.8}{2.8} < z < \frac{15 - 12.2}{2.8}\right)$

$= P(-0.0714 < z < 1)$.

Now, $P(z \leq 1) - P(z < -0.0714)$

$= 0.841 - 0.472$.

$= 0.369$. $= 36.9\%$.