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Adv-Stats

Q1) $P(D/A) = 0.005$ $P(A) = 0.5$

$P(D/B) = 0.001$ $P(B) = 0.1$

$P(D/C) = 0.010$ $P(C) = 0.4$

i) Prob of manofacturers was A = $P(A/B)$

$$P(A/B) = \frac{P(A \cap B)}{P(B)}$$

$$= \frac{P(A/B) \cdot P(B)}{P(A/B_1)P(B_1) + P(A/B_2)P(B_2) \cdots}$$

$$= 0.005 \times 0.5 + 0.001 \times 0.1 + 0.0010 \times 0.4$$

$$= 0.006$$

$$P(A/D) = \frac{0.005 \times 0.5}{0.0066} = \boxed{0.3788}$$

ii) $P(C/D) = \frac{P(D/C) \, P(C)}{P(D)} = \frac{0.004}{0.0066} = \boxed{0.60}$

Q2)

$$f(n) = \lambda e^{-2x}$$

$$\lambda = 1$$
$$n = 7$$
$$P(x > 10)$$
$$= 1e^{-7}$$

$$= e^{-10}\left(1 + 10 + \frac{10^2}{2!} + \dots + \frac{10^6}{6!}\right)$$

$$= e^{-10} \times 2866.5$$

$$\boxed{= 0.13}$$

Q3)

$$\mu = 10$$
$$\sigma^2 = 4$$

$$P(x < 9)$$

$$\text{var } \sigma^2 \text{ of R.V} = \frac{4}{9} =$$

$$\frac{9 - 10}{4/9} = -1.5$$

$$P(9 < -1.5)$$

$$= \boxed{0.0668}$$

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Q4)

mean = 36

S.D = 36

Sample = 16

Lifetime = X

$P(X < 600)$

mean = $36 \times 16 = 576$

var = $36^2 \times 16 = 20736$

SD = 144

$P(X < 600)$

$Z = \dfrac{600 \times 576}{144} = 0.1667$

$= 0.5663$

Q5)

$P(\mu) = \frac{1}{2}$ $E(x) = 50$ var = 2.5

$X = N(50, 5^2)$

$P(40 < \mu < 60)$

$Z = \dfrac{x - \mu}{6}$

$\dfrac{40 - 50}{5} < \mu < \dfrac{60 - 50}{5}$

$-2 < \mu < 2$

ii) ~~$P(50 < x < 55 - 50)$~~
          ~~5~~

$P(50 \le x \le 55)$

$\dfrac{50 - 50}{5} \le x \le \dfrac{55 - 50}{5}$

$0.5 \le z \le 0.84$

$= 0.84 - 0.5$

$= 0.34$

$$0.97 - 0.02 = \boxed{0.95}$$

Q6) $\mu = 8$ $\sigma = 2$

a) $P(780 < S < 820)$

$N = 100$

$$= (8 \times 100, \; 2^2 \times 100)$$

$$(800, 400)$$

$$= \frac{x - \bar{x}}{\sigma}$$

$$= \frac{780 - 800}{20} < Z < \frac{820 - 800}{20}$$

$$= -1 \; < Z < 1$$

$$= 0.15 < Z < 0.84$$

$$= 0.84 - 0.15$$

$$= \boxed{0.68}$$

b) $P\left(S > \dfrac{1000}{n}\right) = 0.90$

$$z = -1.28$$

$$\frac{1000 - (n)(x)}{\sigma \sqrt{n} \times \sigma (s_n)} = -1.2$$

$\mu = 8, 6 = 2$

$1000 . 8n = -1.2$

$8n - 2.56 \sqrt{n} = 1000$

$n = 130$

$8(130) . 2.56 \sqrt{130} = 1040 - 256(11.40) = 1010.82$

$1010.82 = 1000$

$n = 130$ is the closest