September 29, 2021 9:03 AM

Q1

	Mean 10	SD 2^2
(i) $3X$	$E(3X) = 3E(X) = 30$	$V(3X) = 3^2 V(X) = (6)^2$ $\rightarrow sd(3X) = 6$
(ii) $Y+6$	$E(Y+6) = E(Y) + 6$ $= 26$ ($E(Y) = 20$)	$V(Y+6) = V(Y) = 5^2$ $\rightarrow sd(Y+6) = 5$

Q1

	Mean	SD $(X \perp Y)$
(iii) $X+Y$	$E(X+Y) = EX + EY$ $= 10 + 20$ $= 30$	$V(X+Y) = V(X) + V(Y)$ $= 2^2 + 5^2$ $= 29$ $(sd = \sqrt{29})$
(iv) $X-Y$	$E(X-Y) = EX - EY$ $= 10 - 20$ $= -10$	$V(X-Y) = V(X + (-1)Y)$ $= V(X) + (-1)^2 V(Y)$ $= V(X) + V(Y)$ $= 29$ $(sd = \sqrt{29})$

September 29, 2021 9:51 AM

Q1 (v) $\quad * X_1 \overset{D}{=} X_2 \overset{D}{=} X, \quad ** X_1 \perp X_2$

$X_1 + X_2$

$$\text{Mean} = E(X_1+X_2) = E(X_1) + E(X_2)$$

$$\overset{(*)}{=} E(X) + E(X)$$

$$= 10 + 10 = 20$$

$$\text{Var} = V(X_1+X_2) \overset{(**)}{=} V(X_1) + V(X_2)$$

$$\overset{(*)}{=} V(X) + V(X)$$

$$= 2^2 + 2^2 = 8 \quad (\text{sd} = \sqrt{8})$$

September 29, 2021 12:14 PM

Q4

$$E(\text{profit/policy}) = E\left(\begin{array}{l}\text{Premium/policy} \\ -\ \text{Admin Fees/policy} \\ -\ \text{payout/policy}\end{array}\right)$$

(constant)
(constant)
(Random)

$$50 = \text{Premium} - 15 - E(\text{payout/policy})$$

$$\Rightarrow \text{Premium} = 50 + 15 + E(\text{payout/policy})$$

$$\text{Payout/policy} = \begin{cases} 1000 & \text{w.p. } 2/100 \\ 0 & \text{w.p. } 1 - 2/100 \end{cases}$$

$$\Rightarrow E(\text{payout/policy}) = 1000\left(\frac{2}{100}\right) = 20$$

$$\therefore \text{Premium} = 50 + 15 + 20$$

$$= 85$$