

Q100 Prob 5.3

X can be $-1, 1$ w. prob $\frac{1}{4}, \frac{3}{4}$
 $Y = X$ w. prob $1-p-p_e$

$= -X$ w. prob p .

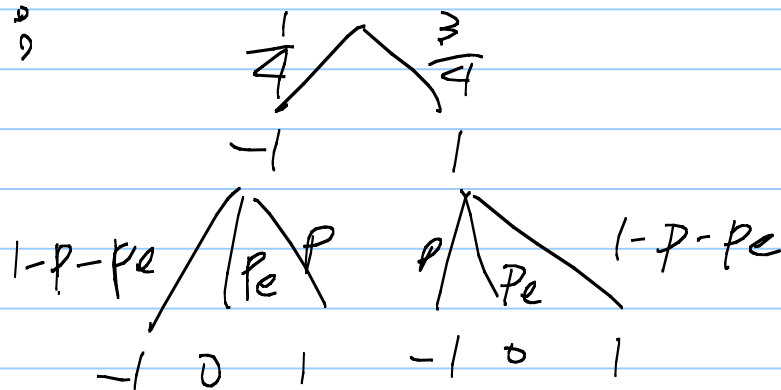
$= 0$ w. prob p_e

Q. S_{XY}

$$A_{xy}^0 = S_{XY} = \begin{array}{c} -1 \quad 0 \quad 1 \\ -1 \left| \begin{array}{c|c|c} \frac{1}{4}(1-p-p_e) & \frac{1}{4} \times p_e & \frac{1}{4} \times p \\ \frac{3}{4} \times p & \frac{3}{4} \times p_e & \frac{3}{4} \cdot (1-p-p_e) \end{array} \right. \end{array}$$

Q: Weight assignment

Ans:



Q: $P(X \neq Y)$

$$\text{Ans: } \frac{1}{4} p_e + \frac{1}{4} p + \frac{3}{4} p + \frac{3}{4} p_e = p + p_e$$

Q: $P(Y=0)$

$$\text{Ans: } \frac{1}{4} p_e + \frac{3}{4} p_e = p_e$$

Q105 Prob 5.12

$$X = r \cos\left(\frac{2\pi \oplus}{8}\right)$$

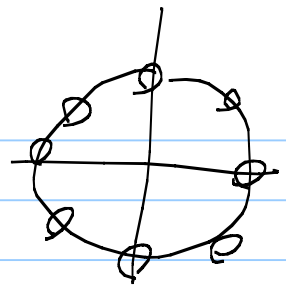
$$Y = r \sin\left(\frac{2\pi \oplus}{8}\right)$$

\oplus : uniformly distributed on $\{0, 1, 2, \dots, 7\}$.

Q: $S_{XY} = ?$

Ans:

| | | | | | |
|-----|-----------------------|-----------------------|---------------|----------------------|---------------|
| | | $-r$ | 0 | r | |
| | Y | $-\frac{r}{\sqrt{2}}$ | 0 | $\frac{r}{\sqrt{2}}$ | r |
| X | $-r$ | | $\frac{1}{8}$ | | |
| | $-\frac{r}{\sqrt{2}}$ | $\frac{1}{8}$ | | $\frac{1}{8}$ | |
| | 0 | $\frac{1}{8}$ | | | $\frac{1}{8}$ |
| | $\frac{r}{\sqrt{2}}$ | $\frac{1}{8}$ | | $\frac{1}{8}$ | |
| | r | | $\frac{1}{8}$ | | |



Q: W.A Ans: ↑

Q: Marginal prob of X

Ans: $P(X=x) = \begin{cases} \frac{1}{8} & \text{if } x = -r, r \\ \frac{1}{4} & \text{if } x = -\frac{r}{\sqrt{2}}, 0, \frac{r}{\sqrt{2}} \\ 0 & \text{otherwise.} \end{cases}$

$P(Y=y) = \begin{cases} \frac{1}{8} & \text{if } y = -r, r \\ \frac{1}{4} & \text{if } y = -\frac{r}{\sqrt{2}}, 0, \frac{r}{\sqrt{2}} \\ 0 & \text{otherwise.} \end{cases}$

Q: $P(X=0)$. Ans: $\frac{1}{4}$

Q: $P(Y \leq \frac{r}{\sqrt{2}})$. Ans: $\frac{7}{8}$

Q: $P(X \geq \frac{r}{\sqrt{2}} \text{ and } Y \geq \frac{r}{\sqrt{2}})$. Ans: $\frac{1}{8}$

Q: $P(X < -\frac{r}{\sqrt{2}})$ Ans: $\frac{1}{8}$