

Put your work and answers on this sheet of paper. Make everything neat and legible. You do not need to show work unless asked to.

The table to the right is for the joint distribution for two discrete random variables. Use it to do all of the following.

		x			
		0	1	2	3
y	1	.06	.07	.12	.06
	2	.08	.12	.08	.06
	3	.15	.09	.07	.04

1. Give each of the following, as a decimal.

(a) $P(X \geq 2) = 0.43$

(b) $P(X = 2, Y = 3) = 0.07$

(c) $P(X = 2 \text{ or } Y = 3) = 0.55$

(d) $P(X \leq 3, Y \leq 2) = 0.65$

+ 1/4 each

change in future

2. Give the two marginal distributions $g(x)$ and $h(y)$.

x: 0 1 2 3 y: 1 2 3

g(x): 0.29 0.28 0.27 0.16 h(y): 0.31 0.34 0.35

3. The random variables X and Y are not independent. Give a brief explanation of how we know this, based on the definition and the distributions f , g and h .

I'll grade this

4. Give $P(Y = 1)$ in terms of f , using a summation, then give it in terms of one of the marginal distributions.

$$P(Y=1) = \sum_{x=0}^3 f(x,1) = h(1)$$

5. Give $P(X = 0 \text{ or } Y = 1)$ in terms of f , g and h .

$$P(X=0 \text{ or } Y=1) = g(0) + h(1) - f(0,1)$$

6. Give the conditional distributions $v(x|3)$ and $w(y|1)$:

x: 0 1 2 3 y: 1 2 3

v(x|3): 0.43 0.26 0.20 0.11 w(y|1): 0.25 0.43 0.32

For Friday

There are more on the back.

Continue to use the table to the right, for the joint distribution for two discrete random variables.

		x			
		0	1	2	3
y	1	.06	.07	.12	.06
	2	.08	.12	.08	.06
	3	.15	.09	.07	.04

7. Give two summations of $f(x,y)$ for $P(X \leq Y - 1)$, and give the probability. **Connect all of these in a string, with equal signs.**

$$P(X \leq Y - 1) = \sum_{x=0}^2 \sum_{y=x+1}^3 f(x,y) = \sum_{y=1}^3 \sum_{x=0}^{y-1} f(x,y) = 0.57$$

8. Find the expected value $E(XY)$, showing clearly how you do it. You might find Example 5.6(a) useful.

$$E(XY) = \sum_{x=0}^3 \sum_{y=1}^3 xy f(x,y) = 1(.07) + 2(.12) + 3(.09) + 2(.12) + 4(.08) + 6(.07) + 3(.06) + 6(.06) + 9(.04) = 2.46$$

9. Use Theorem 5.2 to find the covariance σ_{XY} . Note that μ_X is $E(X)$, the expected value of the marginal distribution g , and similarly for μ_Y and h . **Show clearly how all values are obtained.**

$$\mu_X = E(X) = \sum_{x=0}^3 xg(x) = 0(0.29) + 1(0.28) + 2(0.27) + 3(0.16) = 1.3$$

$$\mu_Y = E(Y) = \sum_{y=1}^3 yh(y) = 1(0.31) + 2(0.34) + 3(0.35) = 2.04$$

$$\sigma_{XY} = E(XY) - E(X)E(Y) = 2.46 - (1.3)(2.04) = -0.192$$

-0.19 is ok

+2/2

+1/1

+1/1

or leave for me if incorrect

+4