

Question 1: The following table shows the relationship between the price of a loaf of bread and the corresponding quantity demanded. Derive correlation coefficient and comment on the found value.

X (Price)	Y (Quantity Demanded)
1	100
2	80
3	50
4	20

Correct setup, wrong calculation -2

X	y	$x - \bar{x}$	$(x - \bar{x})^2$	$y - \bar{y}$	$(y - \bar{y})^2$	$(x - \bar{x})(y - \bar{y})$
1	100	$1 - 2.5 = -1.5$	2.25	$100 - 62.5 = 37.5$	1406.25	-56.25
2	80	$2 - 2.5 = -0.5$	0.25	$80 - 62.5 = 17.5$	306.25	-8.75
3	50	$3 - 2.5 = 0.5$	0.25	$50 - 62.5 = -12.5$	156.25	-6.25
4	20	$4 - 2.5 = 1.5$	2.25	$20 - 62.5 = -42.5$	1806.25	-63.75
$\bar{x} = 2.5$	$\bar{y} = 62.5$		$\sum x^2 = 5$		$\sum y^2 = 3675$	$\sum = -135$

$Cov(X,Y) = \frac{-135}{3} = -45$

$Corr(X,Y) = \frac{-45}{(1.29)(35)} = -0.9967$

$S_x = \sqrt{\frac{5}{3}} = 1.29$, $S_y = \sqrt{\frac{3675}{3}} = 35$

price & QD have strong negative relationship

Question 2: Consider a standard deck of cards; 13 cards (1~10, J, Q, K) for 4 suits (clover, spade, heart and diamond). Set Event A as Red suit and Event B and odd numbers (consider as J=11, Q=12, K=13).

(a) Complete the probability table, including joint and marginal probabilities

	odd 1,3,5,7,9 B	even 2,4,6,8,10,12 B	
A Red ♥♦	$\frac{14}{52} P(A \cap B)$	$\frac{12}{52} P(A \cap \bar{B})$	$P(A) = \frac{26}{52}$
\bar{A} Black ♠♣	$\frac{14}{52} P(\bar{A} \cap B)$	$\frac{12}{52} P(\bar{A} \cap \bar{B})$	$P(\bar{A}) = \frac{26}{52}$
	$P(B) = \frac{26}{52}$	$P(\bar{B}) = \frac{26}{52}$	1

4 each
32

Confusion b/w events & probability -3

(b) Show if A and B are mutually exclusive.

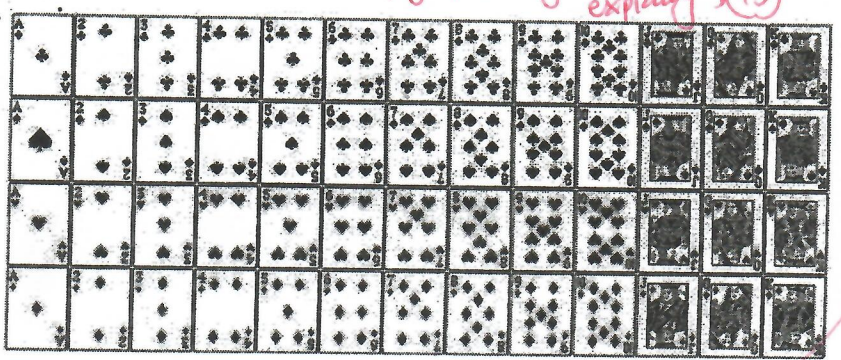
$A \cap B = \emptyset$? No, $A \cap B = \{ \heartsuit 1,3,5,7,9,11,13 \}$

OR $P(A \cap B) = 0$? No, $P(A \cap B) = \frac{14}{52}$
 \Rightarrow Not Mutually Exclusive.

(c) Show if A and B are collectively exhaustive.

$A \cup B = S$?
 $A \cup B = \{ \text{All red suits \& All odd numbers} \}$
 $= \{ \heartsuit 1 \sim 13, \spadesuit 1 \sim 13, \heartsuit 1,3,5,7,9,11,13, \spadesuit 1,3,5,7,9,11,13 \}$

if just change calculation instead explaining +5



$\neq S$ $\{ \spadesuit 2,4,6,8,10,12 \}$
 $\{ \clubsuit 2,4,6,8,10,12 \}$
 missing.

\Rightarrow Not collectively exhaustive.

OR
 $P(A \cup B) = 1$? $P(A \cup B) = P(A) + P(B) - P(A \cap B)$