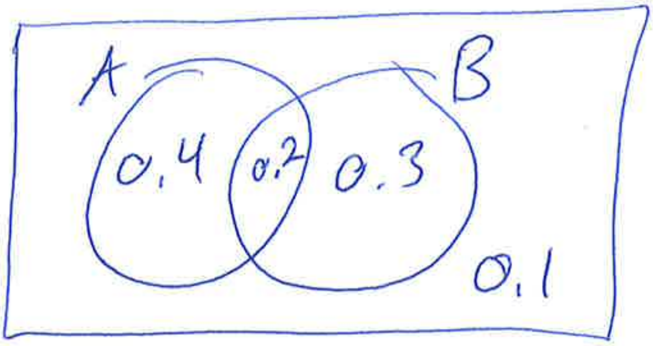
1. OF 52 CARDS, THERE ARE 8 HEARTS AND 8 DIAMONDS (RED CARDS) BETWEEN 3 AND 10, SO THE PROBABILITY OF DRAWING ONE OF THEM IS 16/52.

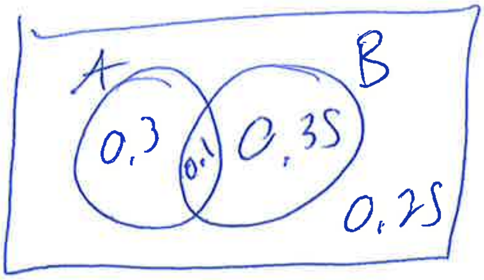
2. (a)

| | $B$ | $\bar{B}$ | |
|---|---|---|---|
| $A$ | 0.2 | 0.4 | 0.6 |
| $\bar{A}$ | 0.3 | 0.1 | 0.4 |
| | 0.5 | 0.5 | 1 |




$P(A \cup B) = 0.4 + 0.2 + 0.3 = 0.9$

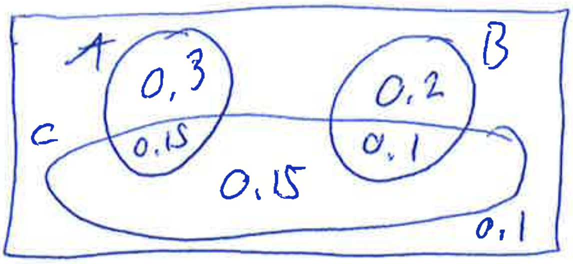
(b)




| | $B$ | $\bar{B}$ | |
|---|---|---|---|
| $A$ | 0.1 | 0.3 | 0.4 |
| $\bar{A}$ | 0.35 | 0.25 | 0.6 |
| | 0.45 | 0.55 | 1 |

$P(A \cup B) = 0.3 + 0.1 + 0.35 = 0.75$

3.




(a) $P(A \cap B) = 0 \rightarrow$ A AND B ARE DISJOINT.

$P(A) = 0.45$, $P(B) = 0.3$, $P(A)P(B) = 0.15 \neq P(A \cap B)$

$\rightarrow$ A AND B ARE NOT INDEPENDENT.

(b) $P(A|B) = \dfrac{P(A \cap B)}{P(B)} = \dfrac{0}{0.3} = 0$

$P(B|C) = \dfrac{P(B \cap C)}{P(C)} = \dfrac{0.1}{0.4} = 0.25$

$P(C|B) = \dfrac{P(C \cap B)}{P(B)} = \dfrac{0.1}{0.3} = 0.33$

4. A: POSITIVE TEST RESULT.

B: DRUG IS PRESENT.

$P(A|B) = 0.96$, $P(\bar{A}|\bar{B}) = 0.93$, $P(B) = 0.007$, $P(B|A) = ?$

BAYES' RULE:

$$P(B|A) = \frac{P(A|B)P(B)}{P(A|B)P(B) + P(A|\bar{B})P(\bar{B})}$$

$$= \frac{0.96 \cdot 0.007}{0.96 \cdot 0.007 + (1-0.93)(1-0.007)} \approx 0.09$$

THERE IS A 9% PROBABILITY THAT THE DRUG IS PRESENT, GIVEN A POSITIVE TEST RESULT. (!!)