Given the following probabilities:
- P(A) = .7
- P(B) = .5
- P(B|A) = .4✳

Calculate probabilities in 1 and 2

1.) $P(A \cap B)$ ✳

2.) $P(A|B)$

Cond. Prob. $\boxed{P(A|B) = \dfrac{P(B \cap A)}{P(B)} \quad \dfrac{P(A \cap B)✳}{P(B)}}$
✳

$P(A \cap B) = P(B \cap A)$

$P(A)✗$

$P(B|A) = \dfrac{P(B \cap A)}{P(A)} \times P(A)$

$P(A \cap B) = P(B|A) \cdot P(A)$

$= .4 \times .7$

$= .279\!\!9 = \boxed{.28}$

$P(A|B) = \dfrac{P(A \cap B)}{P(B)} = \dfrac{.28}{.5}$

$\boxed{= .56}$

At a supermarket, customers are selected randomly, the store owner recorded whether customers owned a Visa card (event A) or an Amex card (event B). Some customers owned both. Assume that:
- P(A) = .5 — Visa
- P(B) = .4 — P(Amex)
- P(A and B) = .25
  $\underline{\quad\quad}$ .2

Calculate and interpret the following probabilities:

$-P(B|A) \quad - P(B'|A) \quad - P(A|B) \quad P(A'|B)$

$$P(B|A) = \frac{P(A \cap B)}{P(A)} = \frac{.25}{.5} = \boxed{.5}$$

$$P(B'|A) = 1 - P(B|A) = 1 - 0.5$$

$$P(B'|A) = 0.5$$

$$P(A|B) = \frac{P(A \cap B)}{P(B)} = \frac{.25}{.4} = \underline{.625}$$

$$P(A'|B) = 1 - P(A|B) = 1 - .625 \boxed{= .375}$$

Let me i, j be the numbers shown on the dice. Events A and B are described below:
- **A** -> either i or j is a 5 or 6
- **B** -> $i + j = 8$

- what is size of sample space Ω?
- what is P(A ∩ B)?
- What is P(A)?
- Use above to calculate P(A|B)

$$\Omega = \{(1,1), (1,2), (1,3), (1,4), (1,5), (1,6)$$
$$(2,1), (2,2), (2,3), (2,4), (2,5), (2,6),$$
$$(3,1), (3,2), (3,3), (3,4), (3,5), (3,6)$$
$$(4,1), (4,2), (4,3), (4,4), (4,5), (4,6)$$
$$(5,1), (5,2), (5,3), (5,4), (5,5), (5,6)$$
$$(6,1), (6,2), (6,3), (6,4), (6,5), (6,6)$$

$P(B|A)$

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

$$P(A) = \frac{20}{36}$$

$$P(A) = \frac{2}{6} + \frac{2}{6} = \frac{12}{36} + \frac{12}{36} = \frac{24}{36} - \frac{4}{36}$$

$$i = \{1, 2, 3, 4, 5, 6\} \qquad P(A) = \frac{20}{36}$$

$$j = \{1, 2, 3, 4, 5, 6\}$$

$$P(B) = (2,6), (3,5), (4,4), (5,3), (6,2)$$

$$P(A \cap B) = 4/36$$

$$\frac{(4/36)}{(20/36)} = \boxed{.2} \qquad \frac{P(A \cap B)}{P(A)}$$