# PROBABILITY PROBLEMS ABOUT CARDS #1

If we select two cards from a well shuffled deck of cards, what is the probability that:

a) Both are Hearts

b) One is a Heart and the other is a Spade

c) Both are Kings

d) One is a King and the other is a Face card

a) $\underbrace{\frac{13}{52}}_{P(A)\ A} \times \underbrace{\frac{12}{51}}_{B} \leftarrow P(B|A) = \frac{1}{17}$

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

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

If the question had been: what is the probability that the second card is a Heart knowing that the first one was also a Heart? $\frac{12}{51}$

b) $\underbrace{\frac{13}{52}}_{\text{Heart}} \times \underbrace{\frac{13}{51}}_{\text{Spade}}$ or $\underbrace{\frac{13}{52}}_{\text{Spade}} \underbrace{\frac{13}{51}}_{\text{Heart}}$

$$\frac{13}{52} \times \frac{13}{51} + \frac{13}{52} \times \frac{13}{51} = 2 \times \frac{13}{52} \times \frac{13}{51}$$

$$= \frac{13}{102}$$

c) $\frac{4}{52}$ (King) $\times \frac{3}{51}$ (King) $= \frac{1}{221}$

d) $\frac{4}{52}$ (King) $\times \frac{11}{51}$ (Face) $= \frac{11}{663}$

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