324 cheat sheet Bayes Rule:

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

Law of Total Probability: If $B = \{B_1, ...B_m\}$ is an event space, then

$$P(X) = \sum_{i=1}^{m} P(X \cap B_i) \text{ and } P(X) = \sum_{i=1}^{m} P(X|B_i)$$

Expectation and variance:

$$E[X] = \sum_{x \epsilon S_x} x \cdot p_X(x) \text{ and } Var(X) = E[(X - E[X])^2] = E[X^2] - E[X]^2$$

Conditional Expectation:

$$E[X|Y] \text{ and } E[E[X|Y]] = E[X]$$

De Morgan's Law

$$(A \cup B)^c = A^c \cap B^c \text{ and } (A \cap B)^c = A^c \cup B^c$$