

# Cheatsheet for Math Exercises

## Probability and Conditional Probability

Notation	Value	Formula
$\$P(A)\$$	Probability of event A occurring.	$\$P(A) = \frac{\text{Number of favorable outcomes for } A}{\text{Total number of possible outcomes}}\$$
$\$P(A \mid B)\$$	Conditional probability of event A occurring, given that event B has occurred.	$\$P(A \mid B) = \frac{P(A \cap B)}{P(B)}\$$
$\$P(A \cap B)\$$	Probability of both events A and B occurring.	In general: $\$P(A \cap B) = P(A) \cdot P(B \mid A)\$$ If A and B are independent events, then: $\$P(A \cap B) = P(A) \cdot P(B)\$$
$\$P(A \cup B)\$$	Probability that event A or event B (or both) occur.	$\$P(A \cup B) = P(A) + P(B) - P(A \cap B)\$$

## Information Theory

Notation	Value	Formula
$\$I(A)\$$	Information content or self-information of an event A.	$\$I(A) = -\log_2 P(A) \text{ [bits]}\$$
$\$H(X)\$$	Entropy, which measures the average amount of information (or uncertainty) in a random variable X.	$\$H(X) = -\sum_{x \in X} P(x) \log_2 P(x) \text{ [bits]}\$$
$\$R(X)\$$	Redundancy, which refers to the measure of how much information is duplicative within a message.	$\$R(X) = 1 - \frac{H(X)}{\log_2  X }\$$

## Combinatorics

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