# Prometheus Cheatsheet

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## 1 Metric vs. Time-Series

**Metric** is a numerical value that represents a specific measurement at a specific point in time.

**Time Series** is a sequence of data points, typically ordered by time, that represents the evolution of a metric over time.

- every metric & label combo is a time series.

## 2 Prometheus TSDB

**Prometheus TSDB** is a time series database designed for storing and querying time series data, particularly metrics data collected from various sources.

### 2.1 Head block

**Head block** is the in-memory storage component of Prometheus TSDB that holds the most recent time series data before it is flushed to disk.

- Each chunk for a time series in the head block typically contains data points for a specific time range and can grow to 120 samples before it is flushed to the active chunk's segment file in the `chunks_head` directory on the disk.
- Each head chunk segment file can grow to 128 MB before it is finalized and a new segment file is created for that chunk.
- When the head block reaches 1.5x the minimum block size (default 2 hours), a new block is created, and the current head block is flushed to disk as a finalized block.

### 2.2 WAL

**WAL (Write-Ahead Log)** is a log file that records all changes made to the head block before they are applied, ensuring data durability and consistency in case of crashes.

- The WAL prevents loss of recent data by allowing Prometheus to replay the log and restore the head block to its last known state upon restart.
- WAL segments are stored in the `wal` directory and are named sequentially (e.g., 00000000, 00000001, etc.).
- Each WAL segment can grow up to 512 MB before a new segment is created

# 3 promQL (Prometheus Query Language)

**promQL** is the query language used to query metrics stored in Prometheus.

PromQL queries can evaluate to one of four types of results:

- Instant vector: A set of time series containing a single sample for each time series, all sharing the same timestamp.
- Range vector: A set of time series containing a range of data points over time for each time series.
- Scalar: A single numerical value. (i.e., 177.6)
- String: A single string value. (i.e., "Primus Sux")

## 3.1 Selectors & Matchers

### 3.1.1 Selctors

- timeseries
- Range Vector Selector will returns all values for a metric over a time period

### 3.1.2 Label Matchers

- Label matchers allow you to return metrics for a subset of time series.

  = Exact match on a label value.

  **!=** Negative equality matcher - return time series that do not have specified label.

  =~ Regualar Expression Matcher - utilize `regex` to match time series.

  **!~** Negative Regualar Expression Matcher - return time series that do not match `regex` expression

- multiple seletors can. be used in a query by seperating them with a comma.

## 3.2 Modifiers

**offset modifiers** allows you top retrieve historc data.

**@ modifier** allows you to retrieve data from a specific point in time.

- **offset** and @ modifiers can be combined in a query (order does not matter).
- **Range vectors** can also be combined with **offset** and @ modifiers.

## 3.3 Operators

### 3.3.1 Arithmatic Operators

**Arithmatic Operators** allow users to perform basic math operations

### 3.3.2 Bool Operators

**Bool Operators**

### 3.3.3 Logical Operators

## 3.4 Vector Matching

Rules for vector matching:

1. *All labels must be identical* between vectors samples to match.

### 3.4.1 Vector Matching Keywords