## 0.1 Rate Of

Calculates the number of times something occured within an interval of time given a unit of time.

$$rateOf(nOccurances, start, end, unit)$$

Where the output translates to: the rate of occurance per unit within interval

### 0.1.1 Arguments

- $nOccurances$ is the number of times something happened and should be an Integer

- $start$ is an ISO 8601 timestamp which serves as the first timestamp within the interval

- $end$ is an ISO 8601 timestamp which servers as the last timestamp within the interval

- $unit$ is a String Enum representing the unit of time

### 0.1.2 Relevant Operations

- isoToUnixEpoch

- $timeunit \rightarrow seconds$

### 0.1.3 Summary

$rateOf$ determines the number of seconds within the interval $start \rightarrow end$

$$intervalSeconds = isoToUnixEpoch(end) - isoToUnixEpoch(start)$$

and resolves the numer of seconds corresponding to $unit$

$$unitSeconds = timeunit \rightarrow seconds(unit)$$

so that the interval can be converted from Seconds to $unit$

$$per = intervalSeconds/unitSeconds$$

and the rate can be calculated

$$rateOf(nOccurances, start, end, unit) \equiv nOccurances \div per$$

### 0.1.4 Usage of Operations

The Operations used within $rateOf$ convert from a String to a Integer

- $isoToUnixEpoch$ is used to convert

$$end \ \wedge start \to \mathbb{R}$$

- $timeunit \to seconds$ is used to convert

$$unit \to \mathbb{R}$$

The only other functionality required by $rateOf$ is supplied via basic arithmetic

### 0.1.5 Example output

Given an example $start$ and $end$

$$start = 2015 - 11 - 18T12 : 17 : 00Z$$

$$end = 2015 - 11 - 18T14 : 17 : 00Z$$

Then the Unix Epoch of each is

$$nStart = 1447849020$$

$$nEnd = 1447856220$$

Which provides an interval range (in seconds)

$$intervalSeconds = nEnd - nStart = 7200$$

which is divided by $timeunit \to seconds(unit)$ to derive per $unit$

$$per = 7200 \iff unit = second \Rightarrow 7200/1$$

$$per = 120 \iff unit = minute \Rightarrow 7200/60$$

$$per = 2 \iff unit = hour \Rightarrow 7200/3600$$

such that if

$$nOccurances = 10$$

and $unit = second$ then the output is 0.001389 occurances per second within $start \to end$

$$rateOf(nOccurances, start, end, second) \equiv 10/7200 \equiv 0.001389$$

and $unit = minute$ then the output is 0.0833 occurances per minute within $start \to end$

$$rateOf(nOccurances, start, end, minute) \equiv 10/120 \equiv 0.0833$$

and $unit = hour$ then the output is 5 occurances per hour within $start \to end$

$$rateOf(nOccurances, start, end, hour) \equiv 10/2 \equiv 5$$