# Syntax Summary

The table below shows some common condition expressions, grouped into categories. The complete condition syntax is in the Reference Guide in the RippleDown Help pages.

| Category | Expression | Description |
|---|---|---|
| arithmetic | **absolute value of** | Takes the absolute value of a number. |
| | **as integer** | Rounds a calculation to the nearest whole number. |
| | **+, -, *, /** | Sum, difference, product and ratio of two numbers. |
| | **to the power of** | Raises one number to the power of another. |
| | **ln** | Calculates the natural (base e) logarithm of a number. |
| | **log** | Calculates the logarithm (base 10) of a number. |
| | **exp** | Calculates e (euler's number) to the power of a number. |
| | **sum across episodes of** | The total value, across all episodes, of an attribute. |
| comparison | **<, <=, >, >=** | Compares two numerical values. |
| | **__ < __ < __ (between)** | Compares a value with two values at once. |
| statistical analysis | **max, min** | The maximum and minimum values for an attribute, amongst all episodes. |
| | **mean** | Average of the numerical values. |
| | **baseline mean of first … … values beginning … days ago** | Average of a "window" of values beginning sometime in the past. |
| | **standard deviation** | Standard deviation of the numerical values. |
| text analysis and manipulation | **is, is not, are, are not** | Compares text values, ignoring case. also compares numeric values for equality. |
| | **as one line** | Converts multi-line text to a single line |
| | **available** | Evaluates as true if there is a value present. |
| | **numeric** | Evaluates as true if the value is a number. |
| | **are all the same** | Identifies sample sequences that all have the same value. |
| | **has changed since last episode** | Identifies sample sequences in which there is a change between the current and second-last values. |
| | **contains, does not contain** | Analyses text strings for presence or absence of substrings (case insensitive). |
| | **starts with, ends with** | Identifies samples that start or end with a particular text fragment (case insensitive). |
| | **append** | Appends the text value of one attribute to another. |
| | **distinct values of** | Appends together the distinct text values across episodes of a single attribute to produce a comma separated, alphabetically ordered list. |
| | **list of … values** | Appends together the text values across episodes of a single attribute to produce a list separated by new lines. |

| Category | Expression | Description |
|---|---|---|
| | **text after** | Extracts the phrase after a matching phrase. |
| | **text before** | Extracts the phrase before a matching phrase. |
| | **part ... of ... split by** | For extracting elements from a list in which elements are separated by a fixed token. |
| | **text between** | Extracts the phrase between two phrases. |
| | **text of ... between ... and ...** | Extracts the phrase (substring, in IT terms) bounded by two positions in some text. |
| | **character of ... at position** | Extracts the symbol at a given position in a string of text. |
| | **first match in... of ...** | Extracts a phrase defined by a regular expression from some text. |
| | **first match in... of ... calculated per-episode** | Extracts a phrase defined by a regular expression from some text, with the regular expression itself a calculation. |
| | **matches** | Detects samples in which text matching a regular expression is found. |
| | **matches ... with case** | Same as **matches**, but case sensitive. |
| | **exactly matches** | Detects samples that exactly match a regular expression. |
| | **exactly matches ... with case** | Same as **exactly matches**, but case sensitive. |
| | **to upper case** | Re-writes some text in capitals so that it stands out in conclusions. |
| | **as word** | Converts small integers to the equivalent words. for use in comments. |
| | **as set** | Converts comma separated values of an attribute set. |
| reference range | **high, normal, low** | Compares sample values with their reference ranges from the external information system. |
| | **upper reference value of** | Refers to the upper value in a reference range provided by the external information system. |
| | **lower reference value of** | Refers to the lower value in a reference range provided by the external information system. |
| change since last result | **has increased by more than** | Identifies cases in which there has been an increase (absolute or percentage) for an attribute from the previously available value to the current value. |
| | **has decreased by more than** | Identifies cases in which there has been a decrease (absolute or percentage) for an attribute from the previously available value to the current value. |
| | **has changed by more than** | Identifies cases in which there has been an increase or decrease (absolute or percentage) for an attribute from the previously available value to the current value. |
| | **has not changed by more than** | Identifies cases in which the current value for an attribute is within some limit (absolute or percentage) of the previously available value for that attribute. |
| | **percent increase from previous** | Relative change between current and previous sample. |
| | **percent decrease from previous** | Relative change between current and previous sample. |
| trend | **has increased by more than x from each result to next** | For detection of cases in which the values for an attribute show a rising trend, over all results or over all results in a given time period. |
| | **has increased by more than x** | For detection of cases in which the values for an attribute show a rising trend over a |

| Category | Expression | Description |
|---|---|---|
| | **between each of last n results** | certain number of results. |
| | **has decreased by more than x from each result to next** | For detection of cases in which the values for an attribute show a falling trend, over all results or over all results in a given time period. |
| | **has decreased by more than x between each of last n results** | For detection of cases in which the values for an attribute show a falling trend over a certain number of results. |
| | **net change in** | Calculates the difference between the first and last samples for an attribute. |
| | **percent increase from min** | Relative change between current and minimum value. |
| | **percent decrease from max** | Relative change between current and maximum value. |
| | **differences between** | Differences between successive numerical episodes. |
| | **differences from first** | Differences between the numerical episodes and the first numerical episode. |
| | **differences from average** | Differences between the numerical episodes and the average of the numerical episodes. |
| | **differences from max** | Differences between the numerical episodes and the maximum value amongst the numerical episodes. |
| | **difference from min** | Differences between the numerical episodes and the minimum value amongst the numerical episodes. |
| | **as percentages** | Modifies the differences functions to give results as percentages. |
| | **rate of change** | Absolute or point-to-point daily or annual rate of change between selected episodes. |
| | **yearly rate of change by linear regression** | Annual linear rate of change according to the least-squares line of best fit. |
| counting | **all, each** | Identifies cases in which every episode satisfies a constraint. |
| | **some** | Identifies cases in which at least one episode satisfies a constraint. |
| | **at least, more than** | Identifies cases in which the number of episodes that satisfy a constraint is greater than some given number. |
| | **exactly** | Identifies cases in which the number of episodes that satisfy a constraint is equal to some given number. |
| | **at most, fewer than** | Identifies cases in which the number of episodes that satisfy a constraint is less than or equal to some given number. |
| | **no, none** | Identifies cases in which no episodes satisfy a constraint. |
| identifying a particular episode | **at** | Identifies a particular episode based on the values of an attribute. |
| | **first** | Refers to the first non-blank sample. |
| | **most recent** | Refers to the most recent non-blank sample. |
| | **second most recent** | Refers to the second most recent non-blank sample. |
| | **next** | Refers to the sample after the indicated one. |
| | **previous…to…** | Refers to the latest non-blank sample before the indicated one. |
| | **nearest** | Refers to the sample closest in time to the indicated one. |

| Category | Expression | Description |
|---|---|---|
| | **current** | Used to refer to the current episode in complex conditions. |
| time since an incident | **days since (weeks, months, years too)** | Identify cases in which no episodes satisfying a constraint have occurred recently. |
| | **days between (also minutes between, hours between, weeks between, years between)** | Compare the times of two significant events. |
| | **days between episodes** | Calculates the number of days between successive episodes. |
| | **has value of more recently than** | Compare the times at which two attributes have attained a particular value (e.g. "true"). |
| calendar calculations | **date at** | Determines the date of a particular sample and presents it in the form "21/Apr/05". |
| | **long date at** | Determines the date of a particular sample and presents it in the form "21 April, 2005". |
| | **day of** | Determines the day in the week of a particular sample. |
| | **minutes at** | Evaluates a sample as the number of minutes in the day after midnight. |
| | **days from now, months from now** | Calculates the date some days/months after the date of the most recent episode. |
| | **is after date** | Compares an attribute value with a fixed date in one of the two formats "21/apr/05" or "21 apr 05". |
| | **as days** | Used for finding the number of days between two sample values |
| | **minutes after epoch using format** | Used for finding the time between any two case values, in any format. |
| | **minutes difference between ... and ...** | Time in minutes between the values of two attributes. |
| | **days between episodes** | Calculates the days between each successive episode in the case |
| | **fractional days (years) between episodes** | Calculates the time between selected episodes. |
| | **fractional days (years) between first and subsequent episodes** | Calculates the time between the first episode and subsequent episodes. |
| | **today** | Today's date and time |
| formatting | **formatted to ... places** | Formats a numerical output to a fixed number of decimal places |
| | **formatted as ...** | Formats a numerical value according to some output pattern |
| | **as date** | Display the sample value as a readable date in the format dd mmm yy |
| | **as time** | Display the sample value as a readable time in the format hh:mm |
| | **as datetime** | Display the sample value as a readable time using a flexible date and time format |
| | **in format** | Display the date and time using a flexible date and time format |
| restriction clauses | **of latest ... values** | Restricts attention to the most recent episodes. |

| Category | Expression | Description |
|---|---|---|
| | **… episodes ago** | For getting a value from some previous episode |
| | **previous** | Restricts attention to the episodes before the current episode. |
| | **where** | Restricts attention to those episodes satisfying a constraint. |
| | **within last** | Restrict attention to recent episodes. |
| | **older than** | Restrict attention to older episodes. |
| | **after** | Restrict attention to episodes after some specified episode. |
| | **before** | Restrict attention to episodes before some specified episode. |
| logical operators | **and** | For combining conditions. evaluates to true if both conditions are true |
| | **or** | For combining conditions. evaluates to true if either condition is true |
| | **if...else** | For choosing which attribute's values to use, depending on some true or false condition. |
| | **whenever...otherwise** | For choosing between the samples of two attributes, on a per-episode basis. |
| sets | **{attributes}** | Returns all of the primary attributes in a case. |
| | **that equal** | Selects the attributes in a case that have a specified value |
| | **in range** | Defines a set as those attributes whose values are within a specified range |
| | **except** | Defines a set as those attributes in the first set but not in the second set (i.e. set difference) |
| | **intersect** | Defines a set as those attributes that are in both the first set and the second set (i.e.set intersection) |
| | **union** | Combines two sets into single set containing all elements from both sets (i.e. set union) |
| | **not in** | Same as 'except" |
| | **for, for current** | Selects a set subject to some condition. |
| | **for which, for which currently** | Selects the attributes from a set that satisfy a predicate that uses variable attributes. |
| | **in range ... for** | Defines a set with the 'in range' syntax, subject to some condition. |
| | **number of** | The number elements in a set. |
| | **sum of** | The sum of the values of the elements in a set. |
| | **includes, does not include** | Whether or not a set contains a particular attribute. |
| | **is empty, is not empty** | Whether or not a set contains any elements. |
| | **with some abnormal value** | Collects together those attributes that have had an abnormal value. |
| | **contains only high (low, normal) values** | Detects cases in which every attribute in a set has high, low or normal values. |
| | **contains only samples within … percent of normal** | Detects cases in which every attribute in a set has a normal value, to within some percentage tolerance. |

| Category | Expression | Description |
|---|---|---|
| | **as groups from** | Displays a group name for each attribute in the set, rather than the attribute name. |
| | **as names** | Displays just the names of the attributes in a set, rather than the names and values |
| miscellaneous | **cardiovascular event risk** | Calculates the probability of a patient having a heart attack. |
| | **flag** | Returns the flag field from a sample. |
| | **circular right shift of** | Re-arranges a sample sequence. |
| | **distance between ... and ...** | Calculates the distance between two points, given their latitude and longitude. |
| | **fill from** | Sets all episodes with the value from an attribute or constant. |

## Testing Syntax

The above syntax can be combined in many ways to generate powerful conditions. It When complex syntax is composed, special care is needed and the evaluation of the syntax should always be validated by searching for cases where this syntax is expected to apply and cases where the syntax has been applied. That is, evaluate for false positives and false negatives.

## "If…Else" or "Whenever…otherwise"

The two syntax "If…else" and "Whenever…otherwise" can seem to be almost the same to a new user. However, there is one key difference which influences the evaluations, particularly when used in a Calculated Value Attribute (CVA).

"If…else" will use the current episode to evaluate the condition used, and then display this evaluation into the CVA for each episode of the case. That is, the evaluation of the CVA in the current episode will be shown for the CVA in all previous episodes in the case.

"Whenever…otherwise" will evaluate each individual episode in the case for the condition used, and then display the individual evaluations into the CVA for each episode of the case. That is, the evaluation of the CVA is unique to each episode.

For Example:

| | Jan 17 | Feb 17 | Mar 17 | Apr 17 | May 17 |
|---|---|---|---|---|---|
| Sex | | F | M | | M |
| CVA1: 1 if sex is "M" else 2 | 1 | 1 | 1 | 1 | 1 |
| CVA2: 1 whenever sex is "M" otherwise 2 | 2 | 2 | 1 | 2 | 1 |

## "Previous" verses "Most Recent"

The two syntaxes "Previous" and "Most recent" can sometimes be mistakenly assumed to be the same but these syntaxes are very different.

When "Previous" is used, the syntax is looking at the episode directly before the current episode in the case, and will test the condition against that episode. That is, "previous" refers to the episode immediately before the current episode, whether there is a relevant attribute value for that episode or not.

When “Most recent” is used, the syntax will start looking back through all episodes to the first non-blank episode to test the condition. That is, “most recent” will refer to any episode within a case including the current episode.

## “AT” Syntax Evaluations

One combination of syntax where special care must be taken is in the combination of the “at” syntax when it is combined with “numeric/available”. Care is required as the “numeric/available” syntax evaluates in its own unique way and only episodes that have a numeric/available value are taken into consideration. That is, the use of “numeric/available” reduces the number of values in a sample sequence.

If the “numeric” or “available” syntax is combined with the “at” syntax, then the “numeric” or “available” syntax must be used on both sides of the “at” syntax.

For example, if a condition is needed to find the collection date of an episode for the second last numeric fasting glucose, then the condition syntax could be:

“Collection_Date where Fasting Glucose is numeric **at** second most recent Fasting Glucose is numeric”

Note that the “is numeric” is used on both sides of “at”.

The “at” syntax can also be completely substituted with “where” if the “numeric/available” is going to be used. So, the condition syntax above could also be written as:

“second most recent Collected _Date **where** Fasting Glucose is numeric”

Syntax such as: “Collection_Date **at** second most recent numeric Fasting Glucose” should not be used.

## When to use a “,” for the “where” restriction clause

If multiple conditions are to be used when using the “where” syntax to apply a restriction clause, then a “,” must be used to group the conditions together for the restriction. Let’s look at the example:

| | Range | Feb 17 | Mar 17 | Apr 17 | May 17 |
|---|---|---|---|---|---|
| ALT | < 55 | 48 | 62* | 65* | 41 |
| AST | < 45 | 17 | 25 | 31 | 19 |
| ALP | 30 - 110 | 95 | 132* | 121* | 108 |

The syntax “all ALT > 50 and all AST > 20 where ALP is high” may be expected to find the “Mar 17” and “Apr 17” episodes and evaluate as TRUE, but will actually evaluate as FALSE. This is because no “,” was used to group the conditions, hence, the syntax is evaluated as:

(all ALT > 50) and (all AST > 20 where ALP is high)

Even though the (all AST > 20 where ALP is high) is TRUE for “Mar 17” and “Apr 17”, the (all ALT > 50) is FALSE for the case (as “Feb 17” and “May 17” are < 50), so the complete condition is evaluated as FALSE.

However, the syntax “all ALT > 50 and all AST > 20, where ALP is high” will evaluate as TRUE. This is because the “,” groups the conditions together for the restriction and the syntax is evaluated as:

(all ALT > 50 and all AST > 20) where (ALP is high)

(all ALT > 50 and all AST > 20) now tests TRUE at all points where ALP is high in “Mar 17” and “Apr 17”.