

# Package ‘ruler’

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**Title** Tidy Data Validation Reports

**Version** 0.1.4

**Description** Tools for creating data validation pipelines and tidy reports. This package offers a framework for exploring and validating data frame like objects using 'dplyr' grammar of data manipulation.

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ruler-package	<i>ruler: Rule Your Data</i>
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## Description

ruler offers a set of tools for creating tidy data validation reports using [dplyr](#) grammar of data manipulation. It is designed to be flexible and extendable in terms of creating rules and using their output.

## Details

The common workflow is:

- Define dplyr-style [packs](#) of rules for basic data units (data, group, column, row, cell) to obey.
- [Expose](#) some data to those rules. The result is the same data with possibly created [exposure](#) attribute. Exposure contains information [about applied packs](#) and [tidy data validation report](#).
- Use data and exposure to perform some [actions](#): [assert about rule breakers](#), impute data, remove outliers and so on.

To learn more about ruler browse vignettes with `browseVignettes(package = "ruler")`. The preferred order is:

1. Design process and exposure format.
2. Rule packs.
3. Validation

## Author(s)

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## See Also

Useful links:

- <https://echasnovski.github.io/ruler/>
- <https://github.com/echasnovski/ruler>
- Report bugs at <https://github.com/echasnovski/ruler/issues>

---

act\_after\_exposure      *Act after exposure*

---

## Description

A wrapper for consistent application of some actions based on the data after exposure.

## Usage

```
act_after_exposure(.tbl, .trigger, .actor)
```

## Arguments

<code>.tbl</code>	Result of <code>exposure</code> , i.e. data frame with <code>exposure</code> attribute.
<code>.trigger</code>	Function which takes <code>.tbl</code> as argument and returns TRUE if some action needs to be performed.
<code>.actor</code>	Function which takes <code>.tbl</code> as argument and performs the action.

## Details

Basically `act_after_exposure()` is doing the following:

- Check that `.tbl` has a proper `exposure` attribute.
- Compute whether to perform intended action by computing `.trigger(.tbl)`.
- If trigger results in TRUE then `.actor(.tbl)` **is returned**. In other case `.tbl` is returned.

It is a good idea that `.actor` should be doing one of two things:

- Making side effects. For example throwing an error (if condition in `.trigger` is met), printing some information and so on. In this case it should return `.tbl` to be used properly inside a [pipe](#).
- Changing `.tbl` based on exposure information. In this case it should return the imputed version of `.tbl`.

## See Also

[any\\_breaker](#) for trigger which returns TRUE in case any rule breaker is found in exposure.

[assert\\_any\\_breaker](#) for usage of `act_after_exposure()` in building data validation pipelines.

**Examples**

```

exposure_printer <- function(.tbl) {print(get_exposure(.tbl)); .tbl}
mtcars_exposed <- mtcars %>%
  expose(data_packs(. %>% dplyr::summarise(nrow_low = nrow(.) > 50))) %>%
  act_after_exposure(any_breaker, exposure_printer)

```

---

any_breaker	<i>Is there any breaker in exposure?</i>
-------------	--

---

**Description**

Function designed to be used as trigger in `act_after_exposure()`. Returns TRUE if `exposure` attribute of `.tbl` has any information about data units not obeying the rules, i.e. rule breakers.

**Usage**

```
any_breaker(.tbl)
```

**Arguments**

`.tbl` Result of `exposure`, i.e. data frame with `exposure` attribute.

**See Also**

[assert\\_any\\_breaker](#) for implicit usage of `any_breaker()`.

**Examples**

```

mtcars %>%
  expose(data_packs(. %>% dplyr::summarise(nrow_low = nrow(.) > 50))) %>%
  any_breaker()

```

---

assert_any_breaker	<i>Assert presence of rule breaker</i>
--------------------	--

---

**Description**

Function to assert if `exposure` resulted in `detecting` some rule breakers.

**Usage**

```
assert_any_breaker(.tbl, .type = "error", .silent = FALSE, ...)
```

**Arguments**

.tbl	Result of <a href="#">exposure</a> , i.e. data frame with <a href="#">exposure</a> attribute.
.type	The type of assertion. Can be only one of "error", "warning" or "message".
.silent	If TRUE no printing of rule breaker information is done.
...	Arguments for printing rule breaker information.

**Details**

In case breaker presence this function does the following:

- In case .silent is FALSE print rows from exposure [report](#) corresponding to rule breakers.
- Make assertion of the chosen .type about breaker presence in exposure.
- Return .tbl (for using inside a [pipe](#)).

If there are no breakers only .tbl is returned.

**See Also**

[any\\_breaker](#) for checking of breaker presence in exposure result.

[act\\_after\\_exposure](#) for making general actions based in exposure result.

**Examples**

```
## Not run:
mtcars %>%
  expose(data_packs(. %>% dplyr::summarise(nrow_low = nrow(.) > 50))) %>%
  assert_any_breaker()

## End(Not run)
```

---

bind\_exposures

*Bind exposures*


---

**Description**

Function to bind several exposures into one.

**Usage**

```
bind_exposures(..., .validate_output = TRUE)
```

**Arguments**

...	Exposures to bind.
.validate_output	Whether to validate with <a href="#">is_exposure()</a> if the output is exposure.

## Details

**Note** that the output doesn't have names in list-column fun in [packs info](#).

## Examples

```
my_data_packs <- data_packs(
  data_dims = . %>% dplyr::summarise(nrow_low = nrow(.) < 10),
  data_sum = . %>% dplyr::summarise(sum = sum(.) < 1000)
)

ref_exposure <- mtcars %>% expose(my_data_packs) %>% get_exposure()

exposure_1 <- mtcars %>% expose(my_data_packs[1]) %>% get_exposure()
exposure_2 <- mtcars %>% expose(my_data_packs[2]) %>% get_exposure()
exposure_binded <- bind_exposures(exposure_1, exposure_2)

exposure_pipe <- mtcars %>%
  expose(my_data_packs[1]) %>% expose(my_data_packs[2]) %>%
  get_exposure()

identical(exposure_binded, ref_exposure)

identical(exposure_pipe, ref_exposure)
```

---

cell-pack

*Cell rule pack*

---

## Description

Cell rule pack is a [rule pack](#) which defines a set of rules for cells, i.e. functions which convert cells of interest to logical values. It should return a data frame with the following properties:

- Number of rows equals to **number of rows for checked cells**.
- Column names should be treated as concatenation of '**column name of check cell**' + '**separator**' + '**rule name**'
- Values indicate whether the **cell** follows the rule.

## Details

This format is inspired by [scoped variants of transmute\(\)](#).

The most common way to define cell pack is by creating a [functional sequence](#) containing one of:

- `transmute_all(.funs = rules(...))`.
- `transmute_if(.predicate, .funs = rules(...))`.
- `transmute_at(.vars, .funs = rules(...))`.

**Note** that (as of dplyr version 0.7.4) when only one column is transmuted, names of the output don't have a necessary structure. The 'column name of check cell' is missing which results (after [exposure](#)) into empty string in var column of [validation report](#). The current way of dealing with this is to name the input column (see examples).

### Using rules()

Using [rules\(\)](#) instead of [funs\(\)](#) is recommended because:

- It is a convenient way to ensure consistent naming of rules without manual name.
- It adds a common prefix to all rule names. This helps in defining separator as prefix surrounded by any number of non-alphanumeric values.

### Note about rearranging rows

**Note** that during exposure packs are applied to [keyed object](#) with [id key](#). So they can rearrange rows as long as it is done with [functions supported by keyholder](#). Rows will be tracked and recognized as in the original data frame of interest.

### See Also

[Data pack](#), [group pack](#), [column pack](#), [row pack](#).

### Examples

```
cell_outlier_rules <- . %>% dplyr::transmute_at(
  c("disp", "qsec"),
  rules(z_score = abs(. - mean(.)) / sd(.) > 1)
)

cell_packs(outlier = cell_outlier_rules)

# Dealing with one column edge case
improper_pack <- . %>% dplyr::transmute_at(
  dplyr::vars(vs),
  rules(improper_is_neg = . < 0)
)

proper_pack <- . %>% dplyr::transmute_at(
  dplyr::vars(vs = vs),
  rules(proper_is_neg = . < 0)
)

mtcars[1:2, ] %>%
  expose(cell_packs(improper_pack, proper_pack)) %>%
  get_report()
```

---

column-pack

*Column rule pack*

---

## Description

Column rule pack is a [rule pack](#) which defines a set of rules for columns as a whole, i.e. functions which convert columns of interest to logical values. It should return a data frame with the following properties:

- Number of rows equals to **one**.
- Column names should be treated as concatenation of '**check column name**' + '**separator**' + '**rule name**'.
- Values indicate whether the **column as a whole** follows the rule.

## Details

This format is inspired by dplyr's [scoped variants of summarise\(\)](#) applied to non-grouped data.

The most common way to define column pack is by creating a [functional sequence](#) with no grouping and ending with one of:

- `summarise_all(.funs = rules(...))`.
- `summarise_if(.predicate, .funs = rules(...))`.
- `summarise_at(.vars, .funs = rules(...))`.

**Note** that (as of dplyr version 0.7.4) when only one column is summarised, names of the output don't have a necessary structure. The 'check column name' is missing which results (after [exposure](#)) into empty string in var column of [validation report](#). The current way of dealing with this is to name the input column (see examples).

## Using rules()

Using `rules()` instead of `funs()` is recommended because:

- It is a convenient way to ensure consistent naming of rules without manual name.
- It adds a common prefix to all rule names. This helps in defining separator as prefix surrounded by any number of non-alphanumeric values.

## See Also

[Data pack](#), [group pack](#), [row pack](#), [cell pack](#).



## Examples

```
# Validating present columns
numeric_column_rules <- . %>% dplyr::summarise_if(
  is.numeric,
  rules(mean(.) > 5, sd(.) < 10)
)
character_column_rules <- . %>% dplyr::summarise_if(
  is.character,
  rules(. %in% letters[1:4])
)

col_packs(
  num_col = numeric_column_rules,
  chr_col = character_column_rules
)

# Dealing with one column edge case
improper_pack <- . %>% dplyr::summarise_at(
  dplyr::vars(vs),
  rules(improper_is_chr = is.character)
)

proper_pack <- . %>% dplyr::summarise_at(
  dplyr::vars(vs = vs),
  rules(proper_is_chr = is.character)
)

mtcars %>%
  expose(col_packs(improper_pack, proper_pack)) %>%
  get_report()
```

---

 data-pack

*Data rule pack*


---

## Description

Data rule pack is a [rule pack](#) which defines a set of rules for data as a whole, i.e. functions which convert data to logical values. It should return a data frame with the following properties:

- Number of rows equals to **one**.
- Column names should be treated as **rule names**.
- Values indicate whether the **data as a whole** follows the rule.

## Details

This format is inspired by dplyr's [summarise\(\)](#) applied to non-grouped data.

The most common way to define data pack is by creating a [functional sequence](#) with no grouping and ending with `summarise(...)`.

**See Also**

[Group pack](#), [Column pack](#), [row pack](#), [cell pack](#).

**Examples**

```
data_dims_rules <- . %>%
  dplyr::summarise(nrow_low = nrow(.) > 10,
                  nrow_up = nrow(.) < 20,
                  ncol_low = ncol(.) > 5,
                  ncol_up = ncol(.) < 10)
data_na_rules <- . %>%
  dplyr::summarise(all_not_na = Negate(anyNA)(.))

data_packs(
  data_nrow = data_dims_rules,
  data_na = data_na_rules
)
```

---

expose

*Expose data to rule packs*

---

**Description**

Function for applying rule packs to data.

**Usage**

```
expose(.tbl, ..., .rule_sep = inside_punct("\\._\\"),
       .remove_obeyers = TRUE, .guess = TRUE)
```

**Arguments**

<code>.tbl</code>	Data frame of interest.
<code>...</code>	Rule packs. They can be in pure form or inside a list (at any depth).
<code>.rule_sep</code>	Regular expression used as separator between column and rule names in <a href="#">col packs</a> and <a href="#">cell packs</a> .
<code>.remove_obeyers</code>	Whether to remove elements which obey rules from report.
<code>.guess</code>	Whether to guess type of unsupported rule pack type (see Details).

## Details

`expose()` applies all supplied rule packs to data, creates an `exposure` object based on results and stores it to attribute `'exposure'`. It is guaranteed that `.tbl` is not modified in any other way in order to use `expose()` inside a `pipe`.

It is a good idea to name all rule packs: explicitly in `...` (if they are supplied not inside list) or during creation with respective rule pack function. In case of missing name it is imputed based on possibly existing exposure attribute in `.tbl` and supplied rule packs. Imputation is similar to one in `rules()` but applied to every pack type separately.

Default value for `.rule_sep` is the regular expression characters `._` surrounded by non alphanumeric characters. It is picked to be used smoothly with `dplyr`'s `scoped verbs` and `rules()` instead of `funs()`. In most cases it shouldn't be changed but if needed it should align with `.prefix` in `rules()`.

## Value

A `.tbl` with possibly added `'exposure'` attribute containing the resulting `exposure`. If `.tbl` already contains `'exposure'` attribute then the result is binded with it.

## Guessing

To work properly in some edge cases one should specify pack types with `appropriate function`. However with `.guess` equals to `TRUE` `expose` will guess the pack type based on its output after applying to `.tbl`. It uses the following features:

- Presence of non-logical columns: if present then the guess is `group pack`. Grouping columns are guessed as all non-logical. This works incorrectly if some grouping column is logical: it will be guessed as result of applying the rule. **Note** that on most occasions this edge case will produce error about grouping columns define non-unique levels.
- Combination of whether number of rows equals 1 (`n_rows_one`) and presence of `.rule_sep` in all column names (`all_contain_sep`). Guesses are:
  - `Data pack` if `n_rows_one == TRUE` and `all_contain_sep == FALSE`.
  - `Column pack` if `n_rows_one == TRUE` and `all_contain_sep == TRUE`.
  - `Row pack` if `n_rows_one == FALSE` and `all_contain_sep == FALSE`. This works incorrectly if output has one row which is checked. In this case it will be guessed as data pack.
  - `Cell pack` if `n_rows_one == FALSE` and `all_contain_sep == TRUE`. This works incorrectly if output has one row in which cells are checked. In this case it will be guessed as column pack.

## Examples

```
my_rule_pack <- . %>% dplyr::summarise(nrow_neg = nrow(.) < 0)
my_data_packs <- data_packs(my_data_pack_1 = my_rule_pack)

# These pipes give identical results
mtcars %>% expose(my_data_packs) %>% get_report()

mtcars %>% expose(my_data_pack_1 = my_rule_pack) %>% get_report()
```

```

# This throws an error because no pack type is specified for my_rule_pack
## Not run:
  mtcars %>% expose(my_data_pack_1 = my_rule_pack, .guess = FALSE)

## End(Not run)

# Edge cases against using 'guess = TRUE' for robust code
group_rule_pack <- . %>% dplyr::mutate(vs_one = vs == 1) %>%
  dplyr::group_by(vs_one, am) %>%
  dplyr::summarise(n_low = dplyr::n() > 10)
group_rule_pack_dummy <- . %>% dplyr::mutate(vs_one = vs == 1) %>%
  dplyr::group_by(mpg, vs_one, wt) %>%
  dplyr::summarise(n_low = dplyr::n() > 10)
row_rule_pack <- . %>% dplyr::transmute(neg_row_sum = rowSums(.) < 0)
cell_rule_pack <- . %>% dplyr::transmute_all(rules(neg_value = . < 0))

# Only column 'am' is guessed as grouping which defines non-unique levels.
## Not run:
  mtcars %>%
    expose(group_rule_pack, .remove_obeyers = FALSE, .guess = TRUE) %>%
    get_report()

## End(Not run)

# Values in `var` should contain combination of three grouping columns but
# column 'vs_one' is guessed as rule. No error is thrown because the guessed
# grouping column define unique levels.
mtcars %>%
  expose(group_rule_pack_dummy, .remove_obeyers = FALSE, .guess = TRUE) %>%
  get_report()

# Results should have in column 'id' value 1 and not 0.
mtcars %>% dplyr::slice(1) %>% expose(row_rule_pack) %>% get_report()

mtcars %>% dplyr::slice(1) %>% expose(cell_rule_pack) %>% get_report()

```

---

 exposure

*Exposure*


---

## Description

Exposure is a result of [exposing](#) data to rules. It is implemented with S3 class `exposure` which is a list of the following structure: `packs_info` - a [packs\\_info](#) object; `report` - [tidy data validation report](#).

## Usage

```
is_exposure(.x)
```

```
get_exposure(.object)
```

```
remove_exposure(.object)
```

### Arguments

```
.x           Object to test.
.object      Object to get or remove exposure attribute from.
```

### Value

get\_exposure() returns object if it is exposure and its attribute 'exposure' otherwise.

remove\_exposure() returns object with removed attributed 'exposure'.

### Examples

```
my_col_packs <- col_packs(
  col_sum_props = . %>% dplyr::summarise_all(
    rules(
      col_sum_low = sum(.) > 100,
      col_sum_high = sum(.) < 1000
    )
  )
)
mtcars_exposed <- mtcars %>% expose(my_col_packs)
mtcars_exposure <- mtcars_exposed %>% get_exposure()

is_exposure(mtcars_exposure)

identical(remove_exposure(mtcars_exposed), mtcars)

identical(get_exposure(mtcars_exposure), mtcars_exposure)
```

---

group-pack

*Group rule pack*

---

### Description

Group rule pack is a [rule pack](#) which defines a set of rules for groups of rows as a whole, i.e. functions which convert groups of interest to logical values. It should return a data frame with the following properties:

- There should be present some columns which combined values **uniquely** describe group. They should be defined during creation with [group\\_packs\(\)](#).
- Number of rows equals to **number of checked groups**.
- Names of non-grouping columns should be treated as **rule names**.
- Values indicate whether the **group as a whole** follows the rule.

**Details**

This format is inspired by dplyr's `summarise()` applied to grouped data.

The most common way to define data pack is by creating a [functional sequence](#) with grouping and ending with `summarise(...)`.

**Interpretation**

Group pack output is interpreted in the following way:

- All grouping columns are [united](#) with delimiter `.group_sep` (which is an argument of `group_packs()`).
- Levels of the resulting column are treated as names of some new variables which should be exposed as a whole. Names of non-grouping columns are treated as rule names. They are transformed in [column pack](#) format and interpreted accordingly.

Exposure result of group pack is different from others in a way that column var in [exposure report](#) doesn't represent the actual column in data.

**See Also**

[Data pack](#), [Column pack](#), [row pack](#), [cell pack](#).

**Examples**

```
vs_am_rules <- . %>%
  dplyr::group_by(vs, am) %>%
  dplyr::summarise(nrow_low = n(.) > 10,
                  nrow_up = n(.) < 20,
                  rowmeans_low = rowMeans(.) > 19)

group_packs(vs_am = vs_am_rules, .group_vars = c("vs", "am"))
```

---

inside\_punct

*Inside punctuation regular expression*


---

**Description**

Function to construct regular expression of form: 'non alpha-numeric characters' + 'some characters' + 'non alpha-numeric characters'.

**Usage**

```
inside_punct(.x = "\\._\\.")
```

**Arguments**

`.x` Middle characters to be put between non alpha-numeric characters.

**Examples**

```
inside_punct()
inside_punct("abc")
```

---

packs_info	<i>Packs info</i>
------------	-------------------

---

**Description**

An S3 class `packs_info` to represent information about packs in `exposure`. It is a tibble with the following structure:

- **name** <chr> : Name of the pack.
- **type** <chr> : [Pack type](#).
- **fun** <list> : List (preferably unnamed) of rule pack functions.
- **remove\_obeyers** <lgl> : value of `.remove_obeyers` argument of `expose()` with which pack was applied.

**Usage**

```
is_packs_info(.x, .skip_class = FALSE)
get_packs_info(.object)
```

**Arguments**

<code>.x</code>	Object to test.
<code>.skip_class</code>	Whether to skip checking inheritance from <code>packs_info</code> .
<code>.object</code>	Object to get <code>packs_info</code> value from <code>exposure</code> attribute.

**Details**

To avoid possible confusion it is preferred (but not required) that list-column `fun` doesn't have names. Names of packs are stored in `name` column. During `exposure` `fun` is always created without names.

**Value**

`get_packs_info()` returns `packs_info` attribute of `object` if it is `exposure` and of its `'exposure'` attribute otherwise.

## Examples

```
my_row_packs <- row_packs(
  row_mean_props = . %>% dplyr::transmute(row_mean = rowMeans(.)) %>%
    dplyr::transmute(
      row_mean_low = row_mean > 20,
      row_mean_high = row_mean < 60
    ),
  row_outlier = . %>% dplyr::transmute(row_sum = rowSums(.)) %>%
    dplyr::transmute(
      not_row_outlier = abs(row_sum - mean(row_sum)) / sd(row_sum) < 1.5
    )
)
my_data_packs <- data_packs(
  data_dims = . %>% dplyr::summarise(nrow = nrow(.) == 32,
                                    ncol = ncol(.) == 5)
)

mtcars_exposed <- mtcars %>%
  expose(my_data_packs, .remove_obeyers = FALSE) %>%
  expose(my_row_packs)

mtcars_exposed %>% get_packs_info()

mtcars_exposed %>% get_packs_info() %>% is_packs_info()
```

---

 row-pack

*Row rule pack*


---

## Description

Row rule pack is a [rule pack](#) which defines a set of rules for rows as a whole, i.e. functions which convert rows of interest to logical values. It should return a data frame with the following properties:

- Number of rows equals to **number of checked rows**.
- Column names should be treated as **rule names**.
- Values indicate whether the **row as a whole** follows the rule.

## Details

This format is inspired by dplyr's [transmute\(\)](#).

The most common way to define row pack is by creating a [functional sequence](#) containing `transmute(...)`.

## Note about rearranging rows

**Note** that during exposure packs are applied to [keyed object](#) with [id key](#). So they can rearrange rows as long as it is done with [functions supported by keyholder](#). Rows will be tracked and recognized as in the original data frame of interest.



**See Also**

[Data pack](#), [group pack](#), [column pack](#), [cell pack](#).

**Examples**

```
some_row_mean_rules <- . %>% dplyr::slice(1:3) %>%
  dplyr::mutate(row_mean = rowMeans(.)) %>%
  dplyr::transmute(
    row_mean_low = row_mean > 10,
    row_mean_up = row_mean < 20
  )
all_row_sum_rules <- . %>% dplyr::mutate(row_sum = rowSums(.)) %>%
  dplyr::transmute(row_sum_low = row_sum > 30)

row_packs(
  some_row_mean_rules,
  all_row_sum_rules
)
```

---

 rule-packs

*Create rule packs*


---

**Description**

Functions for creating different kinds of rule packs. **Rule** is a function which converts data unit of interest (data, group, column, row, cell) to logical value indicating whether this object satisfies certain condition. **Rule pack** is a function which combines several rules into one functional block. It takes a data frame of interest and returns a data frame with certain structure and column naming scheme. Types of packs differ in interpretation of their output.

**Usage**

```
data_packs(...)

group_packs(..., .group_vars, .group_sep = ".")

col_packs(...)

row_packs(...)

cell_packs(...)
```

**Arguments**

... Functions which define packs. They can be in pure form or inside a list (at any depth).

.group\_vars Character vector of names of grouping variables.

`.group_sep` String to be used as separator when uniting grouping levels for `var` column in [exposure report](#).

### Details

These functions convert `...` to list, apply `rlang`'s [squash\(\)](#) and add appropriate classes (`group_packs()` also adds necessary attributes). Also they are only constructors and do not check for validity of certain pack. **Note** that it is allowed for elements of `...` to not have names: they will be computed during exposure. However it is a good idea to manually name packs.

### Value

`data_packs()` returns a list of what should be [data rule packs](#), `group_packs()` - [group rule packs](#), `col_packs()` - [column rule packs](#), `row_packs()` - [row rule packs](#), `cell_packs()` - [cell rule packs](#).

---

ruler-report	<i>Tidy data validation report</i>
--------------	------------------------------------

---

### Description

A tibble representing the data validation result of certain data units in tidy way:

- **pack** <chr> : Name of rule pack from column 'name' of corresponding [packs\\_info](#) object.
- **rule** <chr> : Name of the rule defined in rule pack.
- **var** <chr> : Name of the variable which validation result is reported. Value 'all' is reserved and interpreted as 'all columns as a whole'. **Note** that `var` doesn't always represent the actual column in data frame (see [group packs](#)).
- **id** <int> : Index of the row in tested data frame which validation result is reported. Value 0 is reserved and interpreted as 'all rows as a whole'.
- **value** <lgf> : Whether the described data unit obeys the rule.

### Usage

```
is_report(.x, .skip_class = FALSE)
```

```
get_report(.object)
```

### Arguments

`.x` Object to test.

`.skip_class` Whether to skip checking inheritance from `ruler_report`.

`.object` Object to get report value from exposure attribute.

## Details

There are four basic combinations of `var` and `id` values which define five basic data units:

- `var == '.all'` and `id == 0`: Data as a whole.
- `var != '.all'` and `id == 0`: Group (`var` shouldn't be an actual column name) or column (`var` should be an actual column name) as a whole.
- `var == '.all'` and `id != 0`: Row as a whole.
- `var != '.all'` and `id != 0`: Described cell.

## Value

`get_report()` returns report element of object if it is exposure and of its 'exposure' attribute otherwise.

## Examples

```
my_row_packs <- row_packs(
  row_mean_props = . %>% dplyr::transmute(row_mean = rowMeans(.)) %>%
    dplyr::transmute(
      row_mean_low = row_mean > 20,
      row_mean_high = row_mean < 60
    ),
  row_outlier = . %>% dplyr::transmute(row_sum = rowSums(.)) %>%
    dplyr::transmute(
      not_row_outlier = abs(row_sum - mean(row_sum)) / sd(row_sum) < 1.5
    )
)
my_data_packs <- data_packs(
  data_dims = . %>% dplyr::summarise(nrow = nrow(.) == 32,
                                   ncol = ncol(.) == 5)
)

mtcars_exposed <- mtcars %>%
  expose(my_data_packs, .remove_obeyers = FALSE) %>%
  expose(my_row_packs)

mtcars_exposed %>% get_report()

mtcars_exposed %>% get_report() %>% is_report()
```

---

rules

*Create a list of rules*

---

## Description

`rules()` is a wrapper for `dplyr`'s [funcs](#) which provides a different naming scheme.

**Usage**

```
rules(..., .args = list(), .prefix = "...")
```

**Arguments**

`...` A list of functions (as in [funs](#)).

`.args` A named list of additional arguments to be added to all function calls (as in [funs](#)).

`.prefix` Prefix to be added to function names.

**Details**

`rules()` behaves exactly as `funs()` with only difference being the names of the output. The following naming scheme is applied:

- Absent names are replaced with the 'rule..{ind}' where {ind} is the index of function position in the ... .
- `.prefix` is added at the beginning of all names. The default is `...` . It is picked for its symbolism (it is the Morse code of letter 'R') and rare occurrence in names. In those rare cases it can be manually changed but this will not be tracked further.

**Examples**

```
rules_1 <- rules(mean, sd, .args = list(na.rm = TRUE))
rules_1_ref <- dplyr::funs('...rule..1' = mean, '...rule..2' = sd,
  .args = list(na.rm = TRUE))
identical(rules_1, rules_1_ref)

rules_2 <- rules(mean, sd = sd, "var")
rules_2_ref <- dplyr::funs(
  '...rule..1' = mean,
  '...sd' = sd,
  '...rule..3' = "var"
)
identical(rules_2, rules_2_ref)

rules_3 <- rules(mean, .prefix = "__")
rules_3_ref <- dplyr::funs('__rule..1' = mean)
identical(rules_3, rules_3_ref)
```

---

 spread\_groups

*Spread grouping columns*


---

**Description**

Function that is used during interpretation of [group pack](#) output. It converts grouped [summary](#) into [column pack](#) format.

**Usage**

```
spread_groups(.tbl, ..., .group_sep = ".", .col_sep = "...")
```

**Arguments**

<code>.tbl</code>	Data frame with result of grouped summary.
<code>...</code>	A selection of grouping columns (as in <code>tidyr::unite()</code> ).
<code>.group_sep</code>	A string to be used as separator of grouping levels.
<code>.col_sep</code>	A string to be used as separator in column pack.

**Details**

Multiple grouping variables are converted to one with `tidyr::unite()` and separator `.group_sep`. New values are then treated as variable names which should be validated and which represent the group data as a whole.

**Value**

A data frame in [column pack](#) format.

**Examples**

```
mtcars_grouped_summary <- mtcars %>%  
  dplyr::group_by(vs, am) %>%  
  dplyr::summarise(n_low = dplyr::n() > 6, n_high = dplyr::n() < 10)  
  
spread_groups(mtcars_grouped_summary, vs, am)  
  
spread_groups(mtcars_grouped_summary, vs, am, .group_sep = "__")  
  
spread_groups(mtcars_grouped_summary, vs, am, .col_sep = "__")
```

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