Validating Data Tables With the **pointblank** Package

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The Goals of the pointblank Package

MAIN WORKFLOWS

You really need to understand and get on top of your **data quality**.

You need to **check your data** before it proceeds further down a pipeline.

SECONDARY WORKFLOWS

You should validate your data tables in your **unit tests**.

You can test your data tables and get **logical values**.

DESIGN CONSIDERATIONS

Work with **local tables** and **database tables** with minimal changes in the API.

Provide extra tools for **understanding** new local and remote datasets.

Have reporting outputs translated to multiple **spoken languages**.
EN ▪ FR ▪ DE ▪ IT ▪ ES

Focus much attention on making the package **docs and examples** the best they can be.

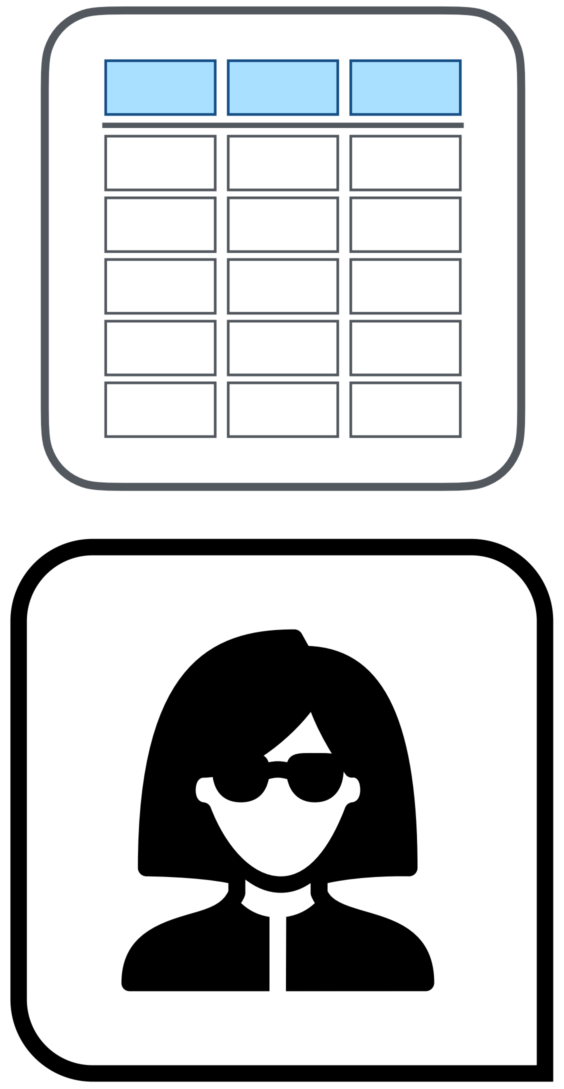
The **pointblank** Data Quality Workflow

`create_agent()`

The **agent** is an integral part of the **data quality workflow**.

The pointblank Data Quality Workflow

The **agent** is given the **target table**…



`create_agent()`

The **agent** is an integral part of the **data quality workflow**.

The pointblank Data Quality Workflow

The **agent** is given the **target table**…

`actions`

`end_fns`

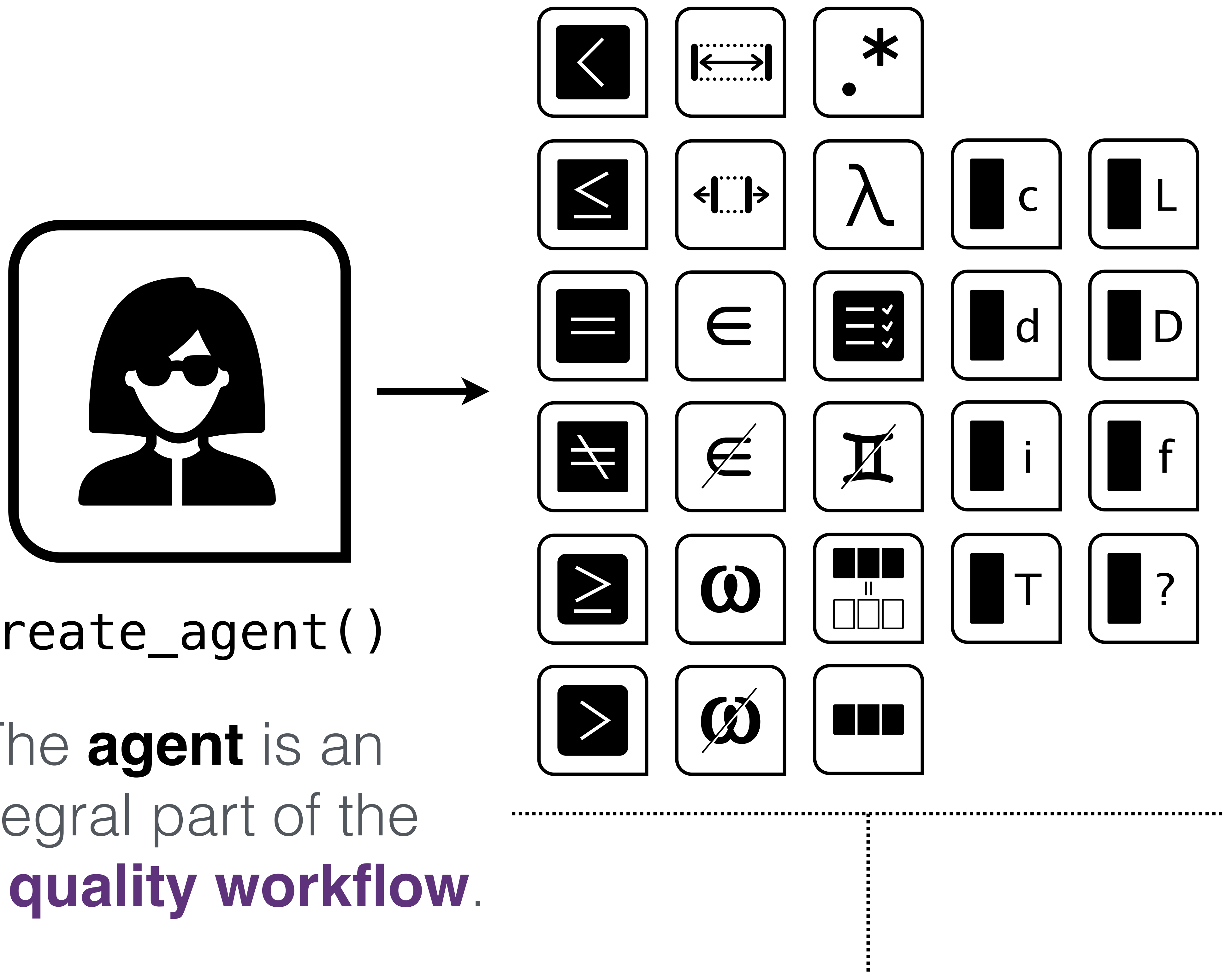
`lang`

…and some directives on interrogation.

`create_agent()`

The **agent** is an integral part of the **data quality workflow**.

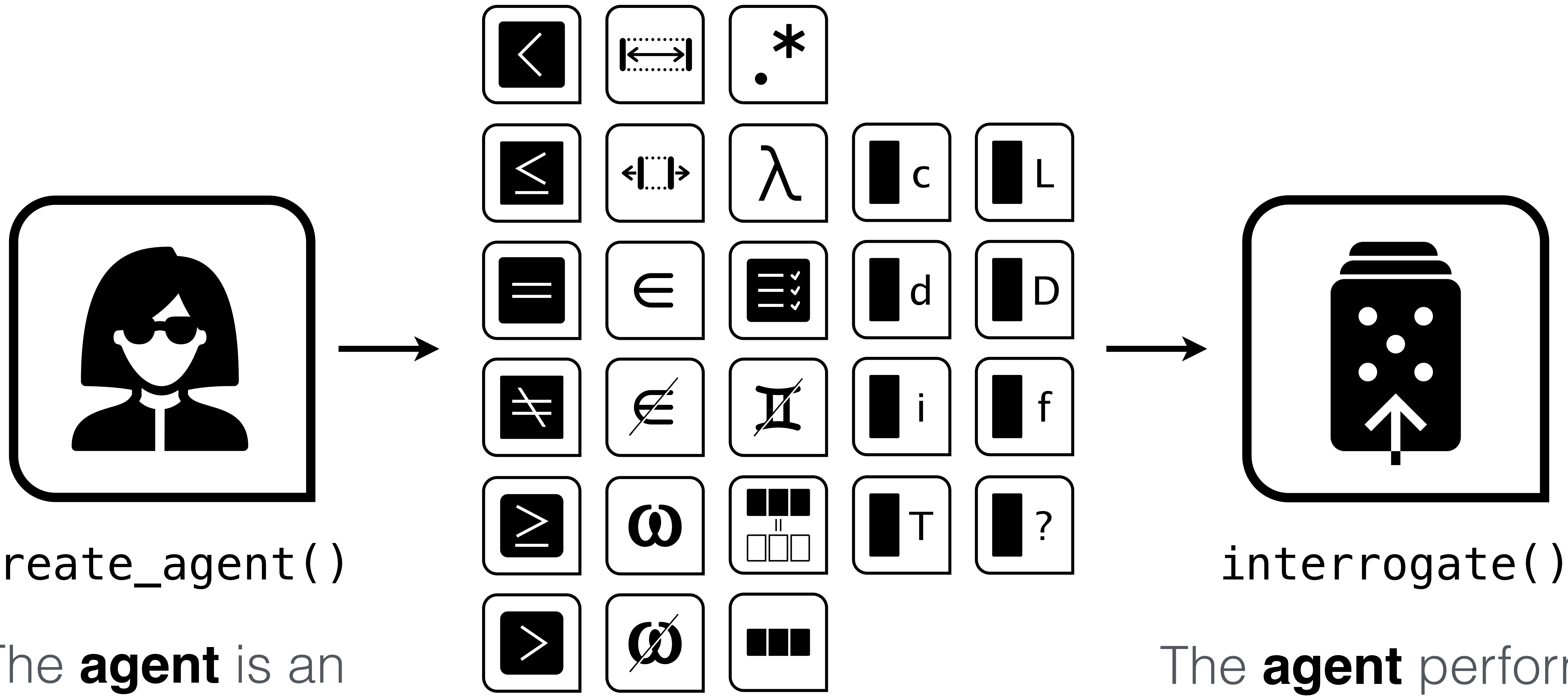
The pointblank Data Quality Workflow



The **agent** is an integral part of the **data quality workflow**.

Use functions to generate a **validation plan**.

The pointblank Data Quality Workflow

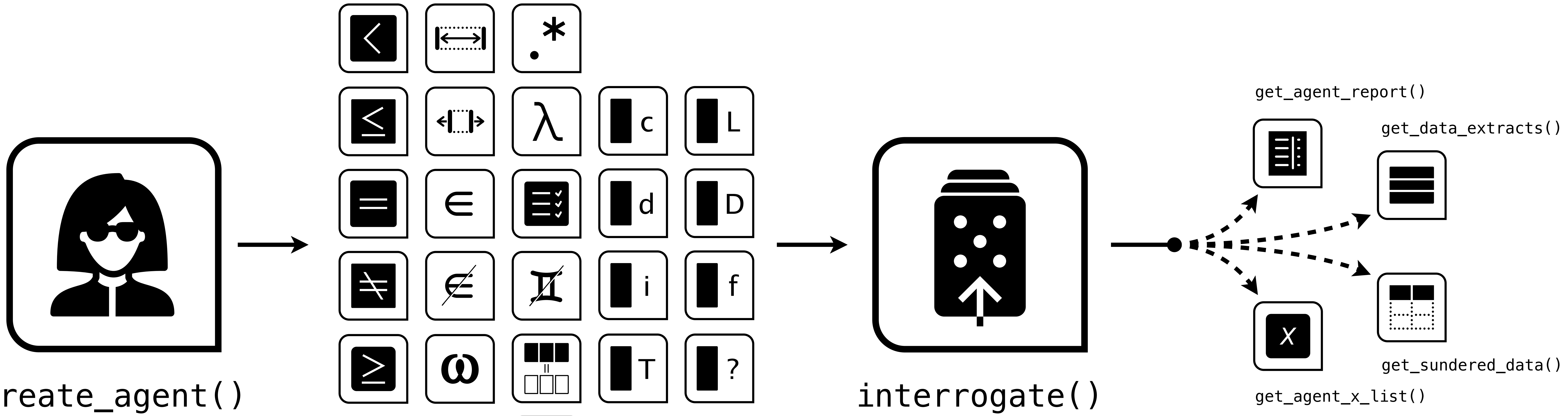


The **agent** is an integral part of the **data quality workflow**.

Use functions to generate a **validation plan**.

The **agent** performs the **interrogation**. Gathers **intel**.

The pointblank Data Quality Workflow



The **agent** is an integral part of the **data quality workflow**.

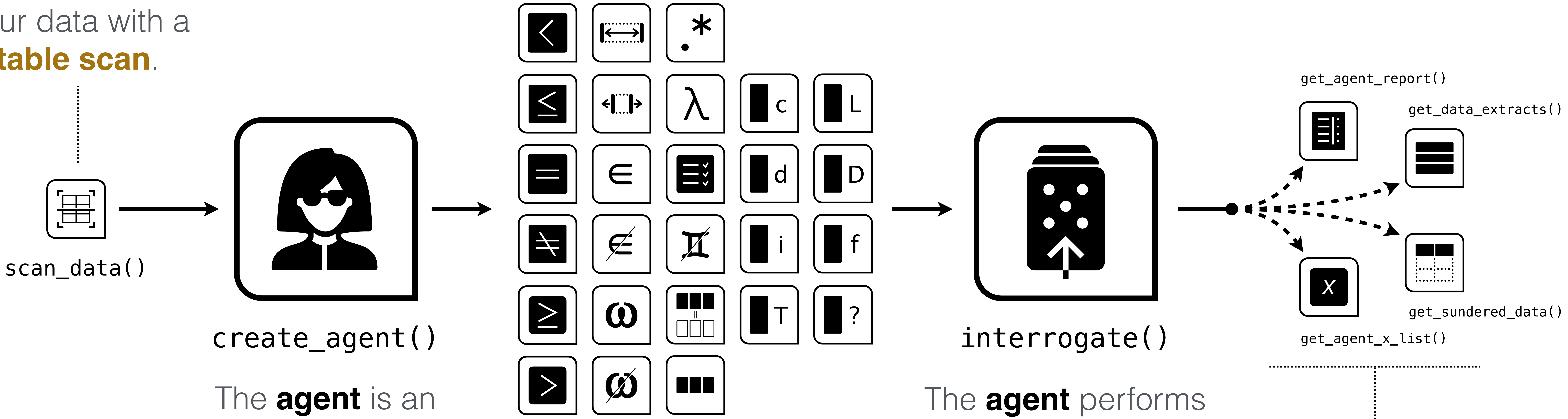
Use functions to generate a **validation plan**.

The **agent** performs the **interrogation**. Gathers **intel**.

Use **post-interrogation** functions for reporting and root-cause analysis.

The pointblank Data Quality Workflow

Better understand your data with a **table scan**.



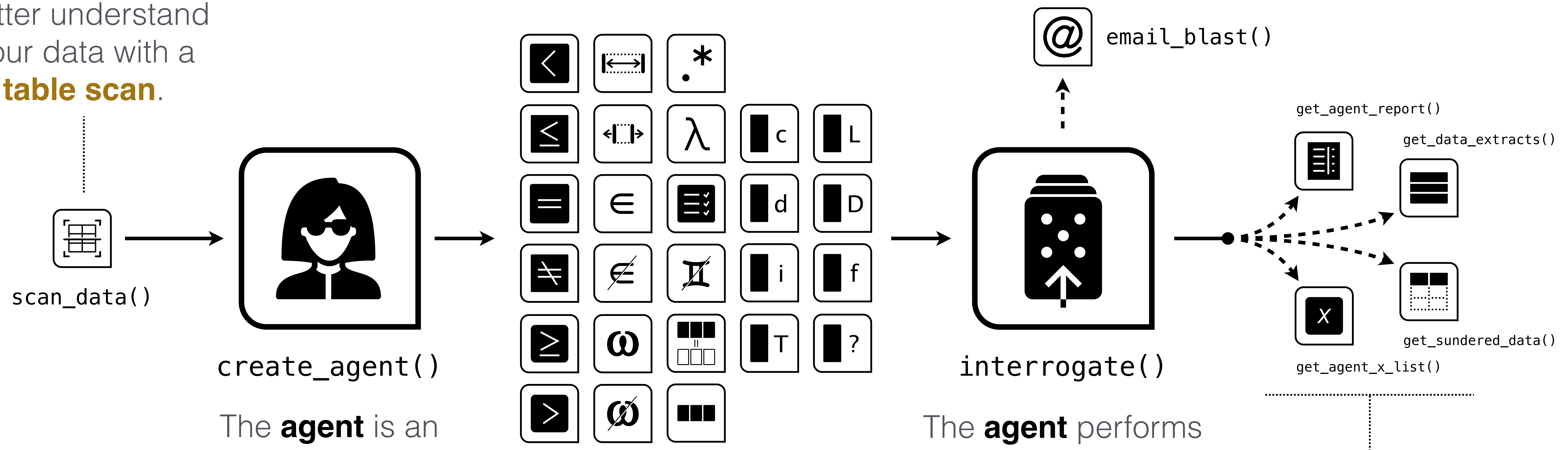
The **agent** is an integral part of the **data quality workflow**.

Use functions to generate a **validation plan**.

The **agent** performs the **interrogation**. Gathers **intel**.

Use **post-interrogation** functions for reporting and root-cause analysis.

The pointblank Data Quality Workflow



Better understand your data with a **table scan**.

The **agent** is an integral part of the **data quality workflow**.

Use functions to generate a **validation plan**.

Send **email** if data quality isn't all that good.

The **agent** performs the **interrogation**. Gathers **intel**.

Use **post-interrogation** functions for reporting and root-cause analysis.

Creating a Validation Plan

a	b	c
yko2	1	23.1
lju7	0	16.3
qib0	1	21.2
sd33	1	24.9
NA	2	NA

Let's start with a simple table

5 rows, 3 columns

Creating a Validation Plan

a	b	c
yko2	1	23.1
lju7	0	16.3
qib0	1	21.2
sd33	1	24.9
NA	2	NA

simple table

5 rows, 3 columns

1 All values in **c** should be greater than `15`

2 All values in **b** should be either `0` or `1`

3 All values in **a** should fit a pattern of three lowercase letters and a digit

4 Values in **c** must be ≥`20` if **b** is `1`; if **b** is `0` then values in **c** must be <`20`

5 Columns **a**, **b**, and **c** should not have any missing values.

validation plan

5 steps

Creating a Validation Plan

1 All values in **c** should be greater than 15

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5 Columns **a**, **b**, and **c** should not have any missing values.

validation plan

5 steps

≥	`col_vals_gte()`
∈	`col_vals_in_set()`
.*	`col_vals_regex()`
λ	`col_vals_expr() + case_when()`
∅	`col_vals_not_null()`

validation functions

5 `col_vals_*()` functions

Creating a Validation Plan

1 All values in **c** should be greater than 15

2 All values in **b** should be either 0 or 1

3 All values in **a** should fit a pattern of three lowercase letters and a digit

4 Values in **c** must be ≥20 if **b** is 1; if **b** is 0 then values in **c** must be <20

5 Columns **a**, **b**, and **c** should not have any missing values.

validation plan

5 steps

```
col_vals_gte(c, 15)
```

```
col_vals_in_set(b, c(0, 1))
```

```
col_vals_regex(a, “[a-z]{3}[0-9]")
```

```
col_vals_expr(~case_when(
  b == 1 ~ c >= 20,
  b == 0 ~ c <  20))
```

```
col_vals_not_null(vars(a, b, c))
```

validation functions

5 `col_vals_*()` functions

Interrogating the Table

a	b	c
yko2	1	23.1
lju7	0	16.3
qib0	1	21.2
sd33	1	24.9
NA	2	NA

simple table

5 rows, 3 columns

1 `col_vals_gte(c, 15)`

2 `col_vals_in_set(b, c(0, 1))`

3 `col_vals_regex(a, “[a-z]{3}[0-9]")`

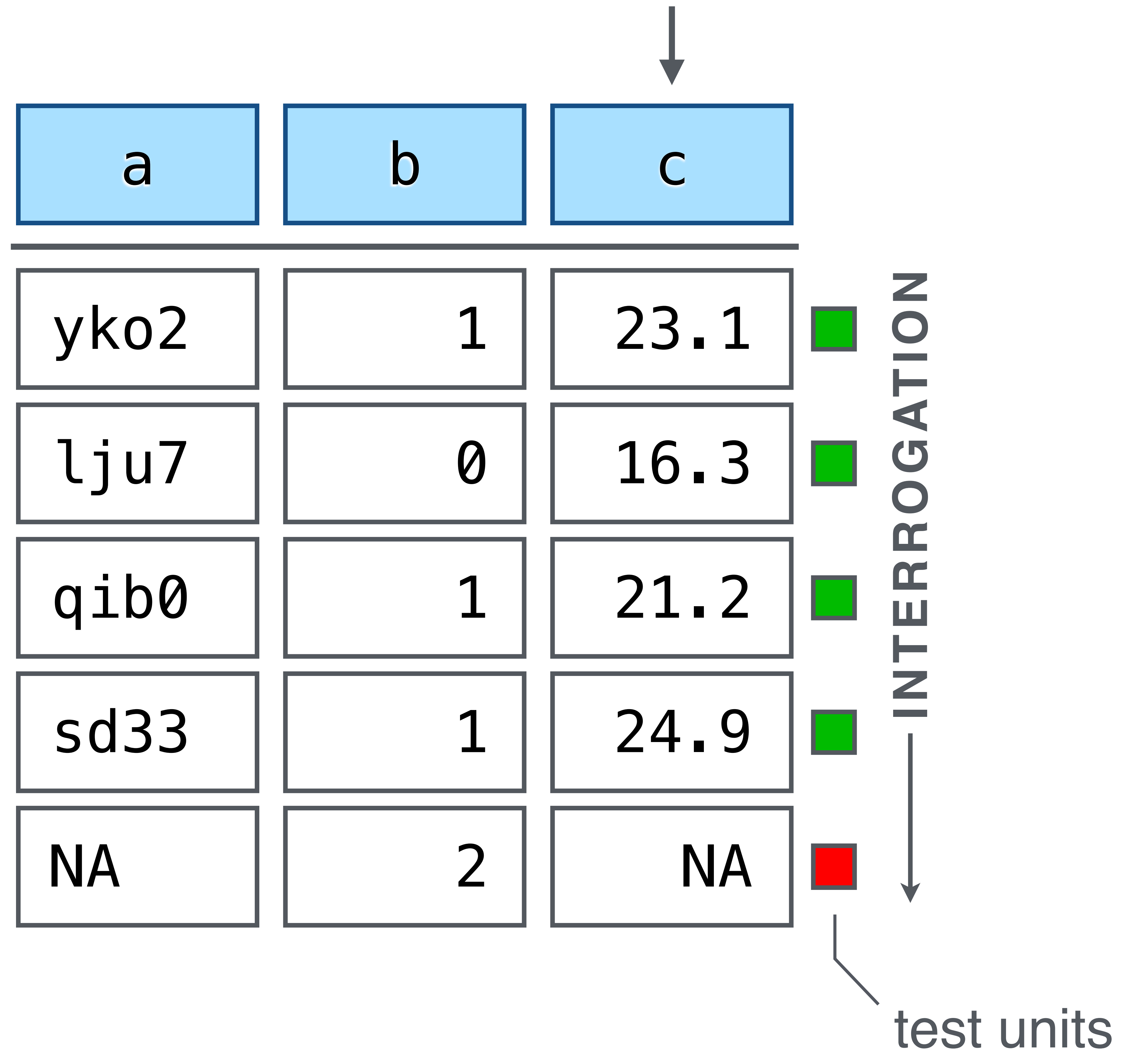
4
```
col_vals_expr(~case_when(
  b == 1 ~ c >= 20,
  b == 0 ~ c <  20))
```

5 `col_vals_not_null(vars(a, b, c))`

validation functions

5 `col_vals_*()` functions

Interrogating the Table



a	b	c	
yko2	1	23.1	🟩
lju7	0	16.3	🟩
qib0	1	21.2	🟩
sd33	1	24.9	🟩
NA	2	NA	🟥

1 ≥ `col_vals_gte(c, 15)`

REPORT

UNITS	PASS	FAIL
5	4 0.8	1 0.2

Interrogating the Table

a	b		c
yko2	1	🟩	23.1
lju7	0	🟩	16.3
qib0	1	🟩	21.2
sd33	1	🟩	24.9
NA	2	🟥	NA

test units

2

```
∈ col_vals_in_set(b, c(0, 1))
```

REPORT

UNITS	PASS	FAIL
5	4 0.8	1 0.2

Interrogating the Table

a		b	c
yko2	🟩	1	23.1
lju7	🟩	0	16.3
qib0	🟩	1	21.2
sd33	🟥	1	24.9
NA	🟥	2	NA

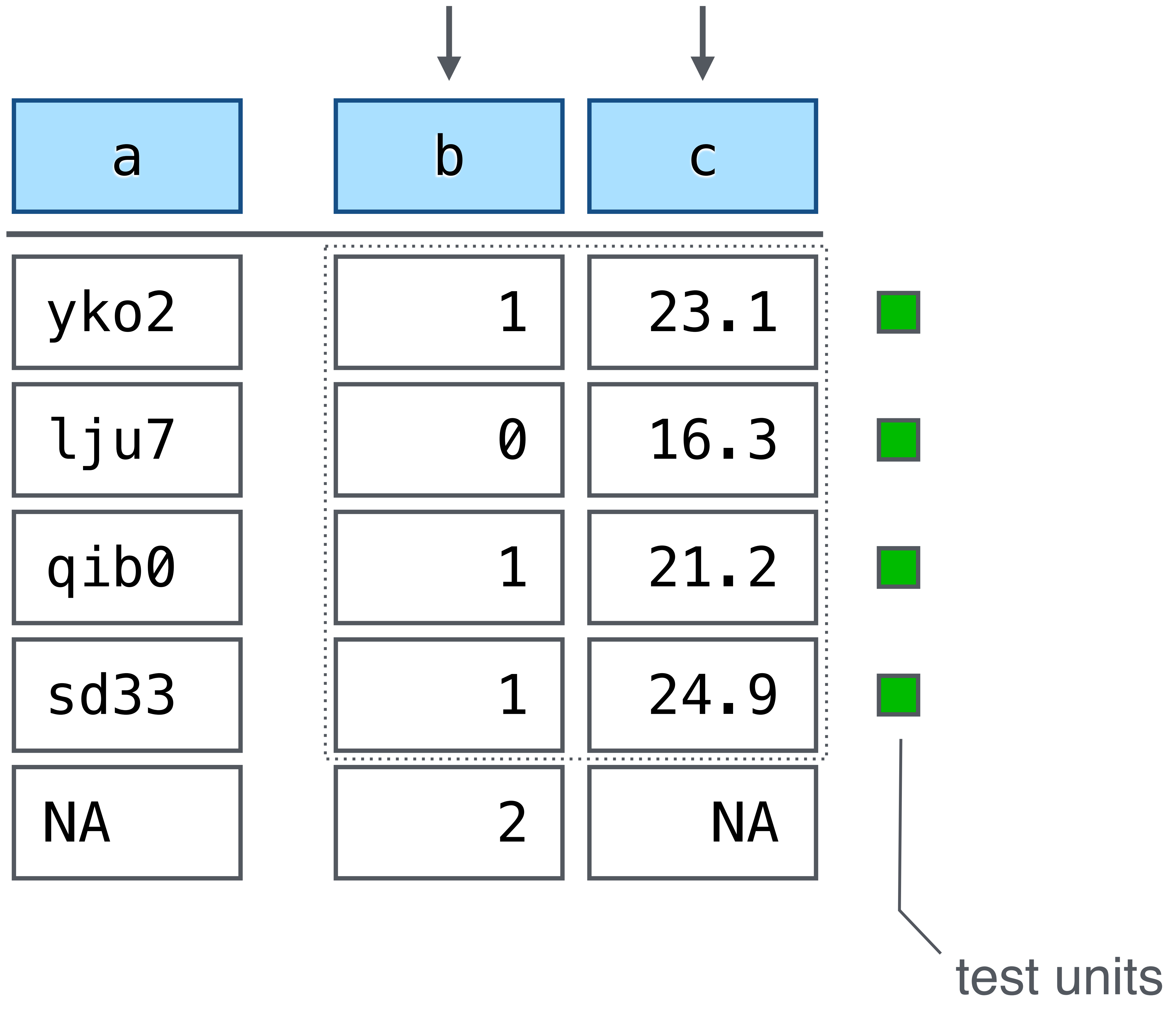
test units

3 `.* col_vals_regex(a, “[a-z]{3}[0-9]")`

REPORT

UNITS	PASS	FAIL
5	3 0.6	2 0.4

Interrogating the Table



4

```
λ col_vals_expr(~case_when(
    b == 1 ~ c >= 20,
    b == 0 ~ c <  20))
```

REPORT

UNITS	PASS	FAIL
4	4 1.0	0 0

Interrogating the Table

a	b	c
yko2	1	23.1
lju7	0	16.3
qib0	1	21.2
sd33	1	24.9
NA	2	NA

5 `col_vals_not_null(vars(a, b, c))`

Interrogating the Table

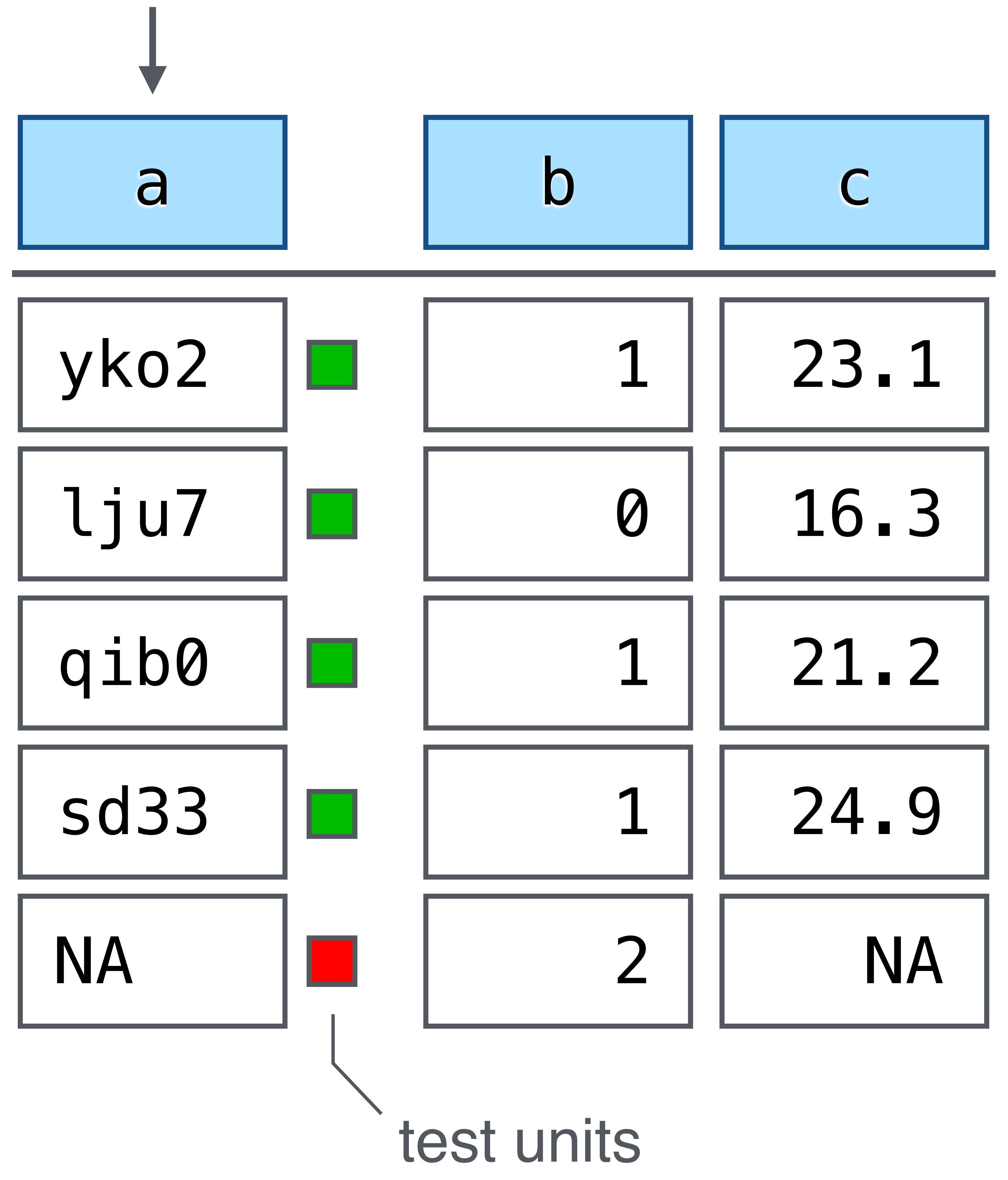
a	b	c
yko2	1	23.1
lju7	0	16.3
qib0	1	21.2
sd33	1	24.9
NA	2	NA

5 `col_vals_not_null(vars(a))`

6 `col_vals_not_null(vars(b))`

7 `col_vals_not_null(vars(c))`

Interrogating the Table



a		b	c
yko2	🟩	1	23.1
lju7	🟩	0	16.3
qib0	🟩	1	21.2
sd33	🟩	1	24.9
NA	🟥	2	NA

5 `col_vals_not_null(vars(a))`

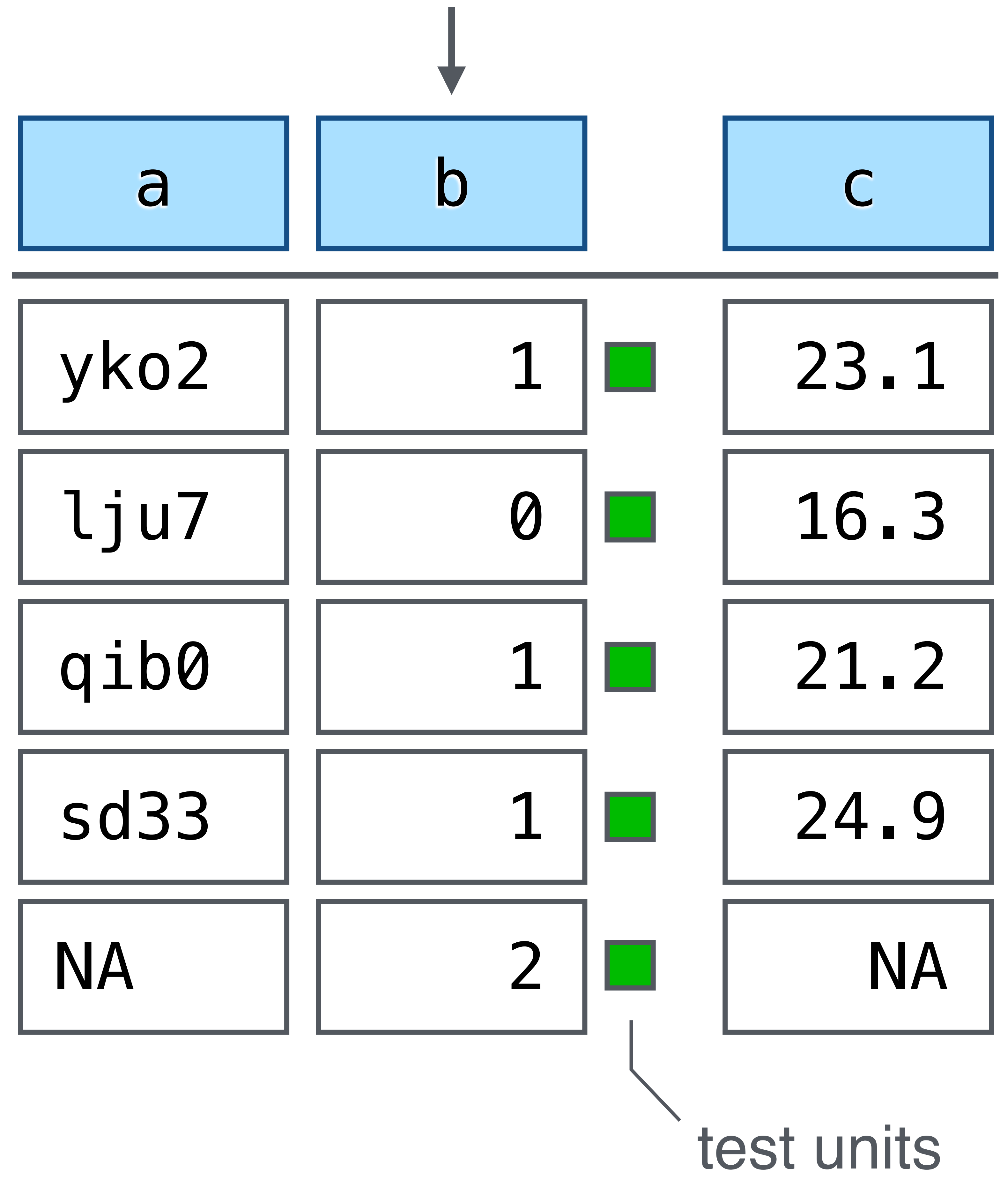
6 `col_vals_not_null(vars(b))`

7 `col_vals_not_null(vars(c))`

REPORT

UNITS	PASS	FAIL
5	4 0.8	1 0.2

Interrogating the Table



a	b		c
yko2	1	🟩	23.1
lju7	0	🟩	16.3
qib0	1	🟩	21.2
sd33	1	🟩	24.9
NA	2	🟩	NA

5 `col_vals_not_null(vars(a))`

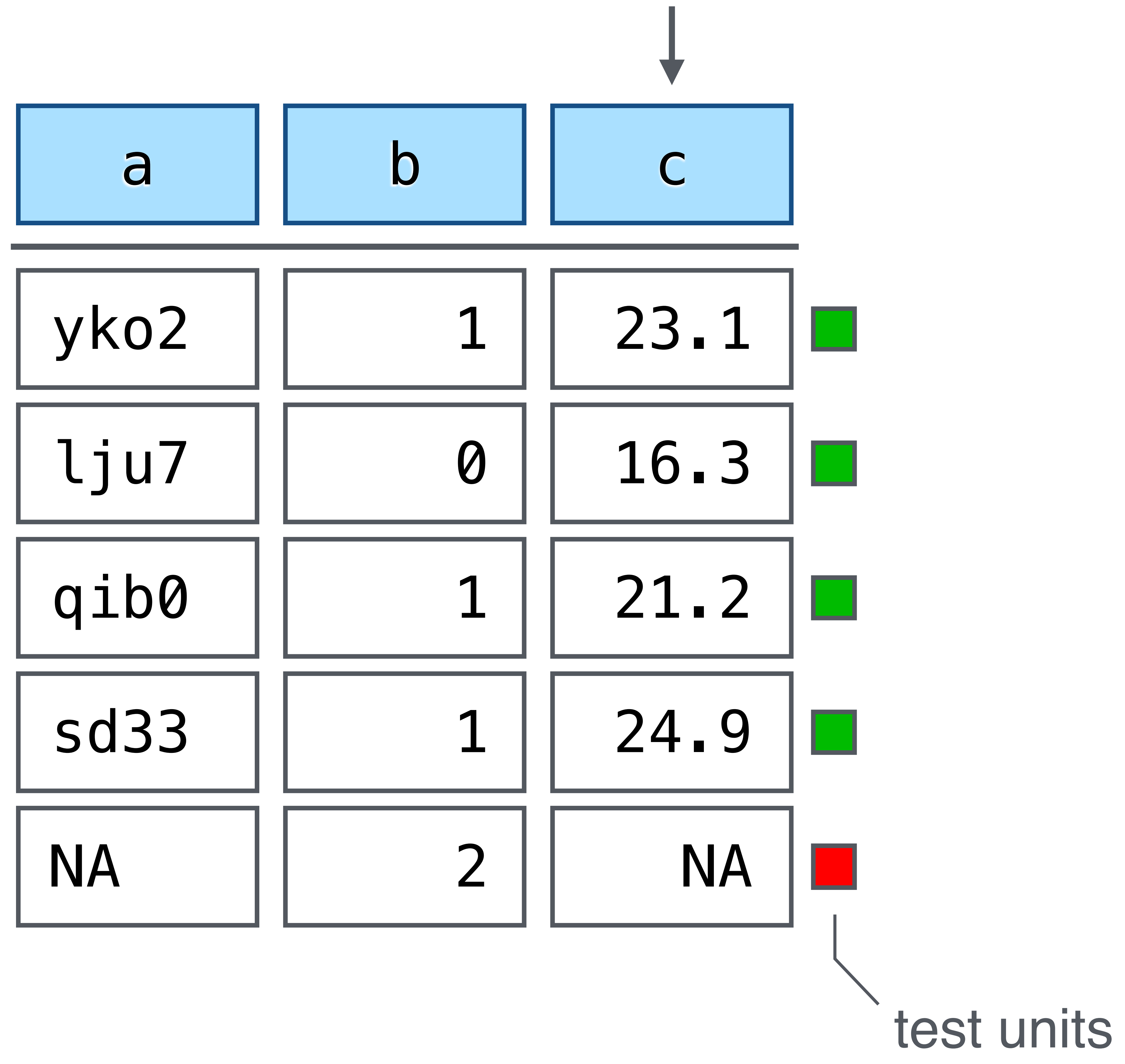
6 `col_vals_not_null(vars(b))`

7 `col_vals_not_null(vars(c))`

REPORT

UNITS	PASS	FAIL
5	5	0
	1.0	0

Interrogating the Table



a	b	c	
yko2	1	23.1	🟩
lju7	0	16.3	🟩
qib0	1	21.2	🟩
sd33	1	24.9	🟩
NA	2	NA	🟥

5 `col_vals_not_null(vars(a))`

6 `col_vals_not_null(vars(b))`

7 `col_vals_not_null(vars(c))`

REPORT

UNITS	PASS	FAIL
5	4 0.8	1 0.2

The pointblank Agent Report

	STEP	UNITS	PASS	FAIL
1	`col_vals_gte()`	5	4 0.8	1 0.2
2	`col_vals_in_set()`	5	4 0.8	1 0.2
3	`col_vals_regex()`	5	3 0.6	2 0.4
4	`col_vals_expr()`	4	4 1.0	0 0
5	`col_vals_not_null()`	5	4 0.8	1 0.2
6	`col_vals_not_null()`	5	5 1.0	0 0
7	`col_vals_not_null()`	5	4 0.8	1 0.2

The pointblank Agent Report

	STEP	UNITS	PASS	FAIL
1	`col_vals_gte()`	5	4 0.8	1 0.2
2	`col_vals_in_set()`	5	4 0.8	1 0.2
3	`col_vals_regex()`	5	3 0.6	2 0.4
4	`col_vals_expr()`	4	4 1.0	0 0
5	`col_vals_not_null()`	5	4 0.8	1 0.2
6	`col_vals_not_null()`	5	5 1.0	0 0
7	`col_vals_not_null()`	5	4 0.8	1 0.2

For better reporting on data quality, can set thresholds and use side effects.

Failure thresholds can be set for three states

W WARNING

S STOP

N NOTIFY

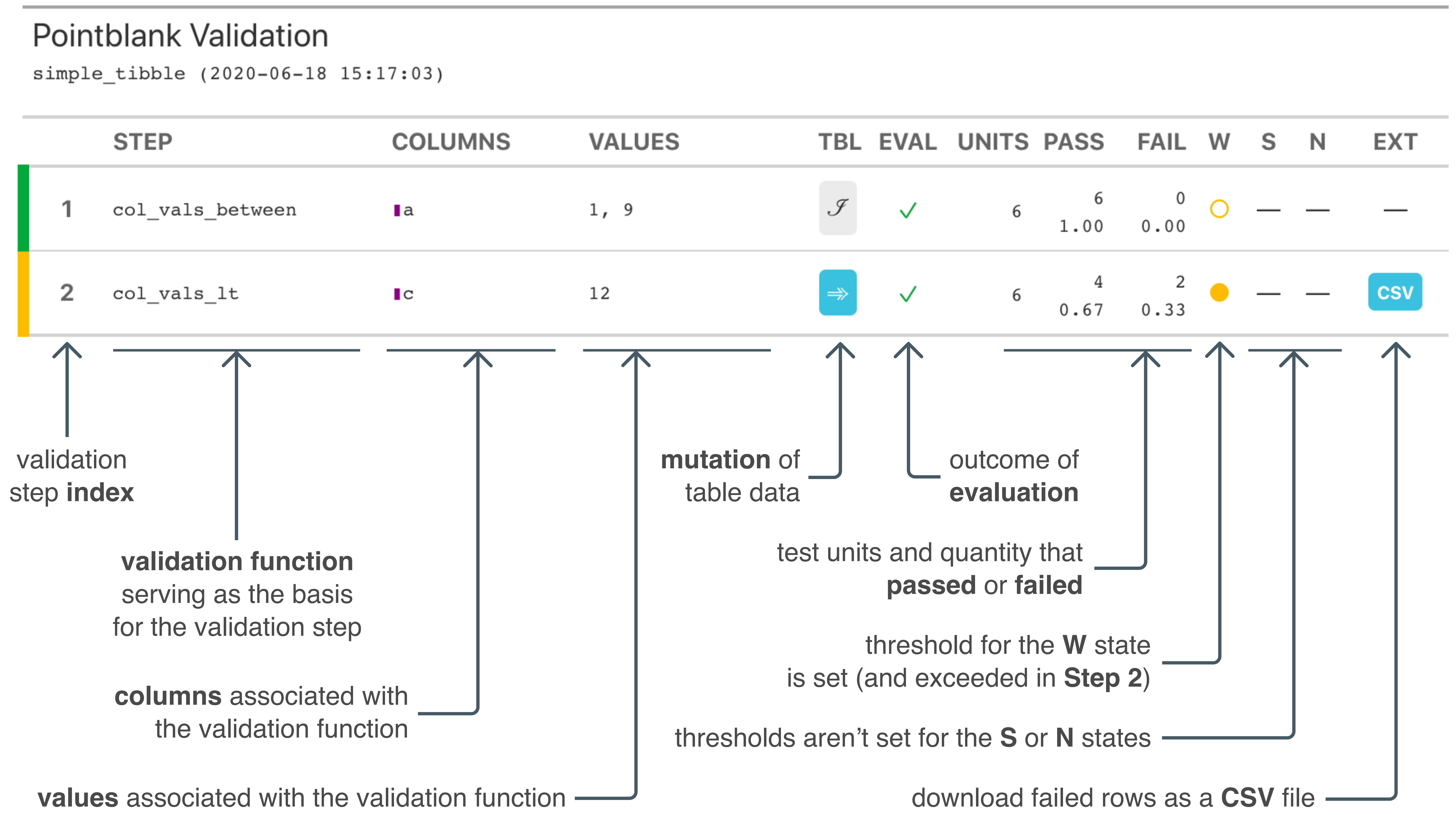
Let's set:

W to 1
S to 2
(**N** not set)

R CODE

```r
action_levels(
  warn_at = 1,
  stop_at = 2
)
```

The pointblank Agent Report



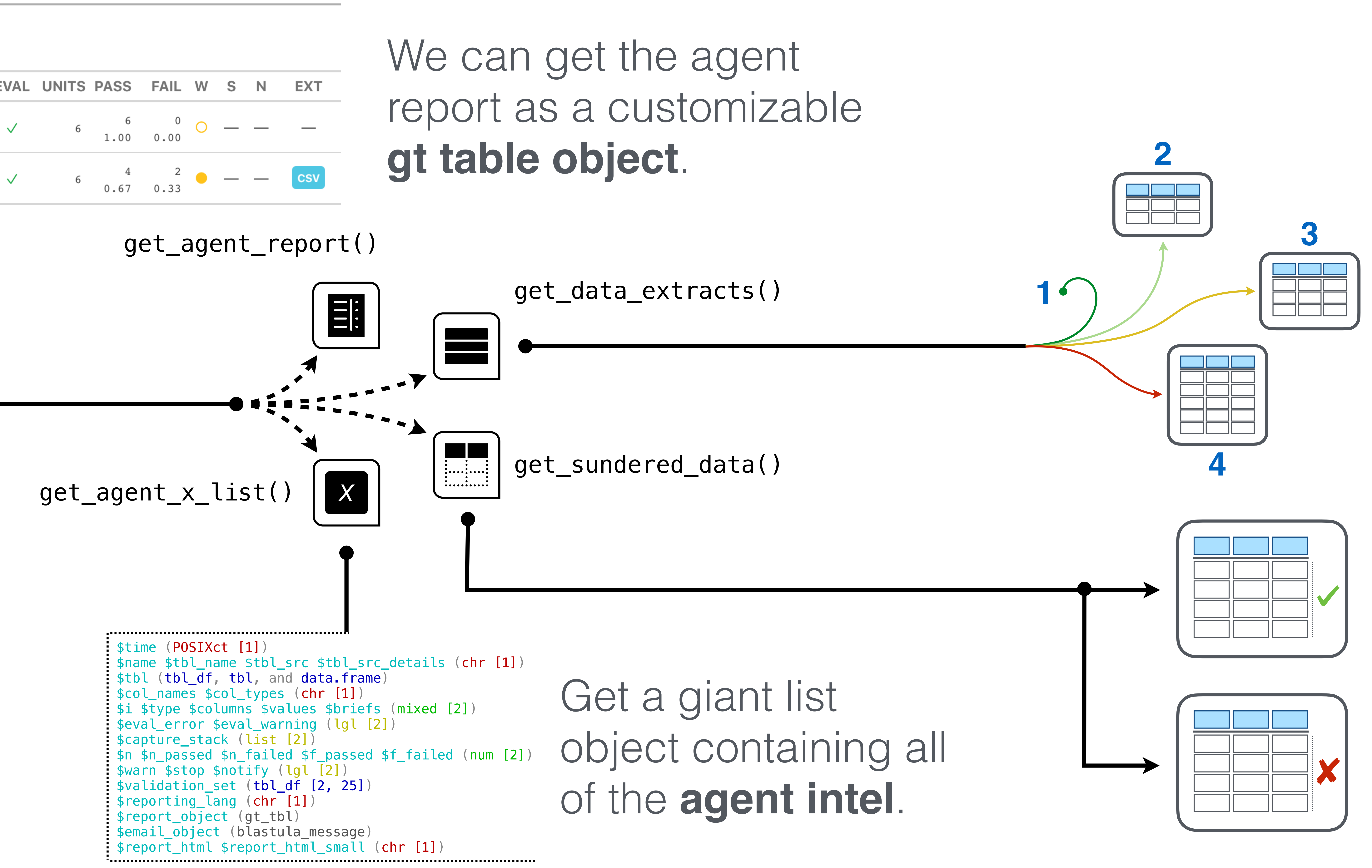
Pointblank Validation

`simple_tibble (2020-06-18 15:17:03)`

	STEP	COLUMNS	VALUES	TBL	EVAL	UNITS	PASS	FAIL	W	S	N	EXT
1	col_vals_between	▮a	1, 9	𝒥	✓	6	6 1.00	0 0.00	○	—	—	—
2	col_vals_lt	▮c	12	⇛	✓	6	4 0.67	2 0.33	●	—	—	CSV

validation step **index**
validation function serving as the basis for the validation step
columns associated with the validation function
values associated with the validation function
mutation of table data
outcome of **evaluation**
test units and quantity that **passed** or **failed**
threshold for the **W** state is set (and exceeded in **Step 2**)
thresholds aren't set for the **S** or **N** states
download failed rows as a **CSV** file

Other Post-Interrogation Ops



EVAL	UNITS	PASS	FAIL	W	S	N	EXT
✓	6	6 1.00	0 0.00	○	—	—	—
✓	6	4 0.67	2 0.33	●	—	—	CSV

```
$time (POSIXct [1])
$name $tbl_name $tbl_src $tbl_src_details (chr [1])
$tbl (tbl_df, tbl, and data.frame)
$col_names $col_types (chr [1])
$i $type $columns $values $briefs (mixed [2])
$eval_error $eval_warning (lgl [2])
$capture_stack (list [2])
$n $n_passed $n_failed $f_passed $f_failed (num [2])
$warn $stop $notify (lgl [2])
$validation_set (tbl_df [2, 25])
$reporting_lang (chr [1])
$report_object (gt_tbl)
$email_object (blastula_message)
$report_html $report_html_small (chr [1])
```

We can get the agent report as a customizable **gt table object**.

Get **table fragments** for failing test units (from row-based validations)

Get a giant list object containing all of the **agent intel**.

Get two table fragments split across the **passing** and **failing** test units.

Other Post-Interrogation Ops

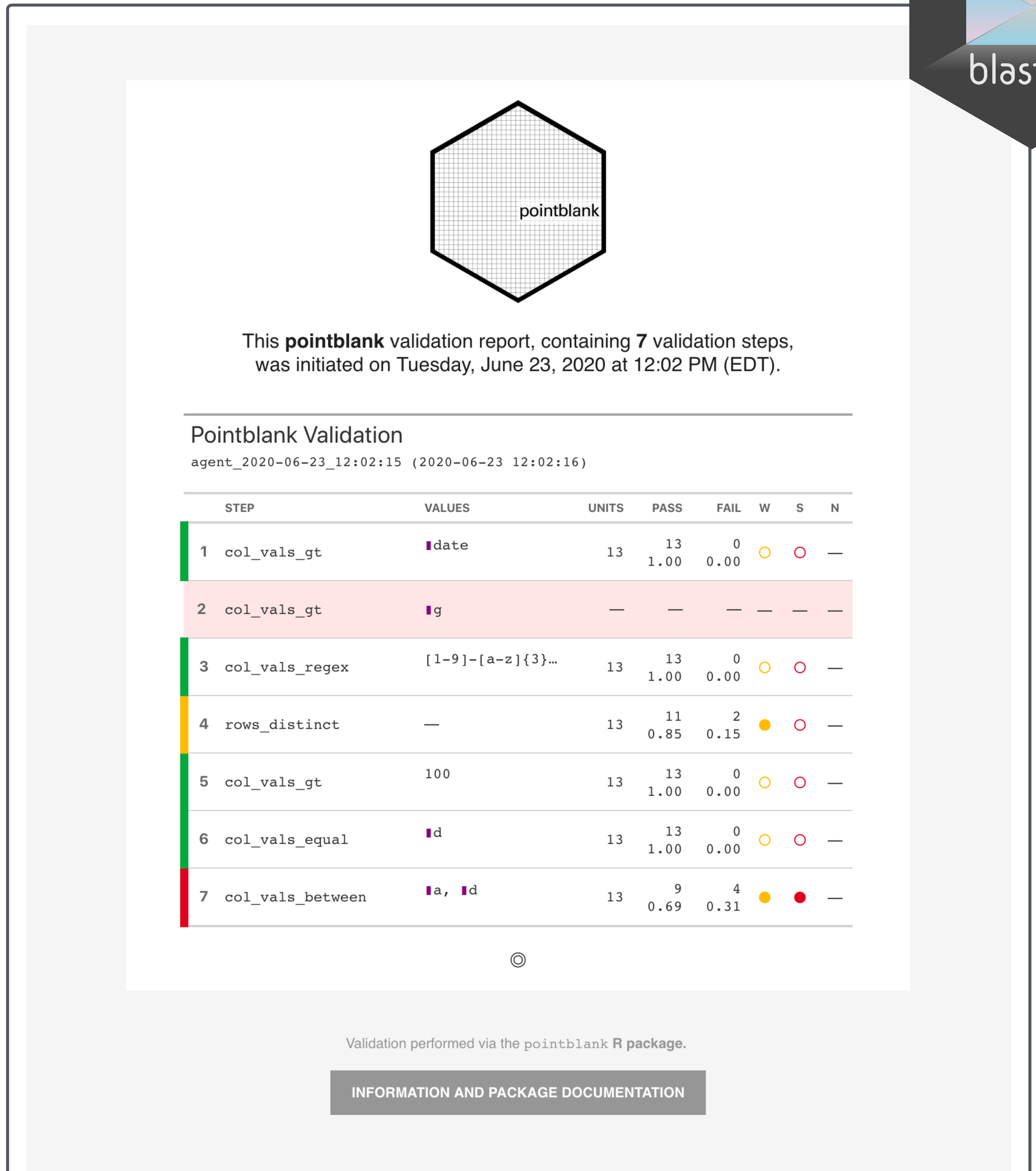
Send email (or *not*) depending on the interrogation results.

`email_blast()`

`interrogate()`

`email_preview()`

Preview a pointblank email, helpful for customization.



pointblank

This **pointblank** validation report, containing **7** validation steps, was initiated on Tuesday, June 23, 2020 at 12:02 PM (EDT).

Pointblank Validation

agent_2020-06-23_12:02:15 (2020-06-23 12:02:16)

	STEP	VALUES	UNITS	PASS	FAIL	W	S	N
1	col_vals_gt	▮date	13	13 1.00	0 0.00	○	○	—
2	col_vals_gt	▮g	—	—	—	—	—	—
3	col_vals_regex	[1-9]-[a-z]{3}…	13	13 1.00	0 0.00	○	○	—
4	rows_distinct	—	13	11 0.85	2 0.15	●	○	—
5	col_vals_gt	100	13	13 1.00	0 0.00	○	○	—
6	col_vals_equal	▮d	13	13 1.00	0 0.00	○	○	—
7	col_vals_between	▮a, ▮d	13	9 0.69	4 0.31	●	●	—

Validation performed via the `pointblank` **R package.**

INFORMATION AND PACKAGE DOCUMENTATION

This is the stock email w/o any customization.

It's made with the **blastula** package so you know it's good!

Demo

Validating Data Tables With the **pointblank** Package

github.com/rich-iannone/pointblank

github.com/rich-iannone/presentations

rich-iannone

@riannone

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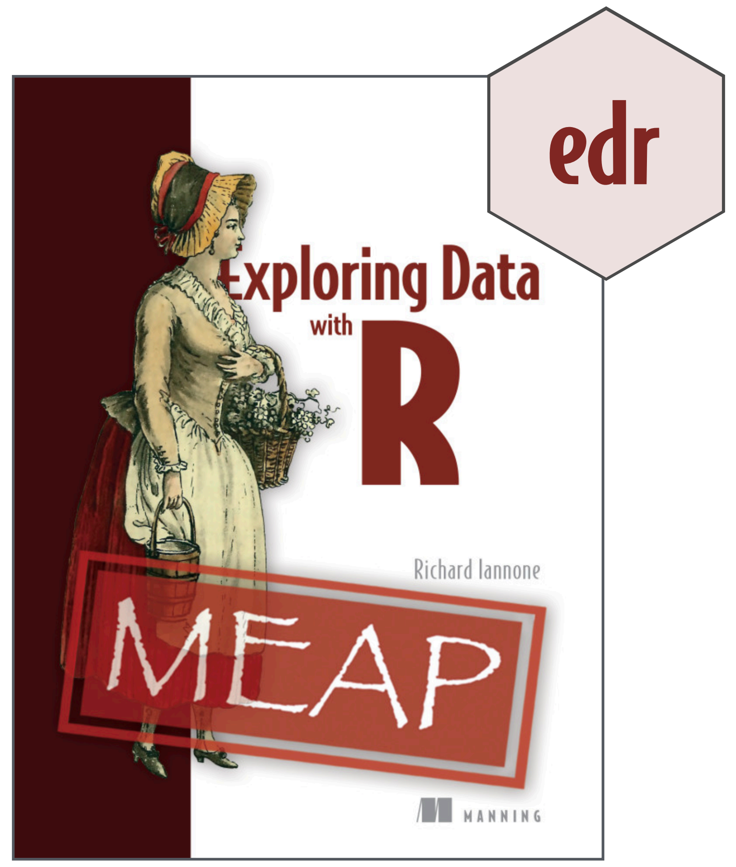

https://www.manning.com/books/exploring-data-with-r