

DSL

Comp.	Type Signature	Description	Example
Concat	$t:\text{Text}, s:\text{Text} \rightarrow \text{Text}$	Concatenation of t and s	$(\text{'a'}, \text{'bc'})$ 'abc'
Length	$t:\text{Text} \rightarrow \text{Int}$	Length of t	('abc') 3
Index	$t:\text{Text}, s:\text{Text} \rightarrow \text{Int}$	0-Index of the first occurrence of s in t	$(\text{'www.abc.com'}, \text{'.'})$ 3
Replace	$t:\text{Text}, \text{old}:\text{Text}, \text{new}:\text{Text} \rightarrow \text{Text}$	Replace the first occurrence of old in t with new	$(\text{'10/05/2019'}, \text{'/'}, \text{'-'})$ '10-05/2019'
Substr	$t:\text{Text}, i:\text{Int}, n:\text{Int} \rightarrow \text{Text}$	Substring of t of length n, starting at index i	$(\text{'10/05/2019'}, 2, 2)$ '05'

Concat

Inputs	Output
('John', 'Doe')	'John Doe'

$(a, b) \mapsto \text{concat}(\text{concat}(a, ' '), b)$

< 0.2 sec

< 0.3 sec with two or three examples

Concat

Inputs	Output
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('John', 'Doe', '-Odoi')

'John Doe-Odoi'

$(a, b, c) \mapsto \text{concat}(a, \text{concat}(\text{concat}(' ', b), c))$

< 1.2 sec

~ 1.5 sec with two examples

~ 2 sec with three examples

Concat

Inputs	Output
('John', 'Doe')	'Dr. John Doe'

$(a, b) \mapsto \text{concat}(\text{'Dr. '}, \text{concat}(\text{concat}(a, \text{' '}), b))$

< 2.5 sec

< 2.0 sec with two examples

< 3.1 sec with three examples

Concat

Inputs	Output
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('John', 'Michael', 'Doe')

'John Michael Doe'

$(a, b, c) \mapsto \text{concat}(\text{'John '}, \text{concat}(b, \text{replace(' Doe'}, a, c)))$

< 2.5 sec

Concat

Inputs	Output
('John', 'Michael', 'Doe')	'John Michael Doe'
('Anne', 'Marie', 'Smith')	'Anne Marie Smith'

$(a, b, c) \mapsto \text{concat}(\text{concat}(a, \text{replace}(' \backslash x10 ', '\\x10', b)), c)$

< 3.6 sec

< 9 sec, with three examples

Concat

Inputs	Output
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('Anne', 'Marie', 'Smith')

'Dr. Anne Marie Smith'

$(a, b, c) \mapsto$

`concat(replace('Dr. A', a, b), concat(concat('nne M', 'arie '),c))`

~44 sec

Concat

Inputs	Output
('John', 'Michael', 'Doe')	'Dr. John Michael Doe'
('Anne', 'Marie', 'Smith')	'Dr. Anne Marie Smith'

$(a, b, c) \mapsto$

`concat('Dr. ', concat(concat(a, concat(' ', b)), concat(' ', c)))`

~2 min 30 sec

Concat

Inputs	Output
('John', 'Oliver', 'Michael', 'Doe', ' ')	'John Oliver Michael Doe'

$(a, b, c, d, e) \mapsto$

`replace(concat('John ', concat(concat(b, concat(e, c)), ' Doe')), d, a)`

~2 min 20 sec

Concat

Inputs	Output
('John', 'Oliver', 'Michael', 'Doe', ' ')	'John Oliver Michael Doe'
('Anne', 'Emily', 'Marie', 'Smith', ' ')	'Anne Emily Marie Smith'

$(a, b, c, d, e) \mapsto$

`concat(concat(concat(a, e), b), concat(concat(e, c), concat(e, d)))`

~7 min 30 sec

Concat

Inputs	Output
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('John', 'Oliver', 'Michael', 'Doe')

'John Oliver Michael Doe'

$(a, b, c, d) \mapsto$

`concat(concat(a, replace(' Doe ', d, b)), concat(c, ' Doe'))`

< 40 sec

Concat

Inputs	Output
('John', 'Oliver', 'Michael', 'Doe')	'John Oliver Michael Doe'
('Anne', 'Emily', 'Marie', 'Smith')	'Anne Emily Marie Smith'

- 10 sec z3 timeout not enough
- z3 timeout at 45 sec and only programs of size ≥ 6 , works:

$(a, b, c, d) \mapsto$

`concat(concat(a, concat(' ', concat(b, concat(' ', c)))), concat(' ', d))`

Index

Inputs	Output
('outsystems.com')	10

$(a) \mapsto \text{index}(a, '.')$

~0.06 sec

More examples or explicitly pass '.' as input gives the same results

Length

Inputs	Output
('abc')	3

$(a) \mapsto \text{length}(a)$

< 0.1 sec

More examples gives the same results

Replace

Inputs	Output
('John Doe')	'John_Doe'

(a) \mapsto `replace(a, ' D', '_D')`

< 0.14 sec

Replace

Inputs	Output
('John Doe')	'John_Doe'
('Michael Scott')	'Michael_Scott'

$(a) \mapsto \text{replace}(a, ' ', '_')$

< 0.42 sec

Replace

Inputs	Output
('01/01/2000')	'01-01-2000'

(a) \mapsto `replace(a, '/01/', '-01-')`

< 0.13 sec

Replace

Inputs	Output
('01/01/2000', '/', '-')	'01-01-2000'
('20/03/1999', '/', '-')	'20-03-1999'

$(a, b, c) \mapsto \text{replace}(\text{replace}(a, b, c), b, c)$

3 min z3 timeout

< 3 min

Replace

Inputs	Output
('01/01/2000', '-')	'01-01-2000'
('20/03/1999', '-')	'20-03-1999'

5 min z3 timeout not enough.

Substr

Inputs	Output
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('Text longer than thirty characters.')

'Text longer than thirty charac'

$(a) \mapsto \text{replace}(a, \text{'ters.'}, \text{''})$

< 0.03 sec

Substr

Inputs	Output
('Text longer than thirty characters.')	'Text longer than thirty charac'
('Small text.')	'Small text.'

$(a) \mapsto \text{substr}(a, 0, 30)$

but it finds the same program as before
if given larger z3 timeout

< 0.4 sec

Substr

Inputs	Output
('Text longer than thirty characters.')	'Text longer than thirty charac'
('Small text.')	'Small text.'
('This text is also longer than thirty characters.')	'This text is also longer than '

$(a) \mapsto \text{substr}(a, 0, 30)$

< 0.3 sec

Substr

Inputs	Output
('01/04/2000')	'01'

$(a) \mapsto \text{substr}(a, 0, 2)$

< 0.14 sec

Substr

Inputs	Output
('01/04/2000')	'04'

$(a) \mapsto \text{substr}(a, 3, 2)$

< 0.16 sec

Substr

Inputs	Output
('01/04/2000')	'2000'

(a) \mapsto substr(a, 6, 6)

< 0.15 sec

Substr

Inputs	Output
('#01-04-2000#')	'2000'

(a) \mapsto substr(a, 7, 4)

< 0.16 sec

Substr + Index

Inputs	Output
('outsystems.com')	outsystems

(a) \mapsto `replace(a, '.com', '')`

< 0.6 sec

Substr + Index

Inputs	Output
('outsystems.com')	'outsystems'
('cmu.edu')	'cmu'

$(a) \mapsto \text{substr}(a, 0, \text{index}(a, '.'))$

< 13 sec

Substr + Index

Inputs	Output
('outsystems.com')	'outsystems'
('cmu.edu')	'cmu'
('tecnico.pt')	'tecnico'

$(a) \mapsto \text{substr}(a, 0, \text{index}(a, '.'))$

< 1.8 sec

Substr + Index

Inputs	Output
('outsystems.com', '.')	'outsystems'
('cmu.edu', '.')	'cmu'

$(a, b) \mapsto \text{substr}(a, 0, \text{index}(a, b))$

< 3.1 sec

Substr + Index + Length

Inputs	Output
('www.outsystems.com')	'outsystems'
('www.cmu.edu')	'cmu'
('www.tecnico.pt')	'tecnico'

(a) \mapsto substr(substr(a, 4, 2122), 0, index(substr(a, 4, 2122), '.'))

< 1 min

Substr + Concat + **If**

Inputs	Output
('Text longer than thirty characters.')	'Text longer than thirty charac...'

(a) \mapsto replace(a, 'ters', '..')

< 0.27 sec

Substr + Concat

Inputs	Output
('Text longer than thirty characters.')	'Text longer than thirty charac...'
Small text.'	Small text.'

Substr + Concat

Inputs	Output
('Text longer than thirty characters.')	'Text longer than thirty charac...'
Small text.'	Small text.'
'This text is also longer than thirty characters.'	'This text is also longer than ...'