Parts of strings

> **PREREQUISITES**
>
> - strings (basic notation)

1 Substrings

A **substring** is a continuous part of a string.

> **EXAMPLE 1.**
> The string *abcd* has 11 substrings:
>
> - *ε*
> - *a*
> - *b*
> - *c*
> - *d*
> - *ab*
> - *bc*
> - *cd*
> - *abc*
> - *bcd*
> - *abcd*

Note that

1. the empty string is a substring of every string, and
2. every string is a substring of itself.

A substring *u* of *v* is a **proper** substring iff $u \neq v$.

> **EXAMPLE 2.**
> All the strings listed above are proper substrings of *abcd*, except *abcd* itself.

> **EXERCISE 1.**
> For each one of the gaps below, enter ⊑, ⊊, or ⋢ depending on whether the first string is a substring of the second string, a proper substring, or neither:
>
> - *a___aaaa*
> - *a___b*
> - *ε___b*
> - *ε___ε*

- *aa_abbbca*
- *bc_abbbca*
- *cb_abbbca*

2   Subsequence

A **subsequence** is a discontinuous part of a string that preserves the order between the symbols.

> **EXAMPLE 3.**
> The string *abcd* has subsequences:
>
> - *ε*
> - *a*
> - *b*
> - *c*
> - *d*
> - *ab*
> - *ac*
> - *ad*
> - *bc*
> - *bd*
> - *cd*
> - *abc*
> - *abd*
> - *bcd*
> - *abcd*
>
> Note that *ca* is not a subsequence of *abcd*, but it is a subsequence of *abcda*.

Just like substrings, a subsequence u of v is proper iff $u \neq v$.

> **EXERCISE 2.**
> For each one of the gaps below, enter $\sqsubseteq$, $\sqsubsetneq$, or $\not\sqsubseteq$ depending on whether the first string is a subsequence of the second string, a proper subsequence, or neither:
>
> - *a_aaaa*
> - *a_b*
> - *ε_b*
> - *ε_ε*
> - *aa_abbbca*
> - *bc_abbbca*

- *cb_abbbca*

EXERCISE 3.
Say whether the following is True or False: Every substring of some string *s* is also a subsequence of *s*, but not the other way round. Justify your answer.

fixme: add prefixes and suffixes