Lecture 21: Interpreters I

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07/27/2016

Announcements

Roadmap

Introduction

Functions

Data

Mutability

Objects

Interpretation

Paradigms

Applications

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- This week (Interpretation), the goals are:

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  - To learn a new language, Scheme, in two days!

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- This week (Interpretation), the goals are:
  - To learn a new language, Scheme, in two days!
  - To understand how interpreters work, using Scheme as an example

Programming Languages

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Python 3

```
def square(x):
    return x * x

from dis import dis
dis(square)
```

Python 3 Bytecode

```
LOAD_FAST                0 (x)
LOAD_FAST                0 (x)
BINARY_MULTIPLY
RETURN_VALUE
```

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  - *Canonical implementation* of either a compiler or interpreter for the language

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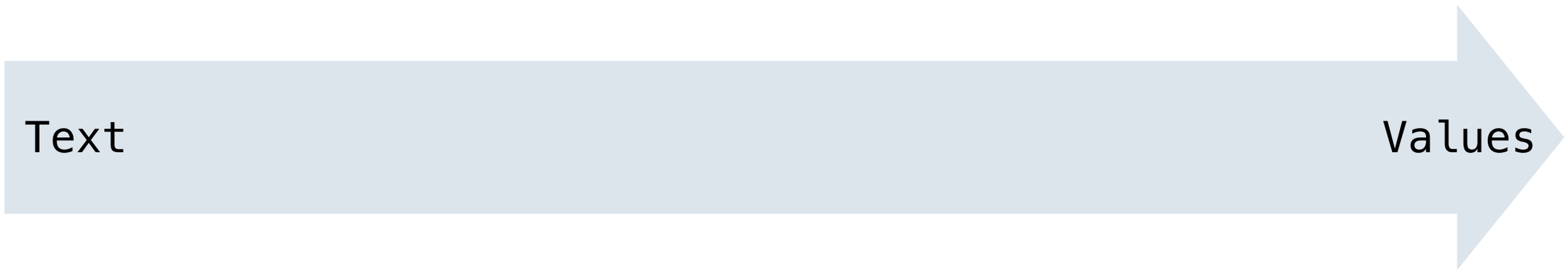

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- The job of the parser is to take in text and perform *syntactic analysis* to convert it into expressions that the evaluator can understand
- The job of the evaluator is to read in expressions and perform *semantic analysis* to evaluate the expressions and output the corresponding values

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```
calc> (+ (* 3
            (+ (* 2 4)
               (+ 3 5)))
         (+ (- 10 7)
            6))
57
```

Parsing

From text to expressions

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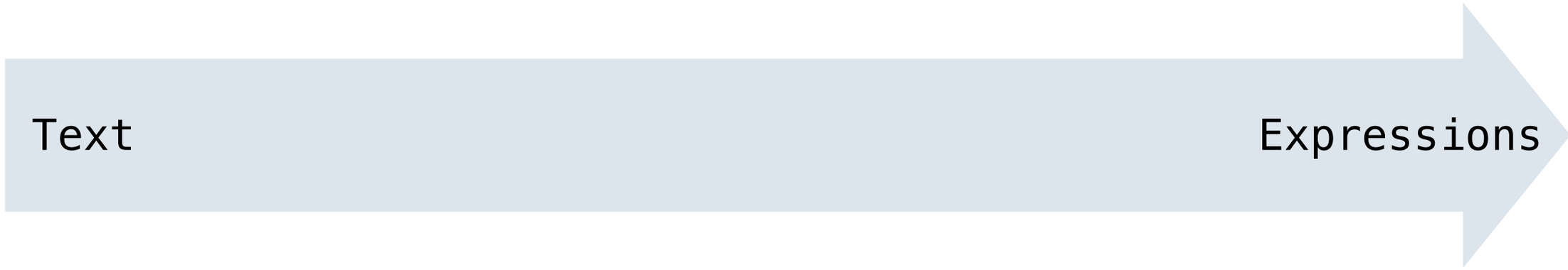

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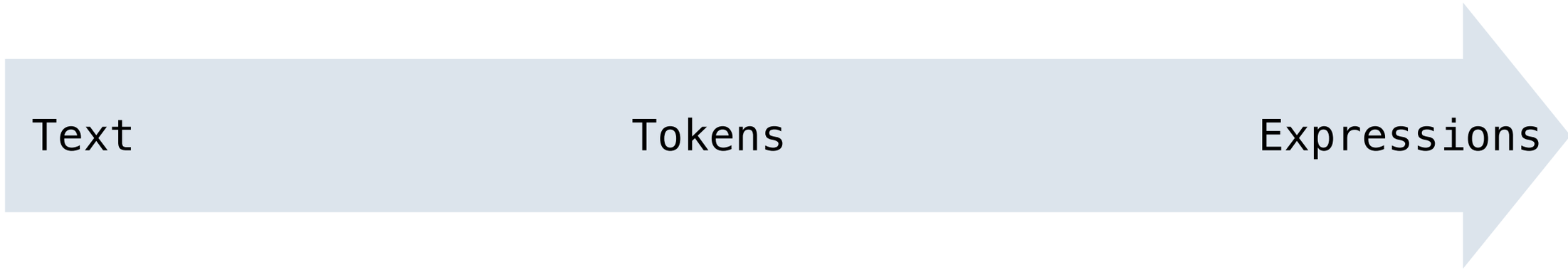

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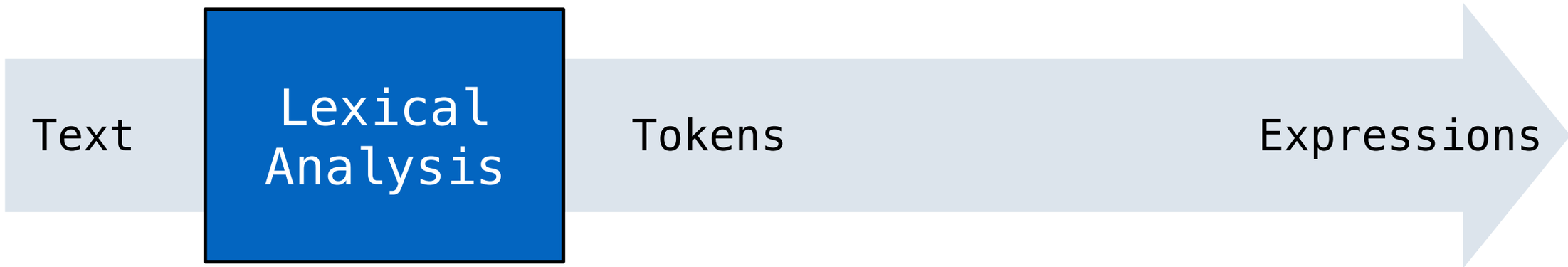

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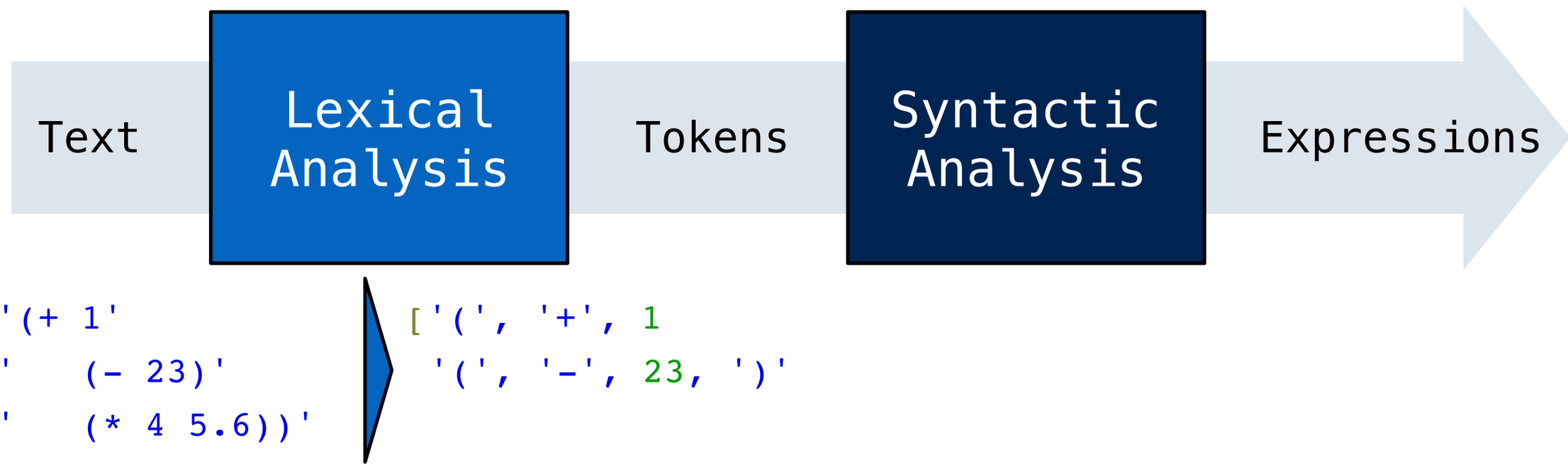

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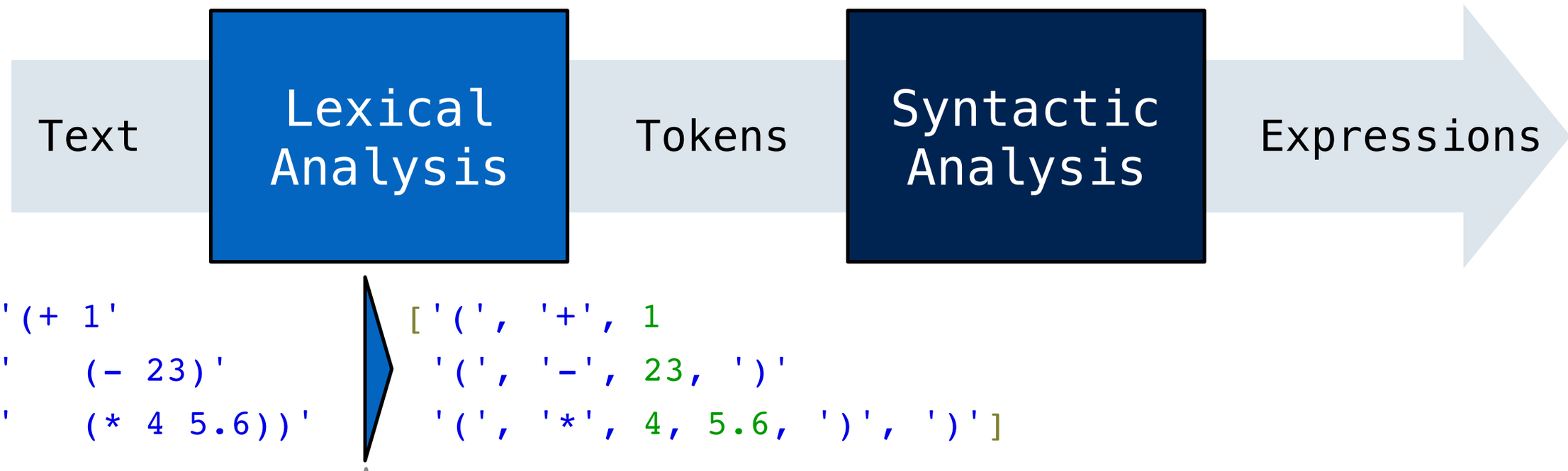

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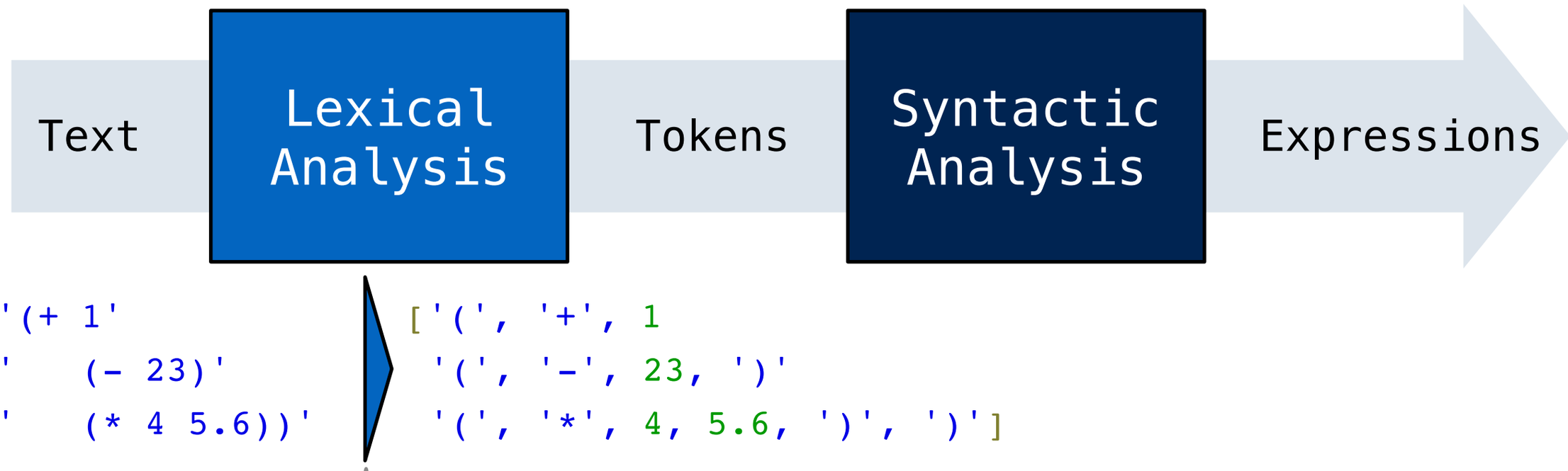

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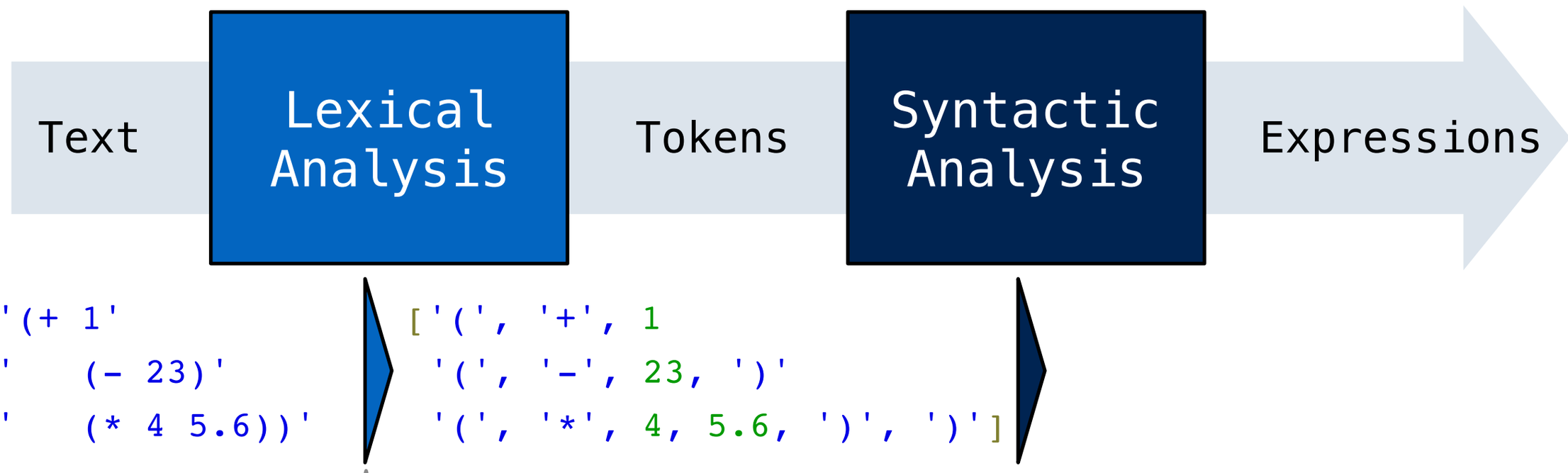

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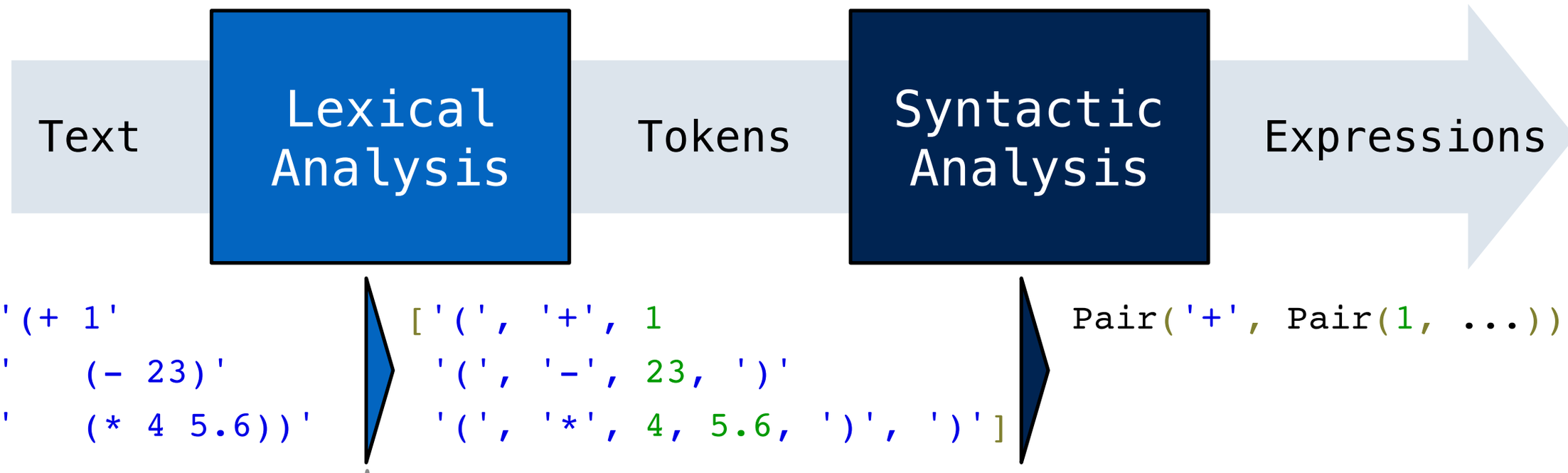

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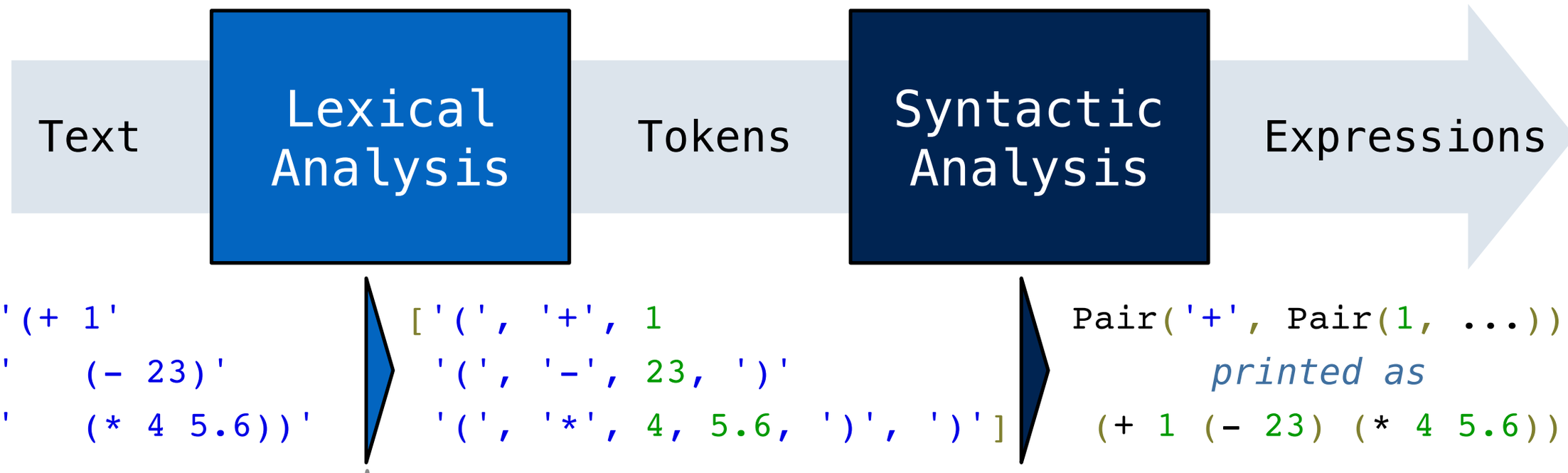

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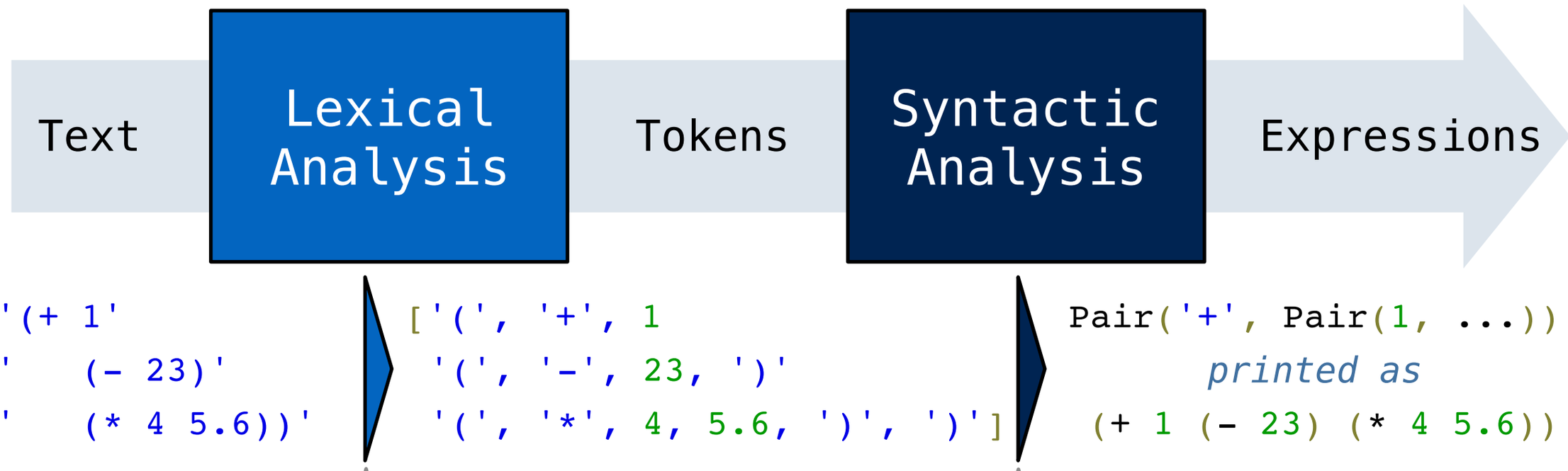

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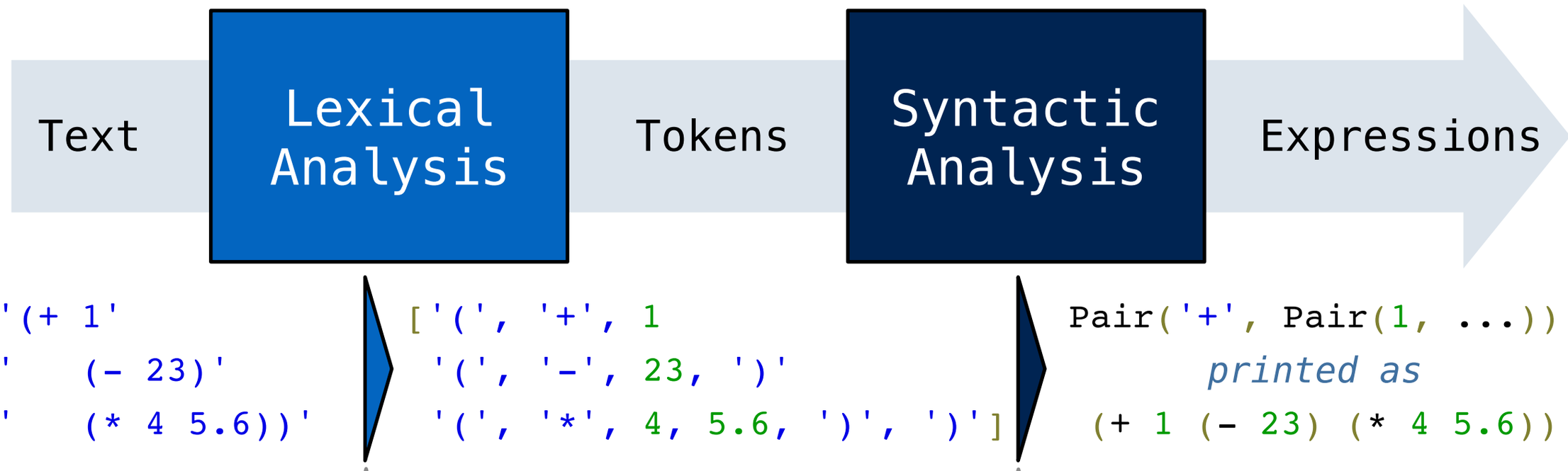

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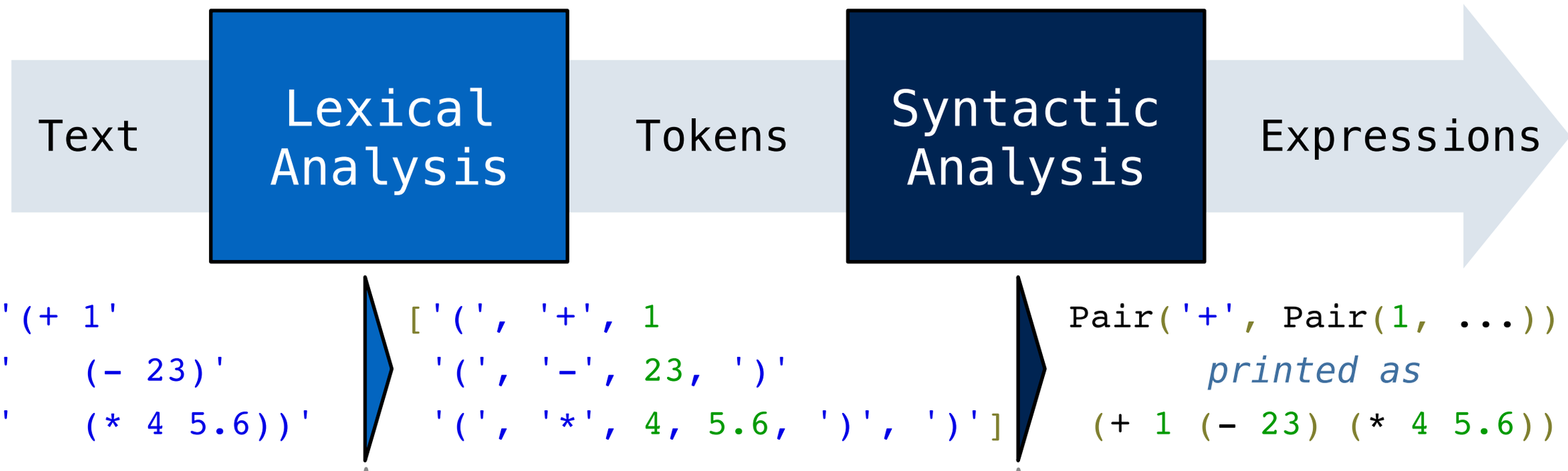

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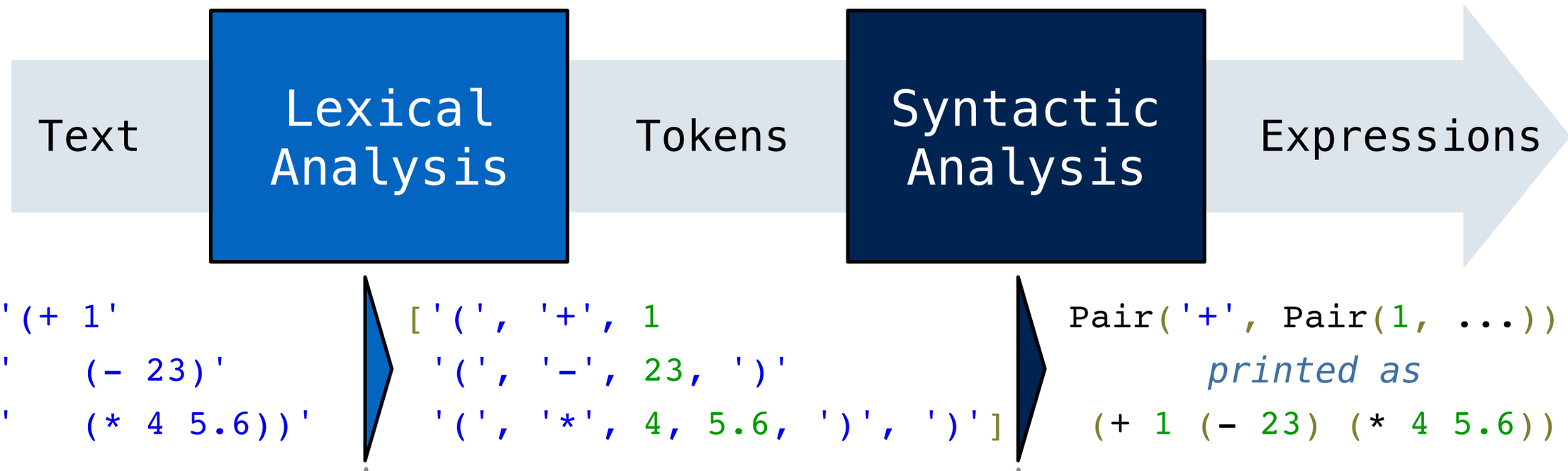

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- Returns expression as a Pair

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Evaluation

From expressions to values

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  - With user-defined functions, the apply function has to call the evaluate function! This mutual recursion is called the *eval-apply loop*

Putting it all together

A Calculator interactive interpreter!

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  - The *read–eval–print loop* completes our interpreter