



Automata Formal Languages & Logic

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Unit 2

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Regex is an algebraic way to describe regular languages.

Regular Expression

Atoms

- A
Character/symbol
- ϕ ($L = \{\}$)
- λ ($L = \{\lambda\}$)

Operators

- (R)
- R^*
- $R_1.R_2$ or R_1R_2
- $R_1 + R_2$ or $R_1 | R_2$

Example

$a b^* c + d$

Example

$$\underbrace{(a \ b^* \ c)}_{R_1} + \underbrace{d}_{R_2}$$

or

Example

$(a b^* c) + d$

Starting with
an 'a'

Followed by 0 or
more no. of b's

Ending with
a 'c'

Example

$(a b^* c) + d$

String that
contains only d

Starting with
an 'a'

Followed by 0 or
more no. of b's

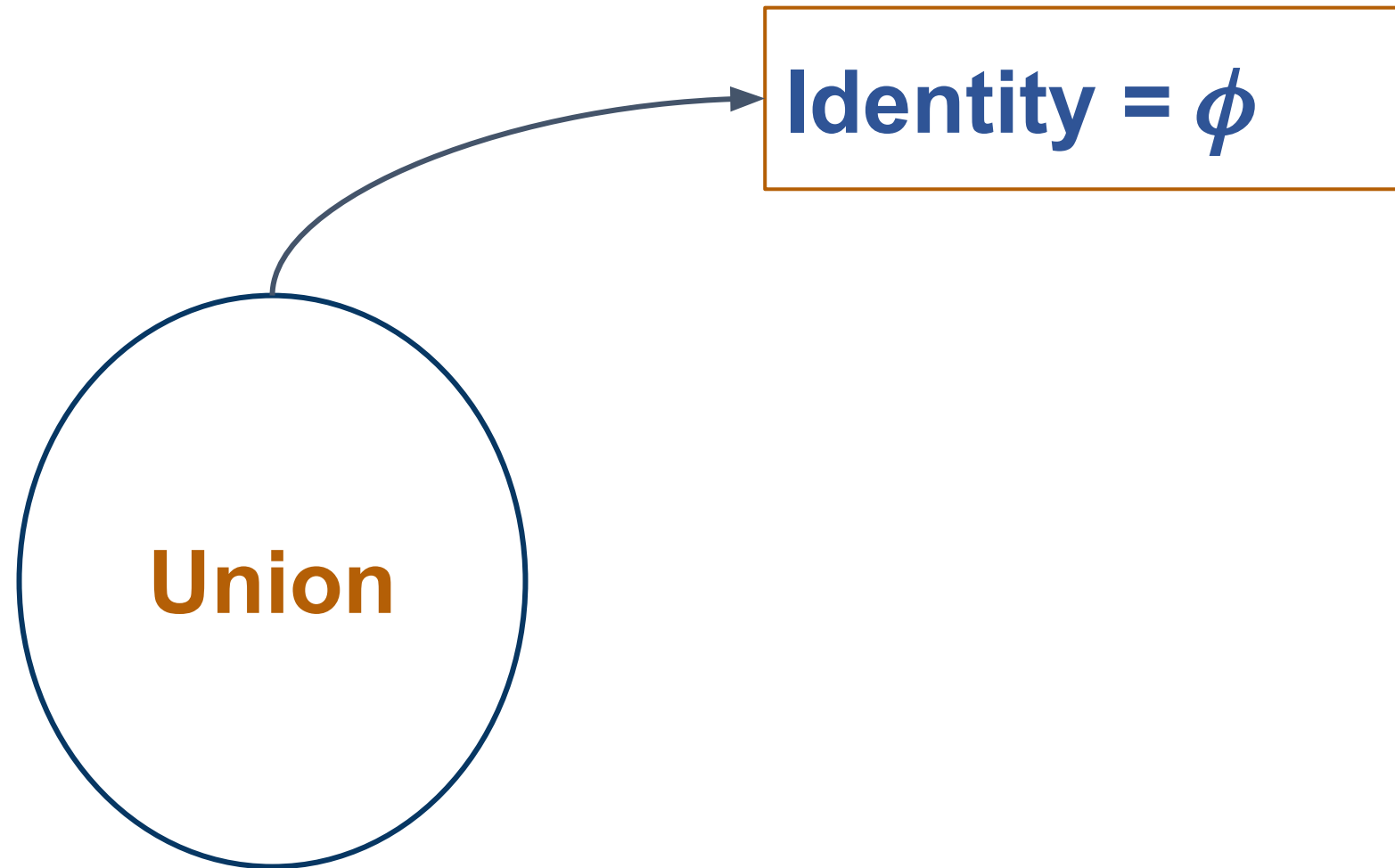
Ending with
a 'c'

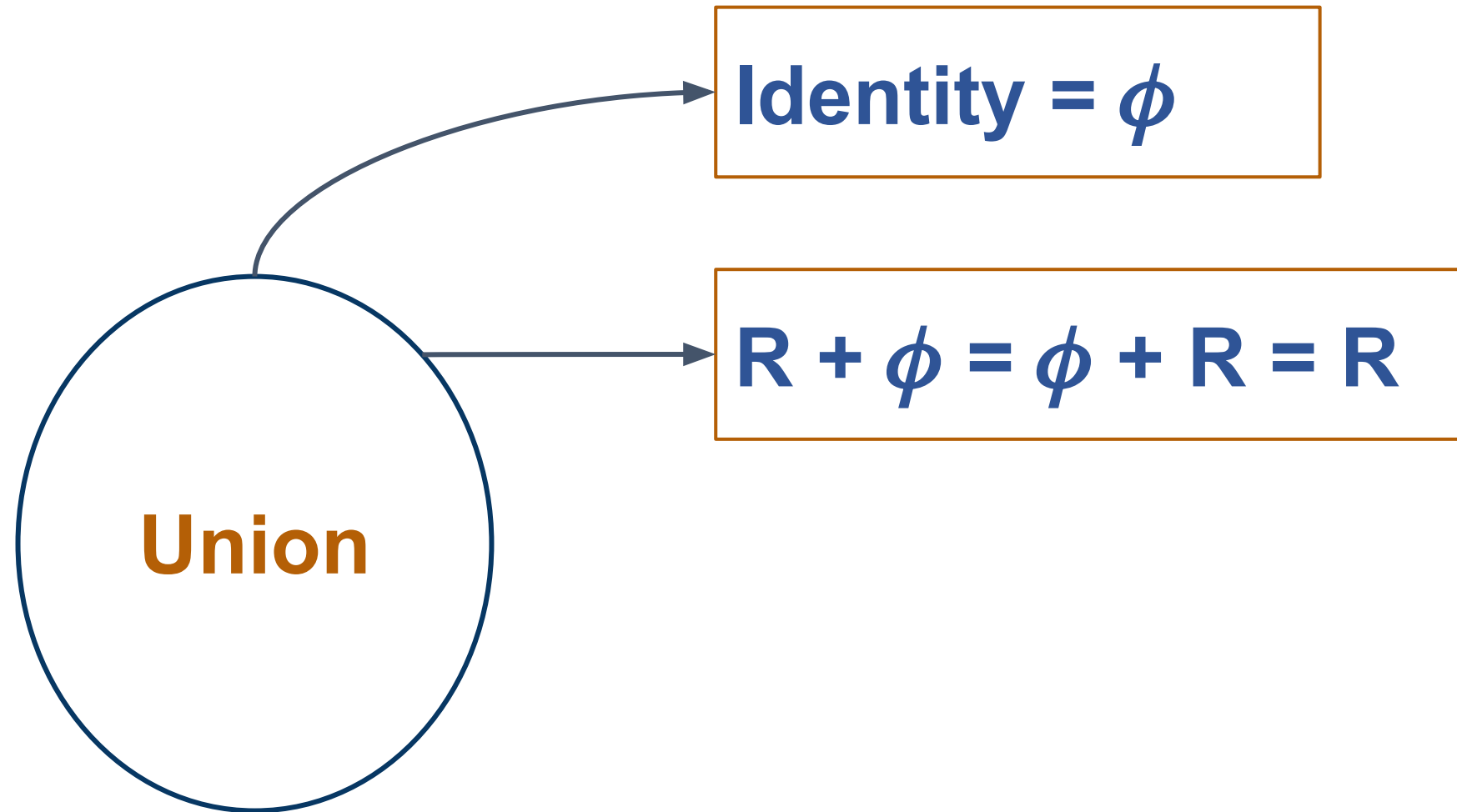
Example

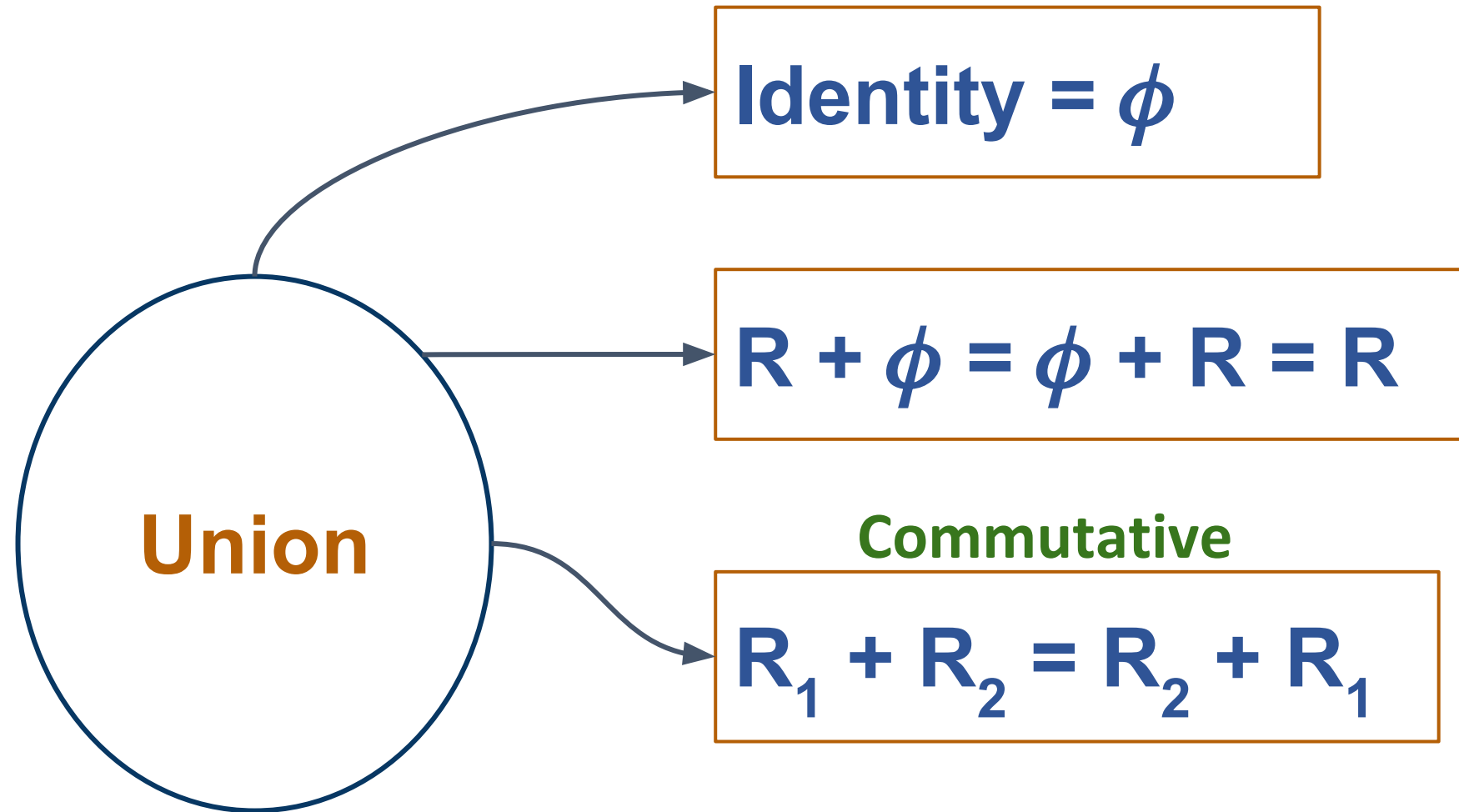
$$(a \ b^* \ c) + d$$
$$L = \{ ac, \\ abc, \\ abbb\dots c, \\ d \}$$

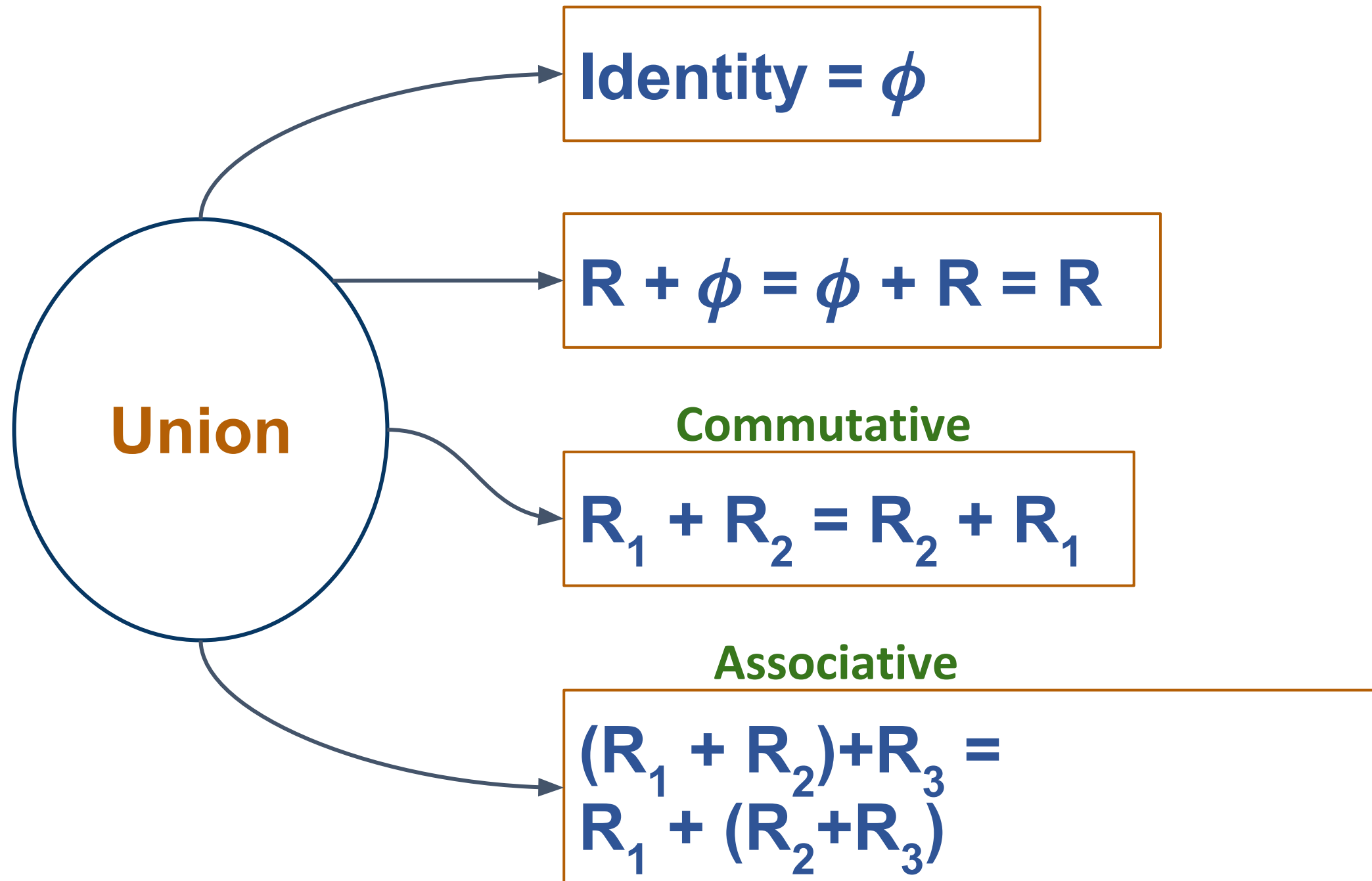
Automata Formal Languages and Logic

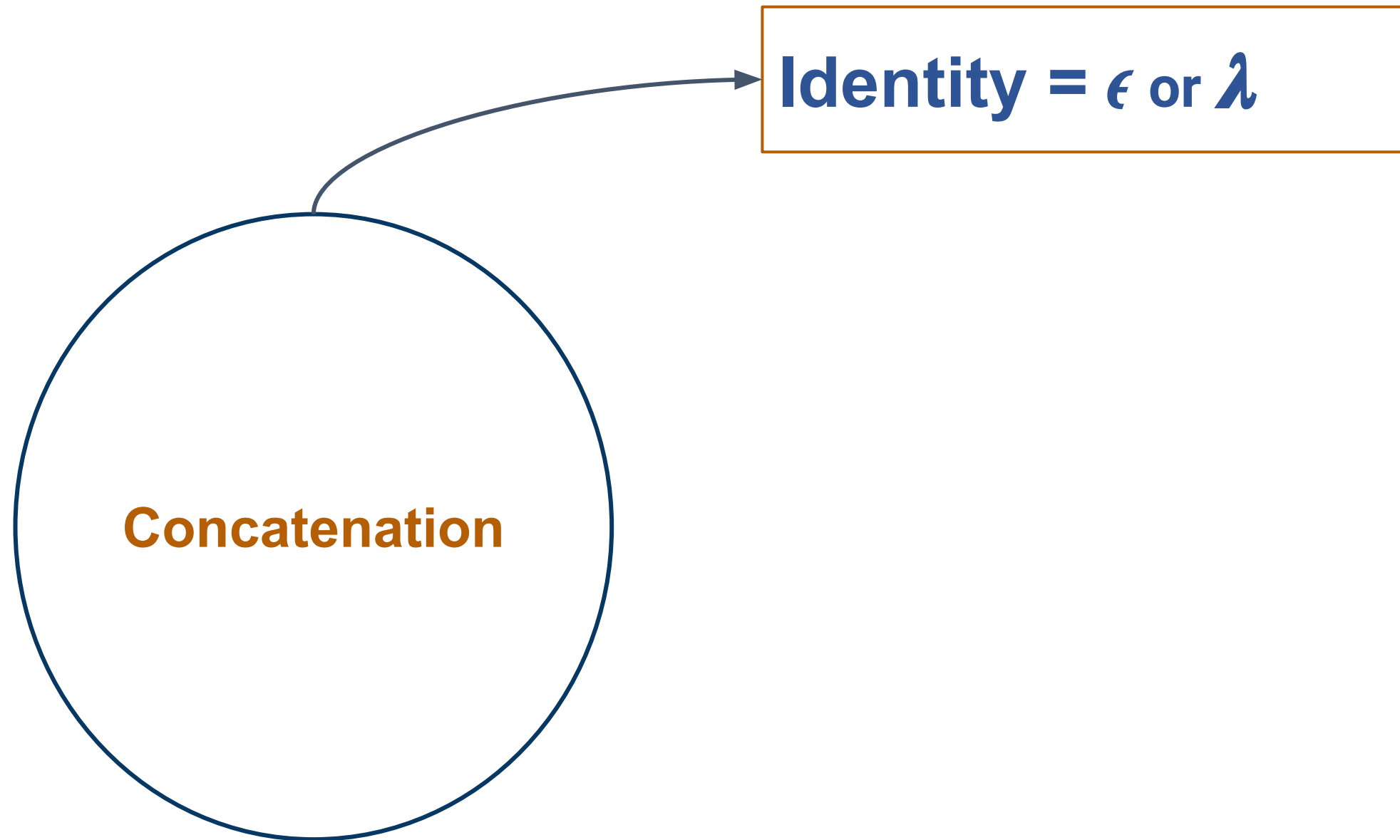
Unit 2 - Algebraic Laws of Regular Expressions

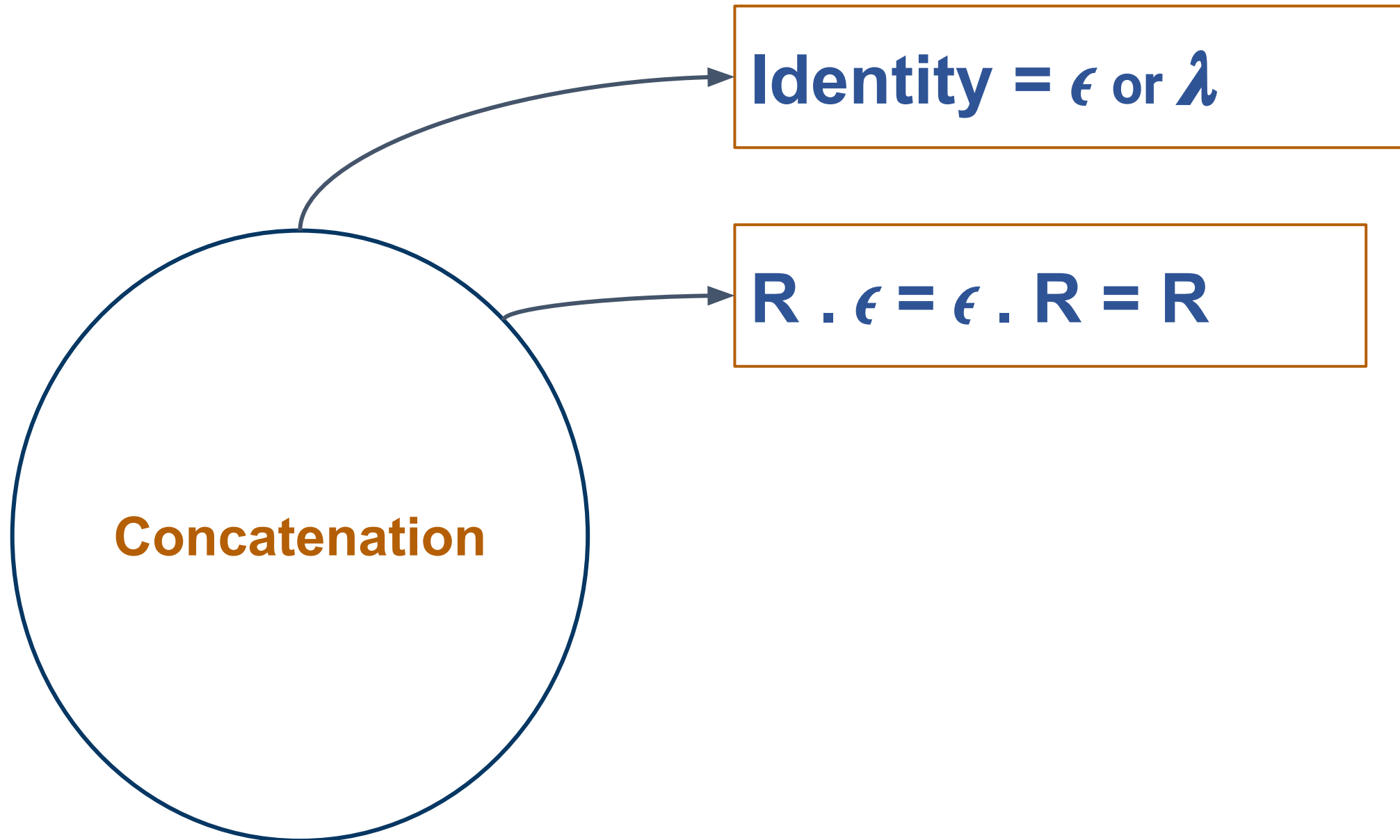






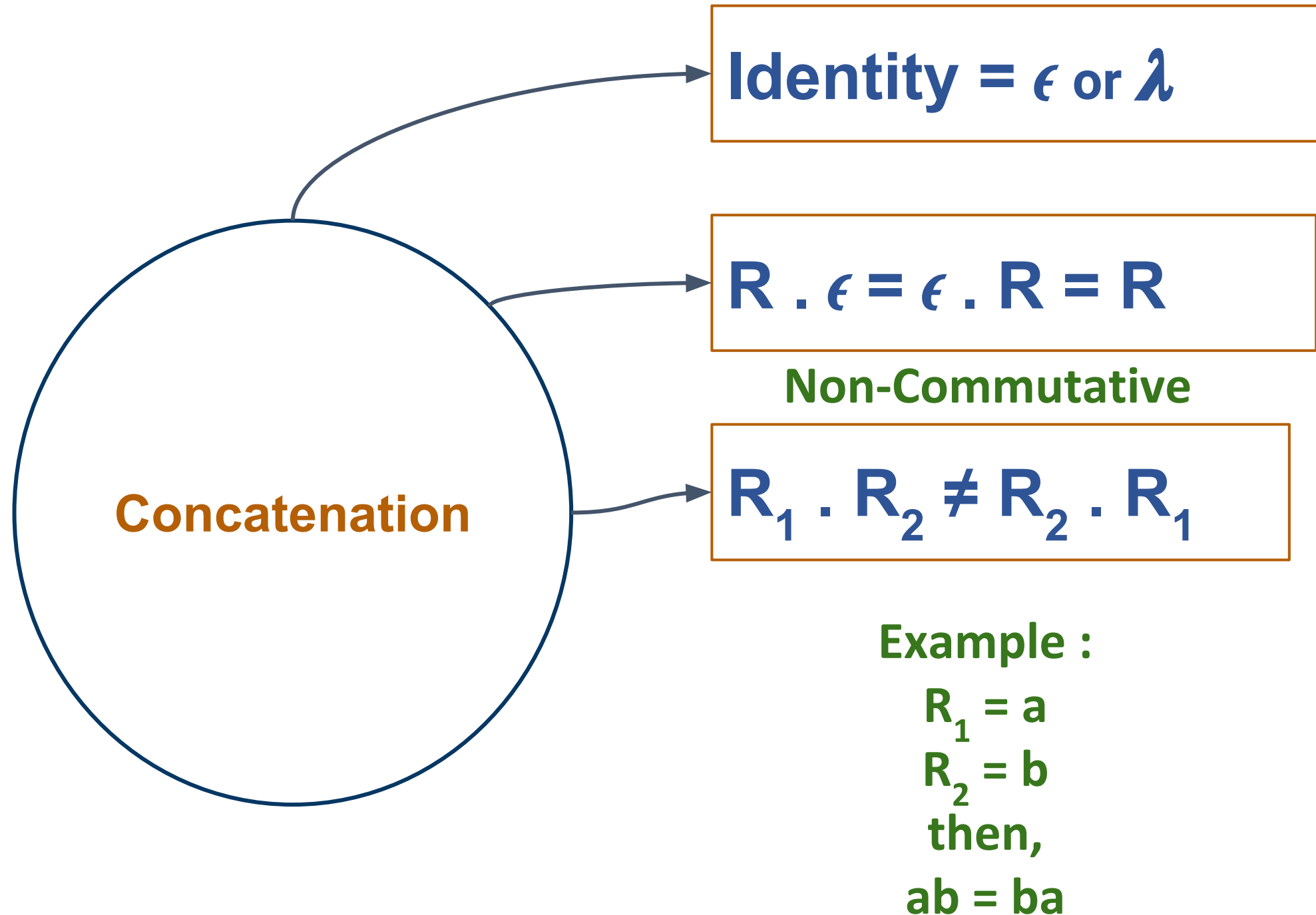


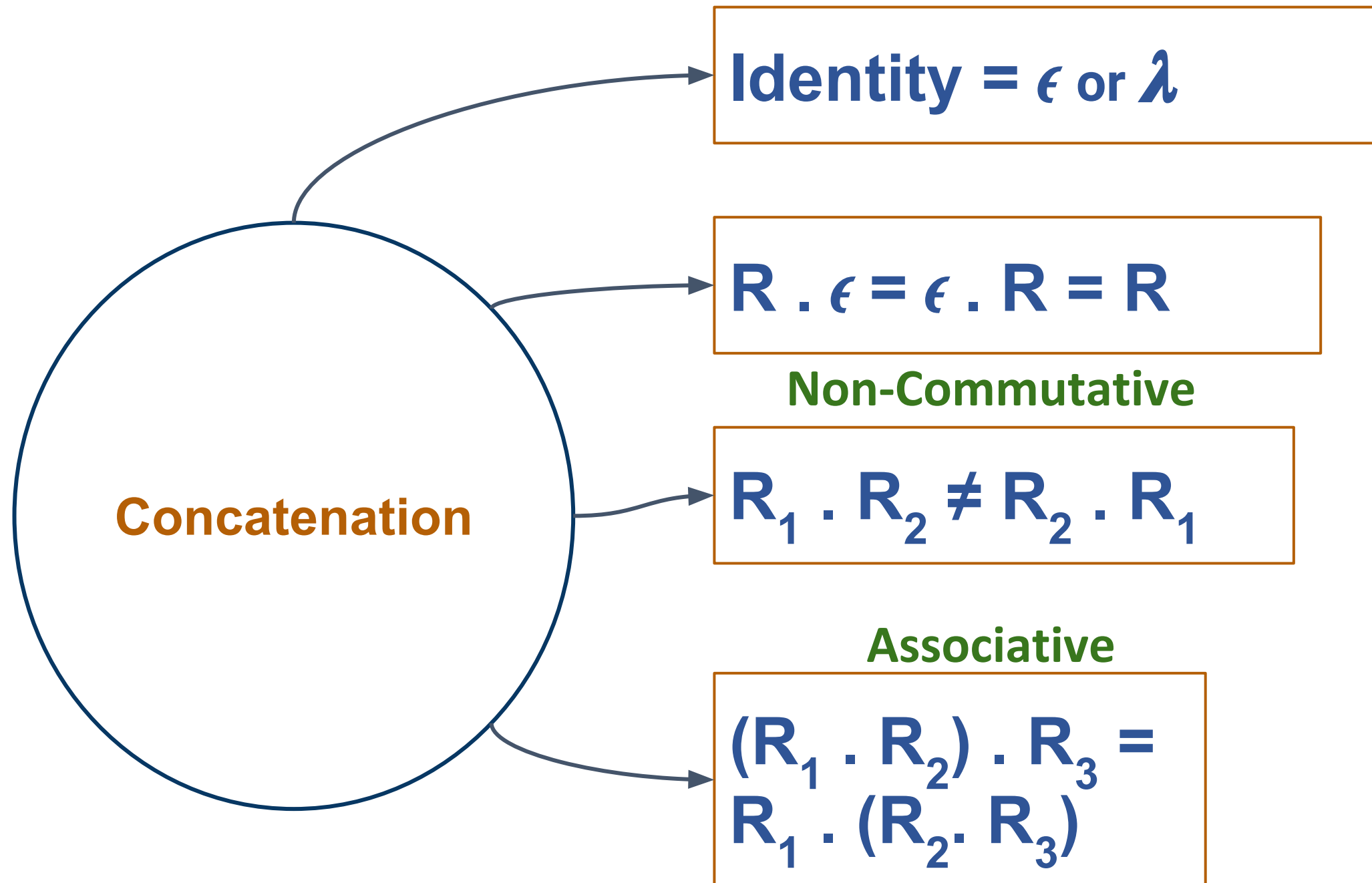




$$R \cdot \phi = \phi \cdot R = \phi$$

Let L_1, L_2 be languages, then the concatenation $L_1 \circ L_2 = \{w \mid w = xy, x \in L_1, y \in L_2\}$. If $L_2 = \emptyset$, then there is no string $y \in L_2$ and so there is no possible w such that $w = xy$. Thus for any L_1 , we'll have $L_1 \circ \emptyset = \emptyset$.





Closure

$$\epsilon^* = \epsilon$$

$$\phi^* = \epsilon$$

$$(R^*)^* = R^*$$

$$(R + \epsilon)^* = R^*$$

$$R^+ = RR^* = R^*R$$

$$(R^+ + \epsilon) = R^*$$

$$\epsilon + RR^* = \epsilon + R^* = R^*$$

Closure

$$\begin{aligned} & (a + b)^* \\ &= (a^* + b^*)^* \\ &= (a^* b^*)^* \\ &= (a + b^*)^* \\ &= (a^* + b)^* \\ &= a^*(ba^*)^* \\ &= b^*(ab^*)^* \end{aligned}$$

Construct a Regular Expression for a given language L



THANK YOU

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