

# Polymorphism

## concrete syntax

$\langle \text{Type} \rangle ::=$   
 | rat  
 | int  
 | pos  
 | bool  
 |  $\{ * \langle \text{Type} \rangle \langle \text{Type} \rangle \}$   
 |  $\{ \rightarrow \langle \text{Type} \rangle \langle \text{Type} \rangle \}$

## abstract syntax

rat  
 int  
 pos  
 bool  
 $A1 \rightarrow * A2$      $A1 * A2$   
 $A1 \rightarrow A2$      $A1 \rightarrow A2$

## Racket syntax

(Trat)  
 (Tint)  
 (Tpos)  
 (Tbool)  
 (T\* A1 A2)  
 (T→ A1 A2)

Polymorphic type

$\{ \text{all } \langle \text{symbol} \rangle \langle \text{Type} \rangle \}$   
 type variable

$a \rightarrow \text{all} \rightarrow A$      $\forall a. A$   
 $a \rightarrow \forall \rightarrow A$

(Tall 'a A)

Type variable

$\langle \text{symbol} \rangle$

$\text{var } a$      $a$

(Tvar 'a)

(EXAMPLE:

$\{ \text{all } a \{ \rightarrow a a \} \}$

$a \rightarrow \text{all} \rightarrow \text{var } a \rightarrow \text{var } a$      $(\forall a. a \rightarrow a)$

(Tall 'a (T→ (Tvar 'a) (Tvar 'a)))

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