Introduction to Computers and Programming

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Recitation 1
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Arrays

• Static structures of fixed size
  - lb: lower bound
  - ub : upper bound
  - index<lb | index>ub → constraint error

```haskell
type My_Array is array (1 .. 10) of Integer;
```

[Diagram showing an array with indices from 1 to 10, with arrows indicating lb and ub]
Palindrome

- A palindrome is a string that reads the same both forward and backward

```
  x y z a z y x
```

- Two questions:
  - How do you check equality?
  - When do you stop?

Evaluating Postfix

Read from left to right:
1. if a number is read, push it on the stack
2. if an operator is read, pop two numbers off the stack (the first number popped is the second binary operand)
3. apply the operation to the numbers, and push the result back onto the stack
4. when the expression is complete, the number on top of stack is the answer

```
5 3 + 4 + 1 +  
5 3 + 10 *
```
**Infix to Postfix**

\[
\text{post\_fix} := ""
\]

Create(Op\_Stack)

**for** I in 1 .. Length **loop**

**If** Is\_Operand(expr(I)) = true **then**

Append(post\_fix, expr(I))

**Else**

**If** Is\_Operator(expr(I)) = true **then**

Process\_Next\_Operator(expr(I))

**end loop**

-- string post\_fix has the result

**Process\_Next\_Operator**

Done := False

**loop**

**If** Is\_Empty(Op\_Stack) or next\_op is ‘(‘,

push next\_op onto Op\_Stack

set Done to True

**Elsif** precedence(next\_op) > precedence(top\_operator)

Push next\_op onto Op\_Stack

-- ensures higher precedence operators evaluated first

Set Done to True

**Else**

Pop the operator\_stack

**If** operator popped is ‘(‘

set Done to True

**Else**

append operator popped to post\_fix string

exit when Done = True

**end loop**
Infix to Postfix: Example

- Infix Expression
  \[ 3 + 5 \times 6 - 7 \times (8 + 5) \]

- Postfix Expression
  \[ 3 \ 5 \ 6 \ + \ 7 \ 8 \ 5 \ + \ * \ - \]

Unary Operators

- ‘+’ and ‘-’ are symbols used for both binary and unary operations
- How do you distinguish between binary and unary operators?
Infix to Postfix: Example

• Infix Expression
  \[ 3 + 5 \times - 6 - 7 \times (8 + 5) \]

• Postfix Expression
  \[ 3 \quad 5 \quad 6 \quad - \quad * \quad + \quad 7 \quad 8 \quad 5 \quad + \quad * \quad - \]