

# Language of Algorithms

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Slides adapted from Dr. Debswapna Bhattacharya's class

# The language of algorithms: Pseudocode

## Reading and writing algorithms

- A mixture of English and some notation
- There is no specific syntax, but we will follow the textbook conventions

- Keywords: `for`, `while`, `repeat-until`, `if-then-else`
- Variables, `object.attributes`, array cells, value assignments, comparisons, arithmetic operations, logical operations
- Parameter passing: variables by value, objects by reference
- Each line is numbered

## Additional Notes about Pseudocode

- $A[p\dots p]$  is an array with one cell with index  $p$
- $A[q\dots p]$  where  $q > p$  is an empty array
- $A[p\dots q]$  where  $q \geq p$  is an array with at least one element
- Two kinds of for loops: “for  $i=p$  to  $q$ ” is an incrementing loop and “for  $i=q$  downto  $p$ ” is a decrementing loop
  - for  $i=q$  to  $p$  where  $q > p$  and for  $i=p$  downto  $q$  where  $q > p$  will both fail immediately without executing.

- Understand the semantics (i.e., meaning) of each line Example:

## **Partition( $A[p..r]$ : array of numbers)**

```
1  x = A[r]
2  i = p - 1
3  for j = p to r - 1
4      if A[j] ≤ x
5          then i = i + 1
6          swap A[i] and A[j]
7  swap A[i + 1] and A[r]
8  return i + 1
```

# Reading Assignment

- **ASAP:** Read the pseudocode conventions from Chapter 2 Section 2.1 pages 20-23.
- Make sure that you understand these algorithm writing conventions. Ask me in next class if there is something you do not understand.
- We will follow those throughout the course.

The “string search” problem:  
*find a string (such as “cat”) in a piece of text*



# Thinking Assignment: Writing Algorithms in Pseudocode

1. Problem: string search
2. Well-defined specification
  - 3 parts
3. Strategy
  - Correct?
  - Efficient?
4. Algorithm

# Reading Assignment

- Read Chapter 32 Section 1 (32.1: p. 988-999) and understand the algorithm there.



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