UNIVERSITY OF CALGARY

CPSC 319
Data Structures, Algorithms, and Their Applications

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Introduction

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  Please start your subject with "CPSC 319 - "

Outline

- Java Primer (Chapter 1)
- Fundamental Data Structures (Chapter 3)
- Specifics about the Programming Assignments
- Any specific data structures/algorithms covered in class throughout the term

Recursion

- A programming concept where a function calls itself to solve a problem.
- Continues until a base case is reached, returning a result without further recursive calls.

- Factorial:

  $n! = n \times (n-1) \times \ldots \times 2 \times 1$

Matrix

- A matrix is a two-dimensional array of numbers, symbols, or expressions arranged in rows and columns.
- Denoted by an uppercase letter, such as A.
- Matrix Elements: a_{ij} represents the element in the i-th row and j-th column of matrix A.
- Matrix Size: m×n indicates a matrix with m rows and n columns.

$$\mathbf{A} = \begin{bmatrix} -1.3 & 0.6 \\ 20.4 & 5.5 \\ 9.7 & -6.2 \end{bmatrix}.$$

Matrix Operations

- Addition:
  C = A + B for matrices A, B, and C of the same size.
  $c_{ij} = a_{ij} - b_{ij}$
- Subtraction:
  C = A - B for matrices A, B, and C of the same size.
  $c_{ij} = a_{ij} - b_{ij}$
- Scalar Multiplication:
  C = k · A for a scalar k and matrix A.
  $c_{ij} = k \cdot a_{ij}$
- Matrix Multiplication:
  C = A × B for matrices A, B, and C with appropriate dimensions.
  $c_{ij} = \sum_{k=1}^{n} a_{ik} \cdot b_{kj}$
- Transpose:
  $B = A^T$ where B is the transpose of A.
  $b_{ij} = a_{ji}$

Exponentiation

- Exponentiation is the process of raising a number (base) to a certain power (exponent).

- $n^m = n \times n^{m-1}$

- $n^m = n^{m/2} \times n^{m/2} \times n$ (m is odd)
- $n^m = n^{m/2} \times n^{m/2}$ (m is even)