

Chapter 2. The Fundamentals: Algorithms, the Integers, and Matrices

Section 2.1. Algorithms

Note. When solving a problem, it is often necessary to execute a sequence of steps on a set of data. In its most general sense, this sequence of steps is an algorithm.

Definition. An *algorithm* is a finite set of precise instructions for performing a computation or for solving a problem.

Note. On page 101 the book gives the “pseudocode” for an algorithm that finds the maximum element of a finite sequence.

Note. On page 103 the book gives the “pseudocode” for an algorithm that linearly searches a sequence for a particular entry. It starts with “ a_1 ” and ends when it finds the target “ x .”

Example. Page 015 Number 4. Give an algorithm that uses repeated multiplication and division to compute x^n power where n is an integer.

Solution. We have:

```
procedure power(x: real number, n: integer)
```

```
    i := 1, P := 1
```

```
while (i ≤ n and n > 0)
```

```
    P := P * x, i = i + 1
```

```
while (i ≤ n and n < 0)
```

```
    P := P ÷ x, i = i + 1
```

```
{  $x^n$  is given by P }
```

Note. On page 104 the text gives a binary algorithm that searches a list of ordered integers by cutting the list into 2 pieces iteratively.

Example. Page 105 Number 7b.

Revised: 4/1/2019