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***“Actividad 1.1 Practicando las matemáticas básicas”***

**Implementación de métodos computacionales**

17 de febrero de 2021

## Herramientas básicas

Fuente: J.E. Hopcroft, J.D. Ullman. Introduction to Automata Theory, Languages, and Computation. Addison-Wesley, (1979), pp. 10-11.

**1.1** In the tree of Fig. 1.4,

a) Which vertices are leaves and which are interior vertices?

Nodos hoja: 2, 4, 6, 8, 9 Nodos interiores: 1, 3, 5, 7

b) Which vertices are the sons of 5?

Nodos 7 y 8

c) Which vertex is the father of 5?

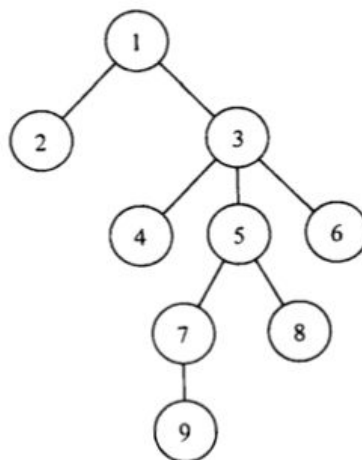
Nodo con valor 3

d) What is the length of the path from 1 to 9?

4

e) Which vertex is the root?

1



**Fig. 1.4** A tree.

1.2 Prove by induction on  $n$  that

$$a) \sum_{i=0}^n i = \frac{n(n+1)}{2}$$

$$1 + 2 + 3 + 4 + 5 + \dots + N = \frac{N(N+1)}{2}$$

$$\text{Caso } 1 = 1 = \frac{1(1+1)}{2} = \frac{2}{2} = 1 \quad \checkmark$$

$$\text{Caso } K = 1 + 2 + \dots + K = \frac{K(K+1)}{2} \rightarrow \text{Si es verdadera también es para } K+1$$

$$\text{Caso } K+1 = 1 + 2 + \dots + K + (K+1) = \frac{K+1((K+1)+1)}{2}$$

$$\text{Caso } K + K+1 = \frac{K+1(K+2)}{2}$$

$$\frac{K(K+1)}{2} + K+1 = \frac{K+1(K+2)}{2}$$

$$\frac{K(K+1) + 2(K+1)}{2} = \frac{K+1(K+2)}{2}$$

$$\frac{(K+1)(K+2)}{2} = \frac{K+1(K+2)}{2} \quad \checkmark$$