Half-Subtractor :

A half Subtractor performs Subtraction of two-binary numbers (digits, bits).

→ It outputs the difference and the borrow that may occur during the subtraction process.

The half subtractor takes two binary inputs :

A : Minuend (The number from which another number is subtracted).

B : Subtrahend (the number to be subtracted)

Outputs :

The half subtractor produces two outputs

1. Difference (D) : This represents the result of A - B

2. Borrow (Bo) : This indicates whether a borrow was needed during the subtraction.

→ A borrow occurs when the minuend (A) is less than subtrahend (B)

Truth-table :

A	B	Difference (D)	Borrow (Bo)
0	0	0	0
0	1	1	1
1	0	1	0
1	1	0	0

Boolean expression:

$$D = A \oplus B$$

$$Bo = \bar{A}B$$

Gate-level implementation: