RD Sharma Solutions
Class 12 Maths
Chapter 3
Ex 3.3

Binary Operations Ex 3.3 Q1

The binary operator $*$ is defined on I^+
and is given by,

$$a * b = a + b \text{ for all } a, b \in I^+$$

Let $a \in I^+$ and $e \in I^+$ be the identity element with respect to $*$.
by identity property, we have,

$$a * e = e * a = a$$

$\Rightarrow \qquad a + e = a$

$\Rightarrow \qquad e = 0$

Thus the required identity element is 0.

Binary Operations Ex 3.3 Q2

Let $R - \{-1\}$ be the set and $*$ be a binary operator, given by

$$a * b = a + b + ab \text{ for all } a, b \in R - \{-1\}$$

Now,
Let $a \in R - \{-1\}$ and $e \in R - \{-1\}$ be the identity element with respect to $*$.
by identity property, we have,

$$a * e = e * a = a$$

$\Rightarrow \qquad a + e + ae = a$

$\Rightarrow \qquad e(1 + a) = 0$

$\Rightarrow \qquad e = 0 \qquad\qquad\qquad\qquad [\because 1 + a \neq 0 \text{ as } a \neq -1]$

$\therefore \qquad$ The required identity element is 0.

Binary Operations Ex 3.3 Q3

We are given the binary operator $*$ defined on Z as
$$a * b = a + b - 5 \text{ for all } a, b \in Q.$$

Let e be the identity element with respect to $*$

Then, $a * e = e * a = a$ [By identity property]

$\Rightarrow$ $a + e - 5 = a$
$\Rightarrow$ $e = 5$

Hence, the required identity element with respect to $*$ is 5.

Binary Operations Ex 3.3 Q4

The binary operator $*$ is defined on Z, and is given by
$$a * b = a + b + 2 \text{ for all } a, b \in Z.$$

Let $a \in Z$ and $e \in Z$ be the identity element with respect to $*$, then
$$a * e = e * a = a$$ [By identity property]

$\Rightarrow$ $a + e + 2 = a$
$\Rightarrow$ $e = -2 \in Z$

Hence, the identity element with respect to $*$ is -2.