



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,

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

$$\Rightarrow a + e = a$$

$$\Rightarrow e = 0$$

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,

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

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

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

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

$\therefore$  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  $*$

$$\text{Then, } a * e = e * a = a \quad [\text{By identity property}]$$

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

$$\Rightarrow e = 5$$

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

$$a * e = e * a = a \quad [\text{By identity property}]$$

$$\Rightarrow a + e + 2 = a$$

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

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

\*\*\*\*\* END \*\*\*\*\*