

$$(i) \ a * b = a - b.$$

$$\text{Let } a = 1 \text{ and } b = 2$$

$$a * b \Rightarrow a - b$$

$$1 * 2 \Rightarrow 1 - 2$$

$$\Rightarrow -1$$

$$(ii) \ a * b = ab$$

$$\text{Let } a = 1, b = 2$$

$$a * b = ab$$

$$= 1 \times 2$$

$$= \underline{\underline{2}}$$

$$(iii) \ a * b = ab^2$$

$$\text{Let } a = 1 \text{ and } b =$$

$$a * b = ab^2$$

$$= 1 \times 2^2$$

$$= \underline{\underline{4}}$$

$$(iv) \ a * b = |a - b|$$

$$a = 1, b = 2$$

$$a * b = |a - b|$$

$$= |1 - 2|$$

$$= \underline{\underline{1}}$$

$$(v) \ a * b = a$$

$$a = 1, b = 2$$

$$\Rightarrow \underline{\underline{1}}$$

$$(i) \ a * b = a - b$$

$$\text{Let } a = 1, b = 2$$

$$a * b = a - b$$

$$1 * 2 = 1 - 2$$

$$= \underline{\underline{-1}}$$

~~$$(ii) \ a * b = ab + 1$$~~

$$a * b = b * a$$

$$a - b = b - a$$

$$1 - 2 = 2 - 1$$

$$\underline{\underline{-1 \neq 1}} \text{ It is not com}$$

$$\underline{a * c} = (a) = c * a$$

$$a * (b * c) = (a * b) * c$$

It is not associative law.

(3)

\wedge	1	2	3	4	5
1	1	1	1	1	1
2	1	2	2	2	2
3	1	2	3	3	3
4	1	2	3	4	4
5	1	2	3	4	5

(4)

set $\{1, 2, 3, 4, 5\}$

(i) compute $(2 * 3) * 4$ and $2 * (3 * 4)$

(ii) is $*$ commutative

(iii) compute $(2 * 3) * (4 * 5)$

\wedge	1	2	3	4	5
1	1	1	1	1	1
2	1	2	1	2	1
3	1	1	3	1	1
4	1	2	1	4	1
5	1	1	1	1	5

(i) $(2 * 3) * 4$, $2 * (3 * 4)$

$$1 * 4$$

$$1$$

$$2 * (1)$$

$$1$$

$$\underline{\hspace{1cm}} \quad \text{LHS} = \text{RHS.} \quad \underline{\hspace{1cm}}$$

(ii) yes it is commutative law.

(iii) $(2 * 3) * (4 * 5)$

$\Rightarrow 1 * 1$

$\Rightarrow \underline{\underline{1}}$ Ans

5) set $\{1, 2, 3, 4, 5\}$ $a * b = \text{HCF of } a \text{ and } b.$

*	1	2	3	4	5
1	1	1	1	1	1
2	1	2	1	2	1
3	1	1	3	1	1
4	1	2	1	4	1
5	1	1	1	1	5

yes it is exact same as ques 4 above.

6) $a * b = \text{L.C.M of } a, b.$

(i) $5 * 7, 20 * 16$

$\Rightarrow (5 * 7) \Rightarrow (\text{Lcm of } 5 \text{ and } 7)$

$\Rightarrow \underline{\underline{1}}$ Ans

$\Rightarrow (20 * 16) \Rightarrow (\text{LCM of } 20 \text{ and } 16)$

$\times 20 = 2 \times 5 \times 2$

$16 = 2 \times 2 \times 2 \times 2$

$\text{LCM} = 2 \times 2 \times 2 \times 2 \times 5$

$\underbrace{2 \times 2}_4 \times \underbrace{2 \times 2}_4 \times 5 = 80 \Rightarrow \underline{\underline{80}}$ Ans

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(ii) is $*$ commutative associative.
to find it let's consider $a=1, b=2$ and $c=3$.

$$a * (b * c) = (a * b) * c$$

$$\Rightarrow 1 * (2 * 3) \quad , \quad (1 * 2) * 3$$

$$\Rightarrow 1 * (1) \quad , \quad (1) * 3$$

$$\Rightarrow 1 \quad \neq \quad 3$$

not equal LHS \neq RHS
It is not commutative, associative

(iii) ~~associative~~ \Rightarrow commutative

$$\Rightarrow (a * b) = (b * a)$$

$$\text{LHS} \Rightarrow (1 * 2) \quad , \quad (2 * 1)$$

$$2 \quad , \quad 2$$

$$2 = 2$$

LHS = RHS It is commutative

⑦ $\{1, 2, 3, 4, 5\}$ $a * b = \text{LCM of } a, b$.

let us consider $a=1, b=2$.

$$a * b = \text{LCM of } a \text{ and } b$$

$$1 * 2 = \text{LCM of } 1, 2$$

$$\textcircled{1} = \textcircled{1}$$

$$\textcircled{2} = \textcircled{1 \times 2}$$

$$\Rightarrow \text{LCM} = 1 \times 2$$

$$= \underline{\underline{2}} \text{ Ans}$$

8) $a * b = \text{HCF of } a \text{ and } b.$

Let us consider $a = 1, b = 2$

$1 * 2 = \text{HCF of } 1, 2.$

- \Rightarrow ① = 1
- ② = 1×2
- \Rightarrow 1

Commutative $\Rightarrow a * b = b * a$
 $1 * 2 = 2 * 1$

LHS = RHS, It is commutative

Associative $\Rightarrow (a * b) * c = a * (b * c)$

$\Rightarrow (1 * 2) * 3, 1 * (2 * 3)$

$\Rightarrow 1 * 3, 1 * 1$

$\Rightarrow 1, 1$
 LHS = RHS It is associative

9) (i) $a * b = a - b.$

Commutative $\Rightarrow a * b = b * a$

$\Rightarrow a - b = b - a$

$\Rightarrow (1 * 2) = (2 * 1)$
 $-1 \neq 1$

LHS \neq RHS It is not commutative

Associative $\Rightarrow a * (b * c) = (a * b) * c$

$\Rightarrow 1 * (2 * 3) = (1 * 2) * 3$

$\Rightarrow 1 * (-1) \neq (-1) * 3$

$2 \neq 4$ LHS \neq RHS Not associative