Multiplication on Number Line

Let us consider 3 packets, each consisting of 4 doughnuts.

Total number of doughnuts = 4 + 4 + 4 = 12	
We can also write:	
Total number of doughnuts = 3 × 4 = 12	

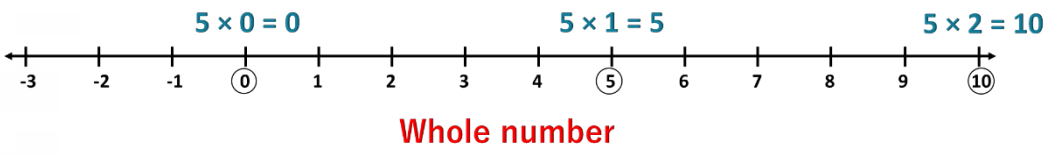
Therefore, we can say that multiplication is repeated addition.

i) Closure Property:

a, b Whole numbers ⇒ a × b, Whole number

If a and b are two whole numbers, then a × b is always a whole number.

a	b	a × b	Whole number
9	7	9 × 7 = 63	Yes
5	11	5 × 11 = 55	Yes
10	27	10 × 27 = 270	Yes



Whole number

When we multiply two whole numbers, the product is also a whole number.

ii) Commutative Property:

a, b Whole numbers ⇒ $a \times b = b \times a$

If a and b are two whole numbers, then a × b = b × a

a	b	a × b	b × a	Is a × b = b × a?
1	7	1 × 7 = 7	7 × 1 = 7	Yes
8	11	8 × 11 = 88	11 × 8 = 88	Yes
3	100	3 × 100 = 300	100 × 3 = 300	Yes

The value of the product does not change even when the order of multiplication is changed.

iii) Associative Property:

a, b and c Whole numbers ⇒ $(a \times b) \times c = a \times (b \times c)$

If a, b and c are any three whole numbers, then (a × b) × c = a × (b × c)

a	b	c	(a × b) × c	a × (b × c)	Is (a × b) × c = a × (b × c)?
1	7	5	(1 × 7) × 5 = 35	1 × (7 × 5) = 35	Yes
5	6	10	(5 × 6) × 10 = 300	5 × (6 × 10) = 300	Yes
8	2	5	(8 × 2) × 5 = 80	8 × (2 × 5) = 80	yes

When we multiply three or more whole numbers, the value of the product remains the same even if they are grouped in any manner.

iv) Multiplicative Identity Property:

If a is any whole number, then a × 1 = a = 1 × a

a	1	a × 0	Is a × 1 = a?
1	1	1 × 1 = 1	Yes
15	1	15 × 1 = 15	Yes
196	1	196 × 1 = 196	Yes

Multiplicative identity is any number which when multiplied by any whole number, then the value remains the same.

So, 1 is the multiplicative identity of whole numbers.

v) Distributivity of Multiplication over Addition:

$a \times (b + c) = a \times b + a \times c$

If a, b and c are any three whole numbers, then a × (b + c) = a × b + a × c

a	b	c	a × (b + c)	a × b + a × c	Is a × (b + c) = a × b + a × c?
2	3	5	2 × (3 + 5) = 16	2 × 3 + 2 × 5 = 16	Yes
1	4	7	1 × (4 + 7) = 11	1 × 4 + 1 × 7 = 11	Yes
3	5	8	3 × (5 + 8) = 39	3 × 5 + 3 × 8 = 39	Yes

vi) if a is any whole number other than zero, then a × 0 = 0

$a \times 0 = 0$

15 × 0 = 0; 100 × 0 = 0

Example: Find the product by suitable rearrangement:

i) 4 × 1768 × 25 ii) 2 × 166 × 50

i) 4 × 1768 × 25

= (4 × 25) × 1768 (by commutative property)

= 100 × 1768 = 176800

ii) 2 × 166 × 50

= (2 × 50) × 166 (by commutative property)

= 100 × 166 = 16600