



1. BIG IDEA

Algebra uses letters to write general statements about patterns and relations.

Distributivity is a property that relates multiplication and addition. It helps us prove statements, discover patterns and solve problems.

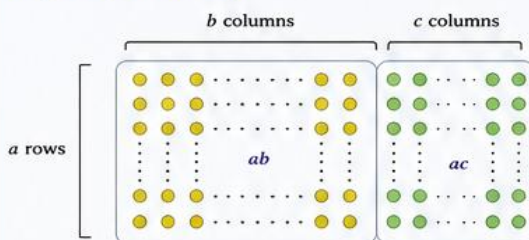


2. DISTRIBUTIVE PROPERTY OF MULTIPLICATION OVER ADDITION

$$a(b + c) = ab + ac$$

This means multiplying a by $(b + c)$ is the same as multiplying a by b and a by c , then adding.

Diagram (Area Model)



Also,

$$(a + b)c = ca + cb = ac + bc$$

(Distributivity + Commutativity)



Remember: $a(b + c)$ and $23(27 + 1)$ mean $a \times (b + c)$ and $23 \times (27 + 1)$ respectively.

3. INCREMENTS IN PRODUCTS

Let the initial two numbers be a and b (product = ab).

- 1 If second number b is increased by 1:

$$a(b + 1) = ab + a$$

→ Increase = a

Example:

$$23(27 + 1) = 23 \times 27 + 23$$

Increase = 23

- 2 If first number a is increased by 1:

$$(a + 1)b = ab + b$$

→ Increase = b

Example:

$$(23 + 1)27 = 23 \times 27 + 27$$

Increase = 27

- 3 If both numbers are increased by 1:

$$(a + 1)(b + 1) = ab + (a + b + 1)$$

→ Increase = $a + b + 1$

Example:

$$(23 + 1)(27 + 1) = 23 \times 27 + (23 + 27 + 1)$$

Increase = 51

- 4 If one number is increased by 1 and the other decreased by 1:

$$(a + 1)(b - 1) = ab + b - a - 1$$

→ Increase = $b - a - 1$

Example:

$$(23 + 1)(27 - 1) = 23 \times 27 + 27 - 23 - 1$$

Increase = 3

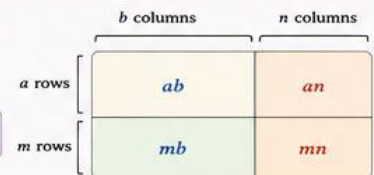
General Case (Increase by m and n)

If a is increased by m and b by n :

$$(a + m)(b + n) = ab + mb + an + mn$$

→ Increase = $an + bm + mn$

$$(a + m)(b + n) = ab + mb + an + mn \quad (\text{Identity 1})$$



4. KEY DEFINITIONS

- ★ **Distributive Property:** $a(b + c) = ab + ac$ and $(a + b)c = ac + bc$.
- ✗ **Product:** The result of multiplying two numbers.
- ↗ **Increase in Product:** The amount by which the product becomes greater after a change.
- = **Identity:** An equality that is true for all values of the letter-numbers (or all numbers in a certain set).
- ↔ **Commutative Property:** $ab = ba$.

5. WHAT TO REMEMBER (AT A GLANCE)

Situation	New Product	Increase in Product
Only b increased by 1	$a(b + 1)$	a
Only a increased by 1	$(a + 1)b$	b
Both a and b increased by 1	$(a + 1)(b + 1)$	$a + b + 1$
a increased by 1, b decreased by 1	$(a + 1)(b - 1)$	$b - a - 1$
a increased by m , b increased by n	$(a + m)(b + n)$	$an + bm + mn$

6. WORKS FOR ALL INTEGERS

These results hold even when a and b are negative integers.

Example:

$$\text{Let } a = -5, b = 8$$

Both increased by 1:

$$(a + 1)(b + 1) = (-4)(9) = -36$$

$$ab + (a + b + 1) = (-5)(8) + (-5 + 8 + 1) = -40 + 4 = -36 \quad \checkmark$$

One increased, one decreased:

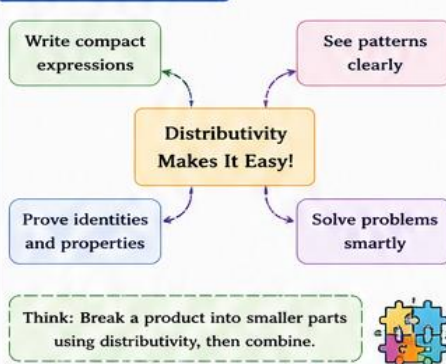
$$(a + 1)(b - 1) = (-4)(7) = -28$$

$$ab + b - a - 1 = (-5)(8) + 8 - (-5) - 1 = -40 + 8 + 5 - 1 = -28 \quad \checkmark$$



Integers also satisfy the distributive property:
 $x(y + z) = xy + xz$ (for any integers x, y, z).
 Hence all the above formulas are valid for integers.

7. VISUAL SUMMARY



8. QUICK CHECK

Find the increase in the product in each case (in terms of a and b).

- 1 $a(b + 1)$
- 2 $(a + 1)b$
- 3 $(a + 1)(b + 1)$
- 4 $(a + 1)(b - 1)$
- 5 $(a + m)(b + n)$



CORE MESSAGE: Distribute, simplify, and patterns appear. Distributivity turns complex expressions into simple truths!

WORKSHEET-1

Section A: MCQs (Part-1) ($10 \times 1 = 10$ marks)

1. Using the distributive property, $5 \times (8 + 2) =$

- a) 40 b) 50 c) 45 d) 35

2. Which expression is equivalent to $7 \times (10 + 3)$?

- a) $7 \times 10 + 7 \times 3$ b) $7 \times 10 - 7 \times 3$ c) $10 \times 3 \times 7$ d) $7 + 10 + 3$

3. The value of $9 \times (6 - 2)$ is:

- a) 54 b) 36 c) 32 d) 28

4. Using the distributive property, 12×11 can be written as:

- a) $12 \times (10 + 1)$ b) $12 + 11$ c) $12 \times (10 - 1)$ d) $11 \times (11 + 1)$

5. What is the value of $4 \times (20 + 5)$?

- a) 80 b) 90 c) 100 d) 120

6. Which property is used in $8 \times (3 + 4) = (8 \times 3) + (8 \times 4)$?

- a) Commutative Property b) Associative Property
c) Distributive Property d) Closure Property

7. Find the value of $15 \times (4 + 2)$.

- a) 60 b) 75 c) 90 d) 120

8. $6 \times (9 - 4) =$

- a) 54 b) 30 c) 24 d) 18

9. Which of the following is correct?

- a) $5 \times (7 + 2) = 5 \times 7 + 5 \times 2$ b) $5 \times (7 + 2) = 5 + 7 + 2$
c) $5 \times (7 + 2) = 5 \times 7 \times 2$ d) $5 \times (7 + 2) = 7 + 2$

10. The value of $13 \times (5 + 5)$ is:

- a) 65 b) 100 c) 130 d) 150

MCQs (Part-2) ($10 \times 1 = 10$ marks)

11. Which of the following best describes the Distributive Law?

- (A) $a \times (b + c) = (a \times b) + c$ (B) $a \times (b + c) = (a \times b) + (a \times c)$
(C) $a + (b \times c) = (a + b) \times (a + c)$ (D) $a \times (b + c) = a \times b \times c$

12. Using the distributive property, 7×99 equals:

- (A) $700 - 7$ (B) $7 \times 100 - 7$ (C) $7 \times 100 + 7$ (D) $700 + 99$

13. Which identity is used when we write $15 \times 12 = 15 \times (10 + 2)$?

- (A) Commutative property (B) Associative property
(C) Distributive property (D) Identity property

14. The value of 25×102 calculated using distribution is:

- (A) 2,500 (B) 2,450 (C) 2,550 (D) 2,525

15. If $a = 6$, $b = 4$, $c = 3$, then $a \times (b - c)$ equals:

- (A) 18 (B) 6 (C) 9 (D) 24

16. Which of the following shows an incorrect application of distributive law?

- (A) $3 \times (4 + 5) = 12 + 15$ (B) $5 \times (6 - 2) = 30 - 10$
(C) $4 \times (3 \times 2) = 12 + 8$ (D) $7 \times (10 + 1) = 70 + 7$

17. 48×25 can be simplified as:

- (A) $48 \times 20 + 48 \times 5$ (B) $48 \times 20 \times 5$ (C) $50 \times 25 - 2$ (D) $48 + 25 \times 4$

18. An orchard has 36 rows of apple trees and 36 rows of mango trees, each row having 15 trees.
Total trees = ?

- (A) 1080 (B) 1440 (C) 720 (D) 900

19. The expression $(a + b) \times c$ is equivalent to:

- (A) $a + bc$ (B) $ac + bc$ (C) $ac + b$ (D) $a + b + c$

20. How does the distributive law help in mental arithmetic?

- (A) It changes the order of numbers
(B) It breaks hard multiplications into simpler ones
(C) It converts multiplication into addition only
(D) It always gives approximate answers

WORKSHEET-2
SECTION B SHORT ANSWER (11×2=20 MARKS)

1. Using the distributive law, evaluate 8×103 without a calculator. Show one step.

2. Fill in the blank using distributive law and state the property used:

$$34 \times 18 = 34 \times \underline{\quad\quad} + 34 \times \underline{\quad\quad}$$

3. Verify: $6 \times (9 - 4) = 6 \times 9 - 6 \times 4$. Show both sides separately.

4. A teacher distributes 12 chocolates to each of 24 boys and 16 girls. Using distribution, find the total chocolates distributed.

5. Write distributive law over subtraction for whole numbers with an example.

6. Using distribution, find the value of 99×13 .

7. State whether True or False and justify: $5 \times (3 + 2) = (5 \times 3) + 2$.

8. Simplify using distribution: $15 \times 8 + 15 \times 2$.

9. If $p = 11$, $q = 5$, $r = 3$, verify: $p \times (q + r) = p \times q + p \times r$.

10. A vegetable vendor sells carrots at ₹18 per kg. He sells 6 kg on Monday and 9 kg on Tuesday. Using distribution, find his total earnings.

SECTION C SHORT ANSWER (6×3=18 MARKS)

11. A shopkeeper buys 25 boxes. Each box has 12 red pens and 8 blue pens. Using the distributive law, find: (i) Total pens in all boxes. (ii) Which law saves calculation steps here?

12. Two numbers are in the ratio 3 : 5. If their sum is 48, find both numbers. Then multiply the smaller number by 11 using distribution over $(10 + 1)$. Show all steps.

13. Explain with two different numerical examples why multiplication distributes over both addition and subtraction. Also explain why it does NOT distribute in the same way over multiplication (e.g., $a \times (b \times c) \neq (a \times b) \times (a \times c)$).

14. A rectangle has length $(x + 4)$ cm and breadth 6 cm. Find its area using the distributive law.

If $x = 5$, find the numeric value of the area.

15. Riya has 3 times as many stickers as Meera. Meera has $(p + q)$ stickers. Write an expression for Riya's stickers and expand it using distribution. If $p = 7$ and $q = 3$, find the total stickers both have together.

16. Using distribution, show that $999 \times 999 = (1000 - 1) \times (1000 - 1)$. Apply the distributive law step-by-step to arrive at the answer. (Hint: treat this as $(a - b)(a - b) = a^2 - 2ab + b^2$).

Section D: Long Answer ($3 \times 5 = 15$ marks)

17. A school organises a Sports Day. There are 18 boys and 22 girls in each of 15 sections. (a) Using distributive law, find the total number of boys in the school. (b) Using distributive law, find the total number of girls in the school. (c) Using the distributive law again, find the combined total of students in all sections. (d) If each student is given a kit worth ₹45, find the total expenditure using distribution.

18. Prove the distributive law $a \times (b + c) = a \times b + a \times c$ for $a = 14$, $b = 7$, $c = 3$.

Also prove $a \times (b - c) = a \times b - a \times c$ for the same values. Explain in your own words why this law is useful in real-life calculations. Give one real-life scenario where you would apply this law.

19. A tile layer lays tiles in a hall of length 36 m and breadth $(12 + 8)$ m. (a) Use the distributive law to find the total area of the hall. (b) If tiles of size $1 \text{ m} \times 1 \text{ m}$ are used and each tile costs ₹55, find the total cost using distribution. (c) If 10% tiles are to be kept as spare, how many extra tiles are needed? (Use distribution where possible.)

SECTION E CASE BASED (2×4=8 MARKS)

20. The School Stationary Store

The school stationery store stocks notebooks, pens, and geometry boxes. Every week, the store manager orders supplies. This week, she orders 35 packets of notebooks. Each packet contains 6 single-line notebooks and 4 four-line notebooks. She also orders 35 geometry boxes at ₹85 each and 35 pen sets at ₹55 each.

- (i) Using the distributive law, find the total number of notebooks ordered this week. Clearly state which form of the law you used.
- (ii) The manager wants to find the total money spent on geometry boxes and pen sets together. Using the distributive law, calculate the total amount and explain how distribution saved calculation effort here.

21. The Community Garden

A community has built a rectangular garden with length 48 m. The breadth is divided into two parts: 13 m is used for flowering plants and 7 m is used for vegetable beds. The municipality decides to lay a cement path of width 1 m all around the garden. The cost of cementing is ₹120 per sq. m.

(i) Using the distributive law, find the total area of the garden (excluding the path). Show all steps clearly.

(ii) If the total area including the path is 1100 sq. m, find the area of the path alone. Then, using distribution, find the total cost of cementing the path at ₹120 per sq. m, writing ₹120 as ₹(100 + 20).

Self Assessment:

I understood all the concepts: ☐ Yes ☐ No

I need more practice: ☐ Yes ☐ No

Name of Concepts having doubts/Not Cleared: _____

Parent's Assessment:

My ward understood all the concepts: ☐ Yes ☐ No

He/She need more practice: ☐ Yes ☐ No

Name of Concepts having doubts/Not Cleared: _____

Signature of Parent:

Teacher's Assessment

Answers Worksheet-1

Q	1	2	3	4	5	6	7	8	9	10
ANS	B	A	B	A	C	C	C	B	A	C
Q	11	12	13	14	15	16	17	18	19	20
ANS	B	B	C	C	B	C	A	A	B	B

Answers Worksheet-2

Q	1	2	3	4	5
ANS	824	612	LHS =RHS	480 chocolates	25
Q	6	7	8	9	10
ANS	1287	FALSE	150	LHS = RHS	270
Q	11	12	13	14	15
ANS	500 pens	198	Distribution does NOT hold over multiplication	54sq cm	40 stickers
Q	16	17	18	19	20
ANS	998,001	27,000	2760.	A) 720 sq m B)39,600 C)72 tiles	A)350 B)4,900
Q	21				
ANS	A)960 sq m B)16,800				