

SUMMARY OF CONCEPTS & DEFINITIONS

CHAPTER 2 : ARITHMETIC EXPRESSIONS

1. WHAT IS AN ARITHMETIC EXPRESSION?

A mathematical phrase formed using **numbers and operations** (+, −, ×, ÷) is called an **arithmetic expression**.

► Every expression has a value (the number it evaluates to).

Example: $13 + 2 = 15$
 ↓ ↓
 Expression Value

Different expressions can have the same value.

For example:

$10 + 2$, $15 - 3$, 3×4 , $24 \div 2$
all have the value 12.



2. TERMS IN AN EXPRESSION

- Terms are the parts of an expression separated by '+' sign.
- All '-' signs are converted to '+' of the inverse (opposite sign).

Expression	As sum of terms	Terms
$13 - 2 + 6$	$13 + (-2) + 6$	13, -2, 6
$5 + 6 \times 3$	$5 + 6 \times 3$	5, 6×3
$4 + 15 - 9 + 2$	$4 + 15 + (-9) + 2$	4, 15, -9, 2
$23 - 2 \times 4 + 16$	$23 + (-2 \times 4) + 16$	23, -2×4 , 16

Examples of terms

7

-5

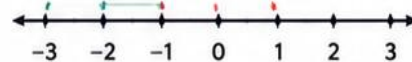
3×4

$18 \div 3$

All are single terms.

3. COMPARING EXPRESSIONS

We compare expressions based on their values using '>', '<' or '='.



$10 + 2 > 7 + 1$
(12 is greater than 8)

$13 - 2 < 4 \times 3$
(11 is less than 12)

$15 - 5 = 2 \times 5$
(10 is equal to 10)



4. BRACKETS AND ORDER OF OPERATIONS

- Brackets () tell us which part to evaluate first.
- Rule: Evaluate inside brackets first, then do the remaining operations.

Example 1:

$30 + (5 \times 4) = 30 + 20 = 50$
(First do 5×4 , then add 30)

Example 2:

$100 - (15 + 56) = 100 - 71 = 29$
(First do $15 + 56$, then subtract)



5. PROPERTIES OF ADDITION (FOR TERMS)

Commutative Property

Swapping terms does not change the sum.

$$a + b = b + a$$

Example:

$$7 + (-3) = (-3) + 7 = 4$$

Associative Property

Grouping terms in any way does not change the sum.

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

Example:

$$(5 + 2) + (-4) = 5 + (2 + (-4)) = 3$$

Conclusion

In an expression with only addition/subtraction, order and grouping of terms do not change the value.



6. REMOVING BRACKETS

When brackets are preceded by a '-' sign, the signs of the terms inside change.

With Brackets	Without Brackets
$-(a + b)$	$= -a - b$
$-(a - b)$	$= -a + b$

When brackets are **NOT** preceded by '-' sign, the signs remain same.

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

$$a + (b - c) = a + b - c$$



7. DISTRIBUTIVE PROPERTY

The multiple of a sum (or difference) is the same as the sum (or difference) of the multiples.

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

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

Example:

$$4 \times (3 + 2) = 4 \times 3 + 4 \times 2 = 20$$

$$5 \times (8 - 3) = 5 \times 8 - 5 \times 3 = 25$$



8. CHANGING TERMS AND VALUES

Changing a term changes the value of the expression.

Expression	Change in term	Change in value
$a + b + c$	Increase a by 1	Value increases by 1
$a + b + c$	Decrease b by 1	Value decreases by 1
$a - b + c$	Increase c by 1	Value increases by 1
$a - b - c$	Decrease b by 1	Value increases by 1

Helps us estimate and compare expressions without full calculation.



9. KEY TAKEAWAYS

- ✓ An arithmetic expression uses numbers and operations (+, −, ×, ÷).
- ✓ Terms are parts separated by '+'; convert '-' to '+' of inverse.
- ✓ In addition/subtraction, order and grouping of terms do not change the value.
- ✓ Brackets show what to evaluate first.
- ✓ Removing brackets with a leading '-' changes the signs inside.
- ✓ The distributive property helps expand products over sums or differences.
- ✓ Understanding terms and properties helps us solve quickly and accurately.



10. REAL LIFE APPLICATIONS



Calculating total cost while shopping



Finding change after a purchase



Ticket cost for groups in transport



Packing items in equal units



Budgeting and savings



Planning time and daily activities

11. REMEMBER

"Understand the terms,
Use brackets wisely,
Apply properties smartly,
Solve expressions easily!"



ARITHMETIC EXPRESSIONS

WORKSHEET-1

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

1. According to the BODMAS rule, which operation should be performed first in the expression $25 - 4 \times (6 + 2) / 2$?

- a) Subtraction
- b) Multiplication
- c) Addition/Brackets
- d) Division

2. What is the value of the arithmetic expression $12 + 18 / 3 \times 2 - 5$?

- a) 15
- b) 19
- c) 20
- d) 11

3. The mathematical expression for 'subtract the product of 4 and 5 from 50' is:

- a) $4 \times 5 - 50$
- b) $50 - (4 \times 5)$
- c) $50 - 4 + 5$
- d) $(50 - 4) \times 5$

4. Simplify the expression inside the brackets first: $3 \times [15 - \{2 \times (6 - 3)\}]$

- a) 27
- b) 18
- c) 45
- d) 9

5. Which of the following represents the correct placement of brackets to make the statement $4 + 8 \times 2 = 24$ true?

- a) $4 + (8 \times 2)$
- b) $(4 + 8) \times 2$
- c) $4 + 8 \times (2)$
- d) None of these

6. What is the value of $100 - 3 \times 10^2 + 50$?

- a) -150
- b) -250
- c) 50
- d) 200

7. Evaluating $45 / (5 \times 3)$ gives:

- a) 27
- b) 3
- c) 9
- d) 15

8. In the arithmetic expression $8 + 4 - 2 \times 3$, which operation has the highest precedence?

- a) Addition
- b) Subtraction
- c) Multiplication
- d) All equal

9. The value of $0 / 15 \times (45 + 5)$ is:

- a) 0
- b) 15
- c) 50
- d) Undefined

10. Simplify: $16 + 4 \times 4 - 16 / 4$

- a) 12
- b) 28
- c) 16
- d) 24

MCQs (PART-1) ($10 \times 1 = 10$ marks)

11. A school buys 8 boxes of chalk, each containing 25 pieces, and then receives 40 extra pieces as a donation. Which expression represents the total number of chalk pieces?

- a. $(8 + 25) \times 40$ b. $8 \times (25 + 40)$ c. $(8 \times 25) + 40$ d. $8 + 25 \times 40$

12. Which expression has the same value as $120 - (45 + 15)$?

- a. $120 - 45 + 15$ b. $120 + 45 - 15$ c. $120 - 45 - 15$ d. $120 + 45 + 15$

13. Evaluate the expression: $18 + 4 \times 7$

- a. 154 b. 46 c. $154 \div 2$ d. 126

14. Which of the following is equivalent to $9 \times (12 + 8)$?

- a. $9 \times 12 + 8$ b. $9 \times 12 + 9 \times 8$ c. $12 + 8 \times 9$ d. $9 + 12 \times 8$

15. If $56 \times 19 = 1064$, then 56×20 is:

- a. 1084 b. 1120 c. 1104 d. 1140

16. Which expression represents "5 less than the product of 12 and 9"?

- a. $(12 - 5) \times 9$ b. $12 \times (9 - 5)$ c. $(12 \times 9) - 5$ d. $5 \times (12 + 9)$

17. Which pair of expressions is always equal?

- a. $6 \times (15 - 4)$ and $6 \times 15 - 6 \times 4$ b. $6 \times (15 - 4)$ and $6 \times 15 - 4$
c. $6 \times (15 + 4)$ and $6 \times 15 + 4$ d. $6 \times (15 + 4)$ and $15 \times 4 + 6$

18. A fruit seller packs 15 apples in each basket. He sells 12 baskets and later gives away 18 apples. Which expression gives the number of apples left from the packed apples?

- a. $15 \times (12 - 18)$ b. $(15 \times 12) - 18$ c. $15 + 12 - 18$ d. $15 \times 18 - 12$

19. Which expression has three terms?

- a. 8×6 b. $12 + 5 \times 3 - 8$ c. $25 \div 5$ d. $9 \times (4 + 2)$

20. Which statement is correct?

- a. Brackets are ignored if multiplication is present.
b. Multiplication is performed before addition when there are no brackets.
c. Addition is always performed before multiplication.
d. Division is always performed after addition.

WORKSHEET-2

Section B: Short Answer ($10 \times 2 = 20$ marks)

1. Write the algebraic/arithmetic expression statement for: 'Divide 60 by the sum of 8 and 4'.

2. Solve the expression using BODMAS: $24 / 6 + 3 \times 2$.

3. Insert brackets in the expression $5 + 5 \times 5 - 5$ to get a final result of 45.

4. Evaluate the arithmetic expression: $40 - [20 - \{15 - 5\}]$.

5. Translate the mathematical statement $(18 - 3) \times 5$ into an English sentence phrase.

6. Find the value of $50 - 4 \times 5 + 12 / 3$.

7. Simplify the expression and find the missing value: $12 \times 3 - \underline{\hspace{1cm}} = 20$.

8. Write the precedence sequence order of operators as per the BODMAS template rule.

9. Use nested brackets to frame an expression representing: 'Multiply 3 with the difference of 20 and the quotient of 8 divided by 2'.

10. State whether true or false and verify: $12 + 6 / 3 = 6$.

Section C: Short Answer ($6 \times 3 = 18$ marks)

11. Evaluate step-by-step using order of operations: $75 - [18 + \{14 - (12 - 8)\}]$.

12. A student evaluated $20 + 10 / 5$ as 6, while another evaluated it as 22. Explain who is correct and why.

13. Simplify the following expression completely: $(100 / 10) \times [50 - \{4 \times (15 - 12)\}]$.

14. Write the expression and solve: A shopkeeper buys 6 boxes of chocolates with 10 chocolates inside each. He distributes 12 chocolates. How many are left?

15. Form and evaluate the expression: The product of 15 and 4 is added to the quotient of 36 divided by 9

16. Simplify the expression by eliminating innermost nested brackets first:

$$8 + 2 \times [15 - \{3 \times (8 - 6)\}].$$

Section D: Long Answer ($4 \times 5 = 20$ marks)

17. Solve the multi-layered dynamic bracket expression:

$$118 - [121 / (11 \times 11) - (-4) - \{3 - (9 - 6)\}].$$

18. Ram bought 5 notebooks at Rs. 40 each and 3 pens at Rs. 15 each. He handed a Rs. 500 note to the shopkeeper. Construct a single arithmetic expression to calculate his change and solve it.

19. Simplify the fractional and operator heavy expression step-by-step: $25 - \frac{1}{2}$ of $\{40 - (4 - 2)\} + 15 / 3$.

20. Formulate an arithmetic expression with nested brackets that contains all four primary math operators (+, -, ×, /) along with round and curly brackets such that its final answer is exactly 10. Verify step by step.

Case Study Based Questions ($2 \times 4 = 8$ marks)

Contextual Passage: In a smart automated fulfillment center, a main computational algorithm processes batches of customer item orders using systematic arithmetic sequencing. Batch order volume runs on the dynamic operational baseline parameter formula:

$250 - 4 \times [15 + \{2 \times (12 - 4)\}]$. This helps dispatch engineers scale cloud load balances correctly during sale cycles.

21. Solve the system expression inside the baseline parameter formula step by step to find the exact net batch order volume capacity.

22. If the operational configuration shifts and the round brackets are modified to $(12 + 4)$ instead of $(12 - 4)$, compute the revised batch parameter step by step.

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 needs more practice:

☐ Yes

☐ No

Name of Concepts having doubts/Not Cleared: _____

Signature of Parent:

Teacher's Assessment:

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Answers of Worksheet-1:

Q	1	2	3	4	5	6	7	8	9	10
Ans	c	b	b	a	b	b	b	c	a	b
Q	11	12	13	14	15	16	17	18	19	20
Ans	c	c	b	b	b	c	a	b	b	b

Answers of Worksheet-2:

Q	1	2	3	4
Ans	$60 \div (8+4)$	10	45	30
Q	5	6	7	8
Ans	The product of 5 and the difference of 18 and 3.	34	16	B – Brackets O – Orders (powers, exponents, roots) D – Division M – Multiplication A – Addition S – Subtraction
Q	9	10	11	12
Ans	48	false	47	Second students
Q	13	14	15	16
Ans	380	$(6 \times 10) - 12$ 48	$(15 \times 4) + (36 \div 9)$ 64	26
Q	17	18	19	20
Ans	113	$500 - [(5 \times 40) + (3 \times 15)]$ 255	11	$20 - \{8 - (6 \div 3)\} \times 2$
Q	21	22		
Ans	126	62		