Class 7 Algebraic Expressions Worksheet

By Thinking Juggernaut

Name: _____ Date: _____ Score: ____/24

📚 Advanced Algebraic Expressions

What You'll Learn:

In Class 7, we work with more complex algebraic expressions involving multiple variables, exponents, and advanced operations.

Key Concepts:

- **Monomial:** An expression with only one term ($5x$, $-3y^2$, $7ab$)
- **Binomial:** An expression with two terms ($3x + 5$, $a^2 - 4b$)
- **Trinomial:** An expression with three terms ($x^2 + 2x + 1$)
- **Polynomial:** An expression with one or more terms
- **Degree:** The highest power of the variable in an expression

Operations with Expressions:

1. **Addition/Subtraction:** Combine like terms only
2. **Multiplication:** Use distributive property: $a(b + c) = ab + ac$
3. **Division:** Divide each term separately
4. **Powers:** When multiplying same bases: $x^m \times x^n = x^{m+n}$

Important Rules:

- x^2 and x are unlike terms (different powers)
- $3xy$ and $5xy$ are like terms (same variables with same powers)
- When expanding brackets: Distribute to every term inside
- When dividing: Each term must be divided separately

Sample Problem

Problem: Simplify: $3(2x^2 + 5x - 3) - 2(x^2 - 3x + 4)$

Step 1: Expand first bracket

$3(2x^2 + 5x - 3) = 6x^2 + 15x - 9$

Step 2: Expand second bracket

$-2(x^2 - 3x + 4) = -2x^2 + 6x - 8$

Step 3: Write complete expression

$6x^2 + 15x - 9 - 2x^2 + 6x - 8$

Step 4: Group like terms

x^2 terms: $6x^2 - 2x^2 = 4x^2$ | x terms: $15x + 6x = 21x$ | Constants: $-9 - 8 = -17$

Final Answer: $4x^2 + 21x - 17$

Remember: When subtracting expressions in brackets, change the sign of every term inside!

Part A: Warm-up Questions

Easy Level

1. Identify the degree of the expression: $5x^3 + 2x^2 - 7x + 3$

Degree = _____

Hint: Degree is the highest power of the variable

2. Classify as monomial, binomial, or trinomial: $3x^2 - 5x + 2$

3. Simplify: $7x^2 + 3x^2 - 2x^2$

4. Add: (4a + 3b) + (2a - 5b)

5. Subtract: (8x + 5) - (3x + 2)

6. If x = 2, find the value of: $3x^2 + 4x - 5$

7. **True or False:** 5xy and 5x are like terms

☐ True ☐ False

8. Multiply: 3x(2x + 5)

Part B: Practice Questions

☆☆ Medium Level

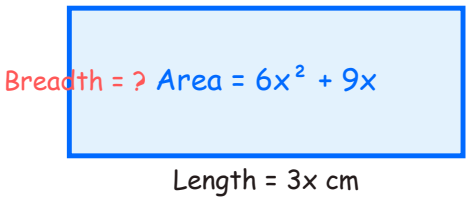
9. Simplify: $5x^2 + 3xy - 2x^2 + 7xy - 4$

10. Expand and simplify: $4(2x + 3y) - 3(x - 2y)$

11. Add: $(3x^2 - 5x + 2) + (2x^2 + 3x - 7)$

12. Subtract: $(7a^2 + 4ab + 3b^2) - (2a^2 - ab + 5b^2)$

13. **Word Problem:** The area of a rectangle is $(6x^2 + 9x)$ cm^2. If the length is $3x$ cm, find the expression for breadth.



14. **Match the Following:**

Column A (Expression)	Column B (Type)

1. 7xy	a. Trinomial
2. 3x + 5	b. Binomial
3. $x^2 + 2x + 1$	c. Monomial
4. 5a - 3b	d. Polynomial of 4 terms

15. Multiply: $5a^2b(3a - 4b + 2)$

16. If a = 3 and b = -2, evaluate: $2a^2 - 3ab + b^2$

17. **Word Problem:** Priya scored x marks in Math, (x + 15) marks in Science, and (x - 5) marks in English. Write and simplify an expression for her total marks in all three subjects.

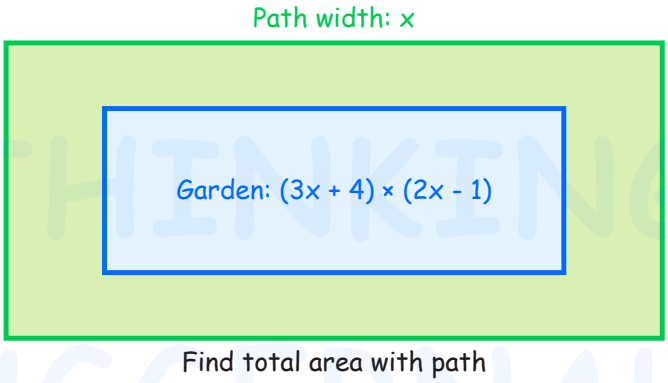
18. Simplify: $2(3x^2 + 5x - 1) - 3(x^2 - 2x + 4)$

Part C: Challenge Questions

⭐⭐⭐ Hard Level

19. Simplify: $3(2x^2 - 5xy + 3y^2) - 2(x^2 + 3xy - 4y^2) + 4(xy - y^2)$

20. **Word Problem:** A rectangular garden has length $(3x + 4)$ meters and breadth $(2x - 1)$ meters. A path of uniform width x meters runs around the outside of the garden. Find the expression for the total area including the path.



21. If the expression $3x^2 + kx - 7$ equals 23 when $x = 2$, find the value of k.

22. Simplify and find the value when $x = 1$, $y = -1$:
$5(x^2 + xy) - 3(2x^2 - xy + y^2) + 4(xy - 2y^2)$

23. **Word Problem:** The cost of x notebooks is ₹($3x^2 + 5x$) and the cost of y pens is ₹($2y^2 + 3y$). Rahul buys 2 notebooks and 3 pens. Write and simplify an expression for the total cost.

24. A polynomial $P(x) = ax^2 + bx + c$ has the following properties:

- $P(0) = 5$
- $P(1) = 8$
- $P(2) = 13$

Find the values of a, b, and c, then write the complete polynomial.

📝 Answer Key

Part A: Warm-up (Easy)

1. Degree = 3

2. Trinomial (3 terms)

3. $8x^2$

4. $6a - 2b$

5. $5x + 3$

6. $3(4) + 4(2) - 5 = 12 + 8 - 5 = 15$

7. False (different variables: xy vs x)

8. $6x^2 + 15x$

Part B: Practice (Medium)

9. $3x^2 + 10xy - 4$

10. $8x + 12y - 3x + 6y = 5x + 18y$

11. $5x^2 - 2x - 5$

12. $5a^2 + 5ab - 2b^2$

13. Breadth = $(6x^2 + 9x) \div 3x = 2x + 3$ cm

14. 1-c, 2-b, 3-a, 4-b

15. $15a^3b - 20a^2b^2 + 10a^2b$

16. $2(9) - 3(3)(-2) + 4 = 18 + 18 + 4 = 40$

17. $x + (x + 15) + (x - 5) = 3x + 10$ marks

18. $6x^2 + 10x - 2 - 3x^2 + 6x - 12 = 3x^2 + 16x - 14$

Part C: Challenge (Hard)

19. $6x^2 - 15xy + 9y^2 - 2x^2 - 6xy + 8y^2 + 4xy - 4y^2 = 4x^2 - 17xy + 13y^2$

20. Total dimensions: $(3x+4+2x) \times (2x-1+2x) = (5x+4)(4x-1) = 20x^2 + 11x - 4$ m²

21. $3(4) + 2k - 7 = 23$; $12 + 2k - 7 = 23$; $2k = 18$; $k = 9$

22. $-x^2 + 12xy - 11y^2$; When x=1, y=-1: -1 - 12 - 11 = -24

23. $2(3x^2 + 5x) + 3(2y^2 + 3y) = 6x^2 + 10x + 6y^2 + 9y$

24. $P(0)=c=5$; $P(1)=a+b+5=8 \rightarrow a+b=3$; $P(2)=4a+2b+5=13 \rightarrow 4a+2b=8 \rightarrow 2a+b=4$; $a=1$, $b=2$; $P(x)=x^2+2x+5$

📊 Scoring Guide

Total Questions: 24 | Total Marks: 24

Score Range	Performance Level	What to Do Next
20-24	⭐⭐⭐ Excellent!	Outstanding! You've mastered algebraic expressions. Challenge yourself with factorization and algebraic identities.
15-19	⭐⭐ Very Good!	Great progress! Practice more problems involving multiple brackets and complex simplifications.
10-14	⭐ Good Effort!	Keep going! Focus on expanding brackets correctly and being careful with negative signs.

0-9	Keep Trying!	Review the concept section. Practice basic addition/subtraction of polynomials before attempting complex problems.

📝 Tips for Improvement:

- **Expand carefully:** Distribute to every term inside brackets
- **Watch the signs:** Negative signs before brackets change all signs inside
- **Group systematically:** Arrange terms by degree (x^3, x^2, x, constants)
- **Check your work:** Substitute small values to verify your answer
- **Practice powers:** Remember x^2 and x are different terms
- **Show all steps:** Don't skip steps to avoid calculation errors

🎯 Common Mistakes to Avoid:

- ❌ Combining unlike terms (x^2 and x cannot be added)
- ❌ Forgetting to distribute negative signs: $-(3x - 2) = -3x + 2$, not $-3x - 2$
- ❌ Multiplying incorrectly: $2x(3x) = 6x^2$, not $6x$
- ❌ Missing terms when expanding: $3(2x + 5 - 1)$ has three terms to distribute
- ❌ Calculation errors with negative numbers

✨ Great Job Completing This Worksheet! ✨

Keep practicing algebraic expressions and you'll master them in no time!

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