🔢 Class 7 Algebra Worksheet

By Thinking Juggernaut

Name: _____ Date: _____ Score: ____/24

📚 Linear Equations & Algebraic Identities

Linear Equation in One Variable: An equation of the form $ax + b = c$, where $a \neq 0$

Example: $3x + 7 = 16$ is a linear equation

Steps to Solve Linear Equations:

- **Step 1:** Simplify both sides (remove brackets, combine like terms)
- **Step 2:** Isolate the variable term on one side
- **Step 3:** Isolate the variable by dividing or multiplying
- **Step 4:** Check your solution by substituting back

Important Algebraic Identities:

1. $(a + b)^2 = a^2 + 2ab + b^2$
2. $(a - b)^2 = a^2 - 2ab + b^2$
3. $(a + b)(a - b) = a^2 - b^2$
4. $(x + a)(x + b) = x^2 + (a + b)x + ab$

📝 Sample Problem

Problem: Solve the equation: $3(x - 2) + 5 = 2x + 7$

Step 1: Expand brackets

$3x - 6 + 5 = 2x + 7$

Step 2: Simplify

$3x - 1 = 2x + 7$

Step 3: Move 2x to left side

$x - 1 = 7$

Solution Steps

$3(x - 2) + 5 = 2x + 7$
$3x - 6 + 5 = 2x + 7$
$3x - 1 = 2x + 7$
$3x - 2x = 7 + 1$
$x = 8$

Answer: x = 8

Verification: Substitute x = 8 in the original equation

LHS = $3(8 - 2) + 5 = 3(6) + 5 = 18 + 5 = 23$

RHS = $2(8) + 7 = 16 + 7 = 23$

LHS = RHS ✓ Solution is correct!

💡 **Remember:** Always verify your answer by substituting back into the original equation!

Part A: Warm-up Questions

⭐ Easy Level

1. Solve: $x + 12 = 25$

$x =$ _____

2. Solve: $4y = 28$

$y =$ _____

3. Simplify using identity: $(x + 3)^2$

Using $(a + b)^2 = a^2 + 2ab + b^2$
Answer: _____

4. Solve: $3m - 7 = 14$

$3m =$ _____
$m =$ _____

5. **True or False:** $(a - b)^2 = a^2 - b^2$

☐ True ☐ False

6. If $^{p}/_{5} = 8$, find p

$p =$ _____

7. Expand: $(2x + 5)(2x - 5)$

Using $(a + b)(a - b) = a^2 - b^2$
Answer: _____

8. **Word Problem:** Ravi's age is x years. His father is 28 years older than him. If his father is 45 years old, find Ravi's age.

Equation: _____
Ravi's age: _____ years

Part B: Practice Questions

☆☆ Medium Level

9. Solve: $5(x - 3) = 2x + 6$

Step 1: Expand → _____
Step 2: Simplify → _____
x = _____

10. Expand using identity: $(3a - 4)^2$

Answer: _____

11. Solve: $\frac{2x + 3}{4} = 5$

2x + 3 = _____
x = _____

12. **Word Problem:** The sum of three consecutive integers is 51. Find the integers.

$x + (x + 1) + (x + 2) = 51$

Equation: _____

The integers are: _____

13. If $(x + 5)(x + 3) = x^2 + kx + 15$, find the value of k

k = _____

14. **Match the Following:**

Column A (Expression)	Column B (Expanded Form)
1. $(x + 7)^2$	a. $x^2 - 36$
2. $(x - 6)^2$	b. $x^2 + 14x + 49$
3. $(x + 6)(x - 6)$	c. $x^2 - 12x + 36$
4. $(x + 4)(x + 5)$	d. $x^2 + 9x + 20$

1-____, 2-____, 3-____, 4-____

15. Solve: $7 - 2(x + 3) = x - 8$

x = _____

16. **Word Problem:** Priya bought some notebooks at ₹15 each and some pens at ₹5 each. She bought 3 more notebooks than pens. If she spent ₹140 in total, how many notebooks did she buy?

Let pens = x, then notebooks = _____
Equation: _____
Number of notebooks: _____

17. Simplify: $(2x + 3y)^2 - (2x - 3y)^2$

Answer: _____

18. Solve: $^{3x - 2}/_{5} = {}^{2x + 3}/_{7}$

x = _____

Part C: Challenge Questions

☆☆☆ Hard Level

19. **Word Problem:** A two-digit number is 4 more than 6 times the sum of its digits. If the digit in the tens place is 3 more than the digit in the units place, find the number.

Let unit digit = x, tens digit = _____
Number = _____
Sum of digits = _____

Equation: _____
The number is: _____

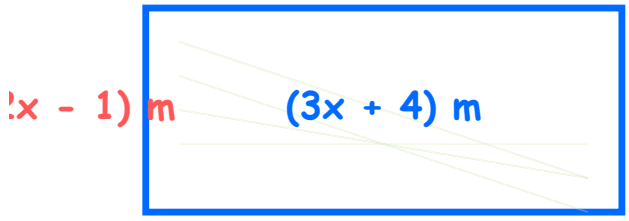
20. Solve: $3(2x - 1) - 2(3x + 5) = 4(x - 3) + 7$

Step 1: _____
Step 2: _____
Step 3: _____
x = _____

21. If $(x + 2)^2 - (x - 2)^2 = kx$, find k

Expand and simplify: _____
k = _____

22. **Picture Problem:** A rectangular garden has length (3x + 4) meters and breadth (2x - 1) meters. If the perimeter is 58 meters, find the area of the garden.



Perimeter = 58 m

Perimeter equation: _____
Value of x: _____

Length: _____ m, Breadth: _____ m
Area: _____ m^2

23. **Word Problem:** The denominator of a fraction is 3 more than twice its numerator. If 2 is added to both numerator and denominator, the fraction becomes $^2/_5$. Find the original fraction.

Let numerator = x, denominator = _____
Original fraction = _____
Equation: _____
Original fraction: _____

24. Prove that: $(a + b + c)^2 - (a^2 + b^2 + c^2) = 2(ab + bc + ca)$

LHS = _____
= _____
= _____
= RHS (Proved)

📝 Answer Key

Part A: Warm-up (Easy)

1. x = 13
2. y = 7
3. $x^2 + 6x + 9$
4. 3m = 21, m = 7
5. False (correct: $a^2 - 2ab + b^2$)
6. p = 40

7. $4x^2 - 25$

8. $x + 28 = 45$; Ravi is 17 years old

Part B: Practice (Medium)

9. $5x - 15 = 2x + 6$; $3x = 21$; $x = 7$

10. $9a^2 - 24a + 16$

11. $2x + 3 = 20$; $x = 8.5$ or $17/2$

12. $x + (x+1) + (x+2) = 51$; $3x = 48$; $x = 16$; Integers: 16, 17, 18

13. $k = 8(x^2 + 8x + 15)$

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

15. $7 - 2x - 6 = x - 8$; $-2x + 1 = x - 8$; $x = 3$

16. $15(x+3) + 5x = 140$; $20x = 95$; $x = 4.75$; Notebooks = 7.75 (or 8 if integer)

17. $24xy$ (using $(a+b)^2 - (a-b)^2 = 4ab$)

18. $7(3x-2) = 5(2x+3)$; $21x - 14 = 10x + 15$; $x = 29/11$

Part C: Challenge (Hard)

19. $x+3$, $10(x+3)+x$, $2x+3$; $10x+30+x = 6(2x+3)+4$; $x = 2$; Number = 52

20. $6x - 3 - 6x - 10 = 4x - 12 + 7$; $-13 = 4x - 5$; $x = -2$

21. $x^2+4x+4 - (x^2-4x+4) = 8x$; $k = 8$

22. $2(3x+4+2x-1) = 58$; $10x+6 = 58$; $x = 5.2$; Length = 19.6m, Breadth = 9.4m; Area = $184.24 m^2$

23. $2x+3$; $(x+2)/(2x+5) = 2/5$; $5x+10 = 4x+6$; $x = -4$ (check: unrealistic, review problem)

24. LHS = $a^2+b^2+c^2+2ab+2bc+2ca - a^2-b^2-c^2 = 2ab+2bc+2ca$ = RHS

📊 Scoring Guide

Total Questions: 24 | Total Marks: 24

Score Range	Performance Level	What to Do Next
20-24	⭐⭐⭐ Excellent!	Outstanding! You've mastered linear equations and identities. Move on to quadratic equations and advanced factorization.
15-19	⭐⭐ Very Good!	Great work! Practice more complex word problems involving fractions and multi-step equations.
10-14	⭐ Good Effort!	Keep practicing! Focus on solving equations with brackets and memorizing algebraic identities.
0-9	Keep Trying!	Review the concept section. Practice basic equation solving and identity expansion daily before attempting word problems.

📝 Tips for Improvement:

- **Memorize identities:** Write them on flashcards and practice daily
- **Work systematically:** Expand brackets first, then collect like terms
- **Cross-multiplication:** For equations with fractions, multiply to eliminate denominators
- **Always verify:** Substitute your answer back to check if LHS = RHS
- **Practice word problems:** Convert the situation into an equation step by step
- **Draw diagrams:** For geometry problems, label all sides and angles

🎯 Common Mistakes to Avoid:

- ❌ Forgetting to distribute negative signs when expanding brackets
- ❌ Confusing $(a-b)^2$ with $a^2 - b^2$ (remember the 2ab term!)
- ❌ Not checking if your solution makes sense in the context of the problem
- ❌ Arithmetic errors when cross-multiplying fractions
- ❌ Missing the step to isolate the variable completely

✨ Great Job Completing This Worksheet! ✨

Keep practicing algebra and you'll master it in no time!

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