Noble Educators | Noble Learners

Name: _____

Date: _____ Class: Algebra 1, per: _____

Chapter 1 - The Foundation of Algebra

A. Algebraic Language

Objective: Identify the parts of algebraic expressions and translate accurately between words and symbols.

Directions: Show substitutions and simplification steps. Follow the order of operations, preserve units in applications, and explain all error-analysis, proof, and challenge responses.

Expression structure	**Core conventions**
term = coefficient × variable part like terms have identical variable parts	grouping → exponents → multiply/divide → add/subtract $a(b+c)=ab+ac$

1. In the expression $7x-12$, identify the variable, coefficient, constant term, and operation connecting the two terms.

2. Classify each as an expression or an equation: (a) $4n+9$ (b) $3y-1=14$ (c) $6(a-2)$ (d) $P=2l+2w$.

3. State the terms and coefficients of $5x^2-3x+8$.

4. Write an algebraic expression for 'eight less than three times a number n.'

5. Write a verbal phrase for $4(x+7)/3$. Make the grouping clear.

6. A student translates 'the square of the difference of x and 5' as x^2-5. Correct the expression and explain the error.

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B. Evaluating Expressions

Objective: Substitute signed values correctly and interpret formulas for geometric quantities.

7. Evaluate $4x-3$ when $x=-2$.	**8.** Evaluate $2a^2-3b$ when $a=-3$ and $b=4$.
9. Evaluate $(m+n)^2/(m-n)$ for $m=5$ and $n=2$.	**10.** If $p=-2$, $q=3$, and $r=-4$, evaluate $pqr+q^2$.
11. Evaluate $3\|2x-5\|-4$ when $x=-1$.	**12.** A rectangle has length $2w+3$ and width w. Evaluate its perimeter when $w=6$.

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C. Order of Operations

Objective: Apply grouping, exponents, and left-to-right conventions with precision.

13. Simplify $18-3(4+2)$.	**14.** Simplify $6+24\div3\cdot2$. Show the left-to-right step.
15. Simplify $5^2-2[3+(8-5)]$.	**16.** Simplify $48\div[2(3+1)]$ and explain why the grouping matters.
17. Simplify $-3^2+(-3)^2$.	**18.** Insert one pair of parentheses in $8+4\cdot3-2$ so the value becomes 34.

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D. Properties of Real-Number Operations

Objective: Recognize and apply commutative, associative, distributive, and factoring structures.

19. Name the property: $7+(x+3)=(7+x)+3$.	**20.** Name the property: $5(y+2)=5y+10$.
21. Use a property to rewrite $13+8$ as $8+13$. Name the property.	**22.** Use the distributive property to expand $-4(2x-7)$.
23. Factor $18x+24$ by removing the greatest common factor.	**24.** Explain why $a(b+c)=ab+ac$ and $(b+c)a=ba+ca$ represent the same result.

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E. Simplifying Expressions

Objective: Distribute, remove grouping, and combine only like terms.

25. Combine like terms: 7x+4-3x+9.	**26.** Simplify 5a-2b+3a+7b-6.
27. Simplify 4(2x-3)-5x+9.	**28.** Simplify -3(2y+5)+4(y-1).
29. Simplify 2[3x-(4-x)]+5.	**30.** A student writes $6x^2+3x=9x^3$. Correct the work and explain which terms may be combined.

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F. Translating and Modeling

Objective: Build simplified algebraic expressions for verbal and financial situations.

31. Translate and simplify: 'five more than twice the sum of x and 4.'	**32.** The length of a garden is 3 feet more than twice its width w. Write and simplify an expression for its perimeter.
33. A streaming service charges $12 per month plus $3 per movie. Write an expression for the cost of m movies in one month and find the cost for 7 movies.	**34.** A taxi charges a $4.50 starting fee and $2.25 per mile. Write C(d) and evaluate C(8).
35. Three consecutive integers begin with n. Write and simplify an expression for their sum.	**36.** A store discounts an item priced p dollars by 20%, then adds 8% sales tax to the discounted price. Write a single expression for the final cost.

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G. Formulas and Substitution

Objective: Use standard formulas with correct units and numerical precision.

37. Use $P=2l+2w$ to find P when $l=8.5$ cm and $w=3.2$ cm.	**38.** Use $A=(1/2)bh$ to find the area when $b=14$ m and $h=9$ m.
39. The formula $d=rt$ gives distance. Find d when $r=55$ miles per hour and $t=2.5$ hours, including units.	**40.** The temperature conversion formula is $F=(9/5)C+32$. Find F when $C=-10$.
41. Use $V=lwh$ to find the volume of a box measuring 2.5 ft by 4 ft by 6.2 ft.	**42.** The simple-interest formula is $I=Prt$. Find I when $P=\$1{,}500$, $r=0.04$, and $t=3$ years.

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H. Units, Rates, and Proportional Reasoning

Objective: Use conversion factors and unit rates to solve quantitative problems.

43. Convert 7.5 feet to inches using a conversion factor.	**44.** Convert 90 kilometers per hour to kilometers per minute.
45. A car travels 156 miles on 6 gallons. Find its unit rate in miles per gallon.	**46.** A recipe uses 2.5 cups of flour for 20 cookies. Find the flour needed for 32 cookies, assuming a constant rate.

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I. Algebraic Reasoning and Challenge

Objective: Analyze errors, prove a pattern, determine a parameter, and model a geometric expression.

47. Error analysis: A student evaluates $2+3(4-1)^2$ as 47. Identify the likely error and give the correct value.	**48.** Prove algebraically that the sum of three consecutive integers is always divisible by 3.
49. Find k so that $3(kx-4)+2x$ simplifies to $20x-12$ for every value of x. Explain why matching coefficients is valid.	**50.** A rectangular frame has outer dimensions $x+6$ by $x+4$ and a rectangular opening x by $x-2$. Write and simplify an expression for the area of the frame. State the physical restriction on x.