



7.AF.1 Apply the properties of operations (e.g., identity, inverse, commutative, associative, distributive properties) to create equivalent linear expressions, including situations that involve factoring out a common number (e.g., given $2x - 10$, create an equivalent expression $2(x - 5)$). Justify each step in the process. (E)

Reporting Category: Algebra & Functions,
Ratios & Proportional Reasoning

Subdomain: Expressions, Equations, and
Inequalities

7.AF.1 Instructional Framework

Assessed On:

☐ Checkpoint 1

☐ Checkpoint 2

☒ Checkpoint 3

☒ Summative

Content Limits:

- Include only rational numbers.
- Linear expressions can be expressed in one or two variables.
- When factoring, the final equation must be in the form $p(qx + r)$ or $p(qx - r)$ where p , q , and r are rational numbers.
- "At Proficiency" may include multiple operations to simplify the expression.
- Do not nest parentheses further than using $()$.

Clarifications:

- [Properties of Operations Table](#)
- Equivalent expressions may be generated in the following ways:
 - Equivalent expressions by adding or subtracting: $(2.1x + 4.3) - (-3x - 7) = -0.9x - 2.7$
 - Equivalent expressions by factoring: $-72x + 60 = -12(6x - 5)$
 - Equivalent expressions by distribution: $-0.8(10.8x - 20 + 3.2x) = -11.2x + 16$
 - Equivalent expression by using a combination: $0.75x + 0.25(x + 12.4) + (x - 2.1) = 2x + 1$
 - Identify the value of a variable in two equivalent expressions: Enter the value of b when the expression $14.1x + b = 4.7(3x - 3.5)$; $b = -16.45$
- The keypad in the ILEARN testing system does not allow students to enter a comma between each period in a multi-digit number. (Example: 13,323 would be entered as 13323.)

Calculator Availability: none

Expected Academic Vocabulary: identity property, inverse property, commutative property, associative property, distributive property, factor, rational coefficient, term

Examples of Context and Varying Difficulty Levels*

Context: Easy	Uses integer coefficients only.
Context: Medium	Uses a mix of integer and non-integer rational number coefficients.
Context: Difficult	Uses only non-integer rational number coefficients.



Proficiency Level Descriptors and Example Items	
Looking Back: 6.NS.7 ILEARN Item Specification	Looking Ahead: This concept is not specifically addressed in the Indiana Academic Standards in the subsequent grade levels.
Below Proficiency: Apply properties of operations as strategies to find missing values of equivalent linear expressions using addition and subtraction. Identify the correct steps in the process or the property applied.	
Enter the value of n so that the expression $(-y + 5) + (7y - 9)$ is equivalent to $(ny - 4)$. Answer: 6	This is a DOK 2 item because the student must find the sum of linear expressions. This is an easy item because only integers are used as coefficients.
Enter the value of n so that the expression $-y + 5.3 + 7.2y - 9$ is equivalent to $6.2y + n$. Answer: $- 3.7$	This is a DOK 2 item because the equivalent linear expression is being identified. This is a medium difficulty item because decimals and integers are used as coefficients.
Which property is demonstrated by the equation shown? $2x + 6 - 3x + 2 = 2x - 3x + 6 + 2$ a. Distributive property b. Commutative property c. Associative property d. Inverse property Answer: b	This is a DOK 1 item because the student must identify the property demonstrated. This is an easy item because integers are used for coefficients.
Approaching Proficiency: Apply properties of operations as strategies to identify equivalent linear expressions by factoring or applying the distributive property. Identify the correct steps in the process or the property applied.	
Which expression is equivalent to $36x + 9$?	This is a DOK 2 item because the student



a. $4x + 1$ b. $36(x + 1)$ c. $4(9x + 1)$ d. $9(4x + 1)$ Answer: d	must factor a linear expression. This is an easy item because integers are used for coefficients.
Select TWO expressions that are equivalent to $-72x + 60$. a. $-12(6x - 5)$ b. $-12(-6x - 5)$ c. $-8(9x - 7)$ d. $8(-9x + 7)$ e. $6(-12x + 10)$ f. $-6(-12x - 10)$ Answer: a and e	This is a DOK 2 item because the student must factor a linear expression. This is an easy item because integers are used for coefficients.
A student wrote an equivalent expression to $1.2(2.2 + 3y - 3.7)$. The students' steps are shown. Step 1: $1.2(2.2 + 3y - 3.7)$ Step 2: $2.64 + 3.6y - 4.44$ Step 3: $2.64 - 4.44 + 3.6y$ Step 4: $7.08 + 3.6y$ Which statement identifies and explains the mistake the student made? a. The first mistake was in Step 3. The $3.6y$ should be negative and the 4.44 should be positive. b. The first mistake was in Step 3. When recording the terms, 2.64 should be the coefficient of y rather than 3.6. c. The first mistake was in Step 4. The $3.6y$ should be negative. d. The first mistake was in Step 4. The student added 4.44 to 2.6 instead of subtracting 4.44 from 2.6. Answer: d	This is a DOK 3 item because the student must analyze the students steps in writing an equivalent expression and identify the mistake made. This is a medium difficulty item because integers and decimals are used throughout.
At Proficiency: Apply properties of operations as strategies to construct equivalent linear expressions by factoring, expansion, and/or addition and subtraction. Justify each step in the process.	
Use the distributive property to simplify the expression. $-4(3x - 7)$ Answer: $-12x + 28$	This is a DOK 2 item because students must apply the distributive factor to identify the equivalent linear expression.



	This is an easy item because integers are used for coefficients.
Simplify the expression. $5x + \frac{1}{2}(4x - 8)$ Answer: $7x - 4$	This is a DOK 2 item because students must apply the distributive property and combine like terms to generate the equivalent expression. This is an easy item because integers are used for coefficients.
Which expression is equivalent to $-0.8(10.8x - 20 + 3.2x)$? a. $-11.2x + 16$ b. $-11.2x - 16$ c. $-8.64x - 16.8$ d. $-8.64x + 16.8$ Answer: a	This is a DOK 2 item because students must apply the distributive factor to identify the equivalent linear expression. This is a medium difficulty item because decimals and integers are used as coefficients.
A student claims that the expression $-3(x - 2)$ is equivalent to $-3x - 2$. Which statement identifies and corrects the error in the student's work? a. The student did not subtract 2 from $-3x$; the equivalent expression is $-5x$. b. The student did not subtract 2 from -3; the equivalent expression is $-3x - 5$. c. The student did not find the product of -3 and -2; the equivalent expression is $-3x + 6$. d. The student did not keep the parenthesis around -2; the equivalent expression is $-3x(-2)$. Answer: c	This is DOK 2 because the student must use the distributive property to make an equivalent expression. This is easy because only integers are used for coefficients.
Simplify the expression. $(2.1x + 4.3) - (-3x - 7)?$	This is a DOK 2 item because the student must construct the equivalent linear



Answer: $5.1x + 11.3$	expression. This is a medium difficulty item because decimals and integers are used as coefficients.
Simplify the expression. $(3x + 2) + (-6x + 3)$? Answer: $-3x + 5$	This is a DOK 2 item because the student must construct the equivalent linear expression. This is an easy item because only integers are used as coefficients.
Enter the value of p so that the expression $\frac{5}{6} - \frac{1}{3}n$ is equivalent to $p(5 - 2n)$. Answer: $\frac{1}{6}$	This is a DOK 2 item because the student must factor a linear expression. This is difficult because the factor is a rational number.
Above Proficiency: Apply properties of operations as strategies to identify or create multiple equivalent linear expressions by factoring, expansion, or addition and subtraction. Justify each step in the process.	
An expression is given. $3x + 5(-4x + 12) - (x - 3)$. Write TWO equivalent expressions by applying the properties of operations. Answer: Student answers may vary. Possible answers: $-18x + 63$ and $3x - 20x + 60 - x + 3$	This is DOK 3 because the student must generate equivalent linear expressions using properties of operations. This is easy because only integers are used for coefficients.
Select all expressions that are equivalent to $6x + 3(2x + 3) + 8x$. a. $12x + 9 + 8x$ b. $12x + 3 + 8x$	This is a DOK 2 because students must identify more than one equivalent expression.



- c. $11x + 6 + 8x$
- d. $20x + 9$
- e. $20x + 3$
- f. $19x + 6$

Answer: a, d

This is easy because only integers are used for coefficients.