

Grade 7 Mathematics Item Specification C1 TC

Claim 1: Concepts and Procedures

Students can explain and apply mathematical concepts and carry out mathematical procedures with precision and fluency.

Content Domain: **Expressions and Equations**

Target C [m]: Use properties of operations to generate equivalent expressions.
(DOK Levels 1, 2)

Tasks for this target will require students to add, subtract, factor, and expand linear expressions with rational coefficients.

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| <p>Standards: 7.EE.A, 7.EE.A.1, 7.EE.A.2</p> | <p>7.EE.A Use properties of operations to generate equivalent expressions. 7.EE.A.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients. 7.EE.A.2 Understand that rewriting an expression in different forms in a problem context can shed light on the problem and how the quantities in it are related. <i>For example, $a + 0.05a = 1.05a$ means that “increase by 5%” is the same as “multiply by 1.05.”</i></p> |
| <p>Related Below-Grade and Above-Grade Standards for Purposes of Planning for Vertical Scaling:</p> <p>6.EE.A, 6.EE.A.1, 6.EE.A.2, 6.EE.A.3, 6.EE.A.4</p> <p>8.EE.C, 8.EE.C.7</p> | <p>Related Grade 6 Standards</p> <p>6.EE.A Apply and extend previous understandings of arithmetic to algebraic expressions. 6.EE.A.1 Write and evaluate numerical expressions involving whole-number exponents. 6.EE.A.2 Write, read, and evaluate expressions in which letters stand for numbers.</p> <ol style="list-style-type: none"> Write expressions that record operations with numbers and with letters standing for numbers. <i>For example, express the calculation “Subtract y from 5” as $5 - y$.</i> Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, and coefficient); view one or more parts of an expression as a single entity. <i>For example, describe the expression $2(8 + 7)$ as a product of two factors; view $(8 + 7)$ as both a single entity and a sum of two terms.</i> Evaluate expressions at specific values of their variables. Include expressions that arise from formulas used in real-world problems. Perform arithmetic operations, including those involving whole-number exponents, in the conventional order when there are no parentheses to specify a particular order (Order of Operations). <i>For example, use the formulas $V = s^3$ and $A = 6s^2$ to find the volume and surface area of a cube with sides of length $s = \frac{1}{2}$.</i> <p>6.EE.A.3 Apply the properties of operations to generate equivalent expressions. <i>For example, apply the distributive property to the expression $3(2 + x)$ to produce the equivalent expression $6 + 3x$; apply the distributive property to the expression $24x + 18y$ to produce the equivalent expression $6(4x + 3y)$; and apply properties of operations to $y + y + y$ to produce the equivalent expression $3y$.</i> 6.EE.A.4 Identify when two expressions are equivalent (i.e., when the two expressions name the same number regardless of which value is substituted into them). <i>For example, the expressions $y + y$</i></p> |

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| | <p><i>+ y and 3y are equivalent because they name the same number regardless of which number y stands for.</i></p> <p>Related Grade 8 Standards</p> <p>8.EE.C Analyze and solve linear equations and pairs of simultaneous linear equations.</p> <p>8.EE.C.7 Solve linear equations in one variable.</p> <ol style="list-style-type: none"> Write examples of linear equations in one variable with one solution, infinitely many solutions, or no solutions. Show which of these possibilities is the case by successively transforming the given equation into simpler forms, until an equivalent equation of the form $x = a$, $a = a$, or $a = b$ results (where a and b are different numbers). Solve linear equations with rational number coefficients, including equations whose solutions require expanding expressions using the distributive property and collecting like terms. |
| DOK Levels: | 1, 2 |
| Achievement Level Descriptors: | |
| <p>RANGE Achievement Level Descriptor (Range ALD)</p> <p>Target C: Use properties of operations to generate equivalent expressions.</p> | <p>Level 1 Students should be able to apply properties of operations as strategies to add and subtract linear expressions with integer coefficients.</p> |
| | <p>Level 2 Students should be able to apply properties of operations as strategies to factor and expand linear expressions with integer coefficients. They should also be able to add and subtract linear expressions with rational coefficients.</p> |
| | <p>Level 3 Students should be able to apply properties of operations as strategies to factor and expand linear expressions with rational coefficients. They should understand that rewriting an expression can shed light on how quantities are related in a familiar problem-solving context with minimal scaffolding.</p> |
| | <p>Level 4 Students should understand that rewriting an expression can shed light on how quantities are related in an unfamiliar problem-solving context with no scaffolding.</p> |
| Evidence Required: | <ol style="list-style-type: none"> The student adds and subtracts linear expressions with rational coefficients. The student factors linear expressions with rational coefficients. The student expands linear expressions with rational coefficients. The student generates equivalent linear expressions using a combination of addition and subtraction, factoring, and expansion. |
| Allowable Response Types: | Multiple Choice, single correct response; Multiple Choice, multiple correct response; Equation/Numeric |
| Allowable Stimulus Materials: | linear expressions in one or two variables |

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| Construct-Relevant Vocabulary: | sum, difference, factor, rational coefficient, linear expression, distributive property of multiplication, associative property of addition/multiplication, commutative property of addition/multiplication |
| Allowable Tools: | None |
| Target-Specific Attributes: | |
| Non-Targeted Constructs: | |
| Accessibility Guidance: | <p>Item writers should consider the following Language and Visual Element/Design guidelines¹ when developing items.</p> <p>Language Key Considerations:</p> <ul style="list-style-type: none"> • Use simple, clear, and easy-to-understand language needed to assess the construct or aid in the understanding of the context • Avoid sentences with multiple clauses • Use vocabulary that is at or below grade level • Avoid ambiguous or obscure words, idioms, jargon, unusual names and references <p>Visual Elements/Design Key Considerations:</p> <ul style="list-style-type: none"> • Include visual elements only if the graphic is needed to assess the construct or it aids in the understanding of the context • Use the simplest graphic possible with the greatest degree of contrast, and include clear, concise labels where necessary • Avoid crowding of details and graphics <p>Items are selected for a student's test according to the blueprint, which selects items based on Claims and targets, not task models. As such, careful consideration is given to making sure fully accessible items are available to cover the content of every Claim and target, even if some item formats are not fully accessible using current technology.²</p> |
| Development Notes: | None |

¹ For more information, refer to the General Accessibility Guidelines at:

<http://www.smarterbalanced.org/wordpress/wp-content/uploads/2012/05/TaskItemSpecifications/Guidelines/AccessibilityandAccommodations/GeneralAccessibilityGuidelines.pdf>

² For more information about student accessibility resources and policies, refer to

http://www.smarterbalanced.org/wordpress/wp-content/uploads/2014/08/SmarterBalanced_Guidelines.pdf

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| <p>Task Model 1</p> <p>Response Type: Multiple Choice, single correct response</p> <p>DOK Level 1</p> <p>7.EE.A.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.</p> <p>Evidence Required: 1. The student adds and subtracts linear expressions with rational coefficients.</p> <p>Tools: None</p> | <p>Prompt Features: The student is prompted to identify the sum or difference of linear expressions with rational coefficients.</p> <p>Stimulus: The student is presented with two or more linear expressions.</p> <ul style="list-style-type: none"> Item difficulty can be adjusted via these methods: <ul style="list-style-type: none"> Expressions have integer coefficients. Expressions include decimal coefficients. Expressions include coefficients which are fractions or mixed numbers. Expressions include exactly one variable. Expressions include more than one variable. <p>TM1a</p> <p>Example Stem 1: Select the expression equivalent to $(3x + 2) + (-6x + 3)$.</p> <p>A. $-3x + 5$ B. $3x + 5$ C. $9x + 5$ D. $-9x + 5$</p> <p>Example Stem 2: Select the expression equivalent to $(2.1x + 4.3) - (-3x - 7)$.</p> <p>A. $-0.9x - 2.7$ B. $-0.9x + 11.3$ C. $5.1x - 2.7$ D. $5.1x + 11.3$</p> <p>Answer Choices: Each answer choice should be expressions in the form $px + q$, where p and q are integers or rational numbers, depending on the level of difficulty. Distractors will include incorrect calculations based on negative sign(s) and incorrectly combining terms.</p> <p>Rubric: (1 point) The student identifies the equivalent expression (e.g., A; D).</p> <p>Response Type: Multiple Choice, single correct response</p> |
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| <p>Task Model 1</p> <p>Response Type: Equation/Numeric</p> <p>DOK Level 1</p> <p>7.EE.A.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.</p> <p>Evidence Required: 1. The student adds and subtracts linear expressions with rational coefficients.</p> <p>Tools: None</p> | <p>Prompt Features: The student is prompted to identify the sum or difference of linear expressions with rational coefficients.</p> <p>Stimulus: The student is presented with a linear equation including a sum or difference where combining like terms of one side of the equation gives rise to the solution for n without further manipulation.</p> <ul style="list-style-type: none"> Item difficulty can be adjusted via these methods: <ul style="list-style-type: none"> Expressions have integer coefficients. Expressions include decimal coefficients. Expressions include coefficients which are fractions or mixed numbers. Expressions include exactly one variable. Expressions include more than one variable. <p>TM1b</p> <p>Example Stem 1: Enter the value of n so that the expression $(-y + 5) + (7y - 9)$ is equivalent to $(ny - 4)$.</p> <p>Example Stem 2: Enter the value of n so that the expression $(-y + 5.3) + (7.2y - 9)$ is equivalent to $6.2y + n$.</p> <p>Rubric: (1 point) The student enters the correct value for the variable (e.g., 6; -3.7).</p> <p>Response Type: Equation/Numeric</p> |
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| <p>Task Model 2</p> <p>Response Type: Multiple Choice, multiple correct response</p> <p>DOK Level 1</p> <p>7.EE.A.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.</p> <p>Evidence Required: 2. The student factors linear expressions with rational coefficients.</p> <p>Tools: None</p> | <p>Prompt Features: The student is prompted to identify the factors of a linear expression.</p> <p>Stimulus: The student is presented with a linear expression with rational coefficients.</p> <ul style="list-style-type: none"> Item difficulty can be adjusted via these methods: <ul style="list-style-type: none"> Expressions have only positive rational coefficients. Expressions include negative rational coefficients. <p>TM2a</p> <p>Example Stem: Select all expressions equivalent to $-72x + 60$.</p> <p>A. $-12(6x - 5)$ B. $-12(-6x - 5)$ C. $6(-12x + 10)$ D. $-6(-12x - 10)$</p> <p>Answer Choices: Answer choices will be expressions in the form $p(qx + r)$ or $p(r + qx)$, where p, q, and r are rational numbers. Distractors will include misuse of the distributive property, incorrect calculations based on negative sign(s), and incorrectly combining terms.</p> <p>Rubric: (1 point) The student selects all of the equivalent expressions (e.g., A and C).</p> <p>Response Type: Multiple Choice, multiple correct response</p> |
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| <p>Task Model 2</p> <p>Response Type: Equation/Numeric</p> <p>DOK Level 1</p> <p>7.EE.A.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.</p> <p>Evidence Required: 2. The student factors linear expressions with rational coefficients.</p> <p>Tools: None</p> | <p>Prompt Features: The student is prompted to enter the factor of a linear expression given an equation containing two variables.</p> <p>Stimulus: The student is presented with two linear expressions.</p> <ul style="list-style-type: none"> Item difficulty can be adjusted via these methods: <ul style="list-style-type: none"> Expressions have only positive rational coefficients. Expressions include negative rational coefficients. Should contain one or more rational coefficient(s). Coefficients are rational numbers sharing a common factor with other terms. <p>TM2b</p> <p>Example Stem 1: Enter the value of p so that the expression $3(n + 5)$ is equivalent to $(n + p)3$.</p> <p>Example Stem 2: Enter the value of p so that the expression $\frac{5}{6} - \frac{1}{3}n$ is equivalent to $p(5 - 2n)$.</p> <p>Rubric: (1 point) The student enters the correct value for p (e.g., 5; $\frac{1}{6}$).</p> <p>Response Type: Equation/Numeric</p> |
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| <p>Task Model 3</p> <p>Response Type: Multiple Choice, single correct response</p> <p>DOK Level 1</p> <p>7.EE.A.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.</p> <p>Evidence Required: 3. The student expands linear expressions with rational coefficients.</p> <p>Tools: None</p> | <p>Prompt Features: The student is prompted to identify equivalent expressions with rational coefficients that involve expanded form.</p> <p>Stimulus: The student is presented with a linear expression.</p> <ul style="list-style-type: none"> Item difficulty can be adjusted via these methods: <ul style="list-style-type: none"> Expressions have positive or negative integer coefficients. Expressions include rational coefficients. <p>TM3a</p> <p>Example Stem 1: Which expression is equivalent to $-15x + 6$?</p> <p>A. $-3(5x - 2)$ B. $-3(5x + 6)$ C. $3(-5x - 2)$ D. $3(5x + 6)$</p> <p>Example Stem 2: Which expression is equivalent to $-0.8(10.8x - 20 + 3.2x)$?</p> <p>A. $-11.2x + 16$ B. $-11.2x - 16$ C. $-8.64x - 16.8$ D. $-8.64x + 16.8$</p> <p>Answer Choices: Distractors will include misuse of the distributive property; incorrect calculations are based on negative sign(s), and incorrectly combining terms.</p> <p>Rubric: (1 point) The student selects the equivalent expression (e.g., A; A).</p> <p>Response Type: Multiple Choice, single correct response</p> |
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| <p>Task Model 3</p> <p>Response Type: Equation/Numeric</p> <p>DOK Level 1</p> <p>7.EE.A.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.</p> <p>Evidence Required: 3. The student expands linear expressions with rational coefficients.</p> <p>Tools: None</p> | <p>Prompt Features: The student is prompted to enter the unknown value of an equivalent expression to the expanded form of a linear expression with rational coefficients.</p> <p>Stimulus: The student is presented with two equivalent linear expressions.</p> <ul style="list-style-type: none"> Item difficulty can be adjusted via these methods: <ul style="list-style-type: none"> Expressions have positive or negative integer coefficients. Expressions include rational coefficients. One expression has two variables. <p>TM3b</p> <p>Example Stem: Enter the value of b when the expression $14.1x + b$ is equivalent to $4.7(3x - 3.5)$.</p> <p>Rubric: (1 point) The student enters the value for b (e.g., -16.45).</p> <p>Response Type: Equation/Numeric</p> |
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| <p>Task Model 4</p> <p>Response Type: Multiple Choice, multiple correct response</p> <p>DOK Level 2</p> <p>7.EE.A.1 Apply properties of operations as strategies to add, subtract, factor, and expand linear expressions with rational coefficients.</p> <p>Evidence Required: 4. The student generates equivalent linear expressions using a combination of addition and subtraction, factoring, and expansion.</p> <p>Tools: None</p> | <p>Prompt Features: The student is prompted to identify a linear expression that is equivalent to a given linear expression.</p> <p>Stimulus: The student is presented with a linear expression.</p> <ul style="list-style-type: none"> Item difficulty can be adjusted via these methods: <ul style="list-style-type: none"> Expressions have only positive rational coefficients. Expressions include negative rational coefficients. Only addition/subtraction of expressions is required. Factoring/expansion of expressions is required. <p>TM4</p> <p>Example Stem 1: Select all expressions that are equivalent to $3x + 5(-4x + 12) - (x - 3)$.</p> <p>A. $-18x + 63$ B. $18x - 63$ C. $3x - 20x + 60 - x + 3$ D. $3x + 20x + 60 - x - 3$</p> <p>Example Stem 2: Select all expressions that are equivalent to $0.75x + 0.25(x + 12.4) + (x - 2.1)$.</p> <p>A. $2x + 1$ B. $x + 1$ C. $x + 3.1 + x + 2.1$ D. $x + 3.1 + x - 2.1$</p> <p>Answer Choices: Distractors will include misuse of the distributive property, incorrect calculations based on negative sign(s), and incorrectly combining terms.</p> <p>Rubric: (1 point) The student selects all the appropriate expressions (e.g., A and C; A and D).</p> <p>Response Type: Multiple Choice, multiple correct response</p> |
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