Task Model 1 **Response Type: Equation/Numeric** **DOK Level 1** **A-REI.B.3** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. **Evidence Required:** 1. The student understands that the factored form of a quadratic expression reveals the zeroes of the function it defines. **Tools:** None **Version 3 Update:** Revised TM1a to allow for multi-step equations. Retired TM1b. Renamed TM1a as TM1.	**Prompt Features:** The student is prompted to solve a linear equation in one variable. **Stimulus Guidelines:** • The student is presented with a linear equation in one variable with rational coefficients. • The solution must be rational. If the student reports the solution as a decimal, it should be rounded to the nearest tenth. • Equations should use a variety of letters for the variable. • Item difficulty can be varied by adjusting the number of steps involved in solving equations, as well as the use of parentheses. **TM1** **Stimulus:** The student is presented with a one-variable, linear equation with rational solution and rational coefficients. **Example Stem 1:** Enter the value for *t* that makes the given equation true. $48 = t - 3$ **Example Stem 2:** Enter the value for *x* that makes the given equation true. $20x - 5(6x + 4) = 4x - 6$ **Rubric:** (1 point) The student enters the correct value for the variable *x* (e.g., 51; -1). **Response Type:** Equation/Numeric

Task Model 2 **Response Types: Equation/Numeric; Multiple Choice, single correct response** **DOK Level 1** **A-REI.B.3** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. **Evidence Required:** 2. The student solves linear inequalities in one variable with numeric coefficients. **Tools:** None **Version 3 Update:** Revised TM2a and TM2b to allow for multi-step inequalities. Retired TM2c and TM2d.	**Prompt Features:** The student is prompted to solve a linear inequality in one variable with rational coefficients. **Stimulus Guidelines:** • The student is presented with a linear inequality in one variable with rational coefficients. • Inequalities should use a variety of letters for the variable. • Item difficulty can be varied by adjusting the number of steps involved in finding the solution set for the inequality, as well as the use of parentheses. **TM2a** **Stimulus:** The student is presented with a one-variable linear inequality with rational coefficients. **Example Stem 1:** Solve the inequality for *n*. $45 \geq -15n$. **Example Stem 2:** Solve the inequality for *w*. $-2w + 17 < 13$. **Rubric:** (1 point) The student enters the correct solution to the inequality (e.g., $n \geq -3;\ w > 2$). **Response Type:** Equation/Numeric **TM2b** **Stimulus:** The student is presented with a one-variable linear inequality with rational coefficients. **Example Stem:** Which inequality represents all possible solutions of -3*n* < 12? A. *n* < -36 B. *n* < -4 C. *n* > -36 D. *n* > -4 **Rubric:** (1 point) The student selects the correct option (e.g., D). **Response Type:** Multiple Choice, single correct response

Task Model 3 **Response Type: Equation/Numeric** **DOK Level 1** **A-REI.B.3** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. **Evidence Required:** 3. The student solves linear inequalities in one variable with letter coefficients or identifies appropriate value(s) of a letter coefficient given specific information about a variable in a linear equation or inequality. **Tools:** None **Version 3 Update:** Revised TM3a to allow for multi-step solving. Retired TM3b and TM3d.	**Prompt Features:** The student is given an equation with more than one variable that is linear in one of the variables. The student is asked to solve for that variable in terms of the other variables. **Stimulus Guidelines**: • The equation has multiple variables and is linear in one of more of those variables. The student is given values for the other variables. • The solution must be rational. If the student reports the solution as a decimal, it should be rounded to the nearest tenth. • Equations should use a variety of letters for the variable. • Item difficulty can be varied by adjusting the number of steps involved in solving equations, as well as the use of parentheses. **TM3a** **Stimulus:** The student is presented with an equation in more than one variable and is given all values for the other variables. **Example Stem 1:** For the given equation, enter the value of *B* when $x = 10$. $Bx = 20$ **Example Stem 2:** For the given equation, enter the value of *B* when $x = -\frac{1}{5}$. $\frac{B}{x} = 20$ **Example Stem 3:** For the given equation, enter the value of *C* when $F = 77$. $$F = \frac{9}{5}C + 32$$ **Rubric:** (1 point) The student enters the correct value for B (e.g., 2; -4; 25). **Response Type:** Equation/Numeric

Task Model 3 **Response Type: Equation/Numeric** **DOK Level 2** **A-REI.B.3** Solve linear equations and inequalities in one variable, including equations with coefficients represented by letters. **Evidence Required:** 3. The student solves linear inequalities in one variable with letter coefficients or identifies appropriate value(s) of a letter coefficient given specific information about a variable in a linear equation or inequality. **Tools:** None **Version 3 Update:** Revised TM3c example stems to focus on more realistic formulas.	**Prompt Features:** The student is given an equation with more than one variable that is linear in one of the variables. The student is asked to solve for that variable in terms of the other variables. **Stimulus Guidelines**: • The equation has multiple variables and is linear in one of more of those variables. • Item difficulty can be varied by adjusting the number of steps involved in solving equations, as well as the use of parentheses. **TM3c** **Stimulus:** The student is presented with a linear equation requiring at least two steps to solve. **Example Stem1:** Solve the given equation for *a* in terms of *v* and *t*. $$v = \frac{1}{2}at^2$$ **Example Stem2:** Solve the given equation for *w* in terms of *P* and *l*. $$P = 2l + 2w$$ **Rubric:** (1 point) The student enters the correct equation (e.g., $a = \frac{2v}{t^2}$; $w = \frac{P}{2} - l$). **Response Type:** Equation/Numeric

Task Model 4
 	
Response Type: Equation/Numeric
 	
DOK Level 2
 	
A-REI.B.4
Solve quadratic equations in one variable.
 	
Evidence Required:
4. The student solves quadratic equations in one variable by taking square roots, completing the square, using the quadratic formula, or by factoring.
 	
Tools: None
 	
Version 3 Update:
Retired TM4a-TM4f and revised TM4 to allow for complex solutions and quadratic equations in different forms. Rather than forcing students to solve problems using a particular method, equations are presented to reward flexible strategies.
	Prompt Features: The student is prompted to solve a quadratic equation presented in various forms.
	
	Stimulus Guidelines:
	• Item difficulty can be adjusted via these example methods, but are not limited to these methods:
	  ○ The quadratic equation used can:
	  ▪ have rational roots
	  ▪ irrational roots
	  ▪ complex roots
	
	TM4
	Stimulus: The student is presented with a quadratic equation in one variable in various forms (e.g., $ax^2 + bx + c = dx^2 + ex + f$, $a(x - r_1)(x - r_2) = dx^2 + ex + f$, etc.).
	
	Example Stem 1: Solve the following equation for *n*.
	
	$n^2 = 49$
	
	Enter one solution in the first box. If there are two solutions, enter the second solution in the second box.
	
	Example Stem 2: Solve the following equation for *t*.
	
	$18t^2 + 50 = 0$
	
	Enter one solution in the first box. If there are two solutions, enter the second solution in the second box.
	
	Example Stem 3: Solve the following equation for *x*.
	
	$x^2 - 10x + 45 = 4x$
	
	Enter one solution in the first box. If there are two solutions, enter the second solution in the second box.
	
	Example Stem 4: Solve the following equation for *w*.
	
	$2w^2 - 16w = -32$
	
	Enter one solution in the first box. If there are two solutions, enter the second solution in the second box.
	
	Rubric:
	(1 point) The student correctly enters the solution(s) to the equation (e.g., $n = 7, -7$; $t = -\frac{5}{3}i, \frac{5}{3}i$; $x = 9, 5$; $w = 4$, --).
	
	Response Type: Equation/Numeric (two response boxes)

Task Model 5 **Response Type: Equation/Numeric** **DOK Level 2** **A-REI.B.4** Solve quadratic equations in one variable. **Evidence Required:** 5. The student recognizes when the quadratic formula enters complex solutions. **Tools:** None **Development Note:** No more than 5% of this target should come from this task model TM5a. **Version 3 Update:** Separated evidence required statements 5 and 6 into separate task models (TM5 and TM6). Renamed TM5b as TM6.	**Prompt Features:** The student is prompted to identify a quadratic equation that has no real solutions. **Stimulus Guidelines:** • All quadratic equations for this task model must have complex solutions. • Item difficulty can be adjusted via these example methods, but are not limited to these methods: ▪ Students are asked to identify a quadratic equation with complex solutions, multiple choice. ○ The form of the quadratic equation can be: ▪ standard form, $ax^2 + bx + c = 0$ ▪ vertex form, $f(x) = a(x-h)^2 + k$ (e.g., $5(x-3)^2 + 10 = 0$). ▪ other non-standard forms such as: $\pm bx \pm c = \pm ax^2$, $\pm c \pm ax^2 = \pm bx$ or $\pm ax^2 \pm bx = \pm c$ (e.g., $6x - 23 = 3x^2$). **TM5a** **Stimulus:** The student is presented with a quadratic equation in one variable where one of the coefficients is given as a parameter. **Example Stem 1:** Consider the equation $x^2 + bx + 9 = 0$ where *b* is a real number. Enter a value for *b* so that the equation has no real solutions. **Rubric:** (1 point) The student enters a correct value for *b* (e.g., -6<*b*<6). **Response Type:** Equation/numeric **Example Stem 2:** Consider the equation $(x+3)^2 + k = 0$ where *k* is a real number. Enter a value for *k* so that the equation has no real solutions. **Rubric:** (1 point) The student enters a correct value for *k* (e.g., -0<*k*). **Response Type:** Equation/numeric

Task Model 6 **Response Type: Multiple Choice, single correct response** **DOK Level 2** **A-REI.B.4** Solve quadratic equations in one variable. **Evidence Required:** 6. The student enters complex solutions for the quadratic formula in the form $a \pm bi$ where *a* and *b* are real numbers. **Tools:** None **Version 3 Update:** Separated evidence required statements 5 and 6 into separate task models (TM5 and TM6). Renamed TM5b as TM6.	**Prompt Features:** The student is prompted to solve a quadratic equation that has complex solutions. **Stimulus Guidelines:** • All quadratic equations for this task model must have complex solutions. • Item difficulty can be adjusted via these example methods, but are not limited to these methods: ▪ Students are asked to identify a quadratic equation with complex solutions, multiple choice. ○ The form of the quadratic equation can be: ▪ standard form, $ax^2 + bx + c = 0$ ▪ vertex form, $f(x) = a(x-h)^2 + k$ (e.g., $5(x-3)^2 + 10 = 0$). ▪ other non-standard forms such as: $\pm bx \pm c = \pm ax^2$, $\pm c \pm ax^2 = \pm bx$ or $\pm ax^2 \pm bx = \pm c$ (e.g., $6x - 23 = 3x^2$). **TM6** **Stimulus:** The student is given a quadratic equation with complex roots in standard form : $ax^2 + bx + c = 0$ **Example Stem:** What are the solutions for the given equation? $x^2 + 4x + 16 = 0$ A. $x = -2 \pm 4i\sqrt{3}$ B. $x = -2 \pm 2\sqrt{3}$ C. $x = -2 \pm 2i\sqrt{3}$ D. $x = -2 \pm 4\sqrt{3}$ **Rubric:** (1 point) The student selects the correct option (e.g., C). **Response Type:** Multiple Choice, single correct response

Task Model 7

Response Type: Equation/Numeric

DOK Level 2

A-REI.B.4
Solve quadratic equations in one variable.

Evidence Required:
7. The student recognizes equivalent equations to given linear or quadratic equations in one variable.

Tools: None

Version 3 Update:
Added new evidence required statement 7 and new TM7.

Prompt Features: Given a linear or quadratic equation in one variable, identify equivalent equations.

Stimulus Guidelines:

- The student is presented with a linear or quadratic equation in one variable and another set of equations.
- The student must identify which of the equations in the set are equivalent to the first.

TM7
Stimulus: The stem will present a linear or quadratic equation in one variable and three or more equations. Equivalent equations should be likely to arise from common algebraic manipulations of the given equation that produce equivalent equations. Non-equivalent equations should be clearly not equivalent based on structural comparisons of the two equations or algebraic manipulations of the equations that give rise to non-equivalent equations.

Example Stem 1: Equivalent equations have exactly the same solution set. Select Yes or No to indicate whether each equation is equivalent to this equation: $4x + 3 = \frac{5}{2}x - 7$

Equation	Yes	No
$4x = \frac{5}{2}x - 4$		
$8x + 3 = 5x - 7$		
$4x = \frac{5}{2}x - 10$		

Example Stem 2: Equivalent equations have exactly the same solution set. Select Yes or No to indicate whether each equation is equivalent to this equation: $t^2 + 5t + 6 = 0$

Equation	Yes	No
$0 = t^2 + 5t + 6$		
$(t + 2)(t + 3) = 0$		
$t(t + 5 + 6) = 0$		

Rubric: (1 point) The student correctly determines whether each equation is equivalent to the first (e.g., NNY; YYN).

Response Type: Matching Tables

Task Model 7

Response Type: Matching Tables

DOK Level 2

A-REI.B.4
Solve quadratic equations in one variable.

Evidence Required:
7. The student recognizes equivalent equations to given linear or quadratic equations in one variable.

Tools: None

Version 3 Update:
Added new evidence required statement 7 and new TM7.

Example Stem 3: Equivalent equations have exactly the same solution set. Select Yes or No to indicate whether each of the following equations is equivalent to the given equation.

$$y^2 + 2y + 1 = 9$$

Equation	Yes	No
$(y+1)^2 = 3^2$		
$(y+1) = 3$		
$y = 2$		

Rubric: (1 point) The student correctly determines whether each equation is equivalent to the first (e.g., YNN).

Response Type: Matching Tables