Task Model 1

Response Type:
Hot Spot

DOK Level 2

A-SSE.B.3a
Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

a. Factor a quadratic expression to reveal the zeros of the function it defines.

Evidence Required:
1. The student understands that the factored form of a quadratic expression reveals the zeros of the function it defines.

Tools: None

Accessibility Note:
Hot Spot items are not currently able to be Brailled. Minimize the number of items developed to this TM.

Prompt Features: The student identifies the factored form of a quadratic expression that represents $f(x)$ as best for revealing zeros and chooses the zeros.

Stimulus Guidelines:

- Equivalent forms of quadratic equations are given in different forms.
- Difficulty level can be altered by varying the type of expression, and by using different variables and coefficients.

TM1a
Stimulus: The student is presented with equivalent quadratic equations for $f(x)$.

Example Stem:

***Part A*:** Three equations that all represent the same function f are shown. Select the equation that includes the zeros of $f(x)$ as numbers that appear in the equation.

***Part B*:** Select all values of x for which $f(x) = 0$.

Part A:

$f(x) = -2x^2 + 24x - 54$

$f(x) = -2(x - 3)(x - 9)$

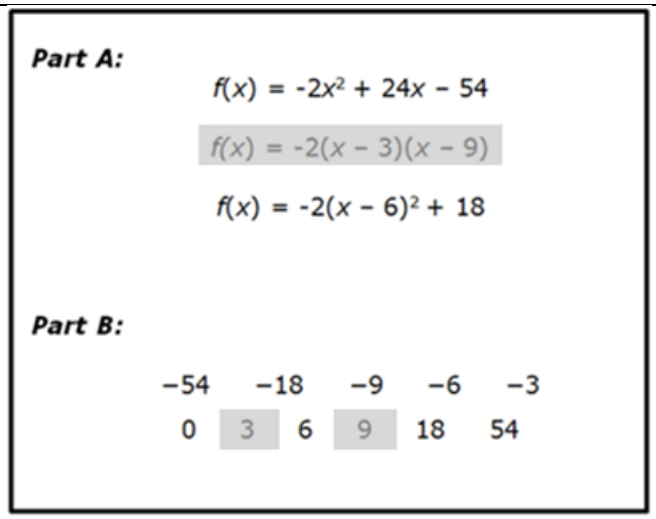
$f(x) = -2(x - 6)^2 + 18$

Part B:

-54 -18 -9 -6 -3

0 3 6 9 18 54

Rubric:
(1 point) The student selects the correct equation for $f(x)$ and selects the correct zeros.



Response Type: Hot spot

Task Model 1

Response Type:
Hot Spot

DOK Level 2

A-SSE.B.3a
Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

a. Factor a quadratic expression to reveal the zeros of the function it defines.

Evidence Required:
1. The student understands that the factored form of a quadratic expression reveals the zeros of the function it defines.

Tools: None

Accessibility Note:
Hot Spot items are not currently able to be Brailled. Minimize the number of items developed to this TM.

Prompt Features: The student identifies the standard form of a quadratic expression that represents $f(x)$ as best for finding the value of $f(0)$.

Stimulus Guidelines:

- Equivalent forms of quadratic equations are given in different forms.
- Difficulty level can be altered by using different variables and coefficients.

TM1b
Stimulus: The student is presented with equivalent quadratic expressions for $f(x)$.

Example Stem:
***Part A*:** Three equations that all represent the same function f are shown. Select the equation that includes the value of $f(0)$ as a number that appears in the equation.

***Part B*:** Identify $f(0)$.

Part A:

$f(x) = -2x^2 + 24x - 54$

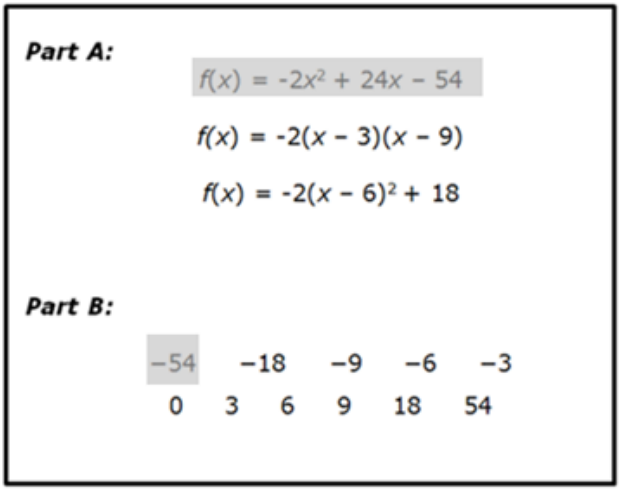
$f(x) = -2(x - 3)(x - 9)$

$f(x) = -2(x - 6)^2 + 18$

Part B:

−54	−18	−9	−6	−3	
0	3	6	9	18	54

Rubric:
(1 point) The student selects the correct equation for $f(x)$ and selects the correct value for $f(0)$.



Response Type: Hot Spot

Task Model 2

Response Type:
Hot Spot

DOK Level 2

A-SSE.B.3b
Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression.

b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines.

Evidence Required:
2. The student understands that completing the square for a quadratic expression reveals the maximum or minimum value of the function it defines.

Tools: None

Accessibility Note:
Hot Spot items are not currently able to be Brailled. Minimize the number of items developed to this TM.

Prompt Features: The student identifies the form of a quadratic expression that represents $f(x)$ that reveals the maximum or minimum value of the function and chooses the maximum or minimum value of the function.

Stimulus Guidelines:

- The completed square form is $a(x-h)^2+k$, knowing that $h=-b/2a$ and $k=c-b^2/4a$
- Difficulty level can be altered by using different variables and coefficients

TM2a
Stimulus: The student is presented with equivalent quadratic expressions for $f(x)$.

Example Stem:
***Part A*:** Three equations that all represent the same function *f* are shown. Select the equation that includes the maximum value of *f* as a number that appears in the equation.

***Part B*:** Select the maximum value of $f(x)$.

Part A:

$f(x) = -2x^2 + 24x - 54$

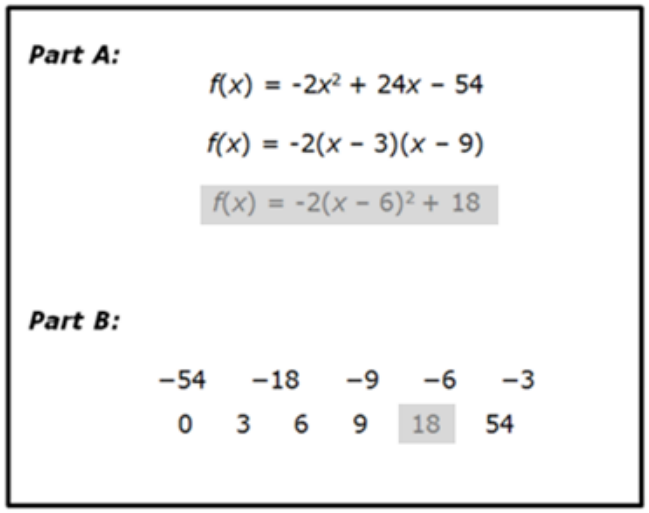
$f(x) = -2(x - 3)(x - 9)$

$f(x) = -2(x - 6)^2 + 18$

Part B:

−54	−18	−9	−6	−3	
0	3	6	9	18	54

Rubric:
(1 point) The student selects the correct equation for $f(x)$ and selects the maximum value.



Response Type: Hot Spot

Task Model 2 **Response Type: Multiple Choice, single correct response** **DOK Level 1** **A-SSE.B.3b** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. **Evidence Required:** 2. The student understands that completing the square for a quadratic expression reveals the maximum or minimum value of the function it defines. **Tools:** None	**Prompt Features:** The student identifies the form of a given quadratic expression that reveals the maximum or minimum of the expression. **Stimulus Guidelines:** • The completed square form is $a(x-h)^2+k$, knowing that $h=-b/2a$ and $k=c-b^2/4a$. • Difficulty level can be altered by using different variables and coefficients. **TM2b** **Stimulus:** The student is presented with four quadratic equations. **Example Stem:** Which equation includes the minimum or maximum value of *f* as a number that appears in the equation? A. $f(x)=(x-1)^2-4$ B. $f(x)=x^2-2x-3$ C. $f(x)=x^2-3x+x-3$ D. $f(x)=(x+1)(x-3)$ **Rubric:** (1 point) The student correctly chooses the equation that reveals the maximum or minimum of the quadratic function (e.g., A). **Response Type:** Multiple Choice, single correct response

Task Model 2 **Response Type: Equation/Numeric** **DOK Level 2** **A-SSE.B.3b** Choose and produce an equivalent form of an expression to reveal and explain properties of the quantity represented by the expression. b. Complete the square in a quadratic expression to reveal the maximum or minimum value of the function it defines. **Evidence Required:** 2. The student understands that completing the square for a quadratic expression reveals the maximum or minimum value of the function it defines. **Tools:** None	**Prompt Features:** The student completes the square for a quadratic expression to reveal the maximum or minimum of the expression. **Stimulus Guidelines:** • The completed square form which is $\mathrm{a}(x-\mathrm{h})^2+\mathrm{k}$, knowing that $\mathrm{h}=-\mathrm{b}/2\mathrm{a}$ and $\mathrm{k}=\mathrm{c}-\mathrm{b}^2/4\mathrm{a}$ • Difficulty level can be altered by using different variables and coefficients. **TM2c** **Stimulus:** The student is presented with a quadratic function in standard form. **Example Stem 1:** Enter the function $f(x)=x^2-7x-18$, in the form $f(x)=\mathrm{a}(x-\mathrm{h})^2+\mathrm{k}$, where *a*, *h*, and *k* are constants. Enter your answer in the first response box. Enter the *x*-coordinate of the vertex of the graph of *f* in the second response box. **Example Stem 2:** Enter the function $f(x)=28x^2+16x-80$, in the form $f(x)=\mathrm{a}(x-\mathrm{h})^2+\mathrm{k}$, where *a*, *h*, and *k* are constants. Enter your answer in the first response box. Enter the *x*-coordinate of the vertex of the graph of *f* in the second response box. **Rubric:** (2 points) The student correctly enters the function in the appropriate form and enters the *x*-coordinate of the vertex of the graph [e.g., $f(x)=\left(x-\frac{7}{2}\right)^2-\frac{121}{4}$ and $\frac{7}{2}$; $28\left(x+\frac{2}{7}\right)^2-\frac{576}{7}$ and $-\frac{2}{7}$]. (1 point) The student correctly enters the function in the equivalent form **or** enters the *x*-coordinate of the vertex of the graph [e.g., $f(x)=\left(x-\frac{7}{2}\right)^2-\frac{121}{4}$ or $\frac{7}{2}$; $28\left(x+\frac{2}{7}\right)^2-\frac{576}{7}$ or $-\frac{2}{7}$]. **Response Type:** Equation/Numeric (two response boxes)

Task Model 3 **Response Type: Equation/Numeric;** **DOK Level 2** **A-SSE.B.3c** Use the properties of exponents to transform expressions for exponential functions. For example, the expression 1.15^t can be rewritten as $\approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%. **Evidence Required:** 3. The student uses the properties of exponents to transform exponential expressions. **Tools:** None	**Prompt Features:** The student uses the properties of exponents to produce an equivalent expression for an exponential expression (transforming expressions into both simpler and expanded forms, as specified in the stem). **Stimulus Guidelines:** • Exponential algebraic expressions with one or more variables, integer and rational coefficients, and rational exponents involving operations of addition, subtraction, multiplication, and division • Difficulty level can be altered by using different variables and exponents. **TM3a** **Stimulus:** The student is presented with an exponential expression and the form in which it is to be transformed. **Example Stem 1:** Enter an expression equivalent to $\left(\frac{a^9}{a^3}\right)$ in the form a^m. **Example Stem 2:** Enter an expression equivalent to a^{20} in the form $(a^n)^m$. **Example Stem 3:** Enter an expression equivalent to a^{-12} in the form $(a^n)^m$. **Example Stem 4:** Enter an expression equivalent to $(a^2a^4b)^5$ in the form a^mb^n. **Rubric:** (1 point) The student correctly enters an equivalent expression in the given form [e.g., a^6; $(a^4)^5$; $(a^{-3})^4$; $a^{30}b^5$]. Multiple correct answers may be possible for some items. **Response Type:** Equation/Numeric

Task Model 3 **Response Type: Multiple Choice, single correct response** **DOK Level 2** **A-SSE.B.3c** Use the properties of exponents to transform expressions for exponential functions. For example, the expression 1.15^t can be rewritten as $\approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%. **Evidence Required:** 3. The student uses the properties of exponents to transform exponential expressions. **Tools:** Calculator	**Prompt Features:** The student is prompted to use the properties of exponents to transform exponential expressions. **Stimulus Guidelines:** • All numbers, variables, and operations should be changed to create an item. • Difficulty level can be altered by using different variables and coefficients. **TM3b** **Stimulus**: The student is presented with a contextual situation and an exponential expression representing an exponentially increasing or decreasing quantity within the given situation. **Example Stem:** This expression defines a function that models the future population of wolves in a park after *t* years. $3280(1.15)^t$ Which expression best defines the function that represents the wolf population after *x* months? A. $3280(1.0125)^x$ B. $3280(1.0117)^x$ C. $3280(1.12)^x$ D. $3280(1.2)^x$ **Rubric:** (1 point) Student selects the correct expression (e.g., B). **Response Type:** Multiple Choice, single correct response

Task Model 3 **Response Type: Equation/Numeric** **DOK Level 2** **A-SSE.B.3c** Use the properties of exponents to transform expressions for exponential functions. For example, the expression 1.15^t can be rewritten as $\approx 1.012^{12t}$ to reveal the approximate equivalent monthly interest rate if the annual rate is 15%. **Evidence Required:** 3. The student uses the properties of exponents to transform exponential expressions. **Tools:** Calculator	**Prompt Features:** The student is prompted to use the properties of exponents to transform exponential expressions to find the growth or decay rate for different units of time. **Stimulus Guidelines:** • All numbers, variables, and operations should be changed to create an item. • Difficulty level can be altered by using different variables and coefficients. **TM3c** **Stimulus**: The student is presented with a contextual situation and an exponential expression representing an exponentially increasing or decreasing quantity within the given situation. **Example Stem:** This expression defines a function that models the future population of wolves in a park after *x* months. $3280(1.0117)^x$ Enter the yearly growth rate for the wolf population as a percent. Round to the nearest hundredth. **Rubric:** (1 point) Student produces the correct growth or decay rate (e.g., 14.98%). **Response Type:** Equation/Numeric