Task Model 1 **Response Type: Multiple Choice, multiple correct response** **DOK Level 1** **8.EE.A.1** Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example,* $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$. **Evidence Required:** 1. The student generates equivalent numerical expressions by applying the properties of integer exponents. **Tools:** None	**Prompt Features:** The student determines equivalent numerical expressions by applying the properties of integer exponents. **Stimulus Guidelines:** • The bases are integers between –5 and 5. • Item difficulty can be adjusted via these example methods: ○ One-step multiplication or division expression. ○ Multi-step multiplication and division expression. ○ All positive integer exponents. ○ Combination of negative and positive integer exponents. ○ Combination of negative and positive integer bases. ○ Including a base to the 1st power with no exponent given. **TM1a** **Stimulus:** The student is presented with a numerical expression involving integer exponents. **Example Stem:** Select **all** expressions equivalent to $(4^5 \bullet 4^{-3})^{-2}$. A. $\frac{1}{256}$ B. 256 C. $4^{-10} \bullet 4^6$ D. $4^3 \bullet 4^{-5}$ **Answer Choices:** There should be four answer choices with at least two correct choices that will be expressions or numbers. Incorrect answer choices will reflect errors in understanding negative exponents or error applying exponent rules. **Rubric:** (1 point) Student selects all equivalent expressions (e.g., A and C) **Response Type:** Multiple Choice, multiple correct response

Task Model 1
 	
Response Type: Equation/Numeric
 	
DOK Level 1
 	
8.EE.A.1 Know and apply the properties of integer exponents to generate equivalent numerical expressions. *For example,* $3^2 \times 3^{-5} = 3^{-3} = 1/3^3 = 1/27$.
 	
Evidence Required:
1. The student generates equivalent numerical expressions by applying the properties of integer exponents.
 	
Tools: None
	Prompt Features: The student determines a value that makes two expressions equivalent by applying the properties of integer exponents.
	
	Stimulus Guidelines:
	• The missing value may represent any exponent.
	• The bases are integers between –5 and 5.
	• Item difficulty can be adjusted via these example methods:
	  ○ One-step multiplication or division expression.
	  ○ Multi-step multiplication and division expression.
	  ○ All positive integer exponents.
	  ○ Combination of negative and positive integer exponents.
	  ○ Combination of negative and positive integer bases. including a base to the 1st power with no exponent given.
	
	TM1b
	Stimulus: The student is presented with an equation with numerical expressions involving integer exponents.
	
	Example Stem: Enter the value of n that makes the equation $4^5 \bullet 4^n = 4^{15}$ true.
	
	Rubric: (1 point) Student applies properties of exponents correctly and enters the correct response (e.g., 10).
	
	Response Type: Equation/Numeric

Task Model 2 **Response Type: Multiple Choice, multiple correct response** **DOK Level 1** **8.EE.A.2** Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. **Evidence Required:** 2. The student generates solutions to equations of the form $x^2 = p$ using square root symbols. **Tools:** None	**Prompt Features:** The student generates solutions to an equation of the form $x^2 = p$ using square root symbols. **Stimulus Guidelines:** • Square roots of non-perfect squares must be in radical form as answer choices • Four to six answer choices may be given, including positive and negative values. • Item difficulty can be adjusted via these methods: ○ p is a perfect square. ○ x is a positive integer or rational number. ○ x is a negative integer or rational number. ○ p is not a perfect square. **TM2** **Stimulus:** The student is presented with an equation in the form $x^2 = p$, where p is a positive rational number. **Example Stem 1:** Select **all** possible values for x that solve the equation $x^2 = 200$. A. $10\sqrt{20}$ B. $100\sqrt{2}$ C. $10\sqrt{2}$ D. $\sqrt{200}$ **Example Stem 2:** Select **all** possible values for x in the equation $x^2 = 200$. A. $10\sqrt{2}$ B. $10\sqrt{20}$ C. $20\sqrt{10}$ D. $-10\sqrt{2}$ E. $-10\sqrt{20}$ F. $-20\sqrt{10}$ **Answer Choices:** At least two answer choices must be correct responses. Incorrect answer choices should reflect errors in inappropriately factoring and not taking the square root of a factor. **Rubric:** (1 point) Student selects all the correct expressions (e.g., C and D; A and D). **Response Type:** Multiple Choice, multiple correct response

Task Model 3 **Response Type: Multiple Choice, multiple correct response** **DOK Level 1** **8.EE.A.2** Use square root and cube root symbols to represent solutions to equations of the form $x^2 = p$ and $x^3 = p$, where p is a positive rational number. Evaluate square roots of small perfect squares and cube roots of small perfect cubes. Know that $\sqrt{2}$ is irrational. **Evidence Required:** 3. The student generates solutions to equations of the form $x = p$ using cube root symbols. **Tools:** None	**Prompt Features:** The student generates solutions to equations of the form x = *p* using cube root symbols. **Stimulus Guidelines:** • Cube roots of non-perfect cubes must be in radical form as answer choices. • Four to six answer choices may be given, including positive and negative values. • Item difficulty can be adjusted via these methods: ○ *p* is a perfect cube. ○ *x* is a positive integer or rational number. ○ *x* is a negative integer or rational number. ○ *p* is not a perfect cube. **TM3** **Stimulus** The student is presented with an equation of the form $x = p$, where *p* is a positive rational number. **Example Stem:** Select **all** possible values for *x* in the equation, $x^3 = 250$. A. $5\sqrt[3]{2}$ B. $\sqrt[3]{250}$ C. $5\sqrt[3]{10}$ D. $25\sqrt[3]{10}$ **Answer Choices:** At least two answer choices must be correct responses. Incorrect answer choices should reflect errors in inappropriately factoring and taking the square root instead of cube root. **Rubric:** (1 point) Student selects all the correct expressions (e.g., A and B). **Response Type:** Multiple Choice, multiple correct response

Task Model 4 **Response Type: Multiple Choice, single correct response** **DOK Level 1** **8.EE.A.3** Use numbers expressed in the form of a single digit times an integer power of 10 to estimate very large or very small quantities and to express how many times as much one is than the other. *For example, estimate the population of the United States as 3 × 10^8 and the population of the world as 7 × 10^9, and determine that the world population is more than 20 times larger.* **Evidence Required:** 4. The student states how many times as large or as small one number, written as a single digit times a power of 10, is than another to estimate very large or very small quantities. **Tools:** None **Version 3 Update:** Retired example stem 2 from TM4.	**Prompt Features:** The student identifies approximately how many times as large or as small one number is than another. **Stimulus Guidelines:** Item difficulty can be adjusted via these methods: • Two expressions in the form *a* x 10^b with *a* as the same single digit whole number in both expressions and *b* is positive in both expressions • Two expressions in the form *a* x 10^b with *a* as the same single digit whole number in both expressions and *b* is negative in both expressions • Two expressions in the form *a* x 10^b with *a* as the same single digit whole number in both expressions; *b* is negative in one expression and *b* is positive in the other expression OR two expressions with *a* as a different single digit whole number in both expressions and *b* is negative in both expressions or *b* is positive in both expressions • Two expressions in the form *a* x 10^b with *a* as a different single digit whole number in both expressions; *b* is negative in one expression and *b* is positive in the other expression **TM4** **Stimulus:** The student is presented with quantities that should be expressed as a single digit times a power of ten. **Example Stem:** How many times larger than 2 x 10^3 is 6 x 10^6? A. 3×10^2 B. 3×10^3 C. 6×10^6 D. 12×10^9 **Response Type:** Multiple Choice, single correct response **Rubric:** (1 point) Student selects the correct expression (e.g., B). **Response Type:** Multiple Choice, single correct response

Task Model 5 **Response Type: Multiple Choice, single correct response** **DOK Level 1** **8.EE.A.4** Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. Use scientific notation and choose units of appropriate size for measurements of very large or very small quantities (e.g., use millimeters per year for seafloor spreading). Interpret scientific notation that has been generated by technology. **Evidence Required:** 5. The student performs operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. **Tools:** None	**Prompt Features:** The student is prompted to perform operations on numbers expressed in scientific notation or decimal form. **Stimulus Guidelines:** • Numbers may be in scientific notation or decimal form. • Context should be familiar to 13–15 year olds. • Items include two expressions in the form of $a \times 10^b$ that are either being added, subtracted, multiplied, or divided. • Item difficulty can be adjusted via these methods: ○ The exponent, *b,* for the two expressions could be either both positive, both negative, or a combination. ○ The variable, *a,* for the two expressions could be both whole numbers, both decimals, or a combination. **TM5** **Stimulus:** The student is presented with very large or very small quantities with or without context. **Example Stem 1:** Approximately 7.5×10^5 gallons of water flow over a waterfall each second. There are 8.6×10^4 seconds in 1 day. Enter the approximate number of gallons of water that flow over the waterfall in 1 day. A. 6.45×10^{21} B. 6.45×10^{20} C. 6.45×10^{10} D. 6.45×10^{9} **Answer Choices:** Answer choices are numbers in scientific notation. **Rubric:** (1 point) Student gives the correct value. (e.g., C). **Response Type:** Multiple Choice, single correct response **Example Stem 2:** Which value is closest to $(6 \times 10^6) + (2 \times 10^4)$? A. 8.0×10^{10} B. 8.0×10^6 C. 6.0×10^{10} D. 6.0×10^6 **Rubric:** (1 point) Student enters the correct value (e.g., D). **Response Type:** Multiple Choice, single correct response