Grade 8 Math C1 TB

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 B [m]: Work with radicals and integer exponents. (DOK 1) Tasks for this target will require students to select or produce equivalent numerical expressions based on properties of integer exponents. Other tasks will ask students to solve simple square root and cube root equations, often expressing their answers approximately using one of the approximations from 8.NS Target A. Other tasks will ask students to represent very large and very small numbers as powers of 10, including scientific notation, and perform operations on numbers written as powers of 10.	
Standards:	8.EE.1, 8.EE.2, 8.EE.3, 8.EE.4
DOK Target(s):	1
Evidence Required:	1. The student generates equivalent numerical expressions by applying the properties of integer exponents. 2. The student represents solutions to equations of the form $x^2 = p$ and $x^3 = p$, where *p* is a positive rational number that is not a perfect square or a perfect cube, using square root and cube root symbols. 3. The student represents solutions to equations of the form $x^2 = p$ and $x^3 = p$, where *p* is a positive rational number that is a perfect square or a perfect cube, and evaluates square roots of small perfect squares and cube roots of small perfect cubes. 4. The student states how many times larger or smaller one number expressed in the form of a single digit times an integer power of 10 is than another. 5. The student estimates very large and very small numbers as a single digit multiplied by a power of 10. 6. The student performs operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used. 7. The student chooses units of appropriate size for measurements of very large or very small quantities expressed in scientific notation. 8. The student interprets scientific notation that has been generated by technology.
Allowable Item	SR, CR

Types*:	
Task Models:	1. SR (DOK 1) **Prompt Features:** The student is prompted to evaluate a numerical expression using the properties of integer exponents. Or the student is prompted to determine equivalent expressions using the properties of integer exponents. **Stimulus 1:** The student is presented with a numerical expression involving integer exponents. **Stimulus 2:** The student is presented with multiple numerical expressions involving integer exponents or asked to determine the equivalent expressions. 1. CR (DOK 1) **Prompt Features:** The student is prompted to evaluate a numerical expression using the properties of integer exponents. Or the student is prompted to use the properties of integer exponents to complete a numerical expression so that it is equivalent to another numerical expression. **Stimulus 1:** The student is presented with a numerical expression involving integer exponents. **Stimulus 2:** The student is presented with a complete numerical expression involving integer exponents and a partially complete numerical expression involving integer exponents. 2. SR (DOK 1) **Prompt Features:** The student is prompted to identify the solution using the square root or cube root symbols to an equation of the form $x^2 = p$ or $x^3 = p$. **Stimulus:** The student is presented with a question that may be pure or in context. The equation may be given, or it may need to be constructed by the student based on a verbal description or a figure. The number *p* is positive and rational but should not be a perfect square or perfect cube. A calculator should not be available and irrational numbers are not simplified. Negative solutions can be considered for square roots as the context allows. 2. CR (DOK 1) **Prompt Features:** The student is prompted to represent the solution to an equation of the form $x^2 = p$ or $x^3 = p$ using the square root or cube root symbols. **Stimulus:** The student is presented with a question that may be pure or in context. The equation may be given, or it may need to be constructed by the student based on a verbal description or a figure. The number *p* is positive and rational but should not be a perfect square or perfect cube. A calculator should not be available and irrational numbers are not simplified. Negative solutions can be considered for square roots as the context allows. 3. SR (DOK 1) **Prompt Features:** The student is prompted to identify the solution to an equation of the form $x^2 = p$ or $x^3 = p$. Or the student

	is prompted to identify the square root of a small perfect square or the cube root of a small perfect cube. **Stimulus 1:** The student is presented with a question that may be pure or in context. The equation may be given, or it may need to be constructed by the student based on a verbal description or a figure. The number *p* is positive and rational, and it is a perfect square less than or equal to 400 or a perfect cube less than or equal to 1000. A calculator should not be available. Negative solutions can be considered for square roots as the context allows. **Stimulus 2:** The student is presented with a perfect square less than or equal to 400 or a perfect cube less than or equal to 1000. A calculator should not be available. 3. CR (DOK 1) **Prompt Features:** The student is prompted to represent the solution to an equation of the form $x^2 = p$ or $x^3 = p$. Or the student is prompted to determine the square root of a small perfect square or the cube root of a small perfect cube. **Stimulus 1:** The student is presented with a question that may be pure or in context. The equation may be given, or it may need to be constructed by the student based on a verbal description or a figure. The number *p* is positive and rational, and it is a perfect square less than or equal to 400 or a perfect cube less than or equal to 1000. A calculator should not be available. Negative solutions can be considered for square roots as the context allows. **Stimulus 2:** The student is presented with a perfect square less than or equal to 400 or a perfect cube less than or equal to 1000. A calculator should not be available. 4. SR (DOK 1) **Prompt Features:** The student is prompted to identify approximately how many times larger or smaller one number is than another. Or the student is given a number in the form of a single digit times an integer power of 10 and the number of times larger or smaller than that number that another number is and the student is prompted to identify the other number. **Stimulus 1:** The student is presented with a question that may be pure or in context. The numbers should be either very large or very small. The numbers must be written in the form of a single digit times an integer power of 10. **Stimulus 2:** The student is presented with a question that may be pure or in context. The very large or very small number must be written in the form of a single digit times an integer power of 10. 4. CR (DOK 1) **Prompt Features:** The student is prompted to state how many times larger or smaller one number is than another and explain the method used to determine the answer. Or the student is given a number in the form of a single digit times an integer power of 10 and the number of times larger or smaller than that number another number is and the student is prompted to write the other

	number. **Stimulus 1:** The student is presented with a question that may be pure or in context. The numbers should be either very large or very small. The numbers must be written in the form of a single digit times an integer power of 10. **Stimulus 2:** The student is presented with a question that may be pure or in context. The very large or very small number must be written in the form of a single digit times an integer power of 10. 5. SR (DOK 1) **Prompt Features:** The student is prompted to identify an estimate of a very large or very small number expressed in the form of a single digit multiplied by an integer power of 10. Or the student is given a number expressed as a single digit multiplied by an integer power of 10 and is prompted to identify the number. **Stimulus 1:** The student is presented with a very large or very small number in decimal notation. **Stimulus 2:** The student is presented with a very large or very small number written as a single digit multiplied by an integer power of 10. 5. CR (DOK 1) **Prompt Features:** The student is prompted to estimate a very large or very small number by writing a number in the form of a single digit times an integer power of 10. Or the student is given a number written as a single digit multiplied by an integer power of 10 and is prompted to write the number. **Stimulus 1:** The student is presented with a very large or very small number in decimal notation. **Stimulus 2:** The student is presented with a very large or very small number written as a single digit multiplied by an integer power of 10, including scientific notation. 6. SR (DOK 1) **Prompt Features:** The student is prompted to identify the answer to a problem where operations are performed on numbers expressed in scientific notation or both scientific notation and decimal form. Scientific calculators may <u>not</u> be used on these items, but four-function calculators may be allowed. **Stimulus 1:** The student is presented with numbers in scientific notation, and information is given that informs the student what operations to perform. The question may be pure or in context. **Stimulus 2:** The student is presented with numbers in scientific notation and decimal form, and information is given that informs the student what operations to perform. The question may be pure or in context. 6. CR (DOK 1) **Prompt Features:** The student is prompted to solve a problem where operations are performed on numbers expressed in scientific notation or both scientific notation and decimal form. Scientific

	calculators may not be used on these items, but four-function calculators may be allowed. **Stimulus 1:** The student is presented with numbers in scientific notation, and information is given that informs the student what operations to perform. The question may be pure or in context. **Stimulus 2:** The student is presented with numbers in scientific notation and decimal form, and information is given that informs the student what operations to perform. The question may be pure or in context. 7. SR (DOK 1) **Prompt Features:** The student is prompted to identify appropriate units when measuring very large or very small quantities. **Stimulus:** The student is presented with a measurement situation. 8. SR (DOK 1) **Prompt Features:** The student is prompted to identify an equivalent number in decimal notation when shown the calculator display of a number in scientific notation (e.g., 6.02E23). **Stimulus:** The student is presented with the calculator display of a number in scientific notation. 8. CR (DOK 1) **Prompt Features:** The student is prompted to write an equivalent number in decimal notation when shown the calculator display of a number in scientific notation (e.g., 6.02E23). **Stimulus:** The student is presented with the calculator display of a number in scientific notation.
Allowable Stimulus Materials:	Positive rational numbers Numbers written as a single digit multiplied by an integer power of 10 Numbers in scientific notation
Allowable Disciplinary Vocabulary:	Rational number, irrational number, estimate, scientific notation, decimal notation, exponent, power, base, radical, square root, cube root, perfect square, perfect cube
Allowable Tools:	Calculator (only on some task models)
Target-Specific Attributes	Exponents should be integers. Roots should be square roots or cube roots of positive rational numbers. Perfect squares should be positive rational numbers that are less than or equal to 400. Perfect cubes should be positive rational numbers that are less than or equal to 1000.
Key Nontargeted Constructs:	
Accessibility Concerns:	
Sample Items:	MAT.08.CR.1.000EE.B.494, MAT.08.SR.1.000EE.B.203,

	MAT.08.TE.1.000EE.B.144, MAT.08.TE.1.000EE.B.323

*SR = selected-response item; CR = constructed-response item; TE = technology-enhanced item; ER = extended-response item; PT = performance task