ESSENTIAL ELEMENTS FOR GRADE 6: MATHEMATICS

**Claim #1: Students demonstrate increasingly complex understanding of number sense.

Ratios and Proportional Relationships

Target Essential Element	Michigan Range of Complexity		
	High Range	Medium Range	Low Range
Michigan Grade 6 Standard for Mathematics: 6.RP.1: Understand the concept of a ratio, and use ratio language to describe a ratio relationship between two quantities. *For example, "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak." "For every vote candidate A received, candidate C received nearly three votes."*			
EE.6.RP.1: Demonstrate a simple ratio relationship.	EE.6.RP.H.1: The student can use a ratio to describe a relationship using numbers and objects.	EE.6.RP.M.1: The student can complete a pattern given a simple ratio.	EE.6.RP.L.1: The student can identify a one-to-one relationship.

The Number System

Target Essential Element	Michigan Range of Complexity		
	High Range	**Medium Range**	**Low Range**
Michigan Grade 6 Standard for Mathematics: 6.NS.1: Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. *For example, create a story context for (2/3) ÷ (3/4), and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that (2/3) ÷ (3/4) = 8/9 because 3/4 of 8/9 is 2/3. (In general, (a/b) ÷ (c/d) = ad/bc.) How much chocolate will each person get if 3 people share 1/2 lb. of chocolate equally? How many 3/4-cup servings are in 2/3 of a cup of yogurt? How wide is a rectangular strip of land with length 3/4 mi and area 1/2 square mi?*			
EE.6.NS.1: Compare the relationships between two unit fractions.	**EE.6.NS.H.1**: The student can compare the relationship between two unit fractions (a fraction with a numerator of 1 such as 1/3, 1/8, etc.) no smaller than 1/10.	**EE.6.NS.M.1**: The student can identify a shape that is separated into equal parts.	**EE.6.NS.L.1**: The student can differentiate between a whole object and half of the object.
Michigan Grade 6 Standard for Mathematics: 6.NS.2: Fluently divide multi-digit numbers using the standard algorithm.			
EE.6.NS.2: Apply the concept of fair share and equal shares to divide.	**EE.6.NS.H.2**: The student can solve a division problem using the concept of equal shares.	**EE.6.NS.M.2**: The student can separate sets into equal subsets.	**EE.6.NS.L.2**: The student can demonstrate an understanding of equal sets by identifying a set that has been divided into subsets that are "the same".
Michigan Grade 6 Standard for Mathematics: 6.NS.3: Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.			
EE.6.NS.3: Solve two-factor multiplication problems with products up to 50 using concrete objects and/or a calculator.	**EE.6.NS.H.3**: The student can solve a simple multiplication problem (one factor times another) using concrete objects and/or a calculator.	**EE.6.NS.M.3**: The student can solve a simple multiplication problem (one factor times another) with products up to 15 using concrete objects and/or a calculator.	**EE.6.NS.L.3**: The student can identify a group of a given quantity.

Target Essential Element	Michigan Range of Complexity		
	High Range	**Medium Range**	**Low Range**
Michigan Grade 6 Standard for Mathematics: 6.NS.5: Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge); use positive and negative numbers to represent quantities in real-world contexts, explaining the meaning of 0 in each situation. **Michigan Grade 6 Standard for Mathematics: 6.NS.6**: Understand a rational number as a point on the number line. Extend number line diagrams and coordinate axes familiar from previous grades to represent points on the line and in the plane with negative number coordinates. **Michigan Grade 6 Standard for Mathematics: 6.NS.6.a**: Recognize opposite signs of numbers as indicating locations on opposite sides of 0 on the number line; recognize that the opposite of the opposite of a number is the number itself (e.g., –(–3) = 3), and that 0 is its own opposite. **Michigan Grade 6 Standard for Mathematics: 6.NS.6.b**: Understand signs of numbers in ordered pairs as indicating locations in quadrants of the coordinate plane; recognize that when two ordered pairs differ only by signs, the locations of the points are related by reflections across one or both axes. **Michigan Grade 6 Standard for Mathematics: 6.NS.6.c**: Find and position integers and other rational numbers on a horizontal or vertical number line diagram; find and position pairs of integers and other rational numbers on a coordinate plane. **Michigan Grade 6 Standard for Mathematics: 6.NS.7**: Understand ordering and absolute value of rational numbers. **Michigan Grade 6 Standard for Mathematics: 6.NS.7.a**: Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram. *For example, interpret –3 > –7 as a statement that –3 is located to the right of –7 on a number line oriented from left to right.* **Michigan Grade 6 Standard for Mathematics: 6.NS.7.b**: Write, interpret, and explain statements of order for rational numbers in real-world contexts. *For example, write –3°C > –7°C to express the fact that –3°C is warmer than –7°C.* **Michigan Grade 6 Standard for Mathematics: 6.NS.7.c**: Understand the absolute value of a rational number as its distance from 0 on the number line; interpret absolute value as magnitude for a positive or negative quantity in a real-world situation. *For example, for an account balance of –30 dollars, write |–30| = 30 to describe the size of the debt in dollars.* **Michigan Grade 6 Standard for Mathematics: 6.NS.7.d**: Distinguish comparisons of absolute value from statements about order. *For example, recognize that an account balance less than –30 dollars represents a debt greater than 30 dollars.* **Michigan Grade 6 Standard for Mathematics: 6.NS.8**: Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane. Include use of coordinates and absolute value to find distances between points with the same first coordinate or the same second coordinate.			
EE.6.NS.5-8: Understand that positive and negative numbers are used together to describe quantities having opposite directions or values (e.g., temperature above/below zero).	**EE.6.NS.H.5-8**: The student can recognize that positive and negative numbers are used together to describe real-world situations (temperature above/below zero).	**EE.6.NS.M.5-8**: The student can identify that positive numbers are more than zero and negative numbers are less than zero.	**EE.6.NS.L.5-8**: The student can use manipulatives to demonstrate understanding of "more than" a given number; and "take away" from a given number so there are zero remaining.

****Claim #2: Students demonstrate increasingly complex spatial reasoning and understanding of geometric principles.**

Geometry

Target Essential Element	Michigan Range of Complexity		
	High Range	Medium Range	Low Range
Michigan Grade 6 Standard for Mathematics: 6.G.1: Find the area of right triangles, other triangles, special quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and other shapes; apply these techniques in the context of solving real-world and mathematical problems.			
EE.6.G.1: Solve real-world and mathematical problems about area using unit squares.	**EE.6.G.H.1**: The student can solve real-world and mathematical problems involving area using unit squares.	**EE.6.G.M.1**: The student can determine the area of a rectangle by counting unit squares.	**EE.6.G.L.1**: The student can identify which of two objects has a larger/bigger area.
Michigan Grade 6 Standard for Mathematics: 6.G.2: Find the volume of a right rectangular prism with fractional edge lengths by packing it with unit cubes of the appropriate unit fraction edge lengths, and show that the volume is the same as would be found by multiplying the edge lengths of the prism. Apply the formulas $V = lwh$ and $V = bh$ to find volumes of right rectangular prisms with fractional edge lengths in the context of solving real-world and mathematical problems.			
EE.6.G.2: Solve real-world and mathematical problems about volume using unit cubes.	**EE.6.G.H.2**: The student can solve real-world and mathematical problems involving volume using unit cubes.	**EE.6.G.M.2**: The student can determine which of 2 objects has a larger volume.	**EE.6.G.L.2**: The student can differentiate between an object that has volume (three-dimensional) and an object that does not.

****Claim #3: Students demonstrate increasingly complex understanding of measurement, data and analytic procedures.**

Statistics and Probability

Target Essential Element	Michigan Range of Complexity		
	High Range	Medium Range	Low Range
Michigan Grade 6 Standard for Mathematics: 6.SP.1: Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers. *For example, "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages.* **Michigan Grade 6 Standard for Mathematics: 6.SP.2**: Understand that a set of data collected to answer a statistical question has a distribution, which can be described by its center, spread, and overall shape.			
EE.6.SP.1-2: Display data on a graph or table that shows variability in the data.	**EE.6.SP.H.1-2**: The student can display data on a graph or table that shows variability in the data.	**EE.6.SP.M.1-2**: The student can identify which quantity is greatest when three quantities are represented on a bar or circle graph.	**EE.6.SP.L.1-2**: The student can identify a set that has objects that are the same or different.
Michigan Grade 6 Standard for Mathematics: 6.SP.5: Summarize numerical data sets in relation to their context, such as by: **Michigan Grade 6 Standard for Mathematics: 6.SP.5.a**: Reporting the number of observations. **Michigan Grade 6 Standard for Mathematics: 6.SP.5.b**: Describing the nature of the attribute under investigation, including how it was measured and its units of measurement. **Michigan Grade 6 Standard for Mathematics: 6.SP.5.c**: Giving quantitative measures of center (median and/or mean) and variability (interquartile range and/or mean absolute deviation), as well as describing any overall pattern and any striking deviations from the overall pattern with reference to the context in which the data were gathered. **Michigan Grade 6 Standard for Mathematics: 6.SP.5.d**: Relating the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered.			
EE.6.SP.5: Summarize data distributions shown in graphs or tables.	**EE.6.SP.H.5**: The student can describe the trend lines of data using informal language (e.g., increasing, decreasing, stays the same).	**EE.6.SP.M.5**: The student can identify which quantity is smallest or least when three quantities are represented on a bar or circle graph.	**EE.6.SP.L.5**: The student can identify which object or symbol appears most frequently when presented with objects or symbols that are unsorted in a row.

****Claim #4: Students solve increasingly complex mathematical problems, making productive use of algebra and functions.**

Solving Expressions and Equations

Target Essential Element	Michigan Range of Complexity		
	High Range	**Medium Range**	**Low Range**
Michigan Grade 6 Standard for Mathematics: 6.EE.1: Write and evaluate numerical expressions involving whole-number exponents. **Michigan Grade 6 Standard for Mathematics: 6.EE.2**: Write, read, and evaluate expressions in which letters stand for numbers. **Michigan Grade 6 Standard for Mathematics: 6.EE.2.a**: Write expressions that record operations with numbers and with letters standing for numbers. *For example, express the calculation "Subtract y from 5" as 5 – y.* **Michigan Grade 6 Standard for Mathematics: 6.EE.2.b**: Identify parts of an expression using mathematical terms (sum, term, product, factor, quotient, coefficient); view one or more parts of an expression as a single entity. *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.* **Michigan Grade 6 Standard for Mathematics: 6.EE.2.c**: 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). *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 = ½.*			
EE.6.EE.1-2: Identify equivalent number sentences.	**EE.6.EE.H.1-2**: The student can recognize equivalent number sentences.	**EE.6.EE.M.1-2**: The student can match a number sentence to a correct picture representation.	**EE.6.EE.L.1-2**: The student can identify a quantity that "is the same as" a given quantity of objects. Instructional focus on using both the language of same with symbol (=) paired together.

Target Essential Element	Michigan Range of Complexity		
	High Range	**Medium Range**	**Low Range**
Michigan Grade 6 Standard for Mathematics: 6.EE.3: Apply the properties of operations to generate equivalent expressions. *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); apply properties of operations to y + y + y to produce the equivalent expression 3y.*			
EE.6.EE.3: Apply the properties of addition to identify equivalent numerical expressions.	**Michigan Range of Complexity:** Not measured at state level, range of complexity determined at classroom level.		
Michigan Grade 6 Standard for Mathematics: 6.EE.5: Understand solving an equation or inequality as a process of answering a question: which values from a specified set, if any, make the equation or inequality true? Use substitution to determine whether a given number in a specified set makes an equation or inequality true. **Michigan Grade 6 Standard for Mathematics: 6.EE.6**: Use variables to represent numbers and write expressions when solving a real-world or mathematical problem; understand that a variable can represent an unknown number, or, depending on the purpose at hand, any number in a specified set. **Michigan Grade 6 Standard for Mathematics: 6.EE.7**: Solve real-world and mathematical problems by writing and solving equations of the form *x + p = q* and *px = q* for cases in which *p, q* and *x* are all nonnegative rational numbers.			
EE.6.EE.5-7: Match an equation to a real-world problem in which variables are used to represent numbers.	**EE.6.EE.H.5-7**: The student can identify an equation that represents a real-world problem in which the variable represents an addend. Use a box to represent the variable. The real-world problem will use objects or pictures as a guide.	**EE.6.EE.M.5-7**: The student can identify an equation that represents a real-world problem in which the variable represents the sum. Use a box to represent the variable. The real world problem will use objects or pictures as a guide.	**EE.6.EE.L.5-7**: The student can determine an unknown unit in an equation using objects or pictures.

Target Essential Elements as developed by: Dynamic Learning Maps Consortium (2013). Dynamic Learning Maps Essential Elements for Mathematics. Lawrence, KS: University of Kansas.