Miami-Dade County Public Schools
Florida's B.E.S.T. Mathematics
Grade 6 - Achievement Level Descriptor Tables

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MA.6.NSO.1.1 (Context: Mathematical)			
Extend previous understanding of numbers to define rational numbers. Plot, order and compare rational numbers.			
Benchmark Clarifications			
Clarification 1: Within this benchmark, the expectation is to plot, order and compare positive and negative rational numbers when given in the same form and to plot, order and compare positive rational numbers when given in different forms (fraction, decimal, percentage). *Clarification 2*: Within this benchmark, the expectation is to use symbols (<. > or =).			
Assessment Limits			
Items requiring the student to plot, order, and/or compare numbers in the same form must contain at least one negative value. Items requiring the student to plot, order, and/or compare numbers in different forms are limited to fractions that result in a terminating decimal. Items may use the words "is less than," "is greater than," or "is equal to."			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
defines a rational number; plots, orders, and compares **integers**.	defines a rational number; plots, orders, and compares **positive and negative rational numbers** when given in the **same form**.	defines a rational number; plots, orders, and compares positive rationale numbers when given in **different forms.**	defines a rational number; **explains and justifies** how to plot, order, and compare positive and negative rational numbers when given in the same form and when positive rational numbers are represented in different forms.

MA.6.NSO.1.2 (Context: Mathematical & Real-World)			
Given a mathematical or real-world context, represent quantities that have opposite direction using rational numbers. Compare them on a number line and explain the meaning of zero within its context. *Example:* Jasmine is on a cruise and is going on a scuba diving excursion. Her elevations of 10 feet above sea level and 8 feet below sea level can be compared on a number line, where 0 represents sea level.			
Benchmark Clarifications			
Clarification 1: Instruction includes vertical and horizontal number lines, context referring to distances, temperatures and finances and using informal verbal comparisons, such as, lower, warmer or more in debt. *Clarification 2:* Within this benchmark, the expectation is to compare positive and negative rational numbers when given in the same form.			
Assessment Limits			
Items will not require the student to perform operations. Items may use, but are not limited to, contexts involving distance, temperature, or finance.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
given a **mathematical context**, represents quantities on a **horizontal** number line that have opposite direction using rational numbers.	given a **mathematical or real-world context**, represents and **compares** quantities on a number line that have opposite direction using rational numbers.	given a mathematical or real-world context, represents quantities that have opposite direction using rational numbers, compares the quantities on a number line, and **explains the meaning of zero within its context.**	(intentionally left blank)

MA.6.NSO.1.3 (Context: Mathematical & Real-World)			
Given a mathematical or real-world context, interpret the absolute value of a number as the distance from zero on a number line. Find the absolute value of rational numbers.			
Benchmark Clarifications			
Clarification 1: Instruction includes the connection of absolute value to mirror images about zero and to opposites. *Clarification 2*: Instruction includes vertical and horizontal number lines and context referring to distances, temperature and finances.			
Assessment Limits			
Items will not require the student to perform arithmetic operations. Items may use, but are not limited to, contexts involving distance, temperature, or finance.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
finds the absolute value of a rational number.	given a mathematical context**, interprets** the absolute value of a rational number as the distance from zero on a number line.	given a **real-world context**, interprets the absolute value of a rational number as the distance from zero on a number line.	given a real-world context, interprets and **explains** the meaning of the absolute value of a rational number in its context.

MA.6.NSO.1.4 (Context: Mathematical & Real-World)			
Solve mathematical and real-world problems involving absolute value, including the comparison of absolute value. *Example:* Michael has a lemonade stand which costs $10 to start up. If he makes $5 the first day, he can determine whether he made a profit so far by comparing | − 10|and |5|.			
Benchmark Clarifications			
Clarification 1: Absolute value situations include distances, temperatures and finances. *Clarification 2*: Problems involving calculations with absolute value are limited to two or fewer operations. *Clarification 3*: Within this benchmark, the expectation is to use integers only.			
Assessment Limits			
Items may use, but are not limited to, contexts involving distance, temperature, or finance.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
solves mathematical problems with one step involving absolute value**; or** compares absolute values.	solves mathematical problems with one step involving absolute value, **including** the comparison of absolute value.	solves mathematical problems with **two steps or real-world problems with up to two steps** involving absolute value, including the comparison of absolute value.	solves and **explains** mathematical or real-world problems with up to two steps involving absolute value, including the **justification** of the comparison of absolute value.

MA.6.NSO.2.1 (Context: Mathematical)			
Multiply and divide positive multi-digit numbers with decimals to the thousandths, including using a standard algorithm with procedural fluency.			
Benchmark Clarifications			
Clarification 1: Multi-digit decimals are limited to no more than 5 total digits.			
Assessment Limits			
Decimals that are multiplied or divided by 0.1 or 0.01 must be to at least the hundredths place.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
multiplies and divides positive multi-digit numbers with decimals to the **hundredths**.	multiplies positive multi-digit numbers with decimals to the **thousandths**, including using a standard algorithm, and divides positive multi-digit numbers with decimals to hundredths, including using a standard algorithm.	**multiplies and divides** positive multi-digit numbers with decimals to the **thousandths**, including using a standard algorithm with procedural fluency.	**analyzes an error** in the multiplication or division computation using a standard algorithm and **justifies the reasoning.**

MA.6.NSO.2.2 (Context: Mathematical)			
Extend previous understanding of multiplication and division to compute products and quotients of positive fractions by positive fractions, including mixed numbers, with procedural fluency.			
Benchmark Clarifications			
Clarification 1: Instruction focuses on making connections between visual models, and the relationship between multiplication and division, reciprocals and algorithms.			
Assessment Limits			
Items requiring the student to multiply a fraction by a fraction must have at least one fraction with a denominator greater than 20. Items will not divide a unit fraction by a whole number or a whole number by a unit fraction.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
using models, computes products of positive fractions and computes quotients involving unit fractions and fractions.	with or **without models**, computes products and **quotients** of positive fractions, involving at least one unit fraction.	computes products and quotients of positive fractions, including **mixed numbers** with procedural fluency.	computes products and quotients of positive fractions by positive fractions, including mixed numbers with procedural fluency and **explains** relationship between multiplication and division, reciprocals, and algorithms.

MA.6.NSO.2.3 (Context: Real World)			
Solve multi-step real-world problems involving any of the four operations with positive multi-digit decimals or positive fractions, including mixed numbers.			
Benchmark Clarifications			
Clarification 1: Within this benchmark, it is not the expectation to include both decimals and fractions within a single problem.			
Assessment Limits			
Context will not include money, perimeter, or area. Items will use at least two different operations but will not use addition and subtraction only. Items with decimals must include one to at least the hundredths. When multiplying fractions, at least one fraction must have a denominator greater than 20. Items will not include a numerical expression.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
solves two-step real-world problems involving **addition, subtraction, and multiplication** with positive multi-digit decimals or positive fractions.	solves two-step real-world problems involving **any of the four operations** with positive multi-digit decimals or positive fractions.	solves **multi-step** real-world problems involving any of the four operations with positive multi-digit decimals or positive fractions, **including mixed numbers.**	solves multi-step real-world problems involving any of the four operations with positive multi-digit decimals or positive fractions, including mixed numbers, and **interprets the solution** in the context of the situation.

MA.6.NSO.3.1 (Context: Mathematical & Real-World)			
Given a mathematical or real-world context, find the greatest common factor and least common multiple of two whole numbers. *Example:* Adam works out every 8 days and Susan works out every 12 days. If both Adam and Susan work out today, how many days until they work out on the same day again?			
Benchmark Clarifications			
Clarification 1: Within this benchmark, expectations include finding greatest common factor within 1,000 and least common multiple with factors to 25. *Clarification 2*: Instruction includes finding the greatest common factor of the numerator and denominator of a fraction to simplify the fraction.			
Assessment Limits			
N/A			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
given a mathematical context, finds the greatest common factor within **500** or least common multiple with factors to **15** of two whole numbers.	given a mathematical context, finds the greatest common factor within **1000** and least common multiple with factors to **25** of two whole numbers.	given a **real-world** context, finds the greatest common factor within 1000 and least common multiple with factors to 25 of two whole numbers.	given a mathematical or real-world context, finds the greatest common factor within 1000 and least common multiple with factors to 25 of two whole numbers and **explains** the relationship between the greatest common factor and rewriting equivalent fractions.

MA.6.NSO.3.2 (Context: Mathematical & Real-World)			
Rewrite the sum of two composite whole numbers having a common factor, as a common factor multiplied by the sum of two whole numbers.			
Benchmark Clarifications			
Clarification 1: Instruction includes using the distributive property to generate equivalent expressions.			
Assessment Limits			
The common factor will not exceed 1000.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
identifies the **common factor** between the sum of two composite whole numbers.	identifies the sum of two composite whole numbers having a common factor, as a **common factor multiplied by the sum** of two whole numbers.	**rewrites** the sum of two composite whole numbers having a common factor as a common factor multiplied by the sum of two whole numbers.	rewrites the sum of two composite whole numbers having a common factor, as a common factor multiplied by the sum of two whole numbers and **justifies rewriting it multiple ways**.

MA.6.NSO.3.3 (Context: Mathematical)			
Evaluate positive rational numbers and integers with natural number exponents.			
Benchmark Clarifications			
Clarification 1: Within this benchmark, expectations include using natural number exponents up to 5.			
Assessment Limits			
Items must include an expression having only a positive rational base and a natural number exponent.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
evaluates positive **whole numbers** with natural number exponents up to 5.	evaluates positive **rational numbers** with natural number exponents up of 5.	evaluates positive rational numbers and **integers** with natural number exponents up to 5.	uses reasoning to determine the **unknown exponential value** when given an equation with a known integer base equal to an equivalent value.

MA.6.NSO.3.4 (Context: Mathematical)			
Express composite whole numbers as a product of prime factors with natural number exponents.			
Benchmark Clarifications			
No Benchmark Clarifications			
Assessment Limits			
N/A			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
identifies composite whole numbers as products of **single** prime factors.	**expresses two-digit** composite whole numbers as products of **prime factors**.	expresses composite whole numbers as products of prime factors using **natural number exponents**.	(intentionally left blank)

MA.6.NSO.3.5 (Context: Mathematical)			
Rewrite positive rational numbers in different but equivalent forms including fractions, terminating decimals and percentages. *Example:* The number $1\frac{5}{8}$ can be written equivalently as 1.625 or 162.5%.			
Benchmark Clarifications			
Clarification 1: Rational numbers include decimal equivalence up to the thousandths place.			
Assessment Limits			
N/A			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
identifies equivalent forms of positive **terminating decimals** with fraction notation with denominators of 1000.	identifies equivalent forms of positive **rational numbers** including fractions, terminating decimals, and **percentages**.	**rewrites** positive rational numbers in **different** but equivalent forms including fractions, terminating decimals, and percentages.	rewrites positive rational numbers in equivalent forms including fractions, terminating decimals, and percentages, and **explains** the relationship between representations.

MA.6.NSO.4.1 (Context: Mathematical)			
Apply and extend previous understandings of operations with whole numbers to add and subtract integers with procedural fluency.			
Benchmark Clarifications			
Clarification 1: Instruction begins with the use of manipulatives, models and number lines working towards becoming procedurally fluent by the end of grade 6. *Clarification 2*: Instruction focuses on the inverse relationship between the operations of addition and subtraction. If p and q are integers, then $p - q = p + (-q)$ and $p + q = p - (-q)$.			
Assessment Limits			
Items involving addition must incorporate at least one negative integer. Items involving subtraction must incorporate at least one negative integer or can include positive integers wherein the subtrahend is larger than the minuend.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
(intentionally left blank)	**using a visual model such as manipulatives or a number line**, adds and subtracts integers.	adds and subtracts integers with **procedural fluency**.	adds and subtracts integers with procedural fluency and **explains and justifies** why the inverse relationship exists between addition and subtraction with integers using properties of operations.

MA.6.NSO.4.2 (Context: Mathematical)			
Apply and extend previous understandings of operations with whole numbers to multiply and divide integers with procedural fluency.			
Benchmark Clarifications			
Clarification 1: Instruction includes the use of models and number lines and the inverse relationship between multiplication and division, working towards becoming procedurally fluent by the end of grade 6. *Clarification 2*: Instruction focuses on the understanding that integers can be divided, provided that the divisor is not zero, and every quotient of integers (with non-zero divisor) is a rational number. If p and q are integers where integers where $q \neq 0$, then $-(\frac{p}{q}) = -\frac{p}{q}$, $-(\frac{p}{q}) = \frac{p}{-q}$ and $\frac{p}{q} = \frac{-p}{-q}$.			
Assessment Limits			
Items must incorporate at least one negative integer.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
(intentionally left blank)	**using a visual model such as manipulatives or a number line**, multiplies and divides integers.	multiplies and divides integers with **procedural fluency**.	multiplies and divides integers with procedural fluency and **explains** why the inverse relationship exists between multiplication and division with integers using properties of operations.

MA.6.AR.1.1 (Context: Mathematical & Real-World)			
Given a mathematical or real-world context, translate written descriptions into algebraic expressions and translate algebraic expressions into written descriptions. **Example:** The algebraic expression $7.2x - 20$ can be used to describe the daily profit of a company who makes \$7.20 per product sold with daily expenses of \$20.			
Benchmark Clarifications			
No Benchmark Clarifications			
Assessment Limits			
Algebraic expressions or written descriptions must include at least one but no more than two unknowns. Items will not require the student to perform operations.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
given a **mathematical** context, translates written descriptions into linear algebraic expressions limited to **one** term.	given a mathematical **or real-world context**, translates written descriptions into linear algebraic expressions limited to one term and translates linear algebraic expressions limited to one term into **written descriptions**.	given a mathematical or real-world context, translates written descriptions into linear algebraic expressions limited to **two terms** and translates linear algebraic expressions limited to **two** terms into written descriptions.	given a mathematical or real-world context, **analyzes an error** in the translation of a written description into a linear algebraic expression or in the translation of a linear algebraic expression into a written description and **justifies the reasoning**.

MA.6.AR.1.2 (Context: Mathematical & Real-World)			
Translate a real-world written description into an algebraic inequality in the form of $x > a$, $x < a$, $x \geq a$ or $x \leq a$. Represent the inequality on a number line. *Example:* Mrs. Anna told her class that they will get a pizza if the class has an average of at least 83 out of 100 correct questions on the semester exam. The inequality $g \geq 83$ can be used to represent the situation where students receive a pizza and the inequality $g < 83$ can be used to represent the situation where students do not receive a pizza.			
Benchmark Clarifications			
Clarification 1: Variables may be on the left or right side of the inequality symbol.			
Assessment Limits			
Items may require the student to perform operations. Given context should be continuous.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
represents an algebraic inequality on a number line wherein the variable is on the **left side** of the inequality.	**translates a real-world written description** into algebraic inequality form and **represents** that inequality on a number line.	translates a real-world written description into algebraic inequality form and represents an inequality with the variable on the **right or left side** of the inequality on a number line.	translates a real-world written description into algebraic inequality form and represents an inequality with the variable on the right or left side of the inequality on a number line **and translates an algebraic inequality into a real- world written description**.

MA.6.AR.1.3 (Context: Mathematical)			
Evaluate algebraic expressions using substitution and order of operations. *Example:* Evaluate the expression $2a^2 - \frac{b}{5}$, where $a = -1$ and $b = 5$.			
Benchmark Clarifications			
Clarification 1: Within this benchmark, the expectation is to perform all operations with integers. *Clarification 2*: Refer to Properties of Operations, Equality and Inequality (Appendix D).			
Assessment Limits			
Items will not include more than three variables.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
evaluates algebraic expressions using substitution and order of operations with one variable and using **positive** integers.	evaluates algebraic expressions using substitution and order of operations with one variable and **any** integer.	evaluates algebraic expressions using substitution and order of operations with **two or more** variables and any integer.	evaluates algebraic expressions using substitution and order of operations and **justifies** using the order of operations.

MA.6.AR.1.4 (Context: Mathematical & Real-World)			
Apply the properties of operations to generate equivalent algebraic expressions with integer coefficients. *Example:* The expression $5(3x + 1)$ can be rewritten equivalently as $15x + 5$.			
Benchmark Clarifications			
Clarification 1: Properties include associative, commutative, and distributive. *Clarification 2:* Refer to Properties of Operations, Equality and Inequality (Appendix D).			
Assessment Limits			
Items must include an expression with only one or two variables where coefficients, factors, and terms are integers only. Items will require the student to use one, all, or a combination of the associative property, distributive property, commutative property, or arithmetic operations to generate equivalent expressions.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
applies properties of operations to **identify** equivalent algebraic expressions with positive integer coefficients.	applies properties of operations to **generate** equivalent algebraic expressions with positive integer coefficients.	applies properties of operations to generate equivalent algebraic expressions with **integer** coefficients.	**explains** how the properties of operations generate equivalent algebraic expressions.

MA.6.AR.2.1 (Context: Mathematical & Real-World)			
Given an equation or inequality and a specified set of integer values, determine which values make the equation or inequality true or false. *Example:* Determine which of the following values make the inequality $x + 1 < 2$ true: −4, −2, 0, 1.			
Benchmark Clarifications			
Clarification 1: Problems include the variable in multiple terms or on either side of the equal sign or inequality symbol.			
Assessment Limits			
Coefficients and constants in equations or inequalities must be integer values only. Items will only use one-variable linear equations or inequalities but may include the variable in more than one term. Items may represent equations or inequalities with the variable on either side or both sides of the equal sign or inequality symbol. Items may present sets of integer values using braces. Items will use the relational symbols >, >, <, or < when presenting inequalities.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
given an equation or inequality and a specified set of **positive** integers, determines which values make the equation or inequality true or false.	given an equation or inequality and a specified set of integers, determines which values make the equation or inequality true or false, **including variables in multiple terms**.	given an equation or inequality and a specified set of integers, determines which values make the equation or inequality true or false, including variables in multiple terms and **variables on either side of the equal sign or inequality symbol**.	(intentionally left blank)

MA.6.AR.2.2 (Context: Mathematical & Real-World)			
Write and solve one-step equations in one variable within a mathematical or real-world context using addition and subtraction, where all terms and solutions are integers. Example: The equations −35 + x = 17, 17 = −35 + x and 17 – x = −35 can represent the question "How many units to the right is 17 from -35 on the number line?"			
Benchmark Clarifications			
Clarification 1: Instruction includes using manipulatives, drawings, number lines and inverse operations. Clarification 2: Instruction includes equations in the forms $x + p = q$ and $p + x = q$, where x, p and q are any integer. Clarification 3: Problems include equations where the variable may be on either side of the equal sign.			
Assessment Limits			
Items will require the student to write an equation, solve an equation, or write and solve an equation. Items must incorporate a negative integer in either the given equation and/or the solution. Equations will be represented in the form $x + p = q$ or $p + x = q$, where x, p, and q are any integer.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
given a visual model such as a **number line**, solves for a variable in a one-step equation within a mathematical context using addition or subtraction, where all terms and solutions are **positive** integers.	**without** a visual model, solves for a variable in a one-step equation within a mathematical context using addition and subtraction, where all terms and solutions are **integers**.	**writes and solves** for a variable in an equation within a mathematical or **real-world** context using addition and subtraction, where all terms and solutions are integers, **including variables on either side of the equal sign.**	**identifies multiple representations** of the same equation using addition and subtraction, **demonstrating how multiple equations can answer the same question**.

MA.6.AR.2.3 (Context: Mathematical & Real-World)			
Write and solve one-step equations in one variable within a mathematical or real-world context using multiplication and division, where all terms and solutions are integers.			
Benchmark Clarifications			
Clarification 1: Instruction includes using manipulatives, drawings, number lines and inverse operations. *Clarification 2:* Instruction includes equations in the forms $\frac{x}{p} = q$, where $p \neq 0$, and $px = q$. *Clarification 3:* Problems include equations where the variable may be on either side of the equal sign.			
Assessment Limits			
Items will require the student to write an equation, solve an equation, or write and solve an equation. Equations will be represented in the form $px=q$ or $\frac{x}{p} = q$, where $p \neq 0$.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
given a visual model such as a **number line**, solves for a variable in a one-step equation within a mathematical context using multiplication and division, where all terms and solutions are **positive** integers.	**without** a visual model, solves for a variable in a one-step equation within a mathematical context using multiplication and division, where all terms and solutions are **integers**.	**writes and solves** for a variable in an equation within a **mathematical or real-world** context using multiplication and division, where all terms and solutions are integers, **including variables on either side of the equal sign**.	**identifies multiple representations** of the same equation using multiplication and division, **demonstrating how multiple equations can answer the same question**.

MA.6.AR.2.4 (Context: Mathematical)			
Determine the unknown decimal or fraction in an equation involving any of the four operations, relating three numbers, with the unknown in any position. Example: Given the equation $\frac{9}{8} = x - \frac{1}{8}$, x can be determined to be $\frac{10}{8}$ because $\frac{10}{8}$ is $\frac{1}{8}$ more than $\frac{9}{8}$.			
Benchmark Clarifications			
Clarification 1: Instruction focuses on using algebraic reasoning, drawings, and mental math to determine unknowns. *Clarification 2*: Problems include the unknown and different operations on either side of the equal sign. All terms and solutions are limited to positive rational numbers.			
Assessment Limits			
Items will not require the student to relate numbers in different forms.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
using a visual model, determines the unknown decimals or fractions in an equation involving any of the four operations, relating three numbers, with the unknown in any position.	**without** a visual model, determines the unknown decimals or fractions in an equation involving any of the four operations, relating three numbers, with the unknown in any position.	determines the unknown decimals or fractions, **including mixed numbers and fractions greater than one**, in an equation involving any of the four operations, relating three numbers, with the unknown in any position, including the unknown and **different operations on either side of the equal sign**.	**describes how comparative relational thinking is used** to determine the unknown decimal or fraction, including mixed numbers and fractions greater than one, in an equation involving any of the four operations, relating three numbers, with the unknown in any position, including the unknown and different operations on either side of the equal sign.

MA.6.AR.3.1 (Context: Real-World)			
Given a real-world context, write and interpret ratios to show the relative sizes of two quantities using appropriate notation: $\frac{a}{b}$, a to b, or $a:b$ where $b \neq 0$.			
Benchmark Clarifications			
Clarification 1: Instruction focuses on the understanding that a ratio can be described as a comparison of two quantities in either the same or different units. *Clarification 2:* Instruction includes using manipulatives, drawings, models and words to interpret part-to-part ratios and part-to-whole ratios. *Clarification 3:* The values of a and b are limited to whole numbers.			
Assessment Limits			
Presentation of context in items does not determine the order of the ratio.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
given a real-world context, writes **part-to-part** ratios to show the relative sizes of two quantities in the same units using appropriate notation: a/b, a to b, or a:b where b ≠ 0.	given a real-world context, writes and interprets **part-to-part and part-to- whole** ratios to show the relative sizes of two quantities in the same units using appropriate notation: a/b, a to b, or a:b where b ≠ 0.	given a real-world context, writes and interprets part-to-part and part-to- whole ratios to show the relative sizes of two quantities in the **different** units using appropriate notation: a/b, a to b, or a:b where b ≠ 0.	(intentionally left blank)

MA.6.AR.3.2 (Context: Real-World)			
Given a real-world context, determine a rate for a ratio of quantities with different units. Calculate and interpret the corresponding unit rate. *Example:* Tamika can read 500 words in 3 minutes. Her reading rate can be described as $\frac{500\ words}{3\ minutes}$ which is equivalent to the unit rate of $166\frac{2}{3}$ words per minute.			
Benchmark Clarifications			
Clarification 1: Instruction includes using manipulatives, drawings, models and words and making connections between ratios, rates and unit rates. *Clarification 2:* Problems will not include conversions between customary and metric systems.			
Assessment Limits			
Presentation of context in items does not determine the order of the ratio. Items will not require the student to convert units.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
using a visual model and given a real-world context, **identifies** a rate for a ratio of quantities with different units.	**with or without** a visual model, given a real-world context, **calculates** a rate for a ratio of quantities with different units.	given a real-world context, **calculates and interprets** a unit rate for a ratio of quantities with different units.	(intentionally left blank)

MA.6.AR.3.3 (Context: Mathematical & Real-World)			
Extend previous understanding of fractions and numerical patterns to generate or complete a two- or three-column table to display equivalent part-to-part ratios and part-to-part-to-whole ratios. *Example:* The table below expresses the relationship between the number of ounces of yellow and blue paints used to create a new color. Determine the ratios and complete the table.			
Yellow (part)	1.5	3		9
Blue (part)	2	4		
New color (whole)			12	21
Benchmark Clarifications			
Clarification 1: Instruction includes using two-column tables (e.g., a relationship between two variables) and three-column tables (e.g., part-to-part-to-whole relationship) to generate conversion charts and mixture charts.			
Assessment Limits			
N/A			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
uses a two- or three-column table to display equivalent part-to-part ratios and part-to-part-to-whole ratios.	**completes** a two- or three-column table to display equivalent part-to-part ratios and part-to-part-to-whole ratios.	**generates** a two- or three-column table to display equivalent part-to-part ratios and part-to-part-to-whole ratios.	**interprets and explains the relationship between** ratios presented in a two- or three-column table.

MA.6.AR.3.4 (Context: Mathematical & Real-World)			
Apply ratio relationships to solve mathematical and real-world problems involving percentages using the relationship between two quantities. *Example:* Gerald is trying to gain muscle and needs to consume more protein every day. If he has a protein shake that contain 32 grams and the entire shake is 340 grams, what percentage of the entire shake is protein? What is the ratio between grams of protein and grams of non-protein?			
Benchmark Clarifications			
Clarification 1: Instruction includes the comparison of $\frac{part}{whole}$ to $\frac{percent}{100}$ in order to determine the percent, the part or the whole.			
Assessment Limits			
Items will only require the student to determine the percent, the part, or the whole. Items will not require the student to convert units.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
identifies ratio relationships to solve mathematical problems involving percentages using the relationship between two quantities.	**applies** ratio relationships to solve mathematical problems involving percentages using the relationship between two quantities.	applies ratio relationships to solve **real-world** problems involving percentages using the relationship between two quantities.	**explains** the relationship between the **percent, the part, and the whole and how it generates equivalent ratios**.

MA.6.AR.3.5 (Context: Mathematical & Real-World)			
Solve mathematical and real-world problems involving ratios, rates and unit rates, including comparisons, mixtures, ratios of lengths and conversions within the measurement system.			
Benchmark Clarifications			
Clarification 1: Instruction includes the use of tables, tape diagrams and number lines.			
Assessment Limits			
Items will not require the student to convert between systems. Items must state the relationship of quantities as a ratio, rate, or unit rate using words or the form $\frac{a}{b}$, a to b, or a:b where b ≠ 0. Items will not require the student to only convert measurements.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
using visual models, solves **mathematical and real-world** problems involving ratios, rates, and unit rates.	solves **mathematical problems** involving ratios, rates, and unit rates, including comparisons and mixtures.	solves **mathematical or real-world** problems involving ratios, rates, and unit rates, including comparisons, mixtures, and **ratios of lengths and a conversion within the same measurement system.**	solves mathematical or real-world problems involving ratios, rates, and unit rates, including comparisons, mixtures, ratios of lengths and **more than one conversion** within the same measurement system.

MA.6.GR.1.1 (Context: Mathematical)			
Extend previous understanding of the coordinate plane to plot rational number ordered pairs in all four quadrants and on both axes. Identify the x- or y- axis as the line of reflection when two ordered pairs have an opposite x- or y- coordinate.			
Benchmark Clarifications			
No Benchmark Clarifications			
Assessment Limits			
Items that require the student to plot points in the first quadrant will not use whole number values for the coordinates. Coordinate planes must be scaled appropriately for given ordered pairs.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
Plots **integer** ordered pairs in all four quadrants and on both axes.	Plots **rational** number ordered pairs in all four quadrants and on both axes.	Plots rational number ordered pairs in all four quadrants and on both axes and **identifies the x- or y-axis as the line of reflection** when two ordered pairs have an **opposite x- or y-coordinate**.	Plots rational number ordered pairs in all four quadrants and on both axes; identifies and **explains why** the x- or y-axis is the line of reflection when two ordered pairs have an opposite x- or y-coordinate.

MA.6.GR.1.2 (Context: Mathematical & Real-World)			
Find distances between ordered pairs, limited to the same x-coordinate or the same y-coordinate, represented on the coordinate plane.			
Benchmark Clarifications			
No Benchmark Clarifications			
Assessment Limits			
Items that require the student to find distance between points must have the same *x*-coordinate or the same *y*-coordinate. Items may use all four quadrants. Ordered pairs must be integers. Items may present the ordered pairs on a coordinate plane.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
Finds distances between **integer** ordered pairs, limited to either the same x-coordinate or y-coordinate in the same quadrant.	Finds distances between ordered pairs of **rational** numbers, limited to the **same y-coordinate or the same x-coordinate**, in the same quadrant, **represented on a coordinate plane**.	Finds distances between ordered pairs of rational numbers, limited to the same y-coordinate or the same x-coordinate, **in any quadrant**, represented on a coordinate plane.	(intentionally left blank)

MA.6.GR.1.3 (Context: Mathematical & Real-World)			
Solve mathematical and real-world problems by plotting points on a coordinate plane, including finding the perimeter or area of a rectangle.			
Benchmark Clarifications			
Clarification 1: Instruction includes finding distances between points, computing dimensions of a rectangle or determining a fourth vertex of a rectangle. *Clarification 2:* Problems involving rectangles are limited to cases where the sides are parallel to the axes.			
Assessment Limits			
Items that require the student to find distance between points must have the same *x*-coordinate or the same *y*-coordinate. Items may use all four quadrants. Ordered pairs must be integers. Items may present the ordered pairs on a coordinate plane.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
Solves **mathematical** problems by plotting **integer** ordered pairs on a coordinate plane.	Solves mathematical or **real-world** problems by plotting ordered pairs of **rational** numbers on a coordinate plane, including **finding** the **perimeter or area** of a rectangle contained in **one quadrant**.	Solves mathematical or real-world problems by plotting ordered pairs of rational numbers on a coordinate plane, including finding the perimeter or area of a rectangle **with vertices in multiple quadrants**.	Solves mathematical and real-world problems including **determining the fourth vertex of a rectangle**.

MA.6.GR.2.1 (Context: Mathematical)			
Derive a formula for the area of a right triangle using a rectangle. Apply a formula to find the area of a triangle.			
Benchmark Clarifications			
Clarification 1: Instruction focuses on the relationship between the area of a rectangle and the area of a right triangle. *Clarification 2:* Within this benchmark, the expectation is to know from memory a formula for the area of a triangle.			
Assessment Limits			
Items must give the vertical height for all triangles.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
Identifies the relationship between the area of a rectangle and the area of a right triangle.	**Applies** the formula for the area of a triangle to find the area of a triangle.	**Derives** a formula for the area of a right triangle using a rectangle and applies that formula to find the area of a triangle.	**Justifies** the relationship between the area of a rectangle and the area of a right triangle.

MA.6.GR.2.2 (Context: Mathematical & Real-World)			
Solve mathematical and real-world problems involving the area of quadrilaterals and composite figures by decomposing them into triangles or rectangles.			
Benchmark Clarifications			
Clarification 1: Problem types include finding area of composite shapes and determining missing dimensions. *Clarification 2:* Within this benchmark, the expectation is to know from memory a formula for the area of a rectangle and triangle. *Clarification 3*: Dimensions are limited to positive rational numbers.			
Assessment Limits			
When finding area of composite shapes that decompose into rectangles only, dimensions of the rectangles must overlap, have at least one fraction, or have at least one decimal. Given quadrilaterals will not be rectangles or squares. Items must give the vertical height for all triangles.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
Solves mathematical problems with positive **integers** involving the area of **quadrilaterals** by decomposing them into triangles or rectangles.	Solves mathematical problems with positive **rational numbers** involving the area of **composite figures** by decomposing them into triangles or rectangles.	Solves mathematical or **real-world** problems with positive rational numbers involving the area of quadrilaterals and composite figures by decomposing them into triangles or rectangles or **finds a missing side when given the area**.	Solves mathematical or real-world problems with positive rational numbers involving the area of quadrilaterals and composite figures by decomposing the shapes **in different ways and showing how they are equivalent**.

MA.6.GR.2.3 (Context: Mathematical & Real-World)			
Solve mathematical and real-world problems involving the volume of right rectangular prisms with positive rational number edge lengths using a visual model and a formula.			
Benchmark Clarifications			
Clarification 1: Problem types include finding the volume or a missing dimension of a rectangular prism.			
Assessment Limits			
Items must include at least one fractional or decimal edge length.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
Solves mathematical problems with a given visual model or using a formula, finds the volume of a right rectangular prism with **one** positive rational number as edge length.	Solves mathematical problems with a given visual model or using a formula, finds the volume of a right rectangular prism with positive rational number edge **lengths**.	Solves mathematical or **real-world** problems **involving** the volume of right rectangular prisms with positive rational number edge lengths or **finds a missing edge length when given a volume**.	(intentionally left blank)

MA.6.GR.2.4 (Context: Mathematical & Real-World)			
Given a mathematical or real-world context, find the surface area of right rectangular prisms and right rectangular pyramids using the figure's net.			
Benchmark Clarifications			
Clarification 1: Instruction focuses on representing a right rectangular prism and right rectangular pyramid with its net and on the connection between the surface area of a figure and its net. *Clarification 2:* Within this benchmark, the expectation is to find the surface area when given a net or when given a three-dimensional figure. *Clarification 3:* Problems involving right rectangular pyramids are limited to cases where the heights of triangles are given. *Clarification 4:* Dimensions are limited to positive rational numbers.			
Assessment Limits			
Items will not require the student to find surface area using the formula. Items may give a three-dimensional figure and require the student to identify the appropriate net with dimensions and find the surface area.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
Given a mathematical context, finds the surface area of right rectangular prisms and right rectangular pyramids **given** the figure's net using **positive integers**.	Given a mathematical context, finds the surface area of right rectangular prisms and right rectangular pyramids **using** the figure's net using **dimensions with one rational number**.	Given a mathematical or **real-world context**, finds the surface area of right rectangular prisms and right rectangular pyramids using the figure's net using **positive rational numbers**.	(intentionally left blank)

MA.6.DP.1.1 (Context: Real-World)			
Recognize and formulate a statistical question that would generate numerical data. *Example:* The question "How many minutes did you spend on mathematics homework last night?" can be used to generate numerical data in one variable.			
Benchmark Clarifications			
No Benchmark Clarification			
Assessment Limits			
N/A			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
(intentionally left blank)	**recognizes** statistical questions that would generate numerical data.	**formulates** statistical questions that would generate numerical data.	**explains** what makes a question statistical.

MA.6.DP.1.2 (Context: Real-World)			
Given a numerical data set within a real-world context, find and interpret mean, median, mode and range. *Example:* The data set {15, 0, 32, 24, 0, 17, 42, 0, 29, 120, 0, 20}, collected based on minutes spent on homework, has a mode of 0.			
Benchmark Clarifications			
Clarification 1: Numerical data is limited to positive rational numbers.			
Assessment Limits			
Data sets are limited to no more than 20 data points. Items will not require the student to calculate mean with data sets containing more than 10 data points. Items must present numerical data as a set using braces, graphically, or in a table.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
given a numerical data set **limited to positive integers**, within a real-world context, finds mean, median, mode, and range.	given a numerical data set within a real-world context, finds mean, median, mode, and range.	given a numerical data set within a real-world context, finds and **interprets** mean, median, mode, and range.	(intentionally left blank)

MA.6.DP.1.3 (Context: Real-World)			
Given a box plot within a real-world context, determine the minimum, the lower quartile, the median, the upper quartile and the maximum. Use this summary of the data to describe the spread and distribution of the data. *Example:* The middle 50% of the population can be determined by finding the interval between the upper quartile and the lower quartile.			
Benchmark Clarifications			
Clarification 1: Instruction includes describing range, interquartile range, halves, and quarters of the data.			
Assessment Limits			
Items may require the student to describe box plots using the words "symmetry", "skewed", "minimum", "maximum", "median", "lower" or "upper quartile", "outlier(s)", "range", "interquartile range", "halves", or "quarters." Items may use vertical or horizontal number lines.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
given a box plot within a real-world context, determines the **minimum, the lower quartile, the median, the upper quartile, and the maximum.**	given a box plot within a real-world context, determines the **interquartile range and range.**	given a box plot within a real-world context, **uses this summary of the data to describe the spread and distribution.**	(intentionally left blank)

MA.6.DP.1.4 (Context: Real-World)			
Given a histogram or line plot within a real-world context, qualitatively describe and interpret the spread and distribution of the data, including any symmetry, skewness, gaps, clusters, outliers and the range.			
Benchmark Clarifications			
Clarification 1: Refer to K-12 Mathematics Glossary (Appendix C).			
Assessment Limits			
Items will not require the student to calculate statistical measures or describe a plot using a statistical value, except range. Items may require the student to describe the representation using the words "symmetry", "skewed", "gap(s)", "cluster(s)", "outliers", or "range."			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
given a histogram or line plot within a real-world context, **describes** the spread and distribution of the data including any symmetry, skewness, and the range.	given a histogram or line plot within a real-world context, **qualitatively** describes the spread and distribution of the data, including any symmetry, skewness, **gaps, clusters, outliers,** and the range.	given a histogram or line plot within a real-world context, qualitatively describes and **interprets** the spread and distribution of the data, including any symmetry, skewness, gaps, clusters, outliers, and the range.	(intentionally left blank)

MA.6.DP.1.5 (Context: Real-World)			
Create box plots and histograms to represent sets of numerical data within real-world contexts. *Example:* The numerical data set {15, 0, 32, 24, 0, 17, 42, 0, 29, 120, 0, 20}, collected based on minutes spent on homework, can be represented graphically using a box plot.			
Benchmark Clarifications			
Clarification 1: Instruction includes collecting data and discussing ways to collect truthful data to construct graphical representations. *Clarification 2*: Within this benchmark, it is the expectation to use appropriate titles, labels, scales and units when constructing graphical representations. *Clarification 3:* Numerical data is limited to positive rational numbers.			
Assessment Limits			
Items will not require the student to calculate statistical measures outside of those needed to create a box plot, when necessary. Data sets are limited to no more than 20 data points.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
identifies **histograms** to corresponding sets of numerical data within real-world contexts.	Identifies **box plots** and histograms to corresponding sets of numerical data within real-world contexts.	**creates** box plots and histograms to represent the set of the numerical data within real-world contexts.	creates box plots and histograms to represent **and interpret** sets of numerical data within real-world contexts; **distinguishes between truthful and deceptive data.**

MA.6.DP.1.6 (Context: Real-World)			
Given a real-world scenario, determine and describe how changes in data values impact measures of center and variation.			
Benchmark Clarifications			
Clarification 1: Instruction includes choosing the measure of center or measure of variation depending on the scenario. *Clarification 2:* The measures of center are limited to mean and median. The measures of variation are limited to range and interquartile range. *Clarification 3:* Numerical data is limited to positive rational numbers.			
Assessment Limits			
Items that require choosing a measure of center or measure of variation must be based on the effect of changes made to the data set.			
Achievement Level Descriptors			
Level 2	**Level 3**	**Level 4**	**Level 5**
given a real-world scenario, **describes** how changes in data values impact measures of center.	given a real-world scenario, **determines and** describes how changes in data values impact measures of center**; identifies measures of center appropriate for the scenario**.	given a real-world scenario, determines and describes how changes in data values impact measures of center and **variation**; identifies measures of center and **variation** appropriate for the scenario.	(intentionally left blank)