

## North Carolina End-of-Grade Tests of Mathematics Grades 3-8 (Edition 5)

On July 8–11, 2019, a committee of North Carolina educators participated in a multi-phase standard setting for the North Carolina tests of general mathematics in grades 3–8, NC Math 1, and NC Math 3; and for the NCEXTEND1 Mathematics tests in grades 3–8 and NC Math 1. The goal of the workshop was to identify cut scores that divide students into four achievement levels for general mathematics (*Not Proficient* through *Level 5*) and three achievement levels for NCEXTEND1 (*Not Proficient* through *Level 4*).

In August 2019, the State Board of Education (SBE) adopted college-and-career readiness Academic Achievement Standards and Academic Achievement Descriptors for the End-of-Grade (EOG) and End-of-Course (EOC) mathematics tests and their alternate assessments. Effective with the 2019-20 school year, the State will report four levels as follows:

| Achievement Level | Meets On-Grade-Level Proficiency Standard | Meets Career-and-College Readiness Standard |
|-------------------|---|---|
| Level 5           | Yes                                       | Yes   |
| Level 4           | Yes                                       | Yes   |
| Level 3           | Yes                                       | No  |
| Not Proficient    | No  | No  |

### Math Grades 3–8 Achievement Level Ranges (Cut Scores)

| Test                                | Grade | Not Proficient | Level 3 | Level 4 | Level 5    |
|-------------------------------------|-------|----------------|---------|---------|------------|
| General<br>Education<br>Mathematics | 3     | $\leq 544$     | 545-550 | 551-559 | $\geq 560$ |
|                                     | 4     | $\leq 546$     | 547-552 | 552-559 | $\geq 560$ |
|                                     | 5     | $\leq 545$     | 546-550 | 551-560 | $\geq 561$ |
|                                     | 6     | $\leq 545$     | 546-550 | 551-560 | $\geq 561$ |
|                                     | 7     | $\leq 545$     | 546-549 | 550-559 | $\geq 560$ |
|                                     | 8     | $\leq 542$     | 543-547 | 548-554 | $\geq 555$ |

## Mathematics Achievement Level Descriptors – Grade 3

### Level 5

*Students at Level 5 demonstrate **comprehensive** understanding of grade level content standards, are on track for career and college, and are prepared for advanced content at the next grade/course.*

*Level 5 students can:*

- Interpret and apply the properties of multiplication and division to solve real-world problems;
- Solve and interpret one-step real-world problems with unknowns involving addition, subtraction, and multiplication;
- Multiply and divide with factors, quotients, and divisors up to and including 10, using the relationship between multiplication and division;
- Interpret and represent two-step real-world problems using equations with unknowns involving addition, subtraction, and multiplication;
- Interpret and apply patterns of multiplication using a hundreds board and/or multiplication table;
- Add and subtract whole numbers up to 1,000 using a variety of strategies to solve two-step real-world problems;
- Apply place value understanding and properties of operation to find the product of a one-digit whole number in the range 10–90 in the context of real-world problems;
- Use models to interpret fractions with denominators of 2, 3, 4, 6, and 8, and explain the meaning of numerators in the context of real-world problems;
- Represent equivalent fractions by composing and decomposing related fractions using area and length models;
- Express whole numbers as fractions and fractions as whole numbers using area and length models;
- Compare two fractions with the same denominator or the same numerator using  $>$ ,  $<$ , and  $=$  symbols by reasoning about their size;
- Solve two-step word problems involving the addition and subtraction of time intervals within the same hour using a variety of models;
- Add, subtract, multiply, or divide to solve one-step word problems involving whole-number measurements of length, weight, and capacity in the same customary units;
- Solve two-step problems from a created frequency table, scaled picture graph, or scaled bar graph involving “how many more” and “how many less”;
- Find the area of a rectangle by partitioning it into two smaller rectangles, and recognize that the area of the large rectangle is the sum of the two smaller rectangles;
- Solve problems involving the perimeter of a polygon with an unknown side length;
- Compose and decompose quadrilaterals and triangles using attributes.

## Level 4

*Students at Level 4 demonstrate a **thorough** understanding of grade level content standards and are on track for career and college.*

*Level 4 students can:*

- Interpret and illustrate products and quotients of two whole numbers with factors, quotients, and divisors up to 10;
- Solve and interpret one-step multiplication and division word problems with factors, quotients, and divisors up to 10;
- Determine an unknown in multiplication and division in real-world problems.
- Multiply and divide with factors, quotients, and divisors up to and including 10;
- Interpret two-step word problems using addition, subtraction, and multiplication operation with a symbol to represent unknown quantities;
- Identify and interpret patterns of multiplication using a hundreds board and/or multiplication table;
- Add and subtract whole numbers up to 1,000 using a variety of strategies;
- Interpret the product of a one-digit whole number and a multiple of 10 in the range 10–90 using place value or properties of operation;
- Use models to interpret fractions with denominators of 2, 3, 4, 6, and 8, and explain the meaning of numerators;
- Represent equivalent fractions by decomposing area and length models;
- Recognize and represent fractions as whole numbers less than 4;
- Compare two fractions with the same denominator or the same numerator using  $>$ ,  $<$ , and  $=$  symbols;
- Solve one-step word problems involving the addition and subtraction of time intervals within the same hour using a variety of models;
- Add and subtract to solve one-step word problems involving whole-number measurements of length, weight, and capacity in the same customary units;
- Solve one-step problems from a created frequency table, scaled picture graph, or scaled bar graph involving “how many more” and “how many less”;
- Find the area of a rectangle with whole-number side lengths by multiplying the side lengths;
- Solve problems involving the perimeter of polygons, given a context;
- Describe and compose quadrilaterals and triangles using attributes.

## Level 3

*Students at Level 3 demonstrate **sufficient** understanding of grade level content standards, though some support may be needed to engage with content at the next grade/course.*

*Level 3 students can:*

- Represent and interpret products and quotients of two whole numbers with factors, quotients, and divisors up to 10;
- Solve one-step word problems involving multiplication and division with factors, quotients, and divisors up to 10;
- Determine an unknown in multiplication and division equations;
- Multiply and divide with factors 0–5 and 10;

- Solve two-step word problems using addition, subtraction, and multiplication with unknowns;
- Identify patterns of multiplication using a hundreds board and/or multiplication table;
- Add and subtract whole numbers up to 1,000;
- Use place value to find the product of a one-digit whole number and a multiple of 10 in the range 10–90;
- Use models to represent fractions with denominators of 2, 3, 4, 6, and 8;
- Represent equivalent fractions using area models;
- Recognize that a fraction with the same numerator and denominator equals one whole;
- Compare two fractions with the same denominator using  $>$ ,  $<$ , and  $=$  symbols;
- Tell and write time to the nearest minute, and measure time intervals in minutes within the same hour;
- Estimate and measure capacity, length (nearest quarter-inch, half-inch, feet and yards to the whole unit), and weight to the nearest whole unit;
- Represent and interpret data in a frequency table, scaled picture graph, or scaled bar graph;
- Find the area of a rectangle by tiling or by multiplying the side lengths;
- Determine the perimeter of a polygon with given side lengths;
- Describe quadrilaterals and rectangles using attributes.

### **Not Proficient**

*Students who are Not Proficient demonstrate **inconsistent** understanding of grade level content standards and will need support.*

*Not Proficient students can:*

- Identify and solve problems with factors, quotients, and divisors up to 10;
- Represent problems with illustrations to solve a one-step multiplication problem;
- Determine an unknown in a multiplication problem;
- Multiply with factors 0, 1, 2, 5, and 10;
- Solve two-step word problems using addition and subtraction;
- Identify patterns of multiplication with factors of 2, 5, or 10 using a hundreds board;
- Add whole numbers up to 1,000;
- Use models to find the product of a one-digit whole number and a multiple of 10 in the range 10–50;
- Identify unit fractions with denominators of 2, 3, and 4 with area models;
- Recognize equivalent fractions that are displayed with models;
- Describe one whole as two halves, three thirds, and four fourths;
- Use models to compare two fractions with the same denominator using  $>$ ,  $<$ , and  $=$  symbols;
- Tell and write time to the nearest 5 minutes;
- Estimate and measure length to the nearest half-inch;
- Interpret data and answer questions about a scaled picture graph or scaled bar graph;
- Find the area of a rectangle using an array model and repeated addition;
- Distinguish the difference between area and perimeter;
- Recognize two-dimensional shapes.

## Mathematics Achievement Level Descriptors – Grade 4

### Level 5

*Students at Level 5 demonstrate **comprehensive** understanding of grade level content standards, are on track for career and college, and are prepared for advanced content at the next grade/course.*

*Level 5 students can:*

- Solve multiplicative comparison (number of groups unknown) word problems;
- Translate multiplicative comparison situations with multiplier unknown into equations using symbols for the unknown, and use them to solve word problems;
- Distinguish between additive and multiplicative comparison situations to determine a matching equation;
- Solve two-step word problems involving the four operations with whole numbers, interpret the meaning of remainders, and use a letter to represent the unknown quantity;
- Apply understanding of prime and composite numbers to solve contextual, real-world problems;
- Analyze a number pattern and describe the rule;
- Decompose numbers to 100,000 using nontraditional forms;
- Compare two multidigit whole numbers up to 100,000 using  $>$ ,  $=$ , and  $<$  symbols given in two different forms and grouped nontraditionally;
- Add and subtract multidigit whole numbers using the standard algorithm with unknown values or errors;
- Solve real-world multistep addition and subtraction word problems;
- Make connections between multiplication models, and solve real-world multiplication word problems;
- Make connections between division models, and solve real-world division word problems;
- Apply knowledge of equivalent fractions to solve multistep word problems;
- Apply knowledge of comparing fractions to compare multiple fractions within contexts;
- Apply knowledge of decomposing fractions to solve word problems using mixed numbers;
- Solve multistep word problems involving addition and subtraction of fractions, including mixed numbers with like denominators;
- Solve multistep word problems involving multiplication of a whole number by a fraction from 0 to 1;
- Use equivalent fractions to add two fractions with denominators of 10 and 100 to solve single-step word problems;
- Apply knowledge of comparing decimals to compare multiple decimals within contexts;
- Solve multistep word problems involving addition and subtraction of time intervals that cross the hour;
- Solve multistep word problems involving the area and perimeter of rectilinear figures;
- Determine whether a survey question will yield categorical or numerical data;
- Solve multistep problems involving the addition and subtraction of angle measurements;
- Compare and contrast attributes of two quadrilaterals or triangles.

## Level 4

*Students at Level 4 demonstrate a **thorough** understanding of grade level content standards and are on track for career and college.*

*Level 4 students can:*

- Solve multiplicative comparison (group size unknown) word problems;
- Interpret models, and use them to solve multiplicative comparative word problems;
- Interpret multiplication equations as comparisons, and use them to solve word problems;
- Distinguish between additive and multiplicative comparison situations to solve word problems;
- Solve two-step word problems involving the four operations with whole numbers, and use a letter to represent the unknown quantity;
- Find all factor pairs for whole numbers up to 50, and determine which numbers are prime or composite;
- Determine the next term in a growing pattern given a sequence of numbers or shapes, and describe the features of the pattern;
- Generate a number or shape pattern that follows a given rule;
- Read and write multidigit whole numbers up to 100,000 using numerals, number names, and expanded form;
- Compare two multidigit whole numbers up to 100,000 using  $>$ ,  $=$ , and  $<$  symbols given in two different forms;
- Add and subtract multidigit whole numbers up to 100,000 using the standard algorithm;
- Analyze and interpret models for multiplication, and solve real-world multiplication word problems;
- Analyze and interpret models for division, solve real-world division word problems, and interpret remainders in context when needed;
- Compare two fractions with different numerators and different denominators (2, 3, 4, 5, 6, 8, 10, 12, and 100) using  $>$ ,  $=$ , and  $<$  symbols;
- Apply knowledge of comparing fractions to solve a word problem;
- Decompose fractions with denominators of 2, 3, 4, 5, 6, 8, 10, 12, and 100 in more than one way;
- Justify decompositions using area models, length models, and equations;
- Solve word problems involving addition and subtraction of fractions, including mixed numbers with like denominators;
- Solve word problems involving the product of a whole number and a fraction;
- Model and explain the equivalence between fractions with denominators of 10 and 100;
- Compare two decimals, one represented as a tenth and the other as a hundredth, using  $>$ ,  $=$ , and  $<$  symbols;
- Use the four operations to solve one-step word problems involving metric units, including conversion from a larger unit to a smaller unit;
- Solve word problems involving addition and subtraction of time intervals that cross the hour;
- Apply formulas to solve real-world and mathematical problems, including problems with a fixed area and varying perimeters or a fixed perimeter and varying areas;
- Interpret data represented in a frequency table, scaled bar graph, or line plot;

- Apply strategies for addition and subtraction of angles to solve real-world, contextual problems;
- Classify quadrilaterals and triangles based on angle measures, side lengths, and the absence or presence of parallel or perpendicular lines.

### Level 3

*Students at Level 3 demonstrate **sufficient** understanding of grade level content standards, though some support may be needed to engage with content at the next grade/course.*

*Level 3 students can:*

- Solve multiplicative comparison (unknown product) word problems;
- Use models to solve a multiplicative comparison word problem;
- Solve two-step word problems involving the four operations with whole numbers (including division problems with remainders as leftovers) using estimation strategies to assess reasonableness of answers;
- Find all factor pairs for whole numbers up to 25;
- Find the next set of terms in a pattern;
- Determine the next term in a repeating pattern given a sequence of numbers or shapes, and describe the features of the pattern;
- Explain that a digit in one place represents 10 times as much as it represents one place to the right for whole numbers up to 1,000;
- Read and write multidigit whole numbers up to 100,000 using numerals, number names, or expanded form;
- Compare two multidigit whole numbers up to 100,000 using  $>$ ,  $=$ , and  $<$  symbols;
- Add and subtract multidigit whole numbers up to 100,000 with place value understanding;
- Multiply a two-digit number by a two-digit number, or a one-digit number by a three-digit number, using area models, partial products, or properties of operations;
- Find whole-number quotients and remainders with up to three-digit dividends and one-digit divisors using multiple methods (rectangular arrays, area models, repeated subtraction, partial quotients, properties of operations, and/or the relationship between multiplication and division);
- Identify fraction equivalence (denominators of 2, 3, 4, 5, 6, 8, 10, 12, and 100);
- Compare two fractions with different numerators and different denominators (2, 3, 4, 6, and 8) using  $>$ ,  $=$ , and  $<$  symbols;
- Decompose fractions with denominators of 2, 3, 4, 5, 6, 8, 10, 12, and 100;
- Add and subtract fractions, including mixed numbers with like denominators;
- Multiply a whole number by a fraction between 0 and 1;
- Represent tenths and hundredths with models to make connections between fractions and decimals;
- Compare two decimals to hundredths using  $>$ ,  $=$ , and  $<$  symbols;
- Use the four operations to solve one-step word problems involving metric units;
- Solve word problems involving addition of time intervals that cross the hour;
- Determine the area and perimeter of rectilinear figures with given side lengths;
- Make a representation in a frequency table, scaled bar graph, or line plot;
- Solve addition and subtraction problems to find unknown angles;

- Describe attributes of different quadrilaterals and triangles;
- Recognize lines of symmetry in two-dimensional figures.

## **Not Proficient**

*Students who are Not Proficient demonstrate **inconsistent** understanding of grade level content standards and will need support.*

*Not Proficient students can:*

- Solve additive comparison problems;
- Solve multiplication problems involving equal groups;
- Solve one-step word problems involving the four operations with whole numbers;
- Identify a factor pair for any given number, up to and including 50;
- Identify the next term in a number or shape pattern;
- Read and write multidigit whole numbers up to 10,000 using numerals and number names;
- Compare two multidigit whole numbers up to 10,000 using  $>$ ,  $=$ , and  $<$  symbols;
- Add and subtract multidigit whole numbers up to 10,000 using a strategy based on place value;
- Multiply a two-digit number by a one-digit number using any method;
- Find whole-number quotients with up to two-digit dividends and one-digit divisors using any method;
- Use models to identify equivalent fractions (denominators of 2, 3, 4, 6, and 8);
- Compare two fractions with like numerators or denominators (denominators of 2, 3, 4, 6, and 8);
- Decompose fractions using unit fractions;
- Add and subtract fractions with like denominators from 0 and 1;
- Use repeated addition as a strategy to multiply a whole number by a unit fraction;
- Multiply a whole number by a unit fraction;
- Represent tenths and hundredths with models;
- Compare two decimals to tenths using  $>$ ,  $=$ , and  $<$  symbols;
- Select appropriate units of measurement for a given attribute;
- Solve word problems involving addition of time intervals within the hour;
- Determine the area and perimeter of rectangles;
- Make a representation in a frequency table, scaled bar graph, or scaled picture graph;
- Use 90- and 180-degree angles to benchmark the measurement of other angles. Identify points, lines, line segments, rays, and angles;
- Identify points, lines, line segments, rays, and angles.
- Draw and identify parallel or perpendicular lines;
- Identify quadrilaterals (rhombuses, rectangles, squares, parallelograms, and trapezoids).



## Mathematics Achievement Level Descriptors – Grade 5

### Level 5

*Students at Level 5 demonstrate **comprehensive** understanding of grade level content standards, are on track for career and college, and are prepared for advanced content at the next grade/course.*

*Level 5 students can:*

- Apply the order of operations and the commutative, associative, and distributive properties to solve two-step word problems using a variety of number sentences;
- Analyze the relationship between the two sets of data solving real-world word problems by extending and continuing the pattern;
- Compare more than two decimals to the thousandths based on the value of the digits in each place, using  $>$ ,  $=$ , and  $<$  symbols in multistep real-world problems;
- Multiply two multidigit whole numbers using the standard algorithm while making a connection using models with unknown values, and solve real-world multistep word problems;
- Interpret the remainder when dividing whole numbers with up to four-digit dividends and two-digit divisors using multiple methods in real-world multistep word problems;
- Add, subtract, and multiply decimals to thousandths using multiple methods based on place value in multistep word problems, using estimation to assess reasonableness of answers;
- Solve multistep word problems using at least two of the four operations and using decimal numbers;
- Apply multiple strategies to add and subtract fractions, including mixed numbers, with unlike denominators to solve real-world multi-operational word problems;
- Solve one-step word problems involving division of whole numbers leading to answers that are fractions and mixed numbers using more than one strategy;
- Explain why multiplying a given number by a fraction greater than 1 or less than 1 results in a product greater than or less than the given number when solving one-step word problems;
- Solve one-step conversion problems within a given measurement system when given a chart in a multistep real-world word problem;
- Solve one- and two-step word problems, and formulate questions that will yield data that changes over time;
- Solve multistep word problems when unknown dimensions are included;
- Solve multistep real-world word problems, including traveling from one point to another and identifying the coordinates of missing points in geometric figures;
- Determine quadrilaterals in a hierarchy based on congruence and similarity, and apply knowledge of the hierarchy in a word-problem context.

### Level 4

*Students at Level 4 demonstrate a **thorough** understanding of grade level content standards and are on track for career and college.*

*Level 4 students can:*

- Write, explain, and evaluate numerical expressions with parentheses using the order of operations and commutative, associative, and distributive properties that involve the four operations to solve up to two-step problems;

- Form ordered pairs of corresponding terms from the patterns that can be graphed on the first quadrant of a coordinate plane;
- Read, write, and compare decimals and fractional notation for tenths, hundredths, and thousandths using base-ten numerals, number names, and expanded form;
- Multiply a three-digit number by a two-digit number using the standard algorithm in real-world word problems;
- Interpret remainders when dividing whole numbers with up to four-digit dividends and two-digit divisors using multiple methods in real-world word problems;
- Add, subtract, and multiply decimals to thousandths using multiple methods based on place value in a word problem using estimation to assess reasonableness of answers;
- Divide a whole number by a decimal and divide a decimal by a whole number to the hundredths in a word problem using repeated subtraction or area models;
- Add and subtract related fractions, including mixed numbers (including regrouping), with unlike denominators in two-step word problems using area and length models, and use estimation to determine the reasonableness of an answer;
- Solve one-step word problems involving division of whole numbers leading to answers that are fractions and mixed numbers using area, length, and set models or equations;
- Multiply a fraction by a fraction, including a mixed number, and solve one-step word problems involving multiplication of fractions;
- Solve one-step word problems involving division of unit fractions by nonzero whole numbers as well as whole numbers by unit fractions;
- Use multiplicative reasoning to solve one-step conversion problems within a given measurement system when given a chart;
- Interpret data on a line graph, and determine whether a survey question will yield categorical or numerical data, or data that changes over time;
- Solve problems involving rectangular prisms with whole-number edge lengths, and find the volume of solid figures with one-digit dimensions composed of two nonoverlapping rectangular prisms;
- Interpret  $x$ - and  $y$ -coordinates of points plotted in the first quadrant of the coordinate plane to solve problems;
- Classify quadrilaterals in a hierarchy based on properties, and label quadrilaterals using all of the other names of quadrilaterals based on their attributes.

### Level 3

*Students at Level 3 demonstrate **sufficient** understanding of grade level content standards though some support may be needed to engage with content at the next grade/course.*

*Level 3 students can:*

- Write, explain, and evaluate numerical expressions that involve the four operations to solve up to two-step problems;
- Generate two numerical patterns using two given rules;
- Read, write, and compare decimals using base-ten numerals, number names, and expanded form;
- Multiply a two-digit number by a two-digit number using the standard algorithm;
- Find quotients with remainders when dividing whole numbers with up to four-digit dividends and two-digit divisors using any method;

- Add, subtract, and multiply decimals to thousandths using any method based on place value;
- Add and subtract related fractions with unlike denominators in one-step word problems using benchmark fractions and area and length models;
- Interpret and model a fraction as a division problem;
- Multiply a fraction by a fraction using area and length models;
- Use area and length models to divide unit fractions by whole numbers and whole numbers by unit fractions;
- Convert one-step conversion problems within a given measurement system when given a chart; Make a representation of data using a line graph;
- Find volume by counting unit cubes, and find the volume of rectangular prisms in cubic units with whole-number edge lengths;
- Identify graph points with whole numbers in the first quadrant of the coordinate plane; Recognize that the attributes that belong to a category of quadrilaterals also belong to all subcategories of that category.

### **Not Proficient**

*Students who are Not Proficient demonstrate inconsistent understanding of grade level content standards and will need support.*

*Not Proficient students can:*

- Evaluate numerical expressions that involve the four operations to solve one-step problems;
- Generate a number pattern that follows a given rule;
- Read and write multidigit whole numbers up to and including 100,000 using numerals, number names, and expanded form;
- Use models to multiply a whole number up to three digits by a one-digit whole number, and multiply up to two two-digit numbers;
- Find whole-number quotients and remainders with up to three-digit dividends and one-digit divisors with place value understanding using one of the following methods: rectangular arrays, area models, repeated subtraction, partial quotients, properties of operations, or the relationship between multiplication and division;
- Add and subtract decimals to hundredths using any method based on place value;
- Add and subtract fractions with like denominators using area and length models and equations;
- Demonstrate an understanding that fractions are an equal sharing context where a quantity is divided into equal parts;
- Multiply a fraction by a whole number;
- Use area or length models to divide whole numbers by fractions;
- Demonstrate knowledge of customary and metric units of measurement;
- Organize data in a table;
- Identify length and width of a rectangle, and find the area in square units to identify the base of a rectangular prism;
- Identify points on a number line;
- Name quadrilaterals based on angle measure, side lengths, and the presence or absence of parallel or perpendicular lines.

## Mathematics Achievement Level Descriptors – Grade 6

### Level 5

*Students at Level 5 demonstrate **comprehensive** understanding of grade-level content standards, are on track for career and college, and are prepared for advanced content at the next grade/course.*

*Level 5 students can:*

- Apply use of scale factor to solve multistep real-world ratio problems in context;
- Solve multiple unit conversions of different quantities in the ratio (converting and manipulating measurements);
- Create and use a table to solve real-world problems, using pairs of values from a coordinate grid;
- Solve multistep real-world problems involving the quotients of fractions in context;
- Solve real-world multistep problems, using long division involving a minimum of four-digit dividends, and interpret the meaning of remainders in context;
- In multistep real-world mathematical word problems, add, subtract, multiply, and divide decimals using the standard algorithms;
- Find the greatest common factor in real-world context of two whole numbers less than or equal to 100, and use the distributive property to rewrite the sum of two whole numbers;
- Find the least common multiple in real-world context of two whole numbers to add and subtract fractions with unlike denominators;
- Interpret how ordered pairs relate to each other on the coordinate plane;
- Use coordinates and absolute value to find the distance between points with the same first coordinate or the same second coordinate, using real-world situations (map);
- Use models to add and subtract integers in multistep problems involving real-world contexts;
- Write and evaluate algebraic expressions that include whole numbers, fractions, exponents, and decimals, using mathematical reasoning to develop a proper sequence of steps;
- Apply and describe properties of operations to generate equivalent expressions involving exponents from real-world situations;
- Use multiple substitutions to determine whether a number makes an equation or inequality true involving exponents;
- Apply and use variables from real-world contexts to model and analyze the relationship between dependent variables and independent variables;
- Given three vertices and the perimeter of a polygon, determine the ordered pair of the missing vertex on the coordinate plane;
- Use nets to find the surface area of right prisms and right pyramids with fractional or decimal side lengths in real-world problems;
- Analyze and compare attributes of different representations of the same data;
- Use data and graphical representations of data in real-world context to analyze measures of center and spread.

## Level 4

*Students at Level 4 demonstrate a **thorough** understanding of grade level content standards and are on track for career and college.*

*Level 4 students can:*

- Model a ratio relationship using a variety of representations (tables, tape diagrams, double number lines, and the coordinate plane);
- Interpret unit ratio and ratios within the context;
- Apply ratio concepts and use multiplicative reasoning to solve ratio problems;
- Solve real-world problems involving equivalent whole-number ratios, using tables and pairs of values on the coordinate grid;
- Solve real-world problems involving percentages in context;
- Solve mathematical and real-world problems involving the quotients of fractions;
- Divide with long division involving a minimum of four-digit dividends, and interpret the meaning of remainders within a context;
- In one-step real-world mathematical word problems, add, subtract, multiply, and divide decimals, using the standard algorithms;
- Find the greatest common factor of two whole numbers less than or equal to 100, and use the distributive property to rewrite the sum of two whole numbers;
- Find the least common multiple of two whole numbers less than or equal to 12 to add and subtract fractions with unlike denominators;
- Interpret and compare the absolute value of rational numbers in a context;
- Recognize that when two ordered pairs differ only by signs, the locations of the points are reflections across one or both axes;
- Interpret or explain statements of order or inequality for rational numbers in real-world contexts;
- Solve real-world and mathematical problems by graphing points in all four quadrants of the coordinate plane;
- Use coordinates and absolute value to find the distance between points with the same first coordinate or the same second coordinate;
- Use models to add and subtract integers from  $-20$  to  $20$  in problems involving real-world contexts;
- Write and evaluate numerical expressions, with groupings, that involve whole number exponents;
- Write and evaluate algebraic expressions that include whole numbers, fractions, exponents, and decimals;
- Apply properties of operations to generate equivalent expressions without exponents;
- Evaluate formulas;
- Use substitution to determine whether a number makes an equation or inequality true involving exponents;
- Write and solve equations of the form  $x + p = q$  and  $p \cdot x = q$  in which  $p$ ,  $q$ , and  $x$  are nonnegative rational numbers;
- Represent the solution of an inequality on a number line diagram;

- Use variables to model and analyze the relationship between dependent variables and independent variables;
- Analyze the relationship between quantities in different representations (context, equations, tables, graphs);
- Solve real-world problems that involve decomposing to find the area of composite figures;
- Solve real-world problems involving rectangular prisms with fractional edge lengths;
- Recognize polygons on a coordinate plane given the vertices of the coordinates, and determine the side length between vertices with the same first coordinate or the same second coordinate;
- Use nets to find the surface area of right prisms and right pyramids in real-world problems;
- Distinguish between the meanings of center, spread, and shape;
- Interpret the mean and median of a data set;
- Identify data sets that have similar measures of center but different spreads;
- Display numerical data on a histogram or box plot;
- Justify an appropriate measure of center using the shape of a data distribution.

### Level 3

*Students at Level 3 demonstrate **sufficient** understanding of grade-level content standards, though some support may be needed to engage with content at the next grade/course.*

*Level 3 students can:*

- Identify the multiplicative relationship of a ratio from a variety of representations;
- Determine unit ratios and ratios within the context;
- Solve mathematical problems involving equivalent whole-number ratios, using tables and pairs of values on the coordinate grid;
- Solve mathematical problems involving percentages;
- Understand and find a percentage of a quantity as a ratio per 100;
- Compute and interpret quotients of fractions, using models and common denominators;
- Divide with long division involving four-digit dividends, using the standard algorithm;
- In one-step mathematical problems, add, subtract, multiply, and divide decimals using the standard algorithms;
- Find the greatest common factor of two whole numbers less than or equal to 100;
- Find the least common multiple of two whole numbers less than or equal to 12;
- Represent real-world quantities, including opposites, and interpret the meaning of zero;
- Find and position rational numbers on horizontal or vertical number lines;
- Find and position pairs of rational numbers on a coordinate plane;
- Write statements of order or inequality for rational numbers in real-world contexts;
- Solve real-world and mathematical problems by graphing points in the same quadrant of the coordinate plane;
- Use the coordinate plane or other strategy as a tool to find the distance between points with the same first coordinate or the same second coordinate, using coordinates in different quadrants;
- Use models to solve multistep addition and subtraction problems involving integers from  $-20$  to  $20$ ;

- Write and evaluate numerical expressions, with or without groupings, that involve whole-number exponents;
- Identify parts of an algebraic expression, and evaluate the expression in its entirety for specific values;
- Use substitution to determine whether a number makes an equation or inequality true;
- Use variables to represent numbers and write expressions when solving a real-world or mathematical problem;
- Solve equations of the form  $x + p = q$  and  $p \cdot x = q$  in which  $p$ ,  $q$ , and  $x$  are nonnegative rational numbers;
- Write an inequality of the form  $x > c$  or  $x < c$ ;
- Use variables to model the relationship between two quantities in a real-world or mathematical context that change in relationship to one another;
- Distinguish between a dependent variable and an independent variable;
- Find the area of triangles and quadrilaterals by composing or decomposing into triangles or rectangles;
- Solve mathematical problems involving rectangular prisms with fractional edge lengths;
- Recognize polygons on a coordinate plane given the vertices of the coordinates;
- Use nets to find the surface area of right prisms and right pyramids in mathematical problems;
- Determine the mean and median of a data set;
- Display numerical data on a dot plot;
- Identify the number of observations from dot plots and histograms.

### **Not Proficient**

*Students who are Not Proficient demonstrate **inconsistent** understanding of grade-level content standards and will need support.*

*Not Proficient students can:*

- Identify a ratio relationship from a visual representation;
- Identify equivalent ratios;
- Solve ratio problems using additive reasoning;
- Identify benchmark percentages;
- Use physical and visual models to divide a whole number by a unit fraction or a unit fraction by a whole number;
- Use a variety of visual methods or the standard algorithm to divide a maximum of three-digit whole-number dividends;
- In one-step mathematical problems, add and subtract decimals, using place value reasoning and the standard algorithms;
- In one-step mathematical problems, multiply and divide decimals, using models, repeated subtraction, and partial quotients;
- Find factors and multiples up to 50;
- When given a number, determine prime or composite;
- Find and position whole numbers on the first quadrant of a coordinate plane;
- Write statements of order or inequality for positive numbers in real-world contexts;

- Use models to add integers  $-10$  to  $10$ ;
  - Write and evaluate numerical expressions, without groupings, that involve whole numbers;
  - Identify parts of an algebraic expression;
  - Evaluate two-step numeric expressions;
  - Use substitution to determine whether a number makes an equation true;
  - Solve equations of the form  $x + p = q$  in which  $p$ ,  $q$ , and  $x$  are nonnegative rational numbers;
  - Recognize inequalities;
- 
- Recognize that variables take the place of an unknown value;
  - Solve mathematical problems involving rectangular prisms with whole-number edge lengths;
  - Recognize polygons on the first quadrant of a coordinate plane;
  - Match nets to their three-dimensional counterparts;
  - Determine the median of a data set, given an ordered data set;
  - Given a dot plot, identify the mode;
  - Identify the number of observations from dot plots.



## Mathematics Achievement Level Descriptors – Grade 7

### Level 5

*Students at Level 5 demonstrate **comprehensive** understanding of grade level content standards, are on track for career and college, and are prepared for advanced content at the next grade/course.*

*Level 5 students can:*

- Interpret the meaning of the  $y$ -coordinate of the ordered pair  $(1, r)$  as it corresponds to the unit rate;
- Use scale factors and unit rates to solve multistep ratio and percentage problems involving fractions, decimals, and unit conversions;
- Solve real-world and multistep mathematical problems that involve different forms of rational numbers;
- Determine the most efficient expression or equation to solve a real-world mathematical problem;
- Solve multistep real-world problems involving circumference and area of circles using  $\pi$ ;
- Solve multistep problems using supplementary, complementary, vertical, and adjacent angles;
- Solve real-world problems involving volume and surface area of composite figures;
- Compare and find the difference between experimental and theoretical probability;
- Use a simulation to generate frequencies for compound events;
- Use lists, tables, tree diagrams, and simulations to determine the probability of compound events.

### Level 4

*Students at Level 4 demonstrate a **thorough** understanding of grade level content standards and are on track for career and college.*

*Level 4 students can:*

- Compare two different proportional relationships from tables, graphs, equations, or verbal descriptions;
- Represent proportional relationships using equations and graphs;
- Interpret the meaning of any point  $(x, y)$  of a graphical representation of a proportional relationship;
- Recognize that the  $y$ -coordinate of the ordered pair  $(1, r)$  corresponds to the unit rate;
- Interpret a circle graph relating angle measurements and percentages;
- Solve real-world and mathematical problems that involve different forms of rational numbers;
- Interpret and apply properties of operations as strategies, including the standard algorithms;
- Add, subtract, and expand linear expressions with rational coefficients;
- Solve multistep real-world and mathematical problems with rational numbers in algebraic expressions;
- Represent equations and inequalities with the variable on one side to solve multistep problems;
- Represent and interpret the solution set of an inequality in context;
- Compute areas from scale drawings;

- Determine whether angle and side-length characteristics create a unique triangle, more than one triangle, or no triangle;
- Write and solve equations to determine unknown angle measures in a figure using properties of supplementary, complementary, vertical, and adjacent angles;
- Solve real-world problems involving the areas and perimeters of two-dimensional objects and the volumes and surface areas of three-dimensional objects;
- Generate a random sample, and use it to draw inferences.
- Use measures of variability and measures of center to make comparative inferences about two populations.
- Use experimental probability to predict approximate relative frequency.

### Level 3

*Students at Level 3 demonstrate **sufficient** understanding of grade level content standards, though some support may be needed to engage with content at the next grade/course.*

*Level 3 students can:*

- Determine a proportional relationship between quantities from tables, graphs, equations, and verbal descriptions;
- Identify and compute unit rates involving fractions using tables and graphs;
- Use unit rates and scale factors to solve ratio and percentage problems;
- Add, subtract, multiply, and divide rational numbers;
- Describe and solve real-world problems involving rational numbers using the properties of operations;
- Use long division to convert a fraction to a decimal;
- Recognize that all rational numbers will terminate or repeat;
- Add, subtract, and expand linear expressions involving integers;
- Factor linear expressions with an integer as the greatest common factor;
- Solve two-step real-world and mathematical problems with rational numbers in algebraic expressions;
- Represent the solution set of an inequality from a two-step real-world or mathematical problem;
- Compute dimensions of actual lengths or scale drawings, given scale factors;
- Represent triangles from three measures of angles or three measures of sides;
- Use the formulas for area and circumference of a circle to solve problems;
- Identify unknown angle measures in a figure using facts about supplementary, complementary, vertical, and adjacent angles;
- Solve mathematical problems involving the areas and perimeters of two-dimensional objects and the volumes and surface areas of three-dimensional objects;
- Determine whether a sample is representative of a general population;
- Calculate the mean absolute deviation, range, and interquartile range of a data set;
- Differentiate between experimental and theoretical probability;
- Use data to calculate the experimental probability of a chance event;
- Develop and use models to determine the probability of simple events.

## Not Proficient

*Students who are Not Proficient demonstrate **inconsistent** understanding of grade level content standards and will need support.*

*Not Proficient students can:*

- Solve a percentage problem using a proportion;
- Solve mathematical problems involving equivalent whole-number ratios using tables and pairs of values on a coordinate grid;
- Identify and compute unit rates using tables and graphs;
- Add, subtract, multiply, and divide integers;
- Describe and solve real-world problems involving integers using various properties of operations;
- Recognize that an inequality can lead to multiple solutions;
- Add and subtract integers from  $-20$  to  $20$ ;
- Identify triangles based on side lengths and the measures of the angles;
- Distinguish and convert between radius and diameter;
- Find the area of basic polygons;
- Find the volume of right rectangular prisms;
- Calculate the mean and median of a data set;
- Create a box-and-whisker plot from a five-number summary.

## Mathematics Achievement Level Descriptors – Grade 8

### Level 5

*Students at Level 5 demonstrate **comprehensive** understanding of grade level content standards, are on track for career and college, and are prepared for advanced content at the next grade/course.*

*Level 5 students can:*

- Apply the values of expressions involving square roots and cubed roots to the tenths and expressions involving  $\pi$  to the hundredths to solve real-world problems;
- Apply properties of integer exponents to generate equivalent expressions;
- Solve multistep equations involving square roots and cube roots;
- Solve multistep linear equations and inequalities involving complex fractions and decimals with the same variable on both sides;
- Compare properties of two linear functions that could be represented in a different way to solve real-world problems;
- Write an equation in slope-intercept form to model a real-world situation;
- Solve multistep angle-relationship problems (for example: shapes involving expressions for angles or finding the value of the angle or angles after finding  $x$ );
- Using the Pythagorean theorem, find the perimeter or area of a figure;
- Find the volumes of composite figures;
- Given a volume, find a missing dimension;
- Predict (using interpolation and extrapolation) using the line of best fit;
- Given a two-way table with relative frequencies (and table filled in with decimal values), determine the values that describe the real-world situation;
- Given a real-world scenario in paragraph form, construct and interpret a two-way table and its relative frequencies.

### Level 4

*Students at Level 4 demonstrate a **thorough** understanding of grade level content standards and are on track for career and college.*

*Level 4 students can:*

- Estimate the values of expressions involving square roots and cubed roots to the tenths and expressions involving  $\pi$  to the hundredths;
- Locate rational approximations of irrational numbers on a number line;
- Apply properties of whole-number exponents to generate equivalent expressions involving power of power;
- Perform multiplication and division with numbers expressed in scientific notation to solve real-world problems (including how many times one number is of another);
- Use the definition of a perfect square to solve an equation with potentially two solutions;
- Solve multistep linear equations and inequalities with benchmark fractions ( $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$ ) or common denominators with the same variable on both sides;
- Recognize linear equations and inequalities with one variable that have one solution, infinitely many solutions, or no solution;

- Recognize linear systems of equations that have one solution, infinitely many solutions, or no solution;
- Solve real-world and mathematical problems by writing and solving a system of linear equations by graphing;
- Compare properties of two linear functions that are each represented in a different way;
- Interpret the rate of change and initial value of a linear function;
- Identify a graph that represents qualitative features of a real-world function;
- Write an equation in slope-intercept form given at least two  $(x, y)$  values;
- Describe a sequence of transformations that can be used to exhibit congruence or similarity between two figures, limited to rotations about the origin in 90-degree increments and reflections across the  $x$ -axis and  $y$ -axis;
- Apply a sequence of transformations to model congruence or similarity between two figures;
- Solve real-world and mathematical problems involving angle relationships;
- Apply the Pythagorean theorem or its converse to solve real-world and mathematical problems in two dimensions;
- Use the relationship between the formulas for the volumes of cones, cylinders, and spheres to solve real-world problems;
- Construct and interpret a scatterplot for bivariate measurement data;
- Interpret the slope and  $y$ -intercept of an equation that models bivariate quantitative data;
- Interpret a two-way table and its relative frequencies.

### Level 3

*Students at Level 3 demonstrate **sufficient** understanding of grade level content standards though some support may be needed to engage with content at the next grade/course.*

*Level 3 students can:*

- Estimate the values of square roots and cube roots to the tenths;
- Identify the two integers that a square root or cube root falls between (including on a number line);
- Recognize an irrational number as a nonrepeating, nonterminating decimal;
- Apply a single property of exponents to generate an equivalent expression;
- Apply properties of whole-number exponents to generate equivalent expressions involving multiplication and division;
- Use numbers expressed in scientific notation to estimate very large or very small numbers;
- Evaluate square roots of perfect squares and cube roots of perfect cubes for positive numbers less than or equal to 400;
- 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;
- Solve multistep linear equations and inequalities involving integer coefficients with the same variable on both sides;
- Solve a system of linear equations by graphing when given the equations in slope-intercept form;
- Identify a function given a table, graph, or set of ordered pairs;
- Identify linear functions from tables, equations, and graphs;

- Determine the rate of change and initial value of a linear relationship given at least two  $(x, y)$  values;
- Determine the rate of change and initial value of a linear relationship given a graph;
- Analyze the graph of a function to determine features such as increasing/decreasing and linear/nonlinear;
- Write an equation in slope-intercept form given a graph;
- Given ordered pairs, identify a rotation, reflection, dilation, and/or translation;
- Determine whether a rotation, reflection, dilation, and/or translation creates congruent or similar figures;
- Identify the angle-angle criterion for triangle similarity;
- Identify the relationships between interior and exterior angles and between angles created by parallel lines cut by a transversal;
- Apply the Pythagorean theorem to find the missing side of a right triangle;
- Apply the Pythagorean theorem to find the distance between two points in a coordinate system;
- Use the formulas for the volumes of cones, cylinders, and spheres to solve mathematical problems;
- Construct a scatterplot for bivariate measurement data, and identify clusters, outliers, and associations;
- Informally fit a straight line to a scatterplot that suggests linear association;
- Construct a two-way table, and calculate relative frequencies.

### **Not Proficient**

*Students who are Not Proficient demonstrate **inconsistent** understanding of grade level content standards and will need support.*

*Not Proficient students can:*

- Determine the whole numbers that a square root or cube root falls between (including on a number line);
- Recognize the digits of  $\pi$  to the hundredths;
- Find the value of an expression with a single whole-number exponent;
- Solve multistep linear equations and inequalities with a variable on only one side;
- Identify the solution to a linear system of equations when given a graph;
- Recognize dependent and independent variables;
- Identify the proportional relationship (rate of change) of a linear relationship given a table or graph;
- Represent proportional relationships using equations and graphs;
- Write an equation in slope-intercept form given the slope and the  $y$ -intercept;
- Given a graph, identify a rotation, reflection, dilation, and/or translation;
- Rotate, reflect, or translate a point on a graph;
- Identify the legs and the hypotenuse of a right triangle;
- Use the formulas to find area or circumference of circles;
- Identify parts of two- or three-dimensional figures;

- Given a scatterplot, identify the type of association, clusters, or outliers;
- Construct a two-way table.