Introduction

The Math Test Specifications provide an overview of the structure and content of Ohio's State Test. This overview includes a description of the test design as well as information on the types of items that will appear on the test. Also included is a test blueprint, a document that identifies the range and distribution of points grouped into various reporting categories (e.g., Fractions, Ratios and Proportions, Functions, Probability). The specifications also provide specific guidelines for the development of all items used for Ohio's math tests.
This document is a resource not only for item writers and test designers, but also for Ohio educators and other stakeholders who are interested in a deeper understanding of the test.

Overview of Structure and Content

Ohio's Learning Standards

In 2017, Ohio adopted revisions to Ohio's Learning Standards for Mathematics which include standards for mathematical content and mathematical practice. Then, based on the 2017 Standards, Ohio adopted revisions to the Model Curriculum, a document that connects standards to instruction. The mathematics assessment items (test questions) align to the 2017 Standards.

Standards for Mathematical Practice

The Standards for Mathematical Practice (SMP) describe skills that mathematics educators at all levels should seek to develop in their students. These practices rest on important "processes and proficiencies" with longstanding importance in mathematics education. The design of each item on Ohio's state tests encourages students to use one or more Standards for Mathematical Practice. Below is a list of the mathematical practices.

Grade 4 Standards for Mathematical Practice
1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.
5. Use appropriate tools strategically.
6. Attend to precision.
7. Look for and make use of structure.
8. Look for and express regularity in repeated reasoning.

Blueprint

Test blueprints serve as a guide for test construction and provide an outline of the content and skills to be measured on the test. They contain information about the number of points of opportunity students will encounter in each reporting category on the math test. The following test blueprint displays the distribution of the content standards and depth of knowledge across the entire test and categories for reporting test results for Grade 4.

Reporting Category	Standards				Approximate Portion of Test
Multiplication and Division	4.OA.1	4.OA.5	4.NBT.1	4.NBT.5	33% – 43% 17 – 21 points
	4.OA.2	4.MD.2	4.NBT.2	4.NBT.6	
	4.OA.3	4.MD.3	4.NBT.3		
	4.OA.4		4.NBT.4		
Fractions	4.NF.1	4.NF.4	4.NF.7		33% – 43% 17 – 21 points
	4.NF.2	4.NF.5	4.MD.4		
	4.NF.3	4.NF.6			
Geometry	4.MD.1	4.MD.6	4.G.1		21% – 27% 11 – 13 points
	4.MD.5	4.MD.7	4.G.2		
				Total Test	49 – 51 points

Modeling and Reasoning* (minimum 20%)

Depth of Knowledge (DOK) Level	Approximate Portion of Test
1	9 – 16 points
2	23 – 33 points
3	5 – 13 points

Modeling and Reasoning

Modeling and Reasoning are included in the eight Standards for Mathematical Practice within Ohio's Learning Standards. Each grade's blueprint identifies modeling and reasoning as an independent reporting category that will account for a minimum of 20 percent of the overall points on that grade's test.

Depth of Knowledge (DOK)

DOK refers to the complexity of thinking required to complete a task in a given item. Items with a DOK 1 designation focus on the recall of information, such as definitions and terms, and

simple procedures. Items with a DOK 2 designation require students to make decisions, solve routine problems, perform calculations, or recognize patterns. Items with a DOK 3 designation feature higher-order cognitive tasks. These DOK 3 tasks include but are not limited to: critiquing a statement and forming a conclusion; explaining, justifying, or proving a statement; or approaching abstract, complex, open-ended, and non-routine problems. Each grade's blueprint contains information about the number of points of opportunity students will encounter at each DOK level.

Test Design

The assessment is a two-part test, developed in a computer-based format and a paper-based format. Its purpose is to measure student progress and provide information to parents, teachers, and building, district and state administrators. The test will contain technology-enhanced items that require the student to enter a response into the computer interface. The test will be administered near the end of the academic school year or the end of a semester (for high school). The test can be administered in one or two sessions. After the student has completed both parts of the test, his or her scores will be combined to yield a comprehensive test score. Test results are reported back to schools by June 30th.

Performance Level Descriptors (PLDs)

At each grade level/course, PLDs are general statements describing what students should know or be able to do at each performance level.

After the Ohio State Mathematics test is scored, each student's performance level is identified based on the combined scores (Part 1 and Part 2). Districts and schools are sent item level reports and the performance level for each student along with the performance level descriptors. Teachers and math coaches can use this information for their instructional design.

Calculator

Calculators are **not** permitted for use on either the paper-based or computer-based mathematics test for grades 3-5. Grades 6 and 7 have a non-calculator part and a calculator part for both the paper-based and the computer-based mathematics test. The calculator designation for items in grades 6 and 7 is decided during development on an item-by-item basis. A calculator may be used on the entire grade 8 and high school End of Course (EOC) paper-based or computer-based mathematics tests. Note that calculator usage may differ for those students with an Individualized Education Plan (IEP) or 504 plan that specifies a calculator accommodation.

- Guidance on Desmos Calculator for Grades 3-8
- Grades 3-8 Handheld Calculator Guidance

- Guidance on Desmos Calculator for High School
- High School Handheld Calculator Guidance

Reference Sheets

A reference sheet may be used on the Ohio State Mathematics Tests by all students in grades four and above. For paper-based testers, the math reference sheets will be included within the student test booklet. For online testers, the math reference sheet is embedded within the testing platform.

Interaction Types

Ohio's State Tests are composed of several interaction types. Currently, there are ten interaction types that may appear on a math computer-based assessment:

- Equation Item (EQ)
- Gap Match Item (GM)
- Grid Item (GI)
- Hot Text Item (HT)
- Inline Choice Item (IC)
- Matching Item (MI)
- Multiple Choice Item (MC)
- Multi Select Item (MS)
- Simulation Item (Sim)
- Table Item (TI)

For paper-based assessments (including those for students with an IEP or 504 plan that specifies a paper-based accommodation), the items may be modified so that they can be scanned and scored electronically or hand-scored.

Interaction Type	Description
Equation Item (EQ)	The student is presented with a keypad that includes a variety of mathematical symbols that can be used to create a response. Responses may be in the form of a number, variable, expression, or equation, as appropriate to the test item. The student enters their response in the response box which may be on a line by itself, or embedded in a sentence or phrase. For paper-based assessments, this interaction type may be replaced with a modified version of the item that can be scanned and scored electronically or the student may be given an answer box to write their answer.

Interaction Type	Description
Gap Match Item (GM)	Given a set of options (e.g., numbers, words, phrases, or sentences) the student hovers over the options which then highlight, indicating that the option is selectable. The student can then click on the object, hold down the mouse button, and drag it to an answer area, indicated by a dotted box, in a graphic, table, or paragraph. For paper-based assessments, the options are associated with a letter, and students write a letter for their response in each response area.
Grid Item (GI)	The student may select numbers, words, phrases, or images to display their response. The student may also use the drag-and-drop feature to place objects into a response area. This interaction type may also require the student to use the point, line, or arrow tools to create a response on a graph or gridded area. For paper-based assessments, the student may be given the response space to draw their answer, or this interaction type may be replaced with another interaction type that assesses the same standard at the same level of difficulty and can be scanned and scored electronically.
Hot Text Item (HT)	**Selectable Hot Text -** Given a set of options (e.g., phrases, sentences, or numbers) the student hovers over the options which then highlight, indicating that the text is selectable ("hot"). The student can then click on an option to select it as their response. For paper-based assessments, a "selectable" hot text item is modified so that it can be scanned and scored electronically. The student fills in a circle to indicate the correct response.
	Drag-and-Drop Hot Text - Given a set of options (e.g., numbers, words, phrases, or sentences) the student hovers over the options which then highlight, indicating that the option is selectable ("hot"). The student can then click on the object, hold down the mouse button, and drag it to a graphic, table, or paragraph. For paper-based assessments, the options are associated with a letter, and students write a letter for their response in each response area.
Inline Choice Item (IC)	Given a sentence, paragraph, or table, the student clicks a blank box embedded within a sentence or table which reveals a drop-down menu containing options for completing a sentence or table. The student then selects an option from the drop-down menu to respond. For paper-based assessments, the interaction is modified so that it can be scanned and scored electronically. The student fills in a circle to indicate the correct response.
Matching Item (MI)	Given column and row headers in a table format, the student checks a box to indicate if information from a column header matches information from a row header. For paper-based assessments, the interaction is modified so that it can be scanned and scored electronically. The student fills in a circle to indicate the correct response.

Interaction Type	Description
Multiple Choice Item (MC)	The student selects one correct answer from four options. For paper-based assessments, the student fills in a circle to indicate the correct response.
Multi Select Item (MS)	The student is directed to either select an indicated number of correct answers or to select all of the correct answers. Students in grades 3-5 always select an indicated number of correct answers; students in grades 6-8 select an indicated number of correct answers on 50% of the items and select all on 50% of the items; and students taking high school end-of-course tests are always directed to select all correct answers. These items are different from multiple choice items, and require the student to select 2 or more correct answers. For paper-based assessments, the student fills in circles to indicate the correct responses.
Simulation Item (Sim)	Given a set of instructions, the student may interact with any of the following controls to generate data: radio buttons, drop-down menus, slide bars, or selecting a number by clicking arrows. Once the student has set the parameters, they click the start button to begin the simulation and generate a data set. Once the student has enough data, they may answer questions about the data using a different interaction type. For paper-based assessments, this interaction will be replaced with another interaction type that assesses the same standard at the same level of difficulty and can be scanned and scored electronically.
Table Item (TI)	The student types numeric values into a given table. The student may complete the entire table or portions of the table depending on what is being asked. For paper-based assessments, the student writes their responses in the blank boxes of the table.

Specific Guidelines for Item Development

Standards are presented according to reporting categories as shown on grade level or course blueprints.

Reporting Category	**MULTIPLICATION AND DIVISION**
Content Standard	***4.OA OPERATIONS AND ALGEBRAIC THINKING*** **Use the four operations with whole numbers to solve problems.** ***4.OA.1*** Interpret a multiplication equation as a comparison, e.g., interpret 35 = 5 × 7 as a statement that 35 is 5 times as many as 7 and 7 times as many as 5. Represent verbal statements of multiplicative comparisons as multiplication equations.
Content Limits	• Multiplication situations must involve comparison. [See Table 2]* • An unknown can be in any position in a comparison problem. • All factors must be whole numbers. • Multiplication may be up to four digits by one-digit or two two-digit numbers. • Length models (e.g., bar or strip models, number lines, etc.) may be used.
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

*Table 2 is located on pg. 96 of the Ohio Learning Standards for Mathematics

Reporting Category	**MULTIPLICATION AND DIVISION**
Content Standard	***4.OA OPERATIONS AND ALGEBRAIC THINKING*** **Use the four operations with whole numbers to solve problems.** ***4.OA.2*** Multiply or divide to solve word problems involving multiplicative comparison, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem, distinguishing multiplicative comparison from additive comparison. See Table 2, page 96. Drawings need not show details, but should show the mathematics in the problem. (This applies wherever drawings are mentioned in the Standards.)
Content Limits	• Addition and multiplication situations must involve comparison. [See Tables 1 and 2]* • An unknown can be in any position in a comparison problem. • All factors, dividends, divisors, and quotients must be whole numbers. • Multiplication may be up to four digits by one digit or two two-digit numbers. • Division may be up to four-digit dividends and one-digit divisors. • Additive comparisons are limited to whole numbers within 1,000 (inclusive). • Length models (e.g., tape diagram, bar or strip models, number lines, etc.) may be used. • Excludes division problems with remainders.
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Required

*Table 1 is located on pg. 95 of the Ohio Learning Standards for Mathematics

*Table 2 is located on pg. 96 of the Ohio Learning Standards for Mathematics

Reporting Category	**MULTIPLICATION AND DIVISION**
Content Standard	***4.OA OPERATIONS AND ALGEBRAIC THINKING*** **Use the four operations with whole numbers to solve problems.** ***4.OA.3*** Solve multistep word problems posed with whole numbers and having whole-number answers using the four operations, including problems in which remainders must be interpreted. Represent these problems using equations with a letter standing for the unknown quantity. Assess the reasonableness of answers using mental computation and estimation strategies including rounding.
Content Limits	• Multistep problems limited to three steps or less. • Addition and subtraction are limited to whole numbers within 1,000 (inclusive). • All factors, products, dividends, and divisors must be whole numbers. • Multiplication may be up to four digits by one-digit or two two-digit numbers. • Division may be up to four-digit dividends and one-digit divisors. • Quotients may contain remainders. • Problems involving remainders must require the student to interpret the remainder in a context.
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Required

Reporting Category	**MULTIPLICATION AND DIVISION**
Content Standard	***4.OA OPERATIONS AND ALGEBRAIC THINKING*** **Gain familiarity with factors and multiples.** ***4.OA.4*** Find all factor pairs for a whole number in the range 1-100. Recognize that a whole number is a multiple of each of its factors. Determine whether a given whole number in the range 1-100 is a multiple of a given one-digit number. Determine whether a given whole number in the range 1-100 is prime or composite.
Content Limits	• Limited to whole numbers from 1-100.
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

Reporting Category	**MULTIPLICATION AND DIVISION**
Content Standard	***4.OA OPERATIONS AND ALGEBRAIC THINKING*** **Generate and analyze patterns.** ***4.OA.5*** Generate a number or shape pattern that follows a given rule. Identify apparent features of the pattern that were not explicit in the rule itself. *For example, given the rule "Add 3" and the starting number 1, generate terms in the resulting sequence and observe that the terms appear to alternate between odd and even numbers. Explain informally why the numbers will continue to alternate in this way.*
Content Limits	• Patterns limited to one-step. • Rules for patterns must be given. • Patterns may begin at numbers other than 0 or 1. • Patterns may be shown using numeric or geometric representations. • Patterns are limited to growing or repeating patterns.
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

Reporting Category	**MULTIPLICATION AND DIVISION**
Content Standard	***4.MD MEASUREMENT AND DATA*** **Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.** ***4.MD.2*** Solve real-world problems involving money, time, and metric measurement. ***4.MD.2a*** Using models, add and subtract money and express the answer in decimal notation. ***4.MD.2b*** Using number line diagrams, clocks, or other models, add and subtract intervals of time in hours and minutes. ***4.MD.2c*** Add, subtract, and multiply whole numbers to solve metric measurement problems involving distances, liquid volumes, and masses of objects.
Content Limits	General: • Multiplication may be up to four digits by one digit or two two-digit numbers. For money: • Addition and subtraction may include decimals with whole numbers (e.g., whole numbers through the tens place and decimals through the hundredths place). • Models must be provided whenever adding or subtracting with money. • Problems must use $ symbol when using decimal notation. For time: • Elapsed time may exceed 90 minutes. • Time intervals are given in whole minutes or a combination of an hour and whole minutes. For metric units: • Metric units are limited to kilometers, meters, centimeters, millimeters, kilograms, grams, liters, and milliliters. • Measurement conversions are from larger units to smaller units. • Limited to conversion within the metric system. • Limited to the following metric conversions: ○ kilometers to meters, meters to centimeters, centimeters to millimeters; ○ kilograms to grams; and ○ liter to milliliters. • Excludes decimal notation.
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Required

Reporting Category	**MULTIPLICATION AND DIVISION**
Content Standard	***4.MD MEASUREMENT AND DATA*** **Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.** ***4.MD.3*** Develop efficient strategies to determine the area and perimeter of rectangles in real-world situations and mathematical problems. *For example, given the total area and one side length of a rectangle, solve for the unknown factor, and given two adjacent side lengths of a rectangle, find the perimeter.*
Content Limits	General: • All shapes must be rectangles. • Side lengths are limited to whole numbers. • Problems must contain enough information to find the length of an unknown side. • Exponential unit notation is not expected at this grade (i.e., use square cm, not cm^2). For perimeter: • Addition and subtraction are limited to whole numbers less than 100,000 (exclusive). For area: • Plane figures in area items must be able to be completely covered by whole unit squares. • Multiplication may be up to four digits by one digit or two two-digit numbers. • Division may be up to four-digit dividends and one-digit divisors.
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

Reporting Category	**MULTIPLICATION AND DIVISION**
Content Standard	***4.NBT NUMBERS AND OPERATIONS IN BASE TEN*** **Generalize place value understanding for multi-digit whole numbers less than or equal to 1,000,000.** ***4.NBT.1*** Recognize that in a multi-digit whole number, a digit in one place represents ten times what it represents in the place to its right by applying concepts of place value, multiplication, or division.
Content Limits	• Place values limited to whole numbers within 1,000,000 (inclusive). • Problems may compare digits across more than one place value.
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

Reporting Category	**MULTIPLICATION AND DIVISION**
Content Standard	***4.NBT NUMBERS AND OPERATIONS IN BASE TEN*** **Generalize place value understanding for multi-digit whole numbers less than or equal to 1,000,000.** ***4.NBT.2*** Read and write multi-digit whole numbers using standard form, word form, and expanded form. Compare two multi-digit numbers based on meanings of the digits in each place, using >, =, and < symbols to record the results of comparisons. Grade 4 expectations in this domain are limited to whole numbers less than or equal to 1,000,000.
Content Limits	• Limited to whole numbers within 1,000,000 (inclusive). • Only the symbols <, =, or > may be used to compare whole numbers. • Comparison of numbers based on place-value understanding may contain: o the same number of digits; o the same leading digits; or o different leading digits and different number of digits. • Problems may include length models (e.g., number lines) or place value charts.
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

Reporting Category	**MULTIPLICATION AND DIVISION**
Content Standard	***4.NBT NUMBERS AND OPERATIONS IN BASE TEN*** **Generalize place value understanding for multi-digit whole numbers less than or equal to 1,000,000.** ***4.NBT.3*** Use place value understanding to round multi-digit whole numbers to any place through 1,000,000.
Content Limits	• Limited to whole numbers within 1,000,000 (inclusive). • Problems may include length models (e.g., number lines) or place value charts.
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

Reporting Category	**MULTIPLICATION AND DIVISION**
Content Standard	***4.NBT NUMBERS AND OPERATIONS IN BASE TEN*** **Use place value understanding and properties of operations to perform multi-digit arithmetic with whole numbers less than or equal to 1,000,000.** ***4.NBT.4*** Fluently add and subtract multi-digit whole numbers using a standard algorithm.
Content Limits	• Addition and subtraction are limited to whole numbers within 1,000,000 (inclusive).
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

Reporting Category	**MULTIPLICATION AND DIVISION**
Content Standard	***4.NBT NUMBERS AND OPERATIONS IN BASE TEN*** **Use place value understanding and properties of operations to perform multi-digit arithmetic with whole numbers less than or equal to 1,000,000.** ***4.NBT.5*** Multiply a whole number of up to four digits by a one-digit whole number, and multiply two two-digit numbers, using strategies based on place value and the properties of operations. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
Content Limits	• Multiplication may be up to four digits by one digit or two two-digit numbers. • Multiplication situations include those represented in Table 2*, but exclude comparison problems. • Excludes requirement to know, recognize, or use the formal name of any property.
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

*Table 2 is located on pg. 96 of the Ohio Learning Standards for Mathematics

Reporting Category	**MULTIPLICATION AND DIVISION**
Content Standard	***4.NBT NUMBERS AND OPERATIONS IN BASE TEN*** **Use place value understanding and properties of operations to perform multi-digit arithmetic with whole numbers less than or equal to 1,000,000.** ***4.NBT.6*** Find whole-number quotients and remainders with up to four-digit dividends and one-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
Content Limits	• Division may be up to four-digit dividends and one-digit divisors. • Multiplication situations include those represented in Table 2*, but exclude comparison problems. • Excludes requirement to know, recognize, or use the formal name of any property.
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

*Table 2 is located on pg. 96 of the Ohio Learning Standards for Mathematics

Reporting Category	**FRACTIONS**
Content Standard	***4.NF NUMBERS AND OPERATIONS–FRACTIONS*** **Extend understanding of fraction equivalence and ordering limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.** ***4.NF.1*** Explain why a fraction $^{a}/_{b}$ is equivalent to a fraction $^{(n \times a)}/_{(n \times b)}$ by using visual fraction models, with attention to how the number and size of the parts differ even though the two fractions themselves are the same size. Use this principle to recognize and generate equivalent fractions.
Content Limits	• Only denominators of 2, 3, 4, 5, 6, 8, 10, 12, 100 may be used. • Fractions may exceed one whole. • Equivalent fractions must refer to the same size whole. • Area models (e.g., circles, rectangles, squares, etc.) and length models (e.g., fraction strips or bars, number lines, etc.) may be used to represent fractions. • Excludes set models. • Excludes use of language such as “reduce,” “simplify,” or “lowest terms.”
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

Reporting Category	**FRACTIONS**
Content Standard	***4.NF NUMBERS AND OPERATIONS–FRACTIONS*** **Extend understanding of fraction equivalence and ordering limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.** ***4.NF.2*** Compare two fractions with different numerators and different denominators, e.g., by creating common denominators or numerators, or by comparing to a benchmark fraction such as $^1/_2$. Recognize that comparisons are valid only when the two fractions refer to the same whole. Record the results of comparisons with symbols >, =, or <, and justify the conclusions, e.g., by using a visual fraction model.
Content Limits	• Only denominators of 2, 3, 4, 5, 6, 8, 10, 12, 100 may be used. • Fractions may exceed one whole. • Benchmark fractions are limited to 0, $\frac{1}{2}$, and 1. • Problems may incorporate the concept of fractions having the same size whole. • Area models (e.g., circles, rectangles, squares, etc.) and length models (e.g., fraction strips or bars, number lines, etc.) may be used to represent fractions. • Only the symbols <, =, or > may be used to compare two fractions. • Excludes set models. • Excludes use of language such as “reduce,” “simplify,” or “lowest terms.”
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

Reporting Category	**FRACTIONS**
Content Standard	***4.NF NUMBERS AND OPERATIONS–FRACTIONS*** **Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100. (Fractions need not be simplified).** ***4.NF.3*** Understand a fraction $^{a}/_{b}$ with $a > 1$ as a sum of fractions $^{1}/_{b}$. ***4.NF.3a*** Understand addition and subtraction of fractions as joining and separating parts referring to the same whole. ***4.NF.3b*** Decompose a fraction into a sum of fractions with the same denominator in more than one way, recording each decomposition by an equation. Justify decompositions, e.g., by using a visual fraction model. *Examples:* $^{3}/_{8} = {}^{1}/_{8} + {}^{1}/_{8} + {}^{1}/_{8}$; $^{3}/_{8} = {}^{1}/_{8} + {}^{2}/_{8}$; $2\ {}^{1}/_{8} = 1 + 1 + {}^{1}/_{8} = {}^{8}/_{8} + {}^{8}/_{8} + {}^{1}/_{8}$. ***4.NF.3c*** Add and subtract mixed numbers with like denominators, e.g., by replacing each mixed number with an equivalent fraction, and/or by using properties of operations and the relationship between addition and subtraction. ***4.NF.3d*** Solve word problems involving addition and subtraction of fractions referring to the same whole and having like denominators, e.g., by using visual fraction models and equations to represent the problem.
Content Limits	• Only denominators of 2, 3, 4, 5, 6, 8, 10, 12, 100 may be used. • Fractions may exceed one whole. • Mixed numbers and fractions must contain like denominators. • Addition and subtraction situations may include add to, take from, pull together, take apart, and comparison. [See Table 1]* • Area models (e.g., circles, rectangles, squares, etc.) and length models (e.g., fraction strips or bars, number lines, etc.) may be used to represent fractions. • Excludes set models. • Excludes use of language such as “reduce,” “simplify,” or “lowest terms.”
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

*Table 1 is located on pg. 95 of the Ohio Learning Standards for Mathematics

Reporting Category	**FRACTIONS**
Content Standard	***4.NF NUMBERS AND OPERATIONS–FRACTIONS*** **Build fractions from unit fractions by applying and extending previous understandings of operations on whole numbers limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100. (Fractions need not be simplified).** ***4.NF.4*** Apply and extend previous understandings of multiplication to multiply a fraction by a whole number. ***4.NF.4a*** Understand a fraction $^{a}/_{b}$ as a multiple of $^{1}/_{b}$. *For example, use a visual fraction model to represent* $^{5}/_{4}$ *as the product* $5 \times (^{1}/_{4})$*, recording the conclusion by the equation* $^{5}/_{4} = 5 \times (^{1}/_{4})$ *or* $^{5}/_{4} = (^{1}/_{4}) + (^{1}/_{4}) + (^{1}/_{4}) + (^{1}/_{4}) + (^{1}/_{4})$. ***4.NF.4b*** Understand a multiple of $^{a}/_{b}$ as a multiple of $^{1}/_{b}$, and use this understanding to multiply a fraction by a whole number. *For example, use a visual fraction model to express* $3 \times (^{2}/_{5})$ *as* $6 \times (^{1}/_{5})$*, recognizing this product as* $^{6}/_{5}$*. (In general,* $n \times (^{a}/_{b}) = ^{(n \times a)}/_{b}$.) ***4.NF.4c*** Solve word problems involving multiplication of a fraction by a whole number, e.g., by using visual fraction models and equations to represent the problem. *For example, if each person at a party will eat* $^{3}/_{8}$ *of a pound of roast beef, and there will be 5 people at the party, how many pounds of roast beef will be needed? Between what two whole numbers does your answer lie?*
Content Limits	• Only denominators of 2, 3, 4, 5, 6, 8, 10, 12, 100 may be used. • Fractions may exceed one whole. • Multiplication is limited to a whole number times a fraction. • Multiplication situations may include equal groups, arrays, and/or area problems. [See Table 2]* • Area models (e.g., circles, rectangles, squares, etc.) and length models (e.g., fraction strips or bars, number lines, etc.) may be used to represent fractions. • Excludes set models. • Excludes use of language such as “reduce,” “simplify,” or “lowest terms.”
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

*Table 2 is located on pg. 96 of the Ohio Learning Standards for Mathematics

Reporting Category	**FRACTIONS**
Content Standard	***4.NF NUMBERS AND OPERATIONS–FRACTIONS*** **Understand decimal notation for fractions, and compare decimal fractions limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.** ***4.NF.5*** Express a fraction with denominator 10 as an equivalent fraction with denominator 100, and use this technique to add two fractions with respective denominators 10 and 100. *For example, express* $^{3}/_{10}$ *as* $^{30}/_{100}$*, and add* $^{3}/_{10} + {}^{4}/_{100} = {}^{34}/_{100}$*.* In general, students who can generate equivalent fractions can develop strategies for adding fractions with unlike denominators, but addition and subtraction with unlike denominators is not a requirement at this grade.
Content Limits	• Only denominators of 10 and 100 may be used. • Fractions may exceed one whole. • Mixed numbers may be used. • Equivalent fractions must refer to the same size whole. • Area models (e.g., rectangles or squares) and length models (e.g., fraction strips or bars, number lines, etc.) may be used to represent fractions. • Excludes decimal notation. • Excludes set models.
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

Reporting Category	**FRACTIONS**
Content Standard	***4.NF NUMBERS AND OPERATIONS–FRACTIONS*** **Understand decimal notation for fractions, and compare decimal fractions limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.** ***4.NF.6*** Use decimal notation for fractions with denominators 10 or 100. *For example, rewrite 0.62 as $^{62}/_{100}$; describe a length as 0.62 meters; locate 0.62 on a number line diagram.*
Content Limits	• Only denominators of 10 and 100 may be used. • Decimal notation may be through hundredths. • Problems may require writing decimals as fractions or fractions as decimals. • Fractions and decimals may exceed one whole. • Mixed numbers in fraction or decimal notation may be used. • Equivalent fractions must refer to the same size whole. • Area models (e.g., rectangles or squares) and length models (e.g., fraction strips or bars, number lines, etc.) may be used to represent fractions. • Excludes set models.
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

Reporting Category	**FRACTIONS**
Content Standard	***4.NF NUMBERS AND OPERATIONS–FRACTIONS*** **Understand decimal notation for fractions, and compare decimal fractions limited to fractions with denominators 2, 3, 4, 5, 6, 8, 10, 12, and 100.** ***4.NF.7*** Compare two decimals to hundredths by reasoning about their size. Recognize that comparisons are valid only when the two decimals refer to the same whole. Record the results of comparisons with the symbols >, =, or <, and justify the conclusions, e.g., by using a visual model.
Content Limits	• Decimal notation is limited to tenths and hundredths. • Decimals may exceed one whole. • Problems may incorporate the concept of decimals having different sized wholes. • Area models (e.g., rectangles, squares) and length models (e.g., fraction strips or bars, number lines, etc.) may be used to represent decimals. • Only the symbols <, =, or > may be used to compare two decimals. • Excludes set models.
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

Reporting Category	**FRACTIONS**
Content Standard	***4.MD MEASUREMENT AND DATA*** **Solve problems involving measurement and conversion of measurements from a larger unit to a smaller unit.** ***4.MD.1*** Know relative sizes of the metric measurement units within one system of units. Metric units include kilometer, meter, centimeter, and millimeter; kilogram and gram; and liter and milliliter. Express a larger measurement unit in terms of a smaller unit. Record measurement conversions in a two-column table. *For example, express the length of a 4-meter rope in centimeters. Because 1 meter is 100 times as long as a 1 centimeter, a two-column table of meters and centimeters includes the number pairs 1 and 100, 2 and 200, 3 and 300,...*

Content Limits	• Metric units are limited to kilometers, meters, centimeters, millimeters, kilograms, grams, liters, and milliliters.
	• Conversions must be from larger units to smaller units.
	• All factors and products must be whole numbers.
	• Metric conversions are limited to the following:
	  ○ kilometers to meters, meters to centimeters, centimeters to millimeters;
	  ○ kilograms to grams; and
	  ○ liter to milliliters.

DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

Reporting Category	**FRACTIONS**
Content Standard	***4.MD MEASUREMENT AND DATA*** **Represent and interpret data.** ***4.MD.4*** Display and interpret data in graphs (picture graphs, bar graphs, and line plots) to solve problems using numbers and operations for this grade.
Content Limits	Picture Graphs • Scale may contain halves and quarters. Bar Graphs • Real-world contexts may include money and metric measures. • Scale can be whole numbers or fractions of halves and quarters when appropriate. Line Plots • Real-world contexts may money and metric measures. • Scale can be whole numbers, halves, quarters, tenths, or hundredths when appropriate.
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Required

Reporting Category	**GEOMETRY**
Content Standard	***4.MD MEASUREMENT AND DATA*** **Geometric measurement: understand concepts of angle and measure angles.** ***4.MD.5*** Recognize angles as geometric shapes that are formed wherever two rays share a common endpoint, and understand concepts of angle measurement. ***4.MD.5a*** Understand an angle is measured with reference to a circle with its center at the common endpoint of the rays, by considering the fraction of the circular arc between the points where the two rays intersect the circle. An angle that turns through $^{1}/_{360}$ of a circle is called a "one-degree angle," and can be used to measure angles. ***4.MD.5b*** Understand an angle that turns through *n* one-degree angles is said to have an angle measure of *n* degrees.
Content Limits	• Limited to whole-number degree measures. • Angles measures may be less than or equal to 360°.
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

Reporting Category	**GEOMETRY**
Content Standard	***4.MD MEASUREMENT AND DATA*** **Geometric measurement: understand concepts of angle and measure angles.** ***4.MD.6*** Measure angles in whole-number degrees using a protractor. Sketch angles of specified measure.
Content Limits	• Limited to whole-number degree measures. • Angles measures may be less than or equal to 360°. • Online problems will provide protractors anytime an angle measurement is required. • Only the protractors provided in an online item should be used when measuring angles.
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

Reporting Category	**GEOMETRY**
Content Standard	***4.MD MEASUREMENT AND DATA*** **Geometric measurement: understand concepts of angle and measure angles.** ***4.MD.7*** Recognize angle measure as additive. When an angle is decomposed into non-overlapping parts, the angle measure of the whole is the sum of the angle measures of the parts. Solve addition and subtraction problems to find unknown angles on a diagram in real-world and mathematical problems, e.g., by using an equation with a symbol for the unknown angle measure.
Content Limits	• Limited to whole-number degree measures. • Sum of angle measures may be less than or equal to 180°. • Addition and subtraction are limited to whole number degrees within 180 (inclusive).
DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

Reporting Category	**GEOMETRY**
Content Standard	***4.G GEOMETRY*** **Draw and identify lines and angles, and classify shapes by properties of their lines and angles.** ***4.G.1*** Draw points, lines, line segments, rays, angles (right, acute, and obtuse), and perpendicular and parallel lines. Identify these in two-dimensional figures.

Content Limits	• Problems are limited to Van Hiele Level 0 (Visualization) and Level 1 (Analysis).
	• Two-dimensional figures limited to polygons with up to 6 sides.
	• Drawings of two dimensional figures are limited to the following attributes:
	  ○ properties of angles;
	  ○ number of sides;
	  ○ parallel sides; and/or
	  ○ perpendicular sides.
	• Excludes usage of formal geometric notation for points, lines, line segments, rays, angles, parallel, and perpendicular (e.g., $\rightarrow, \leftrightarrow \angle, \parallel, \perp$, etc.).

DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional

Reporting Category	**GEOMETRY**
Content Standard	***4.G GEOMETRY*** **Draw and identify lines and angles, and classify shapes by properties of their lines and angles.** ***4.G.2*** Classify two-dimensional figures based on the presence or absence of parallel or perpendicular lines or the presence or absence of angles of a specified size.

Content Limits	• Problems are limited to Van Hiele Level 0 (Visualization) and Level 1 (Analysis).
	• Two-dimensional figures limited to polygons with up to 6 sides.
	• Classification of two-dimensional figures is limited to the following attributes:
	  ○ presence or absence of acute, right, and/or obtuse angles;
	  ○ presence or absence of parallel and/or perpendicular sides; and/or
	  ○ presence or absence of symmetry.
	• Excludes hierarchy of quadrilaterals (i.e., all squares are rhombuses but not all rhombuses are squares).

DOK	1, 2, and/or 3 are eligible. DOK levels are designated on an item-by-item basis.
Context	Context Optional