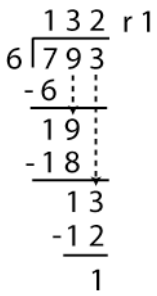
Grade 5

5.1. Core Content: *Multi-digit division* *(Operations, Algebra)*

Students learn efficient ways to divide whole numbers. They apply what they know about division to solve problems, using estimation and mental math skills to decide whether their results are reasonable. This emphasis on division gives students a complete set of tools for adding, subtracting, multiplying, and dividing whole numbers—basic skills for everyday life and further study of mathematics.

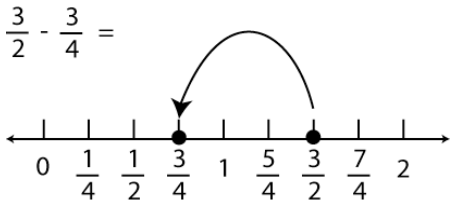
Performance Expectations	***Explanatory Comments and Examples***
Students are expected to:	
5.1.A Represent multi-digit division using place value models and connect the representation to the related equation.	Students use pictures or grid paper to represent division and describe how that representation connects to the related equation. They could also use physical objects such as base ten blocks to support the visual representation. Note that the algorithm for long division is addressed in expectation 5.1.C.
5.1.B Determine quotients for multiples of 10 and 100 by applying knowledge of place value and properties of operations.	Example: • Using the fact that 16 ÷ 4 = 4, students can generate the related quotients 160 ÷ 4 = 40 and 160 ÷ 40 = 4.
5.1.C Fluently and accurately divide up to a four-digit number by one- or two-digit divisors using the standard long-division algorithm.	The use of 'R' or 'r' to indicate a remainder may be appropriate in most of the examples students encounter in grade five. However, students should also be aware that in subsequent grades, they will learn additional ways to represent remainders, such as fractional or decimal parts. Example: •  Teachers should be aware that in some countries the algorithm might be recorded differently.

Performance Expectations *Students are expected to:*	Explanatory Comments and Examples
5.1.D Estimate quotients to approximate solutions and determine reasonableness of answers in problems involving up to two-digit divisors.	Example: • The team has saved $45 to buy soccer balls. If the balls cost $15.95 each, is it reasonable to think there is enough money for more than two balls? Problems like 54,596 ÷ 798, which can be estimated by 56,000 ÷ 800, while technically beyond the standards, could be included when appropriate. The numbers are easily manipulated and the problems support the ongoing development of place value.
5.1.E Mentally divide two-digit numbers by one-digit divisors and explain the strategies used.	
5.1.F Solve single- and multi-step word problems involving multi-digit division and verify the solutions.	The intent of this expectation is for students to show their work, explain their thinking, and verify that the answer to the problem is reasonable in terms of the original context and the mathematics used to solve the problem. Verifications can include the use of numbers, words, pictures, or equations. Problems include those with and without remainders.

Grade 5

5.2. Core Content: *Addition and subtraction of fractions and decimals (Numbers, Operations, Algebra)*

Students extend their knowledge about adding and subtracting whole numbers to learning procedures for adding and subtracting fractions and decimals. Students apply these procedures, along with mental math and estimation, to solve a wide range of problems that involve more of the types of numbers students see in other school subjects and in their lives.

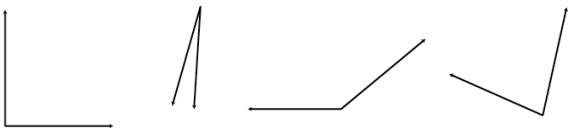
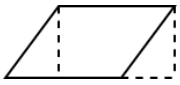
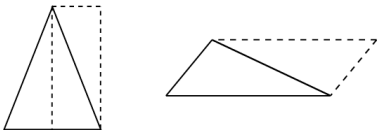
Performance Expectations	***Explanatory Comments and Examples***
Students are expected to:	
5.2.A Represent addition and subtraction of fractions and mixed numbers using visual and numerical models, and connect the representation to the related equation.	This expectation includes numbers with like and unlike denominators. Students should be able to show these operations on a number line and should be familiar with the use of pictures and physical materials (like fraction pieces or fraction bars) to represent addition and subtraction of mixed numbers. They should be able to describe how a visual representation connects to the related equation. Example: 
5.2.B Represent addition and subtraction of decimals using place value models and connect the representation to the related equation.	Students should be familiar with using pictures and physical objects to represent addition and subtraction of decimals and be able to describe how those representations connect to related equations. Representations may include base ten blocks, number lines, and grid paper.
5.2.C Given two fractions with unlike denominators, rewrite the fractions with a common denominator.	Fraction pairs include denominators with and without common factors. When students are fluent in writing equivalent fractions, it helps them compare fractions and helps prepare them to add and subtract fractions. Examples: • Write equivalent fractions with a common denominator for $\frac{2}{3}$ and $\frac{3}{4}$. • Write equivalent fractions with a common denominator for $\frac{3}{8}$ and $\frac{1}{6}$.

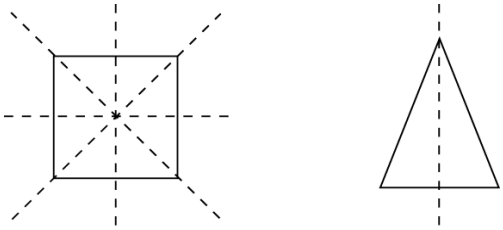
Performance Expectations *Students are expected to:*	Explanatory Comments and Examples
5.2.D Determine the greatest common factor and the least common multiple of two or more whole numbers.	Least common multiple (LCM) can be used to determine common denominators when adding and subtracting fractions. Greatest common factor (GCF) can be used to simplify fractions.
5.2.E Fluently and accurately add and subtract fractions, including mixed numbers.	Fractions can be in either proper or improper form. Students should also be able to work with whole numbers as part of this expectation.
5.2.F Fluently and accurately add and subtract decimals.	Students should work with decimals less than 1 and greater than 1, as well as whole numbers, as part of this expectation.
5.2.G Estimate sums and differences of fractions, mixed numbers, and decimals to approximate solutions to problems and determine reasonableness of answers.	Example: • Jared is making a frame for a picture that is $10\frac{3}{4}$ inches wide and $15\frac{1}{8}$ inches tall. He has a 4-ft length of metal framing material. Estimate whether he will have enough framing material to frame the picture.
5.2.H Solve single- and multi-step word problems involving addition and subtraction of whole numbers, fractions (including mixed numbers), and decimals, and verify the solutions.	The intent of this expectation is for students to show their work, explain their thinking, and verify that the answer to the problem is reasonable in terms of the original context and the mathematics used to solve the problem. Verifications can include the use of numbers, words, pictures, or equations. Multi-step problems may also include previously learned computational skills like multiplication and division of whole numbers.

Grade 5

5.3. Core Content: *Triangles and quadrilaterals* *(Geometry/Measurement, Algebra)*

Students focus on triangles and quadrilaterals to formalize and extend their understanding of these geometric shapes. They classify different types of triangles and quadrilaterals and develop formulas for their areas. In working with these formulas, students reinforce an important connection between algebra and geometry. They explore symmetry of these figures and use what they learn about triangles and quadrilaterals to solve a variety of problems in geometric contexts.

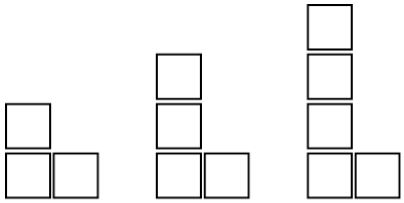
Performance Expectations	***Explanatory Comments and Examples***
Students are expected to:	
5.3.A Classify quadrilaterals.	Students sort a set of quadrilaterals into their various types, including parallelograms, kites, squares, rhombi, trapezoids, and rectangles, noting that a square can also be classified as a rectangle, parallelogram, and rhombus.
5.3.B Identify, sketch, and measure acute, right, and obtuse angles.	Example: • Use a protractor to measure the following angles and label each as acute, right, or obtuse. 
5.3.C Identify, describe, and classify triangles by angle measure and number of congruent sides.	Students classify triangles by their angle size using the terms *acute*, *right*, or *obtuse*. Students classify triangles by the length of their sides using the terms *scalene*, *isosceles*, or *equilateral*.
5.3.D Determine the formula for the area of a parallelogram by relating it to the area of a rectangle.	Students relate the area of a parallelogram to the area of a rectangle, as shown below. 
5.3.E Determine the formula for the area of a triangle by relating it to the area of a parallelogram.	Students relate the area of a triangle to the area of a parallelogram, as shown below. 

Performance Expectations *Students are expected to:*	Explanatory Comments and Examples
5.3.F Determine the perimeters and areas of triangles and parallelograms.	Students may be given figures showing some side measures or may be expected to measure sides of figures. If students are not given side measures, but instead are asked to make their own measurements, it is important to discuss the approximate nature of any measurement.
5.3.G Draw quadrilaterals and triangles from given information about sides and angles.	Examples: • Draw a triangle with one right angle and no congruent sides. • Draw a rhombus that is not a square. • Draw a right scalene triangle.
5.3.H Determine the number and location of lines of symmetry in triangles and quadrilaterals.	Example: • Draw and count all the lines of symmetry in the square and isosceles triangle below. (Lines of symmetry are shown as dotted lines.) 
5.3.I Solve single- and multi-step word problems about the perimeters and areas of quadrilaterals and triangles and verify the solutions.	The intent of this expectation is for students to show their work, explain their thinking, and verify that the answer to the problem is reasonable in terms of the original context and the mathematics used to solve the problem. Verifications can include the use of numbers, words, pictures, or equations.

Grade 5

5.4. Core Content: *Representations of algebraic relationships (Operations, Geometry/Measurement, Algebra)*

Students continue their development of algebraic thinking as they move toward more in-depth study of algebra in middle school. They use variables to write simple algebraic expressions describing patterns or solutions to problems. They use what they have learned about numbers and operations to evaluate simple algebraic expressions and to solve simple equations. Students make tables and graphs from linear equations to strengthen their understanding of algebraic relationships and to see the mathematical connections between algebra and geometry. These foundational algebraic skills allow students to see where mathematics, including algebra, can be used in real situations, and these skills prepare students for success in future grades.

Performance Expectations	***Explanatory Comments and Examples***
Students are expected to:	
5.4.A Describe and create a rule for numerical and geometric patterns and extend the patterns.	Example: • The picture shows a sequence of towers constructed from cubes. The number of cubes needed to build each tower forms a numeric pattern. Determine a rule for the number of cubes in each tower and use the rule to extend this pattern.  Tower 1 Tower 2 Tower 3
5.4.B Write a rule to describe the relationship between two sets of data that are linearly related.	Rules can be written using words or algebraic expressions. Example: • The table below shows numerators (top row) and denominators (bottom row) of fractions equivalent to a given fraction ($\frac{1}{3}$). Write a rule that could be used to describe how the two rows could be related. 1 2 3 4 3 6 9 ?

Performance Expectations

Students are expected to:

Explanatory Comments and Examples

5.4.C Write algebraic expressions that represent simple situations and evaluate the expressions, using substitution when variables are involved.

Students should evaluate expressions with and without parentheses. Evaluating expressions with parentheses is an initial step in learning the proper order of operations.

Examples:

- Evaluate $(4 \times n) + 5$ when $n = 2$.
- If 4 people can sit at 1 table, 8 people can sit at 2 tables, and 12 people can sit at 3 tables, and this relationship continues, write an expression to describe the number of people who can sit at n tables and tell how many people can sit at 67 tables.
- Compare the answers to A and B below. Why aren't the answers the same?

  A: (3 x 10) + 2

  B: 3 x (10 + 2)

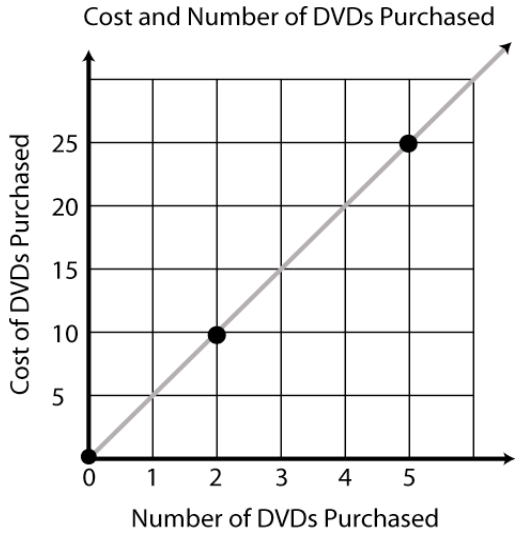
5.4.D Graph ordered pairs in the coordinate plane for two sets of data related by a linear rule and draw the line they determine.

Example:

- The table shows the total cost of purchasing different quantities of equally priced DVDs.

number purchased	0	2	5
total cost	$0	$10	$25

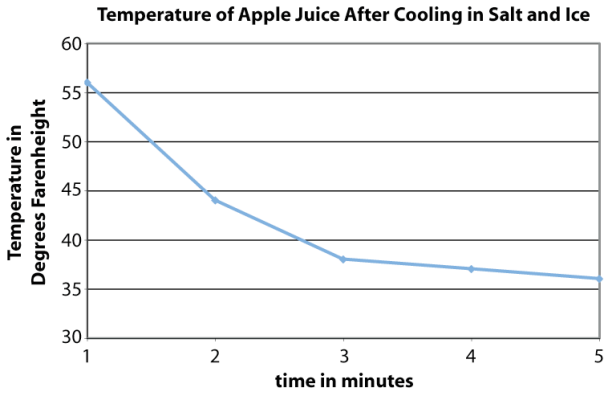
Graph the ordered pairs (0,0), (2,10), and (5, 25) and the line connecting the ordered pairs. Use the line to determine the total cost when 3 DVDs are purchased.



Grade 5

5.5. Additional Key Content *(Numbers, Data/Statistics/Probability)*

Students extend their work with common factors and common multiples as they deal with prime numbers. Students extend and reinforce their use of numbers, operations, and graphing to describe and compare data sets for increasingly complex situations they may encounter in other school subjects and in their lives.

Performance Expectations *Students are expected to:*	***Explanatory Comments and Examples***
5.5.A Classify numbers as prime or composite.	Divisibility rules can help determine whether a number has particular factors.
5.5.B Determine and interpret the mean of a small data set of whole numbers.	At this grade level, numbers for problems are selected so that the mean will be a whole number. Example: • Seven families report the following number of pets. Determine the mean number of pets per family. 0, 3, 3, 3, 5, 6, and 8 [One way to interpret the mean for this data set is to say that if the pets are redistributed evenly, each family will have 4 pets.] • The heights of five trees in front of the school are given below. What is the average height of these trees? Does this average seem to represent the 'typical' size of these trees? Explain your answer. 3 ft., 4 ft., 4 ft., 4 ft., 20 ft.
5.5.C Construct and interpret line graphs.	Line graphs are used to display changes in data over time. Example: • Below is a line graph that shows the temperature of a can of juice after the can has been placed in ice and salt over a period of time. Describe any conclusions you can make about the data. 

Grade 5

5.6. Core Processes: *Reasoning, problem solving, and communication*

Students in grade five solve problems that extend their understanding of core mathematical concepts—such as division of multi-digit numbers, perimeter, area, addition and subtraction of fractions and decimals, and use of variables in expressions and equations—as they make strategic decisions leading to reasonable solutions. Students use pictures, symbols, or mathematical language to explain the reasoning behind their decisions and solutions. They further develop their problem-solving skills by making generalizations about the processes used and applying these generalizations to similar problem situations. These critical reasoning, problem-solving, and communication skills represent the kind of mathematical thinking that equips students to use the mathematics they know to solve a growing range of useful and important problems and to make decisions based on quantitative information.

Performance Expectations

Students are expected to:

5.6.A Determine the question(s) to be answered given a problem situation.

5.6.B Identify information that is given in a problem and decide whether it is essential or extraneous to the solution of the problem.

5.6.C Determine whether additional information is needed to solve the problem.

5.6.D Determine whether a problem to be solved is similar to previously solved problems, and identify possible strategies for solving the problem.

5.6.E Select and use one or more appropriate strategies to solve a problem, and explain the choice of strategy.

5.6.F Represent a problem situation using words, numbers, pictures, physical objects, or symbols.

5.6.G Explain why a specific problem-solving strategy or procedure was used to determine a solution.

5.6.H Analyze and evaluate whether a solution is reasonable, is mathematically correct, and answers the question.

5.6.I Summarize mathematical information, draw conclusions, and explain reasoning.

Explanatory Comments and Examples

Descriptions of solution processes and explanations can include numbers, words (including mathematical language), pictures, physical objects, or equations. Students should be able to use all of these representations as needed. For a particular solution, students should be able to explain or show their work using at least one of these representations and verify that their answer is reasonable.

Examples:

- La Casa Restaurant uses rectangular tables. One table seats 6 people, with 1 person at each end and 2 people on each long side. However, 2 tables pushed together, short end to short end, seat only 10 people. Three tables pushed together end-to-end seat only 14 people. Write a rule that describes how many can sit at *n* tables pushed together end-to-end. The restaurant's long banquet hall has tables pushed together in a long row to seat 70. How many tables were pushed together to seat this many people? How do you know?
- The small square in the tangram figure below is $\frac{1}{8}$ the area of the large square.

  For each of the 7 tangram pieces that make up the large square, tell what fractional part of the large square that piece represents. How do you know?

Performance Expectations

Students are expected to:

5.6.J Make and test conjectures based on data (or information) collected from explorations and experiments.

Explanatory Comments and Examples