

## DOL: Mathematics K-8

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### Numbers and Operations

#### *Grade K*

##### DOL.K.NO.01 Count, write, and order numbers

- DOL.K.NO.01.01 Count to 100, starting at any number less than 100.
- DOL.K.NO.01.02 Count to 100 by 1's, 5's and 10's. Count by 2's to 100 (Count by 2's to 30 using grouped objects as needed.)
- DOL.K.NO.01.03 Read and write numbers 0 to 30 and connect them to the quantities they represent.
- DOL.K.NO.01.04 Use one-to-one correspondence to compare and order sets of objects to 30.
- DOL.K.NO.01.05 Relate that the last number counted is the quantity of objects.
- DOL.K.NO.01.06 Compose and decompose numbers from 2 to 10 with attention to the additive structure of number systems.
- DOL.K.NO.01.07 Understand the numbers 10 to 30 as having one, two, or three groups of ten and ones.
- DOL.K.NO.01.08 Use ordinals to identify position in a sequence up to 10th.
- DOL.K.NO.01.09 Compare and order the number of objects in two groups.
- DOL.K.NO.01.10 Demonstrate that quantities rearranged but not added to or subtracted from remain unchanged.

##### DOL.K.NO.02 Perform operations- addition and subtraction

- DOL.K.NO.02.01 Understand addition and subtraction are strategies that are more efficient for solving problems that involve counting.
- DOL.K.NO.02.02 Describe and represent addition and subtraction in various ways.
- DOL.K.NO.02.03 Record mathematical thinking by writing simple addition and subtraction sentences.
- DOL.K.NO.02.04 Record and solve simple addition and subtraction word problems, and add and subtract within 10.
- DOL.K.NO.02.05 Decompose numbers less than or equal to 10 into two addends in more than one way.

##### DOL.K.NO.03 Understand fractions

- DOL.K.NO.03.01 Identify verbally that shapes can be divided into equal parts such as one half, one third, and one fourth.

#### *Grade 1*

##### DOL.1.NO.01 Count, write and order numbers

- DOL.1.NO.01.01 Count to 120, starting at any number less than 120.
- DOL.1.NO.01.02 Count to 120 by 1's, 2's, and 5's; count to 500 by 10's and 100's.
- DOL.1.NO.01.03 Read and write numerals and represent a number of objects with a written numeral up to 120.
- DOL.1.NO.01.04 Use ordinals to identify position in a sequence to 31st.

- DOL.1.NO.01.05 Compare and order numbers up to 120 using words (greater than/fewer than, more than/less than) and symbols (<, =, >).
- DOL.1.NO.01.06 Decide whether a number is even or odd up to 120.

#### DOL.1.NO.02 Perform operations- addition and subtraction

- DOL.1.NO.02.01 relate counting to addition and subtraction using different strategies.
- DOL.1.NO.02.02 Use properties of operations as strategies to add and subtract.
- DOL.1.NO.02.03 Understand that switching the order of a subtraction problem requires different numbers than they know how to use (in other words commutative property works for addition, but not subtraction).
- DOL.1.NO.02.04 Relate subtraction as an unknown-addend problem.
- DOL.1.NO.02.05 Add and subtract within 20, solve all addition and subtraction facts up to 10 +10/ 20 -20 fluently.
- DOL.1.NO.02.06 Explain the meaning of the equal sign, and determine if equations involving addition and subtraction are true or false.
- DOL.1.NO.02.07 Use knowledge of fact families to solve simple open sentences for addition and subtraction.
- DOL.1.NO.02.08 Calculate sums and differences involving a two-digit number and a one-digit number, a two-digit number and a multiple of 10 without regrouping. Explain reasoning used.
- DOL.1.NO.02.09 Mentally compute sums and differences up to two-digit numbers using number facts and strategies. Explain how the answer was reached.
- DOL.1.NO.02.10 Use addition and and subtraction within 20 to solve word problems.
- DOL.1.NO.02.11 Solve word problems that call for addition of three whole numbers whose sum is less than or equal to 20.
- DOL.1.NO.02.12 Memorize basic addition and subtraction within 12 with quick and accurate recall.

#### DOL.1.NO.03 Understand place value

- DOL.1.NO.03.01 Understand that the two digits of a two-digit number represent amounts of groups of tens and ones.
- DOL.1.NO.03.02 Recognize that 10 can be thought of as a group, block, box, or bundle of ten ones. It can also be called a ten.
- DOL.1.NO.03.03 Compose and decompose numbers up to 99 as bundles of ten and ones.
- DOL.1.NO.03.04 Demonstrate that the numbers 10, 20, 30, 40, 50, 60, 70, 80, 90 refer to one, two, three, four, five, six, seven, eight, or nine tens and 0 ones.
- DOL.1.NO.03.05 Mentally calculate 10 more or 10 less up to 100, and explain how the answer was reached.

#### DOL.1.NO.04 Understand fractions

- DOL.1.NO.04.01 Identify verbally that shapes can be divided into equal parts such as one half, one third and one fourth.
- DOL.1.NO.04.02 Write parts in fraction form such as  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$ .

## Grade 2

### DOL.2.NO.01 Count, write, and order numbers

- DOL.2.NO.01.01 Count within 1,000 by 1's, 2's, 5's, 10's, and 100's starting from any number in the sequence.
- DOL.2.NO.01.02 Count by 3's and 4's starting from 0 to a given number.
- DOL.2.NO.01.03 Read and write numbers to 1000 using base-ten numerals, number names, and expanded form; relating them to quantities they represent.
- DOL.2.NO.01.04 Compare and order numbers to 1000 based on the meanings of hundreds, tens, and ones digits using the symbols  $<$ ,  $=$ , and  $>$ .
- DOL.2.NO.01.05 Decide whether a given number is even or odd.

### DOL.2.NO.02 Perform operations- addition and subtraction

- DOL.2.NO.02.01 Mentally compute sums and differences within 20.
- DOL.2.NO.02.02 Add and subtract fluently within 100 using strategies based on place value, properties of operations, and/or the relationship between addition and subtraction.
- DOL.2.NO.02.03 Add up to four two digit numbers using strategies based on place value and properties of operations.
- DOL.2.NO.02.04 Add and subtract within 1000, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between addition and subtraction; relate the strategy to a written method which may involve regrouping.
- DOL.2.NO.02.05 Mentally add or subtract 10 or 100 to a given number within 1000.
- DOL.2.NO.02.06 Explain why addition and subtraction strategies work, using place value and the properties of operations. (Explanations may be supported by drawings or objects.)
- DOL.2.NO.02.07 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with missing values in all positions, e.g., by using drawings and equations with a symbol for the unknown number to represent the problem.
- DOL.2.NO.02.08 Memorize basic addition and subtraction facts within 20 with quick and accurate recall.

### DOL.2.NO.03 Understand place value

- DOL.2.NO.03.01 Express numbers up to 1,000 using place value. Explain digits of a number represent amounts (ones, tens, and hundreds.) e.g. 406 is 4 hundreds, 0 tens, and 6 ones.
- DOL.2.NO.03.02 Recognize that 100 is a group of ten tens called a "hundred."
- DOL.2.NO.03.03 The numbers 100, 200, 300, 400, 500, 600, 700, 800, 900 refer to one, two, three, four, five, six, seven, eight, or nine hundreds (and 0 tens and 0 ones).

### DOL.2.NO.04 Perform operations- multiplication

- DOL.2.NO.04.01 Determine whether a group of objects (up to 20) has an odd or even number of members, e.g., by pairing objects or counting them by 2s; and dividing into two equal portions; write an equation to express an even number as a sum of two equal addends.

- DOL.2.NO.04.02 Ability to use repeated addition to find the number of objects in an array

#### DOL.2.NO.05 Understand fractions

- DOL.2.NO.05.01 Recognize, name, and represent commonly used unit fractions with denominators  $\frac{1}{2}$  or less. Model  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{1}{4}$  by folding strips.
- DOL.2.NO.05.02 Recognize, name, and write commonly used fractions:  $\frac{1}{2}$ ,  $\frac{1}{3}$ ,  $\frac{2}{3}$ ,  $\frac{2}{4}$ ,  $\frac{3}{4}$ .
- DOL.2.NO.05.03 Place 0 and halves on the number line and relate to a ruler. e.g.  $\frac{1}{2}$ ,  $1\frac{1}{2}$ ,  $\frac{2}{2}$ .
- DOL.2.NO.05.04 Recognize that fractions such as  $\frac{2}{2}$ ,  $\frac{3}{3}$ , and  $\frac{4}{4}$  are equal to the whole (one).

### Grade 3

#### DOL.3.NO.01 Understand place value

- DOL.3.NO.01.01 Identify the place value of a digit in a number and its value.
- DOL.3.NO.01.02 Read and write numbers to 10,000's in standard, written, and expanded form, and relate them to the quantities they represent.
- DOL.3.NO.01.03 Use place value understanding to round whole numbers to the nearest 10, 100, or 1,000.

#### DOL.3.NO.02 Perform operations- addition and subtraction

- DOL.3.NO.02.01 Maintain mastery of basic addition and subtraction facts with quick and accurate recall.
- DOL.3.NO.02.02 Fluently add and subtract within 1000 using strategies and algorithms based on place value, properties of operations, and/or the relationship between addition and subtraction.
- DOL.3.NO.02.03 Solve one- and two-step word problems using addition and subtraction and whole numbers.
- DOL.3.NO.02.04 Identify arithmetic patterns (including patterns in the addition table), and explain them using properties of operations.

#### DOL.3.NO.03 Perform operations- multiplication and division

- DOL.3.NO.03.01 Memorize basic multiplication facts within 144 with quick and accurate recall.
- DOL.3.NO.03.02 Mentally calculate simple products and quotients up to a three-digit number by a one-digit number involving multiples of 10, e.g.,  $500 \times 6$ , or  $400 \div 8$ .
- DOL.3.NO.03.03 Compute and interpret products of whole numbers.
- DOL.3.NO.03.04 Apply properties of operations as strategies to fluently multiply and divide within 144.
- DOL.3.NO.03.05 Use multiplication and division fact families to understand the inverse relationship of these two operations, e.g., because  $3 \times 8 = 24$ , we know that  $24 \div 8 = 3$  or  $24 \div 3 = 8$ .
- DOL.3.NO.03.06 Use multiplication and division within 144 to solve word problems in situations involving repeated addition, equal groups, arrays, and measurement quantities.
- DOL.3.NO.03.07 Understand that not all problems can be divided into whole number

solutions and solve division problems involving remainders, viewing the remainder as the “number left over.”

- DOL.3.NO.03.08 Solve one- and two-step word problems using multiplication and division and whole numbers.
- DOL.3.NO.03.09 Identify arithmetic patterns (including patterns in the multiplication table), and explain them using properties of operations.

#### DOL.3.NO.04 Use factors and multiples

- DOL.3.NO.04.01 Find all factor pairs for a whole number in the range 1–144.
- DOL.3.NO.04.02 Recognize that a whole number is a multiple of each of its factors.
- DOL.3.NO.04.03 Determine whether a given whole number in the range 1–144 is a multiple of a given one-digit number.

#### DOL.3.NO.05 Understand fractions

- DOL.3.NO.05.01 Understand a fraction  $1/b$  as the quantity formed by 1 part when a whole is partitioned into “b” equal parts.
- DOL.3.NO.05.02 Understand a fraction  $a/b$  as the quantity formed by “a” parts of size  $1/b$ .
- DOL.3.NO.05.03 Use the terms “numerator” and “denominator.”
- DOL.3.NO.05.04 Recognize and generate two fractions as equivalent (equal) if they are the same size, or the same point on a number line.
- DOL.3.NO.05.05 Compare two fractions with the same numerator or the same denominator by reasoning about their size.
- DOL.3.NO.05.06 Represent fractions on a number line diagram.
- DOL.3.NO.05.07 Represent a fraction  $1/b$  on a number line diagram by defining the interval from 0 to 1 as the whole and partitioning it into b equal parts.
- DOL.3.NO.05.08 Express whole numbers as fractions, and recognize fractions that are equivalent to whole numbers.
- DOL.3.NO.05.09 Recognize that addition and subtraction of fractions with equal denominators can be modeled by joining and taking away segments on the number line.

### Grade 4

#### DOL.4.NO.01 Understand place value

- DOL.4.NO.01.01 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.
- DOL.4.NO.01.02 Read and write multi-digit whole numbers using standard, written, and expanded form.
- DOL.4.NO.01.03 Compose and decompose multi-digit whole numbers using place value to 1,000,000's.
- DOL.4.NO.01.04 Compare two multi-digit numbers based on meanings of the digits in each place, using  $>$ ,  $=$ , and  $<$  symbols to record the results of comparisons.
- DOL.4.NO.01.05 Use place value understanding to round multi-digit whole numbers to any place.
- DOL.4.NO.01.06 Read, write, and compare decimals up to two decimal places.

#### DOL.4.NO.02 Perform operations- addition and subtraction

- DOL.4.NO.02.01 Maintain mastery of basic addition and subtraction facts with quick and accurate recall.
- DOL.4.NO.02.02 Fluently add and subtract multi-digit whole numbers using the standard algorithm.
- DOL.4.NO.02.03 For problems that use addition and subtraction of decimals through hundredths, represent with mathematical statements and solve.

DOL.4.NO.03 Perform operations- multiplication and division

- DOL.4.NO.03.01 Maintain mastery of basic multiplication facts within 144 with quick and accurate recall.
- DOL.4.NO.03.02 Memorize basic division facts within 144 with quick and accurate recall.
- DOL.4.NO.03.03 Multiply fluently a whole number of up to four digits by a one-digit whole number. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
- DOL.4.NO.03.04 Multiply a two-digit number by a one-digit number, two two-digit numbers, and a three-digit by two-digit number using strategies based on place value and the properties of operations.
- DOL.4.NO.03.05 Find whole number quotients and remainders with up to four-digit dividends and one-digit divisors and multiples of 10.
- DOL.4.NO.03.06 Multiply and divide decimals up to two decimal places by a one-digit whole number where the result is a terminating (non-repeating) decimal.

DOL.4.NO.04 Use factors and multiples

- DOL.4.NO.04.01 Find all factors of any whole number through 144, list factor pairs, and determine if a one-digit number is a factor of a given whole number.
- DOL.4.NO.04.02 Know that some numbers have exactly two factors (1 and the number itself) and are called prime numbers.
- DOL.4.NO.04.03 Determine whether a given whole number in the range 1–144 is prime or composite by using factors and multiples to compose and decompose whole numbers.
- DOL.4.NO.04.04 List the first ten multiples of a given one-digit whole number through 144.

DOL.4.NO.05 Understand fractions

- DOL.4.NO.05.01 Compare two fractions with different numerators and different denominators.
- DOL.4.NO.05.02 Compare and order up to three fractions with different numerators and different denominators, including improper fractions and mixed numbers.
- DOL.4.NO.05.03 Explain why equivalent fractions are equal.
- DOL.4.NO.05.04 Know that fractions of the form  $\frac{a}{b}$  where  $a$  is greater than  $b$ , are greater than 1 and are called improper fractions; locate improper fractions on the number line.
- DOL.4.NO.05.05 Write improper fractions as mixed numbers, and understand that a mixed number represents the number of "wholes" and the part of a whole remaining.

DOL.4.NO.06 Understand fractions- add and subtract

- DOL.4.NO.06.01 Understand addition and subtraction of fractions as joining and separating parts referring to the same whole.
- DOL.4.NO.06.02 Add and subtract fractions with like and unlike denominators (including mixed numbers).
- DOL.4.NO.06.03 Add and subtract fractions less than 1 with denominators through 100, in cases where the denominators are equal or when one denominator is a multiple of the other.
- DOL.4.NO.06.04 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.
- DOL.4.NO.06.05 Solve word problems involving addition and subtraction of fractions referring to the same whole and having like and unlike denominators.

DOL.4.NO.07 Understand fractions- multiply and divide

- DOL.4.NO.07.01 Multiply a fraction by a whole number, using repeated addition and area or array models.
- DOL.4.NO.07.02 Solve word problems involving multiplication of a fraction by a whole number.

DOL.4.NO.08 Understand decimals as fractions

- DOL.4.NO.08.01 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.
- DOL.4.NO.08.02 Write tenths and hundredths in decimal and fraction forms, and know the decimal equivalents for halves and fourths.
- DOL.4.NO.08.03 Recognize that fractions with denominators of place value names can be written as decimals, but other fractions need to be made equivalent in order to convert to decimals.

*Grade 5*

DOL.5.NO.01 Understand place value

- DOL.5.NO.01.01 Identify place value of a digit in a number and its value from thousandths to 1,000,000's.
- DOL.5.NO.01.02 Read and write numbers from the thousandths to 1,000,000's in standard, written, and expanded form and relate them to quantities they represent.
- DOL.5.NO.01.03 Compose and decompose multi-digit whole numbers using place value from the thousandths to 1,000,000's.
- DOL.5.NO.01.04 Read, write, compare ( $<$ ,  $=$ ,  $>$ ) and round decimals to the thousandths using base-ten numerals.
- DOL.5.NO.01.05 Recognize that in a multi-digit number, a digit in one place represents 10 times as much as it represents in the place to its right and  $1/10$  of what it represents in the place to its left.

DOL.5.NO.02 Perform operations- addition and subtraction

- DOL.5.NO.02.01 Maintain mastery of basic addition and subtraction facts with quick and

accurate recall.

- DOL.5.NO.02.02 Add and subtract whole numbers and decimals to the thousandths.

#### DOL.5.NO.03 Perform operations- multiplication and division

- DOL.5.NO.03.01 Maintain mastery of basic multiplication and division facts with quick and accurate recall.
- DOL.5.NO.03.02 Multiply decimal numbers by multiples of 10 to find products and identify patterns.
- DOL.5.NO.03.03 Fluently multiply multi-digit whole numbers by a two digit number, a three-digit number, and by multiples of 10.
- DOL.5.NO.03.04 Divide fluently up to a four-digit number by a two-digit number and by multiples of 10.
- DOL.5.NO.03.05 Demonstrate the meaning of division of whole numbers, with or without remainders. Relate division to fractions and to repeated subtraction. Show relationships and patterns.
- DOL.5.NO.03.06 Solve word problems involving multiplication and division of whole numbers.
- DOL.5.NO.03.07 Multiply and divide whole numbers and decimals to the thousandths and by multiples of 10.
- DOL.5.NO.03.08 Recognize and be able to explain common computational errors.

#### DOL.5.NO.04 Use factors and multiples

- DOL.5.NO.04.01 Find the greatest common factor of two or more whole numbers less than or equal to 144.
- DOL.5.NO.04.02 Find the least common multiple of two or more whole numbers up to 144.
- DOL.5.NO.04.03 Find prime numbers to 144.

#### DOL.5.NO.05 Understand fractions- add and subtract

- DOL.5.NO.05.01 Compare and order fractions and find equivalent fractions, including mixed numbers.
- DOL.5.NO.05.02 Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions using common denominators and the least common denominator.
- DOL.5.NO.05.03 Round fractions to the nearest 0,  $\frac{1}{2}$  or 1 whole and estimate the sum and differences.

#### DOL.5.NO.06 Understand fractions- multiply and divide

- DOL.5.NO.06.01 Multiply and divide two fractions, mixed numbers and a whole number by a fraction.
- DOL.5.NO.06.02 Estimate the product of a mixed number and a whole number by rounding fractions.
- DOL.5.NO.06.03 Discover why multiplying a given number by a fraction greater than 1 results in a product greater than the given number (recognizing multiplication by whole numbers greater than 1 as a familiar case).

- DOL.5.NO.06.04 Solve real world problems involving multiplication of fractions and mixed numbers.
- DOL.5.NO.06.05 Divide unit fractions by whole numbers and whole numbers by unit fractions.
- DOL.5.NO.06.06 Interpret division of a whole number by a unit fraction, and compute such quotients using the reciprocal.
- DOL.5.NO.06.07 Explore and write equivalent forms of fractions, decimals, and percents.
- DOL.5.NO.06.08 Solve real world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions.
- DOL.5.NO.06.09 Interpret a fraction as division of the numerator by the denominator ( $a/b = a \div b$ ). Solve word problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers.

### Grade 6

#### DOL.6.NO.01 Understand rational numbers and their location on the number line

- DOL.6.NO.01.01 Name equivalent decimal, fraction, and percent forms for benchmark numbers of 0,  $1/4$ ,  $1/3$ ,  $1/2$ ,  $2/3$ ,  $3/4$ , and 1 and be able to calculate other conversions using benchmark fractions.
- DOL.6.NO.01.02 Represent rational numbers as fractions or terminating decimals when possible, and translate between these representations.
- DOL.6.NO.01.03 Locate and order positive and negative rational numbers on the number line; know that numbers and their opposites add to 0, and are on opposite sides and at equal distance from 0 on a vertical or horizontal number line.
- DOL.6.NO.01.04 Identify rational numbers as quotients of integers (non-zero denominators).
- DOL.6.NO.01.05 Recall that the absolute value of a number is the distance of the number from 0.
- DOL.6.NO.01.06 Find and position pairs of integers and other rational numbers on a coordinate plane.
- DOL.6.NO.01.07 Interpret statements of inequality as statements about the relative position of two numbers on a number line diagram.

#### DOL.6.NO.02 Perform operations with rational numbers

- DOL.6.NO.02.01 Maintain mastery of basic addition, subtraction, multiplication and division facts with quick and accurate recall.
- DOL.6.NO.02.02 Represent rational numbers as fractions or terminating decimals when possible, and translate between these representations.
- DOL.6.NO.02.03 Find the greatest common factor and least common multiple of at least two whole numbers.
- DOL.6.NO.02.04 Find the prime factorization of a given number.
- DOL.6.NO.02.05 Add, subtract, multiply and divide positive rational numbers fluently.
- DOL.6.NO.02.06 Understand integer subtraction as the inverse of integer addition. Understand integer division as the inverse of integer multiplication.
- DOL.6.NO.02.07 Add and multiply integers between -100 and 100; subtract and divide integers using the related facts.
- DOL.6.NO.02.08 For applied situations, estimate the answers to calculations involving

operations with rational numbers.

- DOL.6.NO.02.09 Solve applied problems that use the four operations.

DOL.6.NO.03 Understand and solve problems involving rates, ratios, and proportions

- DOL.6.NO.03.01 Find equivalent ratios by scaling up or scaling down.
- DOL.6.NO.03.02 Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities.
- DOL.6.NO.03.03 Understand the concept of a unit rate  $a/b$  associated with a ratio  $a:b$  where  $b \neq 0$ , and use rate language in the context of a ratio relationship.
- DOL.6.NO.03.04 Calculate part of a number given the percentage and the number.
- DOL.6.NO.03.05 Solve contextual problems involving percentages such as sales tax and tips.

DOL.6.NO.04 Apply knowledge of exponents

- DOL.6.NO.04.01 Understand and use integer exponents, excluding powers of negative bases.

### Grade 7

DOL.7.NO.01 Understand irrational numbers

- DOL.7.NO.01.01 Estimate and calculate the value of both square roots and cube roots.

DOL.7.NO.02 Perform operations with rational numbers

- DOL.7.NO.02.01 Maintain mastery of basic addition, subtraction, multiplication and division facts with quick and accurate recall.
- DOL.7.NO.02.02 Add, subtract, multiply, and divide both positive and negative rational numbers fluently.
- DOL.7.NO.02.03 Estimate results of computations with rational numbers.
- DOL.7.NO.02.04 Apply order of operations to simplify expressions and solve equations.
- DOL.7.NO.02.05 Translate among percents, decimals and fractions fluently.

DOL.7.NO.03 Understand and solve problems involving rates, ratios, and proportions

- DOL.7.NO.03.01 Calculate rates of change.
- DOL.7.NO.03.02 Convert ratio quantities amongst different systems of units.
- DOL.7.NO.03.03 Solve proportion problems using such methods as finding the unit rate, scaling, finding equivalent fractions, noticing patterns in tables of data, and cross-multiplying.
- DOL.7.NO.03.04 Identify the constant of proportionality (unit rate) in tables, graphs, equations, diagrams, and verbal descriptions of proportional relationships.
- DOL.7.NO.03.05 Calculate percent increase and decrease.
- DOL.7.NO.03.06 Calculate simple and compound interest.

DOL.7.NO.04 Apply knowledge of exponents

- DOL.7.NO.04.01 Express both large and small numbers in scientific notation.
- DOL.7.NO.04.02 Understand and use integer exponents, including powers of negative

bases.

### Grade 8

#### DOL.8.NO.01 Understand rational and irrational numbers

- DOL.8.NO.01.01 Define and describe rational and irrational numbers.
- DOL.8.NO.01.02 Differentiate between rational and irrational.
- DOL.8.NO.01.03 Identify and provide examples of rational and irrational numbers of the real number system.
- DOL.8.NO.01.04 Find square roots and/or cube roots of perfect squares and approximate the square roots and/or cube roots of non-perfect squares by locating between consecutive integers.
- DOL.8.NO.01.05 Estimate and solve problems with square roots and cube roots using calculators.
- DOL.8.NO.01.06 Use square root and cube root symbols to represent solutions to equations.

#### DOL.8.NO.02 Perform operations with rational numbers

- DOL.8.NO.02.01 Maintain mastery of basic addition, subtraction, multiplication and division facts with quick and accurate recall.

#### DOL.8.NO.03 Apply knowledge of exponents

- DOL.8.NO.03.01 Apply the rules of positive and negative exponents to evaluate and simplify expressions and equations.
- DOL.8.NO.03.02 Use numbers expressed in the form of a single digit times a whole-number power of 10 to estimate very large or very small quantities, and to express how many times one is more than the other.
- DOL.8.NO.03.03 Perform operations with numbers expressed in scientific notation, including problems where both decimal and scientific notation are used.

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## Measurement

### Grade K

#### DOL.K.M.01 Explore measurement attributes

- DOL.K.M.01.01 Describe measurable attributes of objects, such as length or weight.
- DOL.K.M.01.02 Directly compare two objects with a measurable attribute in common.
- DOL.K.M.01.03 Compare length and weight of objects by comparing to reference objects, and use terms such as shorter, longer, taller, lighter, heavier.
- DOL.K.M.01.04 Measure classroom items using non-standard units.

#### DOL.K.M.02 Explore concepts of time

- DOL.K.M.02.01 Use the correct terms: morning, evening, night, before, and after to sequence.
- DOL.K.M.02.02 Identify tools that measure time.
- DOL.K.M.02.03 Identify the days of the week in sequence, months and seasons of the

year.

- DOL.K.M.02.04 Read an analog and digital clock to the hour mark. Identify the hour and minute hand on an analog clock.
- DOL.K.M.02.05 Identify daily landmark times to the nearest hour.

#### DOL.K.M.03 Explore money

- DOL.K.M.03.01 Identify different denominations of coins (penny, nickel, dime, quarter) and one dollar bill.
- DOL.K.M.03.02 Use common symbols to read monetary amounts.
- DOL.K.M.03.03 Recognize the value of a penny, nickel, dime, and quarter.
- DOL.K.M.03.04 Match one coin to an equivalent set of coins/bills of other denominations.
- DOL.K.M.03.05 Add and subtract pennies in amounts less than ten cents.

### Grade 1

#### DOL.1.M.01 Explore measurement attributes

- DOL.1.M.01.01 Order three objects by length.
- DOL.1.M.01.02 Use nonstandard units to measure. Express the length of an object as a whole number of length units.

#### DOL.1.M.02 Explore concepts of time

- DOL.1.M.02.01 Tell and write time in hours and half-hours using analog and digital clocks.
- DOL.1.M.02.02 Show the time in hours and half-hours using analog and digital clocks.
- DOL.1.M.02.03 Identify the calendar months in sequence and days of the week in sequence. (master end of 1st grade)

#### DOL.1.M.03 Explore money

- DOL.1.M.03.01 Identify the different denominations of coins and bills and use the dollar sign and cent sign.
- DOL.1.M.03.02 Use coins to show equivalence of one dollar.
- DOL.1.M.03.03 Add the value of coins (pennies, nickels, dimes and quarters) together.
- DOL.1.M.03.04 Solve word problems using coins.

### Grade 2

#### DOL.2.M.01 Explore measurement attributes

- DOL.2.M.01.01 Measure the length of an object by selecting and using appropriate tools such as rulers, yardsticks, meter sticks, and measuring tapes.
- DOL.2.M.01.02 Measure the length of an object twice, using different length units for the two measurements; describe how the two measurements relate to the size of the unit chosen.
- DOL.2.M.01.03 Estimate lengths using units of inches, feet, yards, centimeters, and meters.
- DOL.2.M.01.04 Identify the units of the United States customary system as inches, feet, yards, and miles. Identify the units of the International System of Units (Metric System) as

centimeters, decimeters, meters, and kilometers.

- DOL.2.M.01.05 Compare lengths using standard length unit.

#### DOL.2.M.02 Explore money

- DOL.2.M.02.01 Read and write the value of collections of coins (pennies, nickels, dimes, quarters, half-dollars).
- DOL.2.M.02.02 Add and subtract money in mixed units.
- DOL.2.M.02.03 Solve word problems with manipulatives involving dollar bills, half dollars, quarters, dimes, nickels, and pennies, using \$ and ¢ symbols appropriately.

#### DOL.2.M.03 Relate addition and subtraction to length

- DOL.2.M.03.01 Solve simple word problems involving lengths given in the same units using addition and subtraction within 100.
- DOL.2.M.03.02 Determine perimeters of rectangles and triangles by adding lengths of sides, recognizing the meaning of perimeter.
- DOL.2.M.03.03 Represent whole numbers as lengths from 0 on a number line diagram with equally spaced points corresponding to the numbers 0, 1, 2, ..., and represent whole-number sums and differences within 100 on a number line diagram.

#### DOL.2.M.04 Explore concept of time

- DOL.2.M.04.01 Tell and write time from analog and digital clocks to the nearest five minutes, half hour, and quarter hour, using a.m. and p.m.
- DOL.2.M.04.02 Use the concept of elapsed time.

#### DOL.2.M.05 Investigate temperature

- Tell temperature using the scale on a thermometer in degrees Fahrenheit.

### Grade 3

DOL.3.M.01 Solve problems involving measurement, estimation, and computation of units of measure.

- DOL.3.M.01.01 Tell and write time to the nearest minute and measure elapsed time in hours and minutes.
- DOL.3.M.01.02 Solve word problems involving addition and subtraction of time intervals in hours and minutes from digital clocks or analog clocks (i.e., elapsed time)
- DOL.3.M.01.03 Measure lengths using rulers marked with halves and fourths of an inch.
- DOL.3.M.01.04 Measure and estimate liquid volumes and masses of objects using standard units of liters (l), grams (g), and kilograms (kg).
- DOL.3.M.01.05 Solve addition and subtraction problems in mixed units within the same measurement system for length, weight, and time.
- DOL.3.M.01.06 Understand relationships between sizes of standard units.
- DOL.3.M.01.07 Know benchmark temperatures such as freezing (32°F, 0°C); boiling, (212°F, 100°C); and compare temperatures to these, e.g., cooler, warmer.
- DOL.3.M.01.08 Measure and estimate liquid volumes and masses of objects using

customary units of cups, pints, quarts, gallons, and pounds.

DOL.3.M.02 Solve problems involving money

- DOL.3.M.02.01 Solve word problems without manipulatives involving dollar bills, half dollars, quarters, dimes, nickels, and pennies, using \$ and ¢ symbols appropriately.

*Grade 4*

DOL.4.M.01 Solve problems involving measurement, conversion, and computation of units of measure

- DOL.4.M.01.01 Use the four operations (addition, subtraction, multiplication, and division) to solve word problems involving distances, elapsed time, liquid volumes, masses of objects, and money.
- DOL.4.M.01.02 Convert from one unit of measure to a larger or smaller unit of measure.
- DOL.4.M.01.03 Generate measurement equivalents in a two column table.
- DOL.4.M.01.04 Determine the appropriate measuring tool to use in a given situation and select appropriate units of measure.

*Grade 5*

DOL.5.M.01 Solve problems involving measurement, conversion, and computation of units of measure

- DOL.5.M.01.01 Maintain ability to determine the appropriate measuring tool to use in a given situation and select appropriate units of measure.
- DOL.5.M.01.02 Convert among different-sized standard measurement units within a given measurement system.
- DOL.5.M.01.03 Use measurement conversions in solving multi-step, real world problems.

*Grade 6*

DOL.6.M.01 Solve measurement and conversion problems

- DOL.6.M.01.01 Use appropriate tools to apply basic measuring techniques (to the nearest  $\frac{1}{16}$ in,  $\frac{1}{8}$ in,  $\frac{1}{4}$  in,  $\frac{1}{2}$  in).
- DOL.6.M.01.02 Convert between basic units of measurement within a single measurement system.
- DOL.6.M.01.03 Determine what unit makes sense in a given situation.
- DOL.6.M.01.04 Use measurement conversions in solving multi-step, real world problems.

*Grade 7*

DOL.7.M.01 Solve measurement and conversion problems

- DOL.7.M.01.01 Use conversion factors to convert between units of measurement in the same system.
- DOL.7.M.01.02 Convert between metric and customary systems of measurement.
- DOL.7.M.01.03 Determine what unit makes sense in a given situation.
- DOL.7.M.01.04 Use measurement conversions in solving multi-step, real world problems (mastery at the end of seventh grade).

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## Geometry

### Grade K

DOL.K.G.01 Explore, create and describe shapes

- DOL.K.G.01.01 Relate three-dimensional objects inside and outside the classroom to their geometric name.
- DOL.K.G.01.02 Sort shapes by numbers of sides or corners.
- DOL.K.G.01.03 Correctly identify shapes regardless of their orientations or overall size.
- DOL.K.G.01.04 Identify shapes as two-dimensional (plane, flat) or three-dimensional (solid).
- DOL.K.G.01.05 Analyze and compare two- and three-dimensional shapes, in different sizes and orientations.
- DOL.K.G.01.06 Model shapes and create shapes.
- DOL.K.G.01.07 Compose simple shapes to form larger shapes.
- DOL.K.G.01.08 Identify, sort and classify objects by attribute and identify objects that do not belong in a particular group.

DOL.K.G.02 Explore geometric patterns

- DOL.K.G.02.01 Create, describe, and extend simple geometric patterns.
- DOL.K.G.02.02 Analyze how both repeating and growing patterns are generated.

### Grade 1

DOL.1.G.01 Explore, create, describe shapes

- DOL.1.G.01.01 Sort by physical and geometric attributes.
- DOL.1.G.01.02 Describe and identify the physical and geometric attributes, such as color and shape.
- DOL.1.G.01.03 Use informal language and nonstandard tools to describe if shapes have right corners and corners that are smaller or bigger than right corners.
- DOL.1.G.01.04 Create two-dimensional and three dimensional shapes.
- DOL.1.G.01.05 Identify the attributes of three dimensional shapes.

DOL.1.G.02 Identify orientation

- DOL.1.G.02.01 Describe the relative position of objects.

DOL.1.G.03 Explore patterns

- DOL.1.G.03.01 Describe, create, and extend geometric patterns.

### Grade 2

DOL.2.G.01 Explore, create and describe shapes

- DOL.2.G.01.01 Identify, describe, and compare two and three dimensional shapes.
- DOL.2.G.01.02 Analyze and predict the results of putting together and taking apart two-dimensional and three-dimensional shapes.
- DOL.2.G.01.03 Draw rectangles and triangles, and compute perimeters by adding lengths of sides, recognizing the meaning of perimeter.

- DOL.2.G.01.04 Distinguish between curves and straight lines and between curved surfaces and flat surfaces.
- DOL.2.G.01.05 Recognize two-dimensional plane figures that have line symmetry.
- DOL.2.G.01.06 Classify familiar plane and solid objects by common attributes and explain which attributes are being used for classification.
- DOL.2.G.01.07 Recognize that shapes that have been slid, turned or flipped are the same shape.
- DOL.2.G.01.08 Determine with nonstandard tools using formal language right, obtuse, or acute angles on their own or as parts of polygons.
- DOL.2.G.01.09 Partition a rectangle into rows and columns of same-size squares and count to find the total number of them.

### *Grade 3*

#### DOL.3.G.01 Recognize the basic elements of geometric objects

- DOL.3.G.01.01 Identify points, line segments, lines and distance.
- DOL.3.G.01.02 Identify perpendicular lines and parallel lines in familiar shapes and in the classroom.
- DOL.3.G.01.03 Identify parallel faces of rectangular prisms, in familiar shapes and in the classroom.

#### DOL.3.G.02 Name and explore properties of shapes

- DOL.3.G.02.01 Identify, describe, compare and classify two-dimensional shapes.
- DOL.3.G.02.02 Compose and decompose triangles and rectangles to form other familiar two-dimensional shapes and partition shapes, angles, lengths, and sets of objects into parts with equal areas.
- DOL.3.G.02.03 Identify, describe, build and classify familiar three-dimensional solids.

#### DOL.3.G.03 Understand angles

- DOL.3.G.03.01 Know that a full turn or a circle measures 360 degrees and recognize the measurements of angles measuring 90, 180, and 270 degrees.

#### DOL.3.G.04 Understand perimeter and area

- DOL.3.G.04.01 Solve real world and mathematical problems involving perimeters of polygons.
- DOL.3.G.04.02 Understand that a square with side length 1 unit is said to have “one square unit” of area, and can be used to measure area.
- DOL.3.G.04.03 Measure areas by counting unit squares (square cm, square m, square in, square ft, and improvised units).
- DOL.3.G.04.04 Find the area of a rectangle with whole-number side lengths by tiling it with unit squares, and show that the area is the same as would be found by multiplying the length and width.
- DOL.3.G.04.05 Use area models to represent the distributive property in mathematical reasoning.

### *Grade 4*

DOL.4.G.01 Recognize the basic elements of geometric objects

- DOL.4.G.01.01 Identify and draw points, lines, line segments, rays, angles (right, acute, obtuse), perpendicular, parallel, and intersecting lines using a ruler and a tool or object with a square ( $90^\circ$ ) corner.
- DOL.4.G.01.02 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.
- DOL.4.G.01.03 Represent three-dimensional figures using nets made up of rectangles and triangles, and use the nets.

DOL.4.G.02 Name and explore properties of shapes

- DOL.4.G.02.01 Identify and count the faces, edges, and vertices of basic three-dimensional geometric solids including cubes, rectangular prisms, and pyramids; describe the shape of their faces.

DOL.4.G.03 Understand angles

- DOL.4.G.03.01 Recognize angles are formed wherever two rays (or line segments) share a common endpoint, and understand concepts of angle measurement.
- DOL.4.G.03.02 Know benchmark angles in whole-number degrees. Sketch angles of specified measure.

DOL.4.G.04 Understand the coordinate plane

- DOL.4.G.04.01 Use axes to define a coordinate system and graph ordered pairs.
- DOL.4.G.04.02 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.
- DOL.4.G.04.03 Draw polygons in the coordinate plane given coordinates for the vertices; use coordinates to find the length of a side joining points with the same first coordinate or the same second coordinate.

DOL.4.G.05 Recognize symmetry and transformations

- DOL.4.G.05.01 Recognize plane figures that have line symmetry and transformations (flips, slides, turns) of two-dimensional objects.

DOL.4.G.06 Understand perimeter and area

- DOL.4.G.06.01 Know the formulas for perimeter and area of a square and a rectangle; calculate the perimeters and areas of these shapes and combinations of these shapes using the formulas.
- DOL.4.G.06.02 Find one dimension of a square or rectangle given the other dimension and its perimeter or area.
- DOL.4.G.06.03 Apply the area and perimeter formulas for rectangles in real world and mathematical problems.
- DOL.4.G.06.04 Measure surface area of cubes and rectangular prisms by covering and counting area of the faces.

## Grade 5

### DOL.5.G.01 Name and explore properties of shapes

- DOL.5.G.01.01 Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category.
- DOL.5.G.01.02 Classify two-dimensional figures based on their properties.

### DOL.5.G.02 Understand angles

- DOL.5.G.02.01 Associate an angle with a certain amount of turning; know that angles are measured in degrees with a protractor.
- DOL.5.G.02.02 Measure angles with a protractor, and classify them as acute, right, obtuse, or straight.
- DOL.5.G.02.03 Know that angles on a straight line add up to  $180^\circ$  and angles surrounding a point add up to  $360^\circ$ .
- DOL.5.G.02.04 Understand that the sum of the interior angles of a triangle is  $180^\circ$  and the sum of the interior angles of a quadrilateral is  $360^\circ$ , and use these properties to solve problems.

### DOL.5.G.03 Understand the coordinate plane

- DOL.5.G.03.01 Use axes to define a coordinate system and graph ordered pairs in the first quadrant.
- DOL.5.G.03.02 Represent real world and mathematical problems by graphing points in the first quadrant of the coordinate plane, and interpret coordinate values of points in the context of the situation.

### DOL.5.G.04 Understand concepts of perimeter, area, and volume

- DOL.5.G.04.01 Maintain understanding of perimeter and area concepts.
- DOL.5.G.04.02 Recognize volume as an attribute of solid figures and understand concepts of volume measurement.
- DOL.5.G.04.03 Measure volumes by counting unit cubes, using cubic cm, cubic in, and cubic ft.
- DOL.5.G.04.04 Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding their volumes, applying this technique to solve real world problems.
- DOL.5.G.04.05 Relate volume to the operations of multiplication and addition and solve real world and mathematical problems involving volume.
- DOL.5.G.04.06 Derive the volume formula of a rectangular prism.
- DOL.5.G.04.07 Explain the relationships between the volume formulas for different solids and apply formulas to solve problems.

## Grade 6

### DOL.6.G.01 Draw and construct geometric figures

- DOL.6.G.01.01 Perform basic geometric constructions of perpendicular lines, midpoints of line segments and angle bisectors.

- DOL.6.01.02 Draw and construct two dimensional and three dimensional figures.

DOL.6.G.02 Understand and apply basic properties of lines, angles, and triangles

- DOL.6.G.02.01 Understand properties of triangles.
- DOL.6.G.02.02 Understand relationships of vertical angles, complementary angles, supplementary angles.
- DOL.6.G.02.03 Understand congruence of corresponding and alternate interior angles when parallel lines are cut by a transversal, and that such congruencies imply parallel lines.
- DOL.6.G.02.04 Locate interior and exterior angles of any triangle, and use the property that an exterior angle of a triangle is equal to the sum of the remote (opposite) interior angles.
- DOL.6.G.02.05 Know that the sum of the exterior angles of a convex polygon is  $360^\circ$ .

DOL.6.G.03 Understand the concept of congruence and basic transformations

- DOL.6.G.03.01 Understand that for polygons, congruence means corresponding sides and angles have equal measures.
- DOL.6.G.03.02 Understand and identify transformations of a figure.
- DOL.6.G.03.03 Transform figures to show rotations, reflections, and translations on a coordinate plane.
- DOL.6.G.03.04 Understand and use simple compositions of basic rigid transformations.
- DOL.6.G.03.05 Understand reflective and rotational lines of symmetry.

DOL.6.G.04 Apply knowledge of geometric formulas in problem solving

- DOL.6.G.04.01 Know and apply basic formulas to determine the area, surface area, perimeter, circumference, and volume of a standard geometric shape.

*Grade 7*

DOL.7.G.01 Draw and construct geometric figures

- DOL.7.G.01.01 Use a ruler and other tools to draw squares, rectangles, triangles and parallelograms with specified dimensions.
- DOL.7.G.01.02 Use a compass and a straightedge to perform basic geometric constructions: the perpendicular bisector of a segment, an equilateral triangle, and the bisector of an angle.

DOL.7.G.02 Understand and apply basic properties of lines, angles, and triangles

- DOL.7.G.02.01 Use facts about supplementary, complementary, vertical, and adjacent angles in a multi-step problem to write and solve simple equations for an unknown angle in a figure.

DOL.7.G.03 Understand the concept of similar polygons and solve related problems

- DOL.7.G.03.01 Understand that in similar polygons, corresponding angles are congruent and the ratios of corresponding sides are equal.
- DOL.7.G.03.02 Solve problems involving scale drawings of geometric figures, including

computing actual lengths and areas from a scale drawing and reproducing a drawing at a different scale.

DOL.7.G.04 Apply knowledge of geometric formulas in problem solving

- DOL.7.G.04.01 Know the formulas for the area and circumference of a circle and use them to solve problems; give an informal derivation of the relationship between the circumference and area of a circle.
- DOL.7.G.04.02 Solve real-world and mathematical problems involving area, volume, and surface area of two- and three-dimensional objects composed of triangles, quadrilaterals, polygons, cubes, and right prisms.

### *Grade 8*

DOL.8.G.01 Understand and use the Pythagorean Theorem

- DOL.8.G.01.01 Understand at least one proof of the Pythagorean Theorem.
- DOL.8.G.01.02 Apply the Pythagorean Theorem and its converse to solve problems including perimeter, area, and volume problems.
- DOL.8.G.01.03 Find the distance between two points on the coordinate plane.

DOL.8.G.02 Apply knowledge of geometric formulas in problem solving

- DOL.8.G.02.01 Understand the definition of a circle; know and use the formulas for circumference and area of a circle to solve problems.
- DOL.8.G.02.02 Find area and perimeter of complex figures by sub-dividing them into basic shapes (quadrilaterals, triangles, circles).
- DOL.8.G.02.03 Solve real world problems involving areas of triangles, quadrilaterals, and circles.
- DOL.8.G.02.04 Know the volume formulas for cylinders, cones, pyramids, and spheres and apply them to solve problems.
- DOL.8.G.02.05 Understand the concept of surface area and find the surface area of prisms, cones, spheres, pyramids, and cylinders.
- DOL.8.G.02.06 Sketch a variety of two-dimensional representations of three-dimensional solids and use such two-dimensional representations to help solve problems.

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## **Algebraic Reasoning**

### *Grade K*

DOL.K.AR.01 Develop algebraic concepts

- DOL.K.AR.01.01 Continue to develop algebraic concepts introduced in Numbers and Operations and Geometry.

### *Grade 1*

DOL.1.AR.01 Develop algebraic concepts

- DOL.1.AR.01.01 Continue to develop algebraic concepts introduced in Number and Operations and Geometry.

*Grade 2*

DOL.2.AR.01 Develop algebraic concepts

- DOL.2.AR.01.01 Continue to develop algebraic concepts introduced in Number and Operations and Geometry.
- DOL.2.AR.01.02 Use addition and subtraction within 100 to solve one- and two-step word problems involving situations of adding to, taking from, putting together, taking apart, and comparing, with missing values in all positions.

*Grade 3*

DOL.3.AR.01 Develop algebraic concepts

- DOL.3.AR.01.01 Continue to develop algebraic concepts introduced in Numbers and Operations and Geometry.

*Grade 4*

DOL.4.AR.01 Develop algebraic concepts

- DOL.4.AR.01.01 Continue to develop algebraic concepts introduced in Numbers and Operations and Geometry.

*Grade 5*

DOL.5.AR.01 Develop algebraic concepts

- DOL.5.AR.01.01 Continue to develop algebraic concepts introduced in Numbers and Operations and Geometry.

DOL.5.AR.02 Write and interpret expressions

- DOL.5.AR.02.01 Use parentheses, brackets, or braces in numerical and algebraic expressions and evaluate. Know the order of operations sequence to solve and understand.
- DOL.5.AR.02.02 Write simple numerical expressions involving whole-numbers and solve.

*Grade 6*

DOL.6.AR.01 Understand properties of algebraic expressions and equations

- DOL.6.AR.01.01 Use letters, with units, to represent quantities in a variety of contexts.
- DOL.6.AR.01.02 Distinguish between an algebraic expression and an equation and identify parts of an expression and equation using mathematical terms such as sum, term, product, factor, quotient, coefficient and constant.
- DOL.6.AR.01.03 Represent information given in words using algebraic expressions and equations.
- DOL.6.AR.01.04 Use standard conventions for writing algebraic expressions and equations.

- DOL.6.AR.01.05 Use variables to represent numbers and write expressions when solving a real world or mathematical problem; understand that a variable can represent an unknown number.

#### DOL.6.AR.02 Simplify algebraic expressions

- DOL.6.AR.02.01 Simplify expressions by combining like terms, and evaluate using specific values.
- DOL.6.AR.02.02 Evaluate expressions and equations when given specific values for their variables.

#### DOL.6.AR.03 Solve equations

- DOL.6.AR.03.01 Understand that adding or subtracting the same number to both sides of an equation creates a new equation that has the same solution.
- DOL.6.AR.03.02 Understand that multiplying or dividing both sides of an equation by the same non-zero number creates a new equation that has the same solution.
- DOL.6.AR.03.03 Solve real-world and mathematical problems by writing and solving equations of the form  $x + p = q$  and  $px = q$  for cases in which  $p$ ,  $q$  and  $x$  are all nonnegative rational numbers.

#### DOL.6.AR.04 Represent linear functions using tables, equations, and graphs

- DOL.6.AR.04.01 Understand that relationships between quantities can be suggested by graphs and tables.
- DOL.6.AR.04.02 Solve problems involving linear functions whose input values are integers; write the equation; graph the resulting ordered pairs of integers.

### Grade 7

#### DOL.7.AR.01 Simplify algebraic expressions

- DOL.7.AR.01.01 Simplify expressions of the first degree by combining like terms and evaluate using specific values.
- DOL.7.AR.01.02 Add, subtract, multiply and divide simple algebraic expressions of the first degree.

#### DOL.7.AR.02 Solve equations

- DOL.7.AR.02.01 Manipulate equations by using the inverse operations of addition, subtraction, multiplication and division to solve for a given variable.
- DOL.7.AR.02.02 Solve equations of the form  $ax + b = c$  for rational coefficients.

#### DOL.7.AR.03 Recognize and solve problems involving proportional relationships

- DOL.7.AR.03.01 Recognize when information given in a table, graph, or formula suggests a directly proportional or linear relationship.
- DOL.7.AR.03.02 Represent directly proportional and linear relationships using verbal descriptions, tables, graphs, and formulas, and translate among these representations.
- DOL.7.AR.03.03 For directly proportional or linear situations, solve applied problems using graphs and equations.

- DOL.7.AR.03.04 Given a directly proportional or other linear situation, graph and interpret the slope and intercept(s) in terms of the original situation; evaluate  $y = mx + b$  for specific  $x$  values.
- DOL.7.AR.03.05 Recognize inversely proportional relationships in contextual situations; know that quantities are inversely proportional if their product is constant.

DOL.7.AR.04 Apply basic properties of real numbers in algebraic contexts

- DOL.7.AR.04.01 Understand and use basic properties of real numbers: additive and multiplicative identities, additive and multiplicative inverses, commutativity, associativity, and the distributive property of multiplication over addition.
- DOL.7.AR.04.02 Represent simple relationships between quantities using verbal descriptions, formulas or equations, tables, and graphs.

*Grade 8*

DOL.8.AR.01 Understand the concept of functions

- DOL.8.AR.01.01 Identify and represent linear functions and quadratic functions.
- DOL.8.AR.01.02 Recognize basic functions in problem context and represent using tables, graphs, and formulas.
- DOL.8.AR.01.03 Use the vertical line test to determine if a graph represents a function in one variable.
- DOL.8.AR.01.04 For basic functions describes how changes in one variable affect the others.
- DOL.8.AR.01.05 Graph the solution of linear and quadratic functions.
- DOL.8.AR.01.06 Given a directly proportional or other linear situation, graph and interpret the slope and intercept(s) in terms of the original situation; evaluate  $y = mx + b$  for specific  $x$  values.
- DOL.8.AR.01.07 Calculate the slope from the graph of a linear function as the ratio of "rise/run" for a pair of points on the graph, and express the answer as a fraction and a decimal.
- DOL.8.AR.01.08 Understand that linear functions have slope that is a constant rate of change.
- DOL.8.AR.01.09 Represent linear functions in the form  $y = x + b$ ,  $y = mx$ , and  $y = mx + b$ , and graph, interpreting slope and  $y$ -intercept.
- DOL.8.AR.01.10 Know that the graph of  $y = k/x$  is not a line; know its shape; and know that it crosses neither the  $x$  nor the  $y$ -axis.

DOL.8.AR.02 Recognize, represent, and apply common formulas

- DOL.8.AR.02.01 Apply the distributive property to monomials, binomials, and polynomials.
- DOL.8.AR.02.02 Add and subtract monomials, binomials, polynomials.
- DOL.8.AR.02.03 Factor monomials, binomials, and polynomials.
- DOL.8.AR.02.04 Factor simple quadratic expressions with integer coefficients.
- DOL.8.AR.02.05 Solve applied problems involving simple quadratic equations.

DOL.8.AR.03 Understanding solutions of equations, simultaneous equations,

and linear inequalities

- DOL.8.AR.03.01 Understand that to solve the equation  $f(x) = g(x)$  means to find all values of  $x$  for which the equation is true.
- DOL.8.AR.03.02 Solve simultaneous linear equations in two variables by graphing, by substitution, and by linear combination; estimate solutions using graphs; include examples with no solutions and infinitely many solutions.
- DOL.8.AR.03.03 Solve linear inequalities in one and two variables, and graph the solution sets.
- DOL.8.AR.03.04 Set up and solve applied problems involving simultaneous linear equations and linear inequalities.
- DOL.8.AR.03.05 Graph proportional relationships, interpreting the unit rate as the slope of the graph. Compare two different proportional relationships represented in different ways.

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## Data, Probability and Statistics

### Grade K

DOL.K.DPS.01 Analyze data

- DOL.K.DPS.01.01 Collect and organize data to use in pictograph.
- DOL.K.DPS.01.02 Read and interpret pictographs.
- DOL.K.DPS.01.03 Create pictographs of given data using both horizontal and vertical forms of graphs.

### Grade 1

DOL.1.DPS.01 Analyze data

- DOL.1.DPS.01.01 Collect and organize data to use in pictographs and bar graphs.
- DOL.1.DPS.01.02 Read and interpret pictographs and bar graphs.
- DOL.1.DPS.01.03 Create pictographs and bar graphs using given data using both horizontal and vertical forms of graphs.

### Grade 2

DOL.2.DPS.01 Analyze data

- DOL.2.DPS.01.01 Read, interpret and generate line plots.
- DOL.2.DPS.01.02 Read and interpret pictographs and a bar graphs (with single-unit scale) to represent a data set with up to four categories.
- DOL.2.DPS.01.03 Solve simple put together, take-apart, and compare problems using information presented in a bar graph.

### Grade 3

DOL.3.DPS.01 Represent and interpret data

- DOL.3.DPS.01.01 Draw a scaled pictograph and a scaled bar graph to represent a data set with several categories.
- DOL.3.DPS.01.02 Show data by making a line plot, where the horizontal scale is marked off in whole number units.

- DOL.3.DPS.01.03 Solve one- and two-step “how many more” and “how many less” problems using information presented in scaled bar and pictographs.

#### Grade 4

##### DOL.4.DPS.01 Represent and interpret data

- DOL.4.DPS.01.01 Construct tables and bar graphs from given data.
- DOL.4.DPS.01.02 Solve problems using data presented in tables and bar graphs.
- DOL.4.DPS.01.03 Order a given set of data, find the median, and specify the range of values.
- DOL.4.DPS.01.04 Make a line plot to display a data set of measurements in fractions of a unit ( $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{8}$ ).
- DOL.4.DPS.01.05 Solve problems involving addition and subtraction of fractions by using information presented in line plots.

#### Grade 5

##### DOL.5.DPS.01 Construct and interpret line graphs

- DOL.5.DPS.01.01 Read and interpret line graphs, and solve problems based on line graphs.
- DOL.5.DPS.01.02 Construct line graphs from tables of data; include axis labels and scale.

##### DOL.5.DPS.02 Find and interpret mean and mode

- DOL.5.DPS.02.01 Given a set of data, find and interpret the mean and mode.
- DOL.5.DPS.02.02 Solve multi-step problems involving mean, median, mode, and range.

#### Grade 6

##### DOL.6.DPS.01 Represent and interpret data

- DOL.6.DPS.01.01 Display and interpret numerical data using basic graphing techniques.
- DOL.6.DPS.01.02 Analyze measures of central tendency (mean, median, mode, and range).
- DOL.6.DPS.01.03 Analyze the effects of varying data on central tendency.

##### DOL.6.DPS.02 Understand probability concepts for simple events

- DOL.6.DPS.02.01 Express probabilities as fractions, decimals or percentages between 0 and 1; know that 0 probability means an event will not occur and that probability 1 means an event will occur.
- DOL.6.DPS.02.02 Compute probabilities of events from simple experiments with equally likely outcomes.

#### Grade 7

##### DOL.7.DPS. 01 Represent and interpret data

- DOL.7.DPS.01.01 Represent and interpret data using circle graphs, stem and leaf plots, histograms, and box-and-whisker plots, and select appropriate representation to address

specific questions.

- DOL.7.DPS.01.02 Determine which measure of central tendency (mean, median, mode) best represents a data set.
- DOL.7.DPS.01.03 Recognize practices of collecting and displaying data that may bias the presentation or analysis.

DOL.7.DPS.02 Understand probability concepts for simple and compound events

- DOL.7.DPS.02.01 Compute relative frequencies from a table of experimental results for a repeated event, and answer questions about the results, using relationship of probability to relative frequency.
- DOL.7.DPS.02.02 Apply the Basic Counting Principle to find total number of outcomes possible for independent and dependent events and calculate the probabilities using organized lists or tree diagrams.
- DOL.7.DPS.02.03 Find and/or compare the theoretical probability, the experimental probability, and/or the relative frequency of a given event.
- DOL.7.DPS.02.04 Understand the difference between independent and dependent events and recognize common misconceptions involving probability.
- DOL.7.DPS.02.05 Compute relative frequencies from a table of experimental results for a repeated event; understand the relationship of experimental probability to relative frequency; answer questions regarding the results.

DOL.7.DPS.03 Compute statistics about data sets

- DOL.7.DPS.03.01 Calculate and interpret relative frequencies and cumulative frequencies for given data sets.
- DOL.7.DPS.03.02 Find and interpret the median, quartiles, and interquartile range of a given set of data.

DOL.7.DPS.04 Use random sampling to draw inferences about a population

- DOL.7.DPS.04.01 Understand that statistics can be used to gain information about a population by examining a sample of the population.
- DOL.7.DPS.04.02 Understand that random sampling tends to produce representative samples and support valid inferences.
- DOL.7.DPS.04.03 Use data from a random sample to draw inferences about a population with an unknown characteristic of interest. Generate multiple samples of the same size to gauge the variation in estimates or predictions.

*Grade 8*

DOL.8.DPS.01 Represent and interpret data

- DOL.8.DPS.01.01 Create and interpret scatter plots and find the line of best fit.

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## **Mathematical Practices**

*Grade K*

#### DOL.K-12.MP.01 PROBLEM SOLVING

- Make sense of problems and persevere in solving them while understanding the meaning of quantities involved.

#### DOL.K-12.MP.02 REASONING AND PROOF

- Attend to precision and accuracy of calculations and proved answers using various types of reasoning.

#### DOL.K-12.MP.03 COMMUNICATION

- Clearly communicate mathematical thinking using math vocabulary orally in writing.

#### DOL.K-12.MP.04 CONNECTIONS

- Understand how mathematical ideas interconnect, build on one another, and relate to real-world and faith contexts.

#### DOL.K-12.MP.05 REPRESENTATION

- Use representations to model mathematical ideas.

### *Grade 1*

#### DOL.K-12.MP.01 PROBLEM SOLVING -

- Make sense of problems and persevere in solving them while understanding the meaning of quantities involved

#### DOL.K-12.MP.02.REASONING AND PROOF

- Attend to precision and accuracy of calculations and proved answers using various types of reasoning.

#### DOL.K-12.MP.03 COMMUNICATION

- Clearly communicate mathematical thinking using math vocabulary orally in writing.

#### DOL.K-12.MP.04 CONNECTIONS

- Understand how mathematical ideas interconnect, build on one another, and relate to real-world and faith contexts.

#### DOL.K-12.MP.05 REPRESENTATION

- Use representations to model mathematical ideas.

### *Grade 2*

#### DOL.K-12.MP.01 PROBLEM SOLVING

- Make sense of problems and persevere in solving them while understanding the meaning of quantities involved.

DOL.K-12.MP.02 REASONING AND PROOF

- Attend to precision and accuracy of calculations and proved answers using various types of reasoning.

DOL.K-12.MP.03 COMMUNICATION

- Clearly communicate mathematical thinking using math vocabulary orally in writing.

DOL.K-12.MP.04 CONNECTIONS

- Understand how mathematical ideas interconnect, build on one another, and relate to real-world and faith contexts.

DOL.K-12.MP.05 REPRESENTATION

- Use representations to model mathematical ideas.

*Grade 3*

DOL.K-12.MP.01 PROBLEM SOLVING

- Make sense of problems and persevere in solving them while understanding the meaning of quantities involved

DOL.K-12.MP.02.REASONING AND PROOF

- Attend to precision and accuracy of calculations and proved answers using various types of reasoning.

DOL.K-12.MP.03 COMMUNICATION

- Clearly communicate mathematical thinking using math vocabulary orally in writing.

DOL.K-12.MP.04 CONNECTIONS

- Understand how mathematical ideas interconnect, build on one another, and relate to real-world and faith contexts.

DOL.K-12.MP.05 REPRESENTATION

- Use representations to model mathematical ideas

*Grade 4*

DOL.K-12.MP.01 PROBLEM SOLVING

- Make sense of problems and persevere in solving them while understanding the meaning of quantities involved

DOL.K-12.MP.02 REASONING AND PROOF

- Attend to precision and accuracy of calculations and proved answers using various types of reasoning.

DOL.K-12.MP.03 COMMUNICATION

- Clearly communicate mathematical thinking using math vocabulary orally in writing.

DOL.K-12.MP.04 CONNECTIONS

- Use representations to model mathematical ideas

DOL.K-12.MP.05 REPRESENTATION

- Use representations to model mathematical ideas.

*Grade 5*

DOL.K-12.MP.01 PROBLEM SOLVING

- Make sense of problems and persevere in solving them while understanding the meaning of quantities involved

DOL.K-12.MP.02 REASONING AND PROOF

- Attend to precision and accuracy of calculations and proved answers using various types of reasoning.

DOL.K-12.MP.03 COMMUNICATION

- Clearly communicate mathematical thinking using math vocabulary orally in writing.

DOL.K-12.MP.04 CONNECTIONS

- Understand how mathematical ideas interconnect, build on one another, and relate to real-world and faith contexts.

DOL.K-12.MP.05 REPRESENTATION

- Use representations to model mathematical ideas

*Grade 6*

DOL.K-12.MP.01 PROBLEM SOLVING

- Make sense of problems and persevere in solving them while understanding the meaning of quantities involved

DOL.K-12.MP.02 REASONING AND PROOF

- Attend to precision and accuracy of calculations and proved answers using various types of reasoning.

DOL.K-12.MP.03 COMMUNICATION

- Clearly communicate mathematical thinking using math vocabulary orally in writing.

DOL.K-12.MP.04 CONNECTIONS

- Understand how mathematical ideas interconnect, build on one another, and relate to real-world and faith contexts.

#### DOL.K-12.MP.05 REPRESENTATION

- Use representations to model mathematical ideas

#### *Grade 7*

#### DOL.K-12.MP.01 PROBLEM SOLVING

- Make sense of problems and persevere in solving them while understanding the meaning of quantities involved

#### DOL.K-12.MP.02 REASONING AND PROOF

- Attend to precision and accuracy of calculations and proved answers using various types of reasoning.

#### DOL.K-12.MP.03 COMMUNICATION

- Clearly communicate mathematical thinking using math vocabulary orally in writing.

#### DOL.K-12.MP.04 CONNECTIONS

- Understand how mathematical ideas interconnect, build on one another, and relate to real-world and faith contexts.

#### DOL.K-12.MP.05 REPRESENTATION

- Use representations to model mathematical ideas

#### *Grade 8*

#### DOL.K-12.MP.01 PROBLEM SOLVING

- Make sense of problems and persevere in solving them while understanding the meaning of quantities involved

#### DOL.K-12.MP.02 REASONING AND PROOF

- Attend to precision and accuracy of calculations and proved answers using various types of reasoning.

#### DOL.K-12.MP.03 COMMUNICATION

- Clearly communicate mathematical thinking using math vocabulary orally in writing.

#### DOL.K-12.MP.04 CONNECTIONS

- Understand how mathematical ideas interconnect, build on one another, and relate to real-world and faith contexts.

#### DOL.K-12.MP.05 REPRESENTATION

- Use representations to model mathematical ideas