Maryland Mathematics

Grade 6

Number and Operation Sense NOS

A APPLY AND EXTEND PREVIOUS UNDERSTANDINGS OF MULTIPLICATION AND DIVISION TO DIVIDE FRACTIONS BY FRACTIONS. 6.NOS.A

1 Divide fractions by fractions in context. 6.NOS.A.1

- a Extend estimation strategies to estimate and assess the reasonableness of quotients. 6.NOS.A.1.A
- b Use and connect concrete and visual fraction models (e.g., linear, regional/area, and set models) and equations to divide. 6.NOS.A.1.B
- c Represent and explain the calculation by connecting fraction models, and/or equations to the meaning of division. 6.NOS.A.1.C

B COMPUTE FLUENTLY WITH MULTI-DIGIT NUMBERS AND FIND COMMON FACTORS AND MULTIPLES. 6.NOS.B

2 Fluently divide multi-digit numbers. 6.NOS.B.2

- a Extend estimation strategies to estimate and assess the reasonableness of quotients. 6.NOS.B.2.A
- b Use strategies (e.g., partial quotients, inverse relationship between multiplication and division) to divide. 6.NOS.B.2.B
- c Use a standard algorithm to divide. 6.NOS.B.2.C
- d Determine and explain when a strategy or algorithm is most efficient. 6.NOS.B.2.D

3 Fluently multiply and divide multi-digit decimals to the thousandths in context. 6.NOS.B.3

- a Extend estimation strategies to estimate and assess the reasonableness of products and quotients. 6.NOS.B.3.A
- b Generalize whole number strategies to multiply and divide decimals. 6.NOS.B.3.B
- c Use a standard algorithm to multiply and divide decimals. 6.NOS.B.3.C
- d Determine and explain when a strategy or algorithm is most efficient. 6.NOS.B.3.D

4 Identify the common factors and multiples of two whole numbers. 6.NOS.B.4

a Identify the greatest common factor of two whole numbers within 100. 6.NOS.B.4.A

b Identify the least common multiple of two whole numbers within 12. 6.NOS.B.4.B

c Express the sum of two whole numbers within 100 using the distributive property to factor out the common factor of the addends (e.g., express 36 + 8 as 4(9 + 2)). 6.NOS.B.4.C

C APPLY AND EXTEND PREVIOUS UNDERSTANDING OF NUMBERS TO THE SYSTEM OF RATIONAL NUMBERS. 6.NOS.C

5 Use understanding of rational numbers as positive and negative numbers to describe quantities having opposite directions or values (e.g., temperature above/below zero, elevation above/below sea level, credits/debits, positive/negative electric charge). Use rational numbers to represent quantities in context and explain the meaning of 0 in each situation. 6.NOS.C.5

6 Represent a rational number as a point on vertical or horizontal number lines. Represent points on a number line with negative numbers. 6.NOS.C.6

a Estimate quantities by reasoning about their location on a number line, their relationship to benchmark numbers, and by rounding. 6.NOS.C.6.A

b Locate and interpret the positions of rational numbers on a number line. 6.NOS.C.6.B

c Recognize and locate opposite signs of rational numbers as indicating locations on opposite sides of 0 on the number line. 6.NOS.C.6.C

7 Intersect perpendicular number lines at the point (0,0) as the x-axis and y-axis to introduce the four quadrants of the Coordinate Plane. Represent points on the plane with positive and negative coordinates. 6.NOS.C.7

a Use understanding of the relationship between signs and value of coordinates in ordered pairs to reason about the location of an ordered pair without plotting. 6.NOS.C.7.A

b Locate and interpret the positions of rational numbers on the Coordinate Plane, including how changes in the signs of ordered pairs reflect their location into different quadrants. 6.NOS.C.7.B

8 Order and identify the absolute value of rational numbers. 6.NOS.C.8

a Interpret statements of inequality as statements about the relative position of two numbers on a number line (e.g., interpret −3 > −7 as a statement that −3 is located to the right of −7 on a horizontal number line). 6.NOS.C.8.A

b Write, interpret, and explain statements of order for rational numbers in context (e.g., write −3℃ > −7℃ to express the fact that −3℃ is warmer than −7℃). 6.NOS.C.8.B

c Use understanding of the absolute value of a rational number as its distance from 0 on the number line to interpret absolute value as magnitude for a positive or negative quantity in context (e.g., for an account balance of −30 dollars, write to describe the size of the debt in dollars). 6.NOS.C.8.C

9 Solve problems in context by graphing points (with the same first coordinate or the same second coordinate) in all four quadrants of the Coordinate Plane. 6.NOS.C.8.9

a Explain that points with the same x-coordinate or y-coordinate are located on same vertical or horizontal line respectively. 6.NOS.C.8.9.A

b Use absolute value to calculate length of vertical and horizontal lines on Coordinate Plane. 6.NOS.C.8.9.B

Algebraic Thinking AT

A UNDERSTANDING RATIO CONCEPTS AND USE RATIO REASONING TO SOLVE. 6.AT.A

1 Use ratio language in context (e.g., “__ to __,” “for every,” “per”) to describe a ratio relationship between two quantities, including part to part and part to whole (e.g., "The ratio of wings to beaks in the bird house at the zoo was 2:1, because for every 2 wings there was 1 beak.") 6.AT.A.1

2 Represent and use unit rates, written as fractions ( ) with whole number numerators and denominators, in context. 6.AT.A.2

a Use unit rate language in the context of a ratio relationship (e.g., “The recipe has a ratio of 3 cups of flour to 4 cups of sugar so there is cup of flour for each cup of sugar.”) 6.AT.A.2.A

b Solve unit rate problems, for example those involving unit pricing and constant speed (e.g., “If it took 7 hours to mow 4 lawns, then at that rate, how many lawns could be mowed in 35 hours? At what rate were lawns being mowed?”). 6.AT.A.2.B

3 Use ratio and rate reasoning to solve problems in context by reasoning about tables of equivalent ratios, tape diagrams, double number lines, or the Coordinate Plane. 6.AT.A.3

a Generate, compare and find missing values of equivalent ratios and unit rates using multiple representations. 6.AT.A.3.A

b Plot the pairs of values on the Coordinate Plane (in quadrant 1) to represent unit rates and make connections between representations. 6.AT.A.3.B

c Use ratio reasoning to convert measurement units (e.g., money, time, length within the same system); manipulate and transform units appropriately when multiplying or dividing quantities. 6.AT.A.3.C

4 Find a percent of a quantity in context as a rate per 100 (e.g., 30% of a quantity means times the quantity), including finding the whole given a part and the percent, by using tables, tape diagrams, and double number lines. 6.AT.A.4

B APPLY AND EXTEND PREVIOUS UNDERSTANDINGS OF ARITHMETIC TO ALGEBRAIC EXPRESSIONS. 6.AT.B

5 Write numerical expressions involving whole number exponents and positive rational number bases. Use technology to evaluate numerical expressions involving whole number exponents and positive rational number bases. 6.AT.B.5

6 Write, read, and evaluate expressions in which letters stand for numbers. 6.AT.B.6

a Write expressions that record operations with numbers and with letters standing for numbers (e.g., express the calculation "Subtract y from 5" as 5 − y). 6.AT.B.6.A

b Identify parts of an expression using mathematical language (e.g., sum, term, product, factor, quotient, coefficient) and view one or more parts of an expression as a single unit (e.g., describe the expression 2(8 + 7) as a product of two factors; view (8 + 7) as both a single unit and a sum of two terms). 6.AT.B.6.B

c Evaluate expressions given specific values of their variables in context. Include expressions that involve arithmetic operations and whole number exponents. 6.AT.B.6.C

7 Apply the properties of operations (e.g., distributive, associative, commutative, etc.) to generate equivalent algebraic expressions and to identify when two expressions are equivalent (e.g., apply the distributive property to the expression $3(2 + x)$ to produce the equivalent expression $6 + 3x$; apply the distributive property to the expression $24x + 18y$ to produce the equivalent expression $6(4x + 3y)$; apply properties of operations to $y + y + y$ to produce the equivalent expression 3y.) 6.AT.B.7

C REASON ABOUT AND SOLVE ONE-VARIABLE EQUATIONS AND INEQUALITIES 6.AT.C

8 Solve problems in context by writing and solving equations and interpreting the solutions in context. 6.AT.C.8

a Explain that a variable can represent an unknown number and use substitution to determine whether a given number makes an equation true. 6.AT.C.8.A

b Write and solve one-step equations of the form for cases in which p, q and x are all nonnegative rational numbers. 6.AT.C.8.B

c Represent solutions of such equations on a number line. 6.AT.C.8.C

9 Write an inequality of the form $x > c$ (using) represent a constraint or condition in context. Recognize that inequalities of this form have infinitely many solutions; represent solutions of such inequalities on number lines. 6.AT.C.9

10 Solve problems in context by writing and solving inequalities and interpreting solution sets in context. 6.AT.C.10

a Explain that a variable can represent an unknown number in a set and use substitution to determine whether a given number in a set makes an inequality true. 6.AT.C.10.A

b Write and solve one-step inequalities of the form (using) where p and q are nonnegative rational numbers. 6.AT.C.10.B

c Represent solutions of such inequalities on a number line. 6.AT.C.10.C

D REPRESENT AND ANALYZE QUANTITATIVE RELATIONSHIPS BETWEEN DEPENDENT AND INDEPENDENT VARIABLES 6.AT.D

11 Use variables to represent two quantities in context that change in relationship to one another. 6.AT.D.11

a Write an equation (one-step) to express one quantity, thought of as the dependent variable, in terms of the other quantity, thought of as the independent variable. 6.AT.D.11.A

b Analyze the relationship between the dependent and independent variables using graphs and tables, and relate these to the equation (e.g., in a problem involving motion at constant speed, list and graph ordered pairs of distances and times and write the equation d = 65t to represent the relationship between distance and time). 6.AT.D.11.B

Geometric Reasoning and Measurement GR

A SOLVE PROBLEMS IN CONTEXT INVOLVING AREA, SURFACE AREA, AND VOLUME 6.GR.A

1 Find the area of triangles, quadrilaterals, and polygons by composing into rectangles or decomposing into triangles and quadrilaterals to solve problems. 6.GR.A.1

2 Find the volume of a right rectangular prism with fractional edge lengths. 6.GR.A.2

a By packing prisms with unit cubes and using estimation to show that the volume can be found by multiplying the edge lengths of the prism. 6.GR.A.2.A

b Apply the formulas and (B is the area of the base) to find the volumes of right rectangular prisms with fractional edge lengths in context. 6.GR.A.2.B

3 Draw polygons in the Coordinate Plane given coordinates for the vertices; use coordinates to find the length of a side joining endpoints with the same first coordinate or the same second coordinate. Apply these techniques in context. 6.GR.A.3

4 Represent three-dimensional figures (triangular prism, rectangular prism, pyramid) using nets made up of rectangles and triangles, and use the nets to find the surface area of these figures to solve problems. 6.GR.A.4

Reasoning with Data and Statistics DS

A EXTEND UNDERSTANDING OF STATISTICAL VARIABILITY 6.DS.A

1 Recognize a statistical question as one that anticipates variability in the data related to the question and accounts for it in the answers (e.g., "How old am I?" is not a statistical question, but "How old are the students in my school?" is a statistical question because one anticipates variability in students' ages). 6.DS.A.1

2 Use the language of probability (e.g., likely, unlikely, certain, impossible) to describe the likelihood of possible outcomes and to anticipate variability in data collected from statistical questions. Explain how the likelihood of outcomes helps predict which responses may be more or less common in the data and justify predictions using probability terms. 6.DS.A.2

3 Explain how a set of data collected to answer a statistical question has a distribution which can be described by its center, spread, and overall shape. 6.DS.A.3

4 Recognize that a measure of center (median and/or mean) for a numerical data set summarizes all the values with a single number, while a measure of variation describes how its values vary with a single number. 6.DS.A.4

B SUMMARIZE AND DESCRIBE DISTRIBUTIONS 6.DS.B

5 Interpret numerical data in plots on a number line, including line plots, histograms, and box plots. 6.DS.B.5

6 Summarize numerical data sets in relation to their context. 6.DS.B.6

- a Report the number of observations. 6.DS.B.6.A
- b Describe the nature of the attribute under investigation, including how it was measured and its units of measurement. 6.DS.B.6.B
- c Give quantitative measures of center (median and/or mean) and variability (interquartile range), as well as describing outliers with reference to the context in which the data were gathered. 6.DS.B.6.C
- d Relate the choice of measures of center and variability to the shape of the data distribution and the context in which the data were gathered. 6.DS.B.6.D