

# 5<sup>th</sup> Grade Advanced Math

## 2021-2022

### Term 1

#### Finding the Volume (IM Unit 1)

**5.OA.A.1** Use parentheses and/or brackets in numerical expressions and evaluate expressions having these symbols using the conventional order (Order of Operations).

**5.OA.A.2** Write simple expressions that record calculations with numbers and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as  $2 \times (8 + 7)$ . Recognize that  $3 \times (18,932 + 921)$  is three times as large as  $18,932 + 921$ , without having to calculate the indicated sum or product.*

**5.MD.C.3** Recognize volume as an attribute of solid figures and understand concepts of volume measurement.

- a. Understand that a cube with side length 1 unit, called a "unit cube," is said to have "one cubic unit" of volume and can be used to measure volume.
- b. Understand that a solid figure which can be packed without gaps or overlaps using  $n$  unit cubes is said to have a volume of  $n$  cubic units.

**5.MD.C.4** Measure volume by counting unit cubes, using cubic centimeters, cubic inches, cubic feet, and improvised units.

**5.MD.C.5** Relate volume to the operations of multiplication and addition and solve real-world and mathematical problems involving volume of right rectangular prisms.

- a. Find the volume of a right rectangular prism with whole-number side lengths by packing it with unit cubes and show that the volume is the same as would be found by multiplying the edge lengths, equivalently by multiplying the height by the area of the base. Represent whole-number products of three factors as volumes (*e.g., to represent the associative property of multiplication*).
- b. Know and apply the formulas  $V = l \times w \times h$  and  $V = B \times h$  (where  $B$  represents the area of the base) for rectangular prisms to find volumes of right rectangular prisms with whole number edge lengths in the context of solving real-world and mathematical problems.
- c. Recognize volume as additive. Find volumes of solid figures composed of two non-overlapping right rectangular prisms by adding the volumes of the non-overlapping parts, applying this technique to solve real-world problems.

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### Term 1

#### Fractions as Division and Fraction Multiplication (IM Unit 2)

**5.OA.A.2** Write simple expressions that record calculations with numbers and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as  $2 \times (8 + 7)$ . Recognize that  $3 \times (18,932 + 921)$  is three times as large as  $18,932 + 921$ , without having to calculate the indicated sum or product.*

**5.NF.B.3** Interpret a fraction as division of the numerator by the denominator ( $\frac{a}{b} = a \div b$ ). *For example,  $\frac{3}{4} = 3 \div 4$  so when 3 wholes are shared equally among 4 people, each person has a share of size  $\frac{3}{4}$ .* Solve contextual problems involving division of whole numbers leading to answers in the form of fractions or mixed numbers by using visual fraction models or equations to represent the problem. *For example, if 8 people want to share 49 sheets of construction paper equally, how many sheets will each person receive? Between what two whole numbers does your answer lie?*

**5.NF.B.4** Apply and extend previous understandings of multiplication to multiply a fraction by a whole number or a fraction by a fraction.

- a. Interpret the product  $\frac{a}{b} \times q$  as  $a \times (q \div b)$  (partition the quantity  $q$  into  $b$  equal parts and then multiply by  $a$ ). Interpret the product  $\frac{a}{b} \times q$  as  $(a \times q) \div b$  (multiply  $a$  times the quantity  $q$  and then partition the product into  $b$  equal parts). *For example, use a visual fraction model or write a story context to show that  $\frac{2}{3} \times 6$  can be interpreted as  $2 \times (6 \div 3)$  or  $(2 \times 6) \div 3$ . Do the same with  $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$ . (In general,  $\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$ .)*
- b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles and represent fraction products as rectangular areas.

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### Term 1

#### Fraction Multiplication and Division (IM Unit 3)

**5.NF.B.4** Apply and extend previous understandings of multiplication to multiply a fraction by a whole number or a fraction by a fraction.

- a. Interpret the product  $\frac{a}{b} \times q$  as  $a \times (q \div b)$  (partition the quantity  $q$  into  $b$  equal parts and then multiply by  $a$ ). Interpret the product  $\frac{a}{b} \times q$  as  $(a \times q) \div b$  (multiply  $a$  times the quantity  $q$  and then partition the product into  $b$  equal parts). *For example, use a visual fraction model or write a story context to show that  $\frac{2}{3} \times 6$  can be interpreted as  $2 \times (6 \div 3)$  or  $(2 \times 6) \div 3$ . Do the same with  $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$ . (In general,  $\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$ .)*
- b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles and represent fraction products as rectangular areas.

**5.NF.B.6** Solve real-world problems involving multiplication of fractions and mixed numbers by using visual fraction models or equations to represent the problem.

**5.NF.B.7** Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.

- a. Interpret division of a unit fraction by a non-zero whole number and compute such quotients. *For example, use visual models and the relationship between multiplication and division to explain that  $\frac{1}{3} \div 4 = 1/12$  because  $\frac{1}{12} \times 4 = 1/3$ .*
- b. Interpret division of a whole number by a unit fraction and compute such quotients. *For example, use visual models and the relationship between multiplication and division to explain that  $4 \div \frac{1}{5} = 20$  because  $20 \times \frac{1}{5} = 4$ .*
- c. Solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share  $\frac{1}{2}$  lb of chocolate equally? How many  $\frac{1}{3}$  cup servings are in 2 cups of raisins?*

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### Term 2

#### Fraction Multiplication and Division cont. (IM Unit 3)

**5.NF.B.4** Apply and extend previous understandings of multiplication to multiply a fraction by a whole number or a fraction by a fraction.

- a. Interpret the product  $\frac{a}{b} \times q$  as  $a \times (q \div b)$  (partition the quantity  $q$  into  $b$  equal parts and then multiply by  $a$ ). Interpret the product  $\frac{a}{b} \times q$  as  $(a \times q) \div b$  (multiply  $a$  times the quantity  $q$  and then partition the product into  $b$  equal parts). *For example, use a visual fraction model or write a story context to show that  $\frac{2}{3} \times 6$  can be interpreted as  $2 \times (6 \div 3)$  or  $(2 \times 6) \div 3$ . Do the same with  $\frac{2}{3} \times \frac{4}{5} = \frac{8}{15}$ . (In general,  $\frac{a}{b} \times \frac{c}{d} = \frac{ac}{bd}$ .)*
- b. Find the area of a rectangle with fractional side lengths by tiling it with unit squares of the appropriate unit fraction side lengths, and show that the area is the same as would be found by multiplying the side lengths. Multiply fractional side lengths to find areas of rectangles and represent fraction products as rectangular areas.

**5.NF.B.6** Solve real-world problems involving multiplication of fractions and mixed numbers by using visual fraction models or equations to represent the problem.

**5.NF.B.7** Apply and extend previous understandings of division to divide unit fractions by whole numbers and whole numbers by unit fractions.

- a. Interpret division of a unit fraction by a non-zero whole number and compute such quotients. *For example, use visual models and the relationship between multiplication and division to explain that  $\frac{1}{3} \div 4 = 1/12$  because  $\frac{1}{12} \times 4 = 1/3$ .*
- b. Interpret division of a whole number by a unit fraction and compute such quotients. *For example, use visual models and the relationship between multiplication and division to explain that  $4 \div \frac{1}{5} = 20$  because  $20 \times \frac{1}{5} = 4$ .*
- c. Solve real-world problems involving division of unit fractions by non-zero whole numbers and division of whole numbers by unit fractions by using visual fraction models and equations to represent the problem. *For example, how much chocolate will each person get if 3 people share  $\frac{1}{2}$  lb of chocolate equally? How many  $\frac{1}{3}$  cup servings are in 2 cups of raisins?*

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### Term 2

<b>Wrapping Up Multiplication and Division with Multi-Digit Numbers (IM Unit 4)</b>	<b>5.OA.A.2</b> Write simple expressions that record calculations with numbers and interpret numerical expressions without evaluating them. <i>For example, express the calculation "add 8 and 7, then multiply by 2" as <math>2 \times (8 + 7)</math>. Recognize that <math>3 \times (18,932 + 921)</math> is three times as large as <math>18,932 + 921</math>, without having to calculate the indicated sum or product.</i>
	<b>5.NBT.A.1</b> 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 $\frac{1}{10}$ of what it represents in the place to its left.
	<b>5.NBT.B.5</b> Fluently multiply multi-digit whole numbers (up to three-digit by four-digit factors) using appropriate strategies and algorithms.
	<b>5.NBT.B.6</b> Find whole-number quotients and remainders of whole numbers with up to four-digit dividends and two-digit divisors, using strategies based on place value, the properties of operations, and/or the relationship between multiplication and division. Illustrate and explain the calculation by using equations, rectangular arrays, and/or area models.
<b>Shapes on the Coordinate Plane (IM Unit 7)</b>	<b>5.OA.B.3</b> Generate two numerical patterns using two given rules. <i>For example, given the rule "Add 3" and the starting number 0, and given the rule "Add 6" and the starting number 0, generate terms in the resulting sequences.</i> a. Identify relationships between corresponding terms in two numerical patterns. <i>For example, observe that the terms in one sequence are twice the corresponding terms in the other sequence.</i> b. Form ordered pairs consisting of corresponding terms from two numerical patterns and graph the ordered pairs on a coordinate plane.
	<b>5.G.A.1</b> Graph ordered pairs and label points using the first quadrant of the coordinate plane. Understand in the ordered pair that the first number indicates the horizontal distance traveled along the x-axis from the origin and the second number indicates the vertical distance traveled along the y-axis, with the convention that the names of the two axes and the coordinates correspond (e.g., x-axis and x-coordinate, y-axis and y-coordinate).
	<b>5.G.A.2</b> 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.
	<b>5.G.B.3</b> Classify two-dimensional figures in a hierarchy based on properties. Understand that attributes belonging to a category of two-dimensional figures also belong to all subcategories of that category. <i>For example, all rectangles have four right angles and squares are rectangles, so all squares have four right angles.</i>

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### Term 3

#### Place Value Patterns and Decimal Operations (IM Unit 5)

**5.OA.A.1** Use parentheses and/or brackets in numerical expressions and evaluate expressions having these symbols using the conventional order (Order of Operations).

**5.OA.A.2** Write simple expressions that record calculations with numbers and interpret numerical expressions without evaluating them. *For example, express the calculation "add 8 and 7, then multiply by 2" as  $2 \times (8 + 7)$ . Recognize that  $3 \times (18,932 + 921)$  is three times as large as  $18,932 + 921$ , without having to calculate the indicated sum or product.*

**5.NBT.A.1** 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.

**5.NBT.A.2** Explain patterns in the number of zeros of the product when multiplying a number by powers of 10, and explain patterns in the placement of the decimal point when a decimal is multiplied or divided by a power of 10. Use whole-number exponents to denote powers of 10.

**5.NBT.A.3** Read and write decimals to thousandths using standard form, word form, and expanded form (e.g., the expanded form of 347.392 is written as  $3 \times 100 + 4 \times 10 + 7 \times 1 + 3 \times (1/10) + 9 \times (1/100) + 2 \times (1/1000)$ ). Compare two decimals to thousandths based on meanings of the digits in each place and use the symbols  $>$ ,  $=$ , and  $<$  to show the relationship.

**5.NBT.A.4** Round decimals to the nearest hundredth, tenth, or whole number using understanding of place value.

**5.NBT.B.7** Add, subtract, multiply, and divide decimals to hundredths, using concrete models or drawings and strategies based on place value, properties of operations, and/or the relationship between operations; assess the reasonableness of answers using estimation strategies. (Limit division problems so that either the dividend or the divisor is a whole number.)

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### Term 3

#### More Decimal and Fraction Operations (IM Unit 6)

**5.MD.A.1** Convert customary and metric measurement units within a single system by expressing measurements of a larger unit in terms of a smaller unit. Use these conversions to solve multi-step real-world problems involving distances, intervals of time, liquid volumes, masses of objects, and money (including problems involving simple fractions or decimals). *For example, 3.6 liters and 4.1 liters can be combined as 7.7 liters or 7700 milliliters*

**5.MD.B.2** Make a line plot to display a data set of measurements in fractions of a unit ( $\frac{1}{2}$ ,  $\frac{1}{4}$ ,  $\frac{1}{8}$ ). Use operations on fractions for this grade to solve problems involving information presented in line plots. *For example, given different measurements of liquid in identical beakers, find the amount of liquid each beaker would contain if the total amount in all the beakers were redistributed equally.*

**5.NBT.A.1-See Description Above**

**5.NBT.A.2-See Description Above**

**5.NF.A.1** Add and subtract fractions with unlike denominators (including mixed numbers) by replacing given fractions with equivalent fractions in such a way as to produce an equivalent sum or difference of fractions with like denominators. *For example,  $\frac{2}{3} + \frac{5}{4} = \frac{8}{12} + \frac{15}{12} = \frac{23}{12}$ .*

**5.NF.A.2** Solve contextual problems involving addition and subtraction of fractions referring to the same whole, including cases of unlike denominators. Use benchmark fractions and number sense of fractions to estimate mentally and assess the reasonableness of answers. *For example, recognize an incorrect result  $\frac{2}{5} + \frac{1}{2} = \frac{3}{7}$ , by observing that  $\frac{3}{7} < \frac{1}{2}$ .*

**5.NF.B.4 – See Description above**

**5.NF.B.5** Interpret multiplication as scaling (resizing).

- Compare the size of a product to the size of one factor on the basis of the size of the other factor, without performing the indicated multiplication. *For example, know if the product will be greater than, less than, or equal to the factors.*
- Explain 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); explain why multiplying a given number by a fraction less than 1 results in a product less than the given number; and relate the principle of fraction Equivalence  $\frac{a}{b} = \frac{(a \times n)}{(b \times n)}$  to the effect of multiplying  $\frac{a}{b}$  by 1.

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### Term 4

#### Ratios and Rates

#### IM 6 Accelerated Unit 2 (L1-L19)

- 6.RP.A.1** Understand the concept of a ratio and use ratio language to describe a ratio relationship between two quantities. *For example, the ratio of wings to beaks in a bird house at the zoo was 2:1, because for every 2 wings there was 1 beak. Another example could be for every vote candidate A received, candidate C received nearly three votes.*
- 6.RP.A.2** Understand the concept of a unit rate  $a/b$  associated with a ratio  $a:b$  with  $b \neq 0$ . Use rate language in the context of a ratio relationship. *For example, this recipe has a ratio of 3 cups of flour to 4 cups of sugar, so there is  $3/4$  cup of flour for each cup of sugar. Also, we paid \$75 for 15 hamburgers, which is a rate of \$5 per hamburger.*
- 6.RP.A.3** Use ratio and rate reasoning to solve real-world and mathematical problems (e.g., by reasoning about tables of equivalent ratios, tape diagrams, double number line diagrams, or equations).
- a. Make tables of equivalent ratios relating quantities with whole number measurements, find missing values in the tables, and plot the pairs of values on the coordinate plane. Use tables to compare ratios.
  - b. Solve unit rate problems including those involving unit pricing and constant speed. *For example, if a runner ran 10 miles in 90 minutes, running at that speed, how long will it take him to run 6 miles? How fast is he running in miles per hour?*
  - d. Use ratio reasoning to convert customary and metric measurement units (within the same system); manipulate and transform units appropriately when multiplying or dividing quantities.

#### Fractions and Decimals

#### IM 6 Accelerated Unit 3 (L1-L8 and L13-L21)

- 6.NS.A.1** Interpret and compute quotients of fractions, and solve contextual problems involving division of fractions by fractions (e.g., using visual fraction models and equations to represent the problem is suggested). *For example, create a story context for  $(2/3) \div (3/4)$  and use a visual fraction model to show the quotient; use the relationship between multiplication and division to explain that  $(2/3) \div (3/4) = 8/9$  because  $3/4$  times  $8/9$  is  $2/3$  ( $(a/b) \div (c/d) = ad/bc$ .) Further example: How much chocolate will each person get if 3 people share  $1/2$  lb of chocolate equally? How wide is a rectangular strip of land with length  $3/4$  mi and area  $1/2$  square mi?*
- 6.NS.B.2** Fluently divide multi-digit numbers using a standard algorithm.
- 6.NS.B.3** Fluently add, subtract, multiply, and divide multi-digit decimals using a standard algorithm for each operation.