



**ALPHA PLUS**

**TEACHER'S GUIDE**

# **Math 7**



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**Oklahoma Academic Standards**

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**Math 7**

**Ensuring Student Success**  
*with*

**Oklahoma Academic Standards**

*Written by Oklahoma Teachers for Oklahoma Teachers*

*Nicole Hall*



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# SUCCESS *with* OAS

## ***Math 7 by Nicole Hall***

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## FOREWORD

Adopted in 2016 by the State Board of Education, the Oklahoma Academic Standards (OAS) mathematics objectives are measurably more rigorous in content and different in terms of vertical alignment than previous curriculum frameworks.

Immediately, Alpha Plus Educational Systems sought highly qualified teachers to develop a teaching and learning resource specifically aligned to the new standards. CEO Jan Barrick also enlisted my help and that of Dr. Frank Wang, President of the Oklahoma School of Science and Mathematics (OSSM), who is a nationally known, accomplished mathematics educator and an experienced textbook publisher. It has been my pleasure to help ensure the content is of high quality and will provide a solid mathematical foundation.

Written by Oklahoma teachers for Oklahoma teachers, the *Success with OAS: Alpha Plus Mathematics* series provides a robust set of resources relating mathematical skills to the real world of Oklahoma students.

-- Edna McDuffie Manning, *EdD.*, *Mathematics*  
Founder and President Emerita, Oklahoma School of Science and Mathematics

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## INTRODUCTION

The *Success with OAS: Alpha Plus Mathematics* framework for instruction, independent student work, and continuous review will prepare students for comprehensive assessments at each grade level. Following is a summary addressing the most effective way to use each element.

### Teacher's Guide

**Objective Statement:** At the beginning of each lesson, the OAS objective is stated as adopted. This is helpful when writing lesson plans and understanding the focus of the lesson.

**Real-World Connections:** Students must be engaged and must relate the concept to their daily lives. Connecting to a real-world application taps into students' prior knowledge and shows the practicality behind the concept. It is suggested that the teacher start with a relevant, age-appropriate game, class discussion, website or video, role-play, or other group activity. This will illustrate the need to learn the skill so that students can use it in their daily lives.

**Vocabulary:** A list of vocabulary words critical to each OAS Objective is provided, particularly those used in the state's *Test and Item Specifications*. A complete vocabulary definition can be found in the student workbook and in the comprehensive Glossary at the end of the book.

**Modeling:** The Modeling section provides step-by-step instructions for one or more ways to teach the objective and the skills related to the lesson. Teachers may use this to direct students and add more examples or details as needed for the teachers' lesson plans.

Extension Activities: This is a list of possible resources to enhance the objective lesson. Every author provided links to tools they use in class, to online content available at no charge for teacher use, and to other lesson-planning resources.

Answer Key: Every Teacher's Guide includes a complete Answer Key for each assessment item in the student workbook. The Answer Key for the Continuous Review designates what objectives are assessed.

Comprehensive Examination: A Comprehensive Examination was developed to resemble the state assessment and encompasses every objective taught. It can be used as a pre-test and post-test for the school year to better prepare students for state-mandated tests. The Answer Key provides the answers with objective numbers.

### **Student Workbook**

Objective Statement: At the beginning of each student lesson is the objective statement. It clearly defines the focus of the lesson.

Real-World Connections: Written in age-appropriate language, this section reminds students of prior knowledge they have on the topic and how they might use this skill in their daily lives. Relevance is essential to student engagement in the lesson. Teachers can highlight this scenario for the students with a game, role-play, or other group activity.

Vocabulary: Each lesson includes a vocabulary list with definitions for the words the students will encounter on state assessments. Students should also learn to use the Glossary in the back of the book.

Guided Practice: Every objective lesson includes a Guided Practice, which is a set of items available for use in class as part of, or after, instruction. The ten practice problems reflect every skill students will use when they work independently.

Independent Practice: The Independent Practice is a series of twenty questions and activities the student may do independently, either in the classroom or for homework. The Independent Practice can also be used for reinforcement or review as needed.

Continuous Review: At the end of each lesson, there is a Continuous Review with ten questions covering objectives taught previously in the book or aligned to key skills from previous grade level(s). The Answer Key designates the objective each question assesses. The Continuous Review is in sequence after each objective lesson or can be used as a weekly assessment to reinforce past skills.

**OAS Mathematics**
**Table of Contents**
**7th grade**

| Suggested Order | Objective Number | Objective Description                                                                                                                                                                                                    | Teacher Guide Page Number | Student Book Page Number |
|-----------------|------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------|
| 1               | 7.N.1.1          | Know that every rational number can be written as the ratio of two integers or as a terminating or repeating decimal.                                                                                                    | 1                         | 1                        |
| 2               | 7.N.1.2          | Compare and order rational numbers expressed in various forms using the symbols $<$ , $>$ , and $=$ .                                                                                                                    | 10                        | 7                        |
| 3               | 7.N.1.3          | Recognize and generate equivalent representations of rational numbers, including equivalent fractions.                                                                                                                   | 19                        | 13                       |
| 4               | 7.N.2.1          | Estimate solutions to multiplication and division of integers in order to assess the reasonableness of results.                                                                                                          | 31                        | 21                       |
| 5               | 7.N.2.2          | Illustrate multiplication and division of integers using a variety of representations.                                                                                                                                   | 40                        | 29                       |
| 6               | 7.N.2.3          | Solve real-world and mathematical problems involving addition, subtraction, multiplication and division of rational numbers; use efficient and generalizable procedure including but not limited to standard algorithms. | 55                        | 41                       |
| 7               | 7.N.2.4          | Raise integers to positive integer exponents.                                                                                                                                                                            | 68                        | 51                       |
| 8               | 7.N.2.5          | Solve real-world and mathematical problems involving calculations with rational numbers and positive integer exponents.                                                                                                  | 76                        | 57                       |
| 9               | 7.N.2.6          | Explain the relationship between the absolute value of a rational number and the distance of that number from zero on a number line. Use the symbol for absolute value.                                                  | 87                        | 67                       |

**OAS Mathematics                      Table of Contents                      7th grade**

| Suggested Order | Objective Number | Objective Description                                                                                                                                                                                                                                                                                | Teacher Guide Page Number | Student Book Page Number |
|-----------------|------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------|
| 10              | 7.A.1.1          | Describe that the relationship between two variables, x and y, is proportional if it can be expressed in the form $\frac{y}{x} = k$ or $y = kx$ ; distinguish proportional relationships from other relationships, including inversely proportional relationships ( $xy = k$ or $y = \frac{k}{x}$ ). | 97                        | 75                       |
| 11              | 7.A.1.2          | Recognize that the graph of a proportional relationship is a line through the origin and the coordinate (1,r), where both r and slope are the unit rate (constant of proportionality, k).                                                                                                            | 111                       | 85                       |
| 12              | 7.A.2.1          | Represent proportional relationships with tables, verbal descriptions, symbols, and graphs; translate from one representation to another. Determine and compare the unit rate (constant of proportionality, slope, or rate of change) given any of these representations.                            | 142                       | 103                      |
| 13              | 7.A.2.2          | Solve multi-step problems involving proportional relationships involving distance-time, percent increase or decrease, discounts, tips, unit pricing, similar figures, and other real-world and mathematical situations.                                                                              | 168                       | 121                      |
| 14              | 7.A.2.3          | Use proportional reasoning to solve real-world and mathematical problems involving ratios.                                                                                                                                                                                                           | 182                       | 131                      |
| 15              | 7.A.2.4          | Use proportional reasoning to assess the reasonableness of solutions.                                                                                                                                                                                                                                | 196                       | 143                      |

**OAS Mathematics                      Table of Contents                      7th grade**

| Suggested Order | Objective Number | Objective Description                                                                                                                                                                                                                                                           | Teacher Guide Page Number | Student Book Page Number |
|-----------------|------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------|
| 16              | 7.A.3.1          | Write and solve problems leading to linear equations with one variable in the form $px + q = r$ and $p(x + q) = r$ , where $p$ , $q$ , and $r$ are rational numbers.                                                                                                            | 209                       | 153                      |
| 17              | 7.A.3.2          | Represent, write, solve, and graph problems leading to linear inequalities with one variable in the form $x + p > q$ and $x + p < q$ , where $p$ , and $q$ are nonnegative rational numbers.                                                                                    | 225                       | 165                      |
| 18              | 7.A.3.3          | Represent real-world or mathematical situations using equations and inequalities variable and rational numbers.                                                                                                                                                                 | 240                       | 175                      |
| 19              | 7.A.4.1          | Use properties of operations (limited to associative, commutative, and distributive) to generate equivalent numerical and algebraic expressions containing rational numbers, grouping symbols and whole number exponents.                                                       | 254                       | 185                      |
| 20              | 7.A.4.2          | Apply understanding of order of operations and grouping symbols when using calculators and other technologies.                                                                                                                                                                  | 268                       | 197                      |
| 21              | 7.GM.1.1         | Using a variety of tools and strategies, develop the concept that surface area of a rectangular prism with rational-valued edge lengths can be found by wrapping the figure with same-sized square units without gaps or overlap. Use appropriate measurements such as $cm^2$ . | 283                       | 207                      |

## OAS Mathematics      Table of Contents      7th grade

| Suggested Order | Objective Number | Objective Description                                                                                                                                                                                                                                                                                 | Teacher Guide Page Number | Student Book Page Number |
|-----------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------|
| 22              | 7.GM.1.2         | Using a variety of tools and strategies, develop the concept that the volume of rectangular prisms with rational-valued edge lengths can be found by counting the total number of same-sized unit cubes that fill a shape without the gaps or overlaps. Use appropriate measurements such as $cm^2$ . | 298                       | 219                      |
| 23              | 7.GM.2.1         | Develop and use the formula to determine the area of a trapezoid to solve problems.                                                                                                                                                                                                                   | 311                       | 229                      |
| 24              | 7.GM.2.2         | Find the area and perimeter of composite figures to solve real-world and mathematical problems.                                                                                                                                                                                                       | 328                       | 241                      |
| 25              | 7.GM.3.1         | Demonstrate an understanding of the proportional relationship between the diameter and circumference of a circle and that the unit rate (constant of proportionality) is $\pi$ and can be approximated by rational numbers such as $\frac{22}{7}$ and 3.14.                                           | 345                       | 255                      |
| 26              | 7.GM.3.2         | Calculate the circumference and area of circles to solve problems in various contexts, in terms of $\pi$ and using approximations for $\pi$ .                                                                                                                                                         | 360                       | 265                      |
| 27              | 7.GM.4.1         | Describe the properties of similarity, compare geometric figures for similarity, and determine scale factors resulting from dilations.                                                                                                                                                                | 375                       | 277                      |
| 28              | 7.GM.4.2         | Apply proportions, ratios, and scale factors to solve problems involving scale drawings and determine side lengths and areas of similar triangles and rectangles.                                                                                                                                     | 394                       | 291                      |

**OAS Mathematics                      Table of Contents                      7th grade**

| Suggested Order | Objective Number | Objective Description                                                                                                                                                                                                               | Teacher Guide Page Number | Student Book Page Number |
|-----------------|------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------|--------------------------|
| 29              | 7.GM.4.3         | Graph and describe translations and reflections of figures on a coordinate plane and determine the coordinates of the vertices of the figure after the transformation.                                                              | 412                       | 305                      |
| 30              | 7.D.1.1          | Design simple experiments, collect data, and calculate measure of central tendency (mean, median, and mode) and spread (range). Use these quantities to draw conclusions about the data collected and make predictions.             | 431                       | 321                      |
| 31              | 7.D.1.2          | Use reasoning with proportions to display and interpret data in circle graphs (pie charts) and histograms. Choose the appropriate data display and know how to create the display using a spreadsheet or other graphing technology. | 448                       | 335                      |
| 32              | 7.D.2.1          | Determine the theoretical probability of an event using the ratio between the size of the event and the size of the sample space; represent probabilities as percents, fractions, and decimals between 0 and 1.                     | 473                       | 353                      |
| 33              | 7.D.2.2          | Calculate probability as a fraction of sample space or as a fraction of area. Express probabilities as percents, decimals, and fractions.                                                                                           | 487                       | 365                      |
| 34              | 7.D.2.3          | Use proportional reasoning to draw conclusions about and predict relative frequencies of outcomes based on probabilities.                                                                                                           | 505                       | 379                      |

## Teacher's Guide

**7.N.1.1 Know that every rational number can be written as the ratio of two integers or as a terminating or repeating decimal.**

### Real-World Connections

Students will know every rational number can be written as a ratio. A ratio can help find the best unit price. For example, is the large 44-ounce container of ketchup a better buy than the sale of two 20-ounce containers of ketchup? Students will identify rational numbers written as a ratio of two integers, convert them to decimals, and distinguish between terminating and repeating.

### Vocabulary

Natural or counting number, whole number, rational number, ratio, equivalent, integers, terminating decimal, repeating decimal, non-repeating decimal, non-terminating decimal, and bar notation

### Modeling

**Step 1:** Review the vocabulary. A rational number is any integer, whole numbers and their opposites that can be written as fractions, where the denominator is  $\neq 0$ . A fraction is a ratio ( $\frac{1}{2}$ , 1:2 or 1 to 2).

**Step 2:** In Guided Practice #1 the whole number 5 can be written as the ratio  $\frac{5}{1}$ . Every rational number can be written as a ratio or fraction. Give additional examples if needed, such as the whole number 3 can be written as  $\frac{3}{1}$ .

**Step 3:** Discuss converting a fraction into a decimal using guided practice question #1. Demonstrate dividing the numerator by the denominator  $5 \div 1 = 5$ .

**Step 4:** In Guided Practice questions #3 and #4 give the student  $\frac{1}{2}$  then divide and discuss the decimal 0.5. Give the students  $\frac{3}{4}$  then divide and discuss 0.75. Explain when the decimal ends or terminates, it's a terminating decimal and a rational number.

**Step 5:** On Guided Practice questions #2 and #5 give the students  $\frac{1}{3}$  then divide and discuss the decimal 0.3333333 or  $0.\bar{3}$ . Give the students  $\frac{5}{6}$  then divide and discuss the decimal 0.833333333... or  $0.8\bar{3}$ . Explain when the decimal repeats, it is a repeating decimal and a rational number.

## Teacher's Guide 7.N.1.1

### Extension Activities

Oklahoma State Department of Education objective analysis of 7.N.1.1

<http://okmathframework.pbworks.com/w/page/112218586/7-N-1-1>

For this game, you will need: A deck of cards and a form set up as pictured below. There should be room for 10 rounds on the form.

| Round Number | Your Guess: Repeating or Terminating? | Cards | Fraction Created | Equivalent Decimal | Points Earned |
|--------------|---------------------------------------|-------|------------------|--------------------|---------------|
| Round 1      |                                       |       |                  |                    |               |
| Round 2      |                                       |       |                  |                    |               |
| Round 3      |                                       |       |                  |                    |               |
| Round 4      |                                       |       |                  |                    |               |
| Round 5      |                                       |       |                  |                    |               |
| Round 6      |                                       |       |                  |                    |               |
| Round 7      |                                       |       |                  |                    |               |
| Round 8      |                                       |       |                  |                    |               |
| Round 9      |                                       |       |                  |                    |               |
| Round 10     |                                       |       |                  |                    |               |

Directions:

1. Shuffle the deck of cards and place them face down between two players.
2. Before beginning a round, each player needs to guess “terminating” or “repeating.”
3. Once both players have recorded their guess, they will turn over the top two cards. The smaller card should become the numerator and the larger card will become the denominator. (Jacks = 11, Queens = 12, Kings = 13, Aces = 1)
4. Players will find the equivalent decimal for the fraction that was created and record it in the table.
5. If a player guessed correctly at the beginning of the round, they earn one point, and they can earn additional points as follows:
  - 1 point- the decimal contains a four
  - 2 points- the decimal is less than 0.5
  - 2 points – the decimal is even
  - 5 points- the decimal is exactly 0.7
6. The player with the most points at the end of ten rounds is the winner!

## Answer Key 7.N.1.1

### Guided Practice

1. 5.0 terminating decimal
2.  $0.\overline{3}$ , repeating decimal
3. 0.5, terminating decimal
4. 0.75 terminating decimal
5. 0.833333333... or  $0.8\overline{3}$  repeating decimal
6. 0.7; terminating decimal
7. 0.6; terminating decimal
8.  $0.41\overline{6}$ ; repeating decimal
9.  $0.\overline{3}$ ; repeating decimal
10. 0.875; terminating decimal

### Independent Practice

1. 0.5, terminating decimal
2.  $0.\overline{6}$ , repeating decimal
3. 0.25, terminating decimal
4. 0.875, terminating decimal
5. 0.4, terminating decimal
6.  $0.1\overline{6}$ , repeating decimal
7.  $0.91\overline{6}$ , repeating decimal
8. 0.625, terminating decimal
9.  $0.58\overline{3}$ , repeating decimal
10. 0.8, terminating decimal
11. 0.375, terminating decimal
12. 0.8, terminating decimal
13.  $0.08\overline{3}$ , repeating decimal
14. 8.0, terminating decimal
15. 0.5, terminating decimal
16. 0.1, terminating decimal
17.  $0.8\overline{3}$ , repeating decimal
18. 0.9, terminating decimal
19. 0.2, terminating decimal
20. 0.125, terminating decimal

## Answer Key 7.N.1.1

### Continuous Review

1. (6.N.3.1)  $\frac{12}{10}$ , 12:10, 12 to 10 or  $\frac{6}{5}$ , 6:5, 6 to 5
2. (6.N.3.1)  $\frac{10}{12}$ , 10:12, 10 to 12 or  $\frac{5}{6}$ , 5:6, 5 to 6
3. (6.N.3.1)  $\frac{2}{22}$ , 2:22, 2 to 22 or  $\frac{1}{11}$ , 1:1, 1 to 11
4. (6.N.3.1)  $\frac{22}{5}$ , 22:5, 22 to 5
5. (6.N.1.2) 0.53, 0.503, 0.053, 0.05
6. (6.N.1.2)  $\frac{4}{5}$ ,  $\frac{3}{4}$ ,  $\frac{2}{3}$ ,  $\frac{2}{5}$
7. (6.N.1.2) 84%, 48%, 28%, 4%
8. (6.N.1.2) <
9. (6.N.1.2) <
10. (6.N.1.2) <

**7.N.1.1 Know that every rational number can be written as the ratio of two integers or as a terminating or repeating decimal.**

**Real-World Connections**

In the real-world why would you need to know a ratio? A ratio can help you find the best unit price. For example, is the large 44-ounce container of ketchup a better buy than the sale of two 20-ounce containers of ketchup? Since you want to save money when you can, this is one example of how knowing a ratio can be a useful tool in your daily life.

**Vocabulary**

|                                   |                                                                                                                                                                     |
|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>natural or counting number</b> | 1, 2, 3, 4, 5... no zero                                                                                                                                            |
| <b>ratio</b>                      | a relationship between quantities, for every $a$ units of one quantity there are $b$ units for the other; a ratio is often denoted by $a:b$ and read “ $a$ to $b$ ” |
| <b>integers</b>                   | the set of numbers that contains the whole numbers and their additive inverse (opposites); no fractions or decimals                                                 |
| <b>whole number</b>               | positive numbers, including zero, without any decimal or fractional parts. (ex: 0, 1,2,3,4,5, ....)                                                                 |
| <b>rational number</b>            | a number that can be written as a fraction; rational numbers are all real numbers, and can be positive or negative.                                                 |
| <b>equivalent</b>                 | equal                                                                                                                                                               |
| <b>terminating decimal</b>        | a decimal that ends                                                                                                                                                 |
| <b>repeating decimal</b>          | also called a recurring decimal; a number whose decimal becomes the same sequence of digits and repeats indefinitely and the repeating digit is not zero            |
| <b>non-repeating decimal</b>      | a decimal that neither terminates nor repeats                                                                                                                       |
| <b>non-terminating decimal</b>    | a decimal that does not end in an infinite sequence of zeros; also known as infinite decimal.                                                                       |
| <b>bar notation</b>               | a horizontal bar over decimals to indicate they repeat                                                                                                              |

The repeating portion of a decimal expansion is denoted with a bar notation,  
 for example,  $\frac{2}{3} = .666666 = 0.\overline{6}$

**Convert rational numbers and ratios to equivalent decimals and identify terminating and repeating decimals.**

| Rational Number or Ratio | Decimal          | Terminating or Repeating |
|--------------------------|------------------|--------------------------|
| 1. $\frac{5}{1}$         | $\frac{5}{1} =$  |                          |
| 2. $\frac{1}{3}$         | $\frac{1}{3} =$  |                          |
| 3. $\frac{1}{2}$         | $\frac{1}{2} =$  |                          |
| 4. $\frac{3}{4}$         | $\frac{3}{4} =$  |                          |
| 5. $\frac{5}{6}$         | $\frac{5}{6} =$  |                          |
| 6. $\frac{7}{10}$        | $\frac{7}{10} =$ |                          |
| 7. $\frac{3}{5}$         | $\frac{3}{5} =$  |                          |
| 8. $\frac{5}{12}$        | $\frac{5}{12} =$ |                          |
| 9. $\frac{2}{6}$         | $\frac{2}{6} =$  |                          |
| 10. $\frac{7}{8}$        | $\frac{7}{8} =$  |                          |

**7.N.1.1 Know that every rational number can be written as the ratio of two integers or as a terminating or repeating decimal.**

*Convert the following ratios to their equivalent decimal and identify as terminating or repeating.*

Example:  $\frac{2}{12} = 2 \div 12 = 0.1\bar{6}$     repeating decimal

|                      |                     |
|----------------------|---------------------|
| 1. $\frac{6}{12} =$  | 2. $\frac{2}{3} =$  |
| 3. $\frac{1}{4} =$   | 4. $\frac{7}{8} =$  |
| 5. $\frac{2}{5} =$   | 6. $\frac{1}{6} =$  |
| 7. $\frac{11}{12} =$ | 8. $\frac{5}{8} =$  |
| 9. $\frac{7}{12} =$  | 10. $\frac{4}{5} =$ |

**Independent Practice (7.N.1.1)**

Name \_\_\_\_\_

Convert the following ratios to their equivalent decimal and identify as terminating or repeating.

Example:  $\frac{7}{11} = 7 \div 11 = 0.\overline{63}$  repeating decimal

|                       |                      |
|-----------------------|----------------------|
| 11. $\frac{3}{8} =$   | 12. $\frac{8}{10} =$ |
| 13. $\frac{1}{12} =$  | 14. $8 =$            |
| 15. $\frac{2}{4} =$   | 16. $\frac{1}{10} =$ |
| 17. $\frac{10}{12} =$ | 18. $\frac{9}{10} =$ |
| 19. $\frac{1}{5} =$   | 20. $\frac{1}{8} =$  |

A ratio is a comparison of two quantities by division. It can be written three ways.

$$\frac{60 \text{ miles}}{1 \text{ hour}}, 60 \text{ miles: } 1 \text{ hour, or } 60 \text{ miles to } 1 \text{ hour}$$

For questions 1-4, complete the ratios.

A school bus carrying passengers on a field trip to a local art exhibit at the Great Plains Museum contains 12 boys, 10 girls, 3 parents, and 2 teachers. Write the given ratio in all three forms.

1. Ratio of boys to girls.

\_\_\_\_\_

3. Ratio of teachers to students.

\_\_\_\_\_

2. Ratio of girls to boys.

\_\_\_\_\_

4. Ratio of students to adults

\_\_\_\_\_

Order the numbers from greatest to least

5. 0.05, 0.503,  
0.053, 0.53

\_\_\_\_\_

6.  $\frac{2}{5}, \frac{3}{4}, \frac{4}{5}, \frac{2}{3}$

\_\_\_\_\_

7. 28%, 84%, 4%, 48%

\_\_\_\_\_

Use <, >, or = to compare the following numbers.

8.  $\frac{7}{8}$   1.736

9. 0.064  0.640

10. 9%   $\frac{9}{10}$

## Teacher's Guide

**7.N.2.3 Solve real-world and mathematical problems involving addition, subtraction, multiplication and division of rational numbers; use efficient and generalized procedures including but not limited to standard algorithms.**

### Real-World Connections

Students will apply problem solving skills they use in math to solve problems throughout their lives. They will need to use math problem solving skills to determine the unit cost of an item, how much money you need to buy an item, the price of an item after discounts are applied, and how to enlarge recipe ingredients to make a larger quantity. Students will use addition, subtraction, multiplication and division of rational numbers to solve and justify real world mathematical problems.

### Vocabulary

real-world mathematical problems, addition, subtraction, standard algorithms, quantity

### Modeling

**Step 1:** Discuss the Real-World Connection and emphasize not all problems are mathematical. However, when solving math problems on your own, with partners, or in groups it requires problem solving skills found in math.

**Step 2:** Read the Guided Practice #1 problem to the students or ask a student to read it aloud.

**Step 3:** Ask them to identify the problem, what is it asking, and think about what you know, and what you need to find out. Demonstrate how to record this information to justify their final answer.

**Step 4:** Ask them to decide how to justify their solution. Will you use a standard algorithm, illustration, table, graph, and/or model? This is your proof that supports your solution. Let them know different people may choose different ways. Use all suggestions. If it does not work, ask for other suggestions. Support the trial and error. The students will discover this on their own, and it is a problem-solving skill.

## Teacher's Guide 7.N.2.3

**Step 5:** Once the work is complete, have the students read the problem again to make sure that the entire question is answered, and evidence is provided to support their answer. Check for labels to identify each part of the work and the solution.

### Extension Activities

Oklahoma State Department of Education objective analysis of 7.N.2.3

<http://okmathframework.pbworks.com/w/page/112218607/7-N-2-3>

Below is a link from Illustrative Mathematics that gives real-world situations that students can work through using addition, subtraction, multiplication, and division of integers.

<https://www.illustrativemathematics.org/7.NS.A>

**Answer Key 7.N.2.3**

**Guided Practice**

1. Problem: How many batches of cookies can Emma make with the flour she has?

| What I Know                           | Solution                                                                                                    |
|---------------------------------------|-------------------------------------------------------------------------------------------------------------|
| 1 batch = $2\frac{1}{3}$ cups flour   | $9\frac{4}{5} \div 2\frac{1}{3} =$                                                                          |
| Emma has $9\frac{4}{5}$ cups of flour | $\frac{49}{5} \div \frac{7}{3} =$<br>$\frac{147}{35} = 4\frac{7}{35} = 4\frac{1}{5} = 4$ batches of cookies |

2. Problem: How much money is made in a week?

| What I Know                 | Need to Know                                                          | Solution                          |
|-----------------------------|-----------------------------------------------------------------------|-----------------------------------|
| \$6.50 per hour<br>20 hours | How much money made in a week?<br>$\$6.50 (20 \text{ hours}) = \$130$ | $\$6.50 (20) = \$130$<br>per week |

3. Problem: How much should each student bring for gift?

| What I Know              | Need to Know                                   | Solution                             |
|--------------------------|------------------------------------------------|--------------------------------------|
| 25 students<br>Gift \$30 | Total Cost $\$30 \div 25$ students<br>$= 1.20$ | $\$30 \div 25 = \$1.20$ each student |

**7.N.2.3 Solve real world and mathematical problems involving addition, subtraction, multiplication and division of rational numbers; use efficient and generalized procedures including but not limited to standard algorithms.**

**Real-World Connections**

Every day you encounter problems. Some are mathematical, and others are not. However, applying problem solving skills used in math may solve both. You use math problem solving skills to determine the unit cost of an item, how much money you need to buy an item, the price of an item after discounts are applied, and how to enlarge recipe ingredients to make a larger quantity. In this lesson, you will experience real world problems using one or more, addition, subtraction, multiplication, and division skills to evaluate the solution and justify the answer.

**Vocabulary**

|                                         |                                                                                                  |
|-----------------------------------------|--------------------------------------------------------------------------------------------------|
| <b>real-world mathematical problems</b> | math problems that teach standards through topics students will likely experience in their world |
| <b>addition</b>                         | to join two or more numbers or quantities to get one number called a sum or total                |
| <b>subtraction</b>                      | to reduce one quantity from another ( $x - y$ )                                                  |
| <b>standard algorithms</b>              | specific methods usually used for solving math problems                                          |
| <b>quantity</b>                         | amount, number of, total, sum, size or extent; indicates how much or how many                    |

*Read the following scenarios. Set up the problem using multiplication, division, addition, or subtraction and justify your solution (use illustrations, models or standard algorithms).*

1. Emma wants to make cookies to take to her 7<sup>th</sup> grade dance. She has  $9\frac{4}{5}$  cups of flour. She can make one batch of cookies with  $2\frac{1}{3}$  cups of flour. How many batches can Emma make with the flour she has?

\_\_\_\_\_

**7.N.2.3 Solve real world and mathematical problems involving addition, subtraction, multiplication and division of rational numbers; use efficient and generalized procedures including but not limited to standard algorithms.**

*Read the following scenarios. Work the problem using multiplication, division, addition or subtraction and justify your solution (illustrations, models or standard algorithms).*

1. Steve charges \$25 to mow lawns that take 1 hour to mow and \$10 for each additional hour. How much will he earn on a yard that requires 4 hours to mow. Is this reasonable? Why or Why not?

---

2. Sophia climbed rocks at the rock climbing gym for 130 minutes over 4 days. If she climbed the same amount of time each day, how many minutes did she spend climbing per day?

---

3. Jackson's soccer coach filled the teams' water container with 40 quarts of water. Since 32 ounces equal 1 quart, how many times can a soccer player fill a 16-ounce water bottle before using all the water?

---

4. Kelsey ran the 40-meter track at her school in 91.4 seconds. Running at the same speed, how long did it take her to run 100 meters?

---

**Independent Practice (7.N.2.3)**

Name \_\_\_\_\_

*Read the following scenarios. Work the problem using multiplication, division, addition or subtraction and justify your solution (illustrations, models or standard algorithms).*

17. Chasidy wants to buy a book about owls that costs \$16, a cookbook that costs \$17, and a composition book that costs \$4. She has saved \$28 from her allowance. How much more money does Chasidy need to buy all three books?

\_\_\_\_\_

18. The table below shows Andre's deposits and withdraws made to his bank account.

| Action   | Amount |
|----------|--------|
| deposit  | \$35   |
| withdraw | \$10   |
| deposit  | \$27   |
| deposit  | \$83   |
| withdraw | \$150  |

If there was originally \$120 in Andre's bank account, what was his final bank account balance?

\_\_\_\_\_

19. Mr. Black gave out three pizzas. Each pizza had eight slices. Six slices were not eaten. How many slices of pizza were eaten?

\_\_\_\_\_

20. The school cafeteria has 9 round tables and 7 rectangular tables. Each round table has 8 chairs and each rectangular table has 6 chairs. How many chairs are there in all?

\_\_\_\_\_

Find the equivalent fraction.

1.  $\frac{3}{4} = \frac{36}{\quad}$

2.  $\frac{1}{3} = \frac{\quad}{39}$

3.  $\frac{7}{8} = \frac{77}{\quad}$

Estimate by rounding to the greatest place value and divide.

4.  $65 \div 12 \approx \underline{\quad}$

5.  $98 \div 10 \approx \underline{\quad}$

6.  $191 \div 17 \approx \underline{\quad}$

Find each product and quotient

7.  $(-12)(-5)(3) = \underline{\quad}$

8.  $4\left(\frac{-6}{12}\right) = \underline{\quad}$

9.  $81 \div 3 = \underline{\quad}$

Solve.

10. Koby was making a cake. The recipe called for  $\frac{2}{5}$  cup sugar,  $\frac{7}{8}$  cup flour, and  $\frac{3}{10}$  cup milk. Which ingredient was used the most and which ingredient was used the least?

Most: \_\_\_\_\_

Least: \_\_\_\_\_

# 7<sup>TH</sup> GRADE

# COMPREHENSIVE ASSESSMENT

1. Identify the missing symbol in the expression below.

$$3\frac{2}{3} ? \frac{9}{2}$$

A <

B >

C =

D  $\geq$

2. In the table below, Darius recorded how much it rained over the last four months. Which of the following answers shows the amounts of rain from least to greatest?

| Month | Amount of rain in inches |
|-------|--------------------------|
| March | $\frac{16}{4}$           |
| April | 3.25                     |
| May   | 2.5                      |
| June  | $\frac{16}{8}$           |

A  $\frac{16}{4}$ , 3.25, 2.5,  $\frac{16}{8}$

B  $\frac{16}{4}$ ,  $\frac{16}{8}$ , 2.5, 3.25

C  $\frac{16}{8}$ , 2.5, 3.25,  $\frac{16}{4}$

D 3.25, 2.5,  $\frac{16}{8}$ ,  $\frac{16}{4}$

3. Kayla and Janice both participate in the school track meet. Kayla runs the 50-yard dash in 8.5 seconds, and Janice runs it in  $8\frac{1}{2}$  seconds. Which of the following is true?

A Kayla's speed > Janice's speed

B Kayla's speed < Janice's speed

C Kayla's speed = Janice's speed

4. Identify the missing symbol in the expression below.

$$-\frac{9}{9} \ ? \ -0.925$$

A >

B <

C =

D  $\leq$

5. Simplify the following absolute value expression.

$$|25| - |7| + |-3| =$$

A 21

B 23

C 15

D 35

6. Simplify the following absolute value expression.

$$-|40| \div |-5| \times |-3| =$$

A 24

B -24

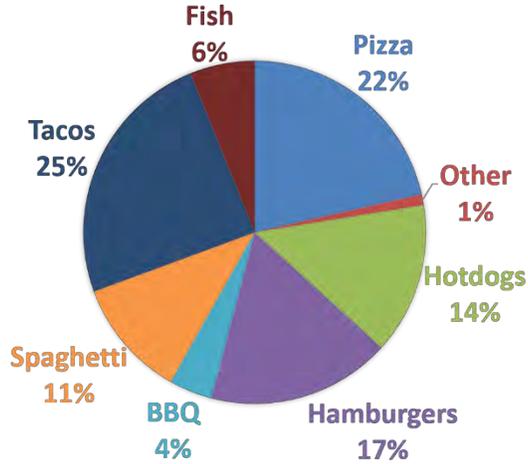
C  $9.\overline{33}$

D  $-9.\overline{33}$

49. The circle graph below represents the results of the 7<sup>th</sup> grade favorite food survey. If 400 students voted, how many students chose pizza as their favorite food?

**7TH GRADERS FAVORITE FOOD RESULTS**

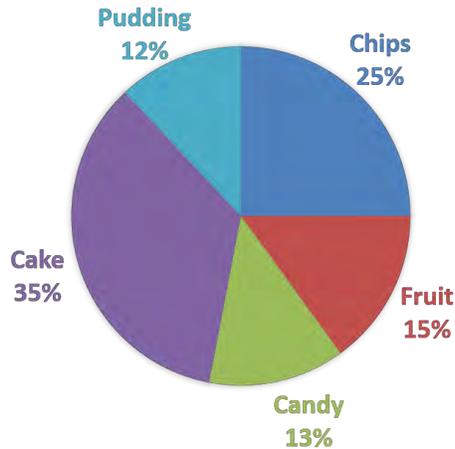
- A 96 students
- B 100 students
- C 21 students
- D 88 students



50. If 500 students were surveyed, how many prefer chips and pudding as a favorite snack?

- A 60 students
- B 125 students
- C 185 students
- D 100 students

**7TH GRADERS FAVORITE SNACKS**



### A

**acute angle:** an angle with a measure greater than  $0^\circ$  but less than  $90^\circ$

**addends:** are the digits in an addition problem that are being added

**absolute value:** the absolute value of a real number is its (non-negative) distance from 0 on a number line; this is also known as magnitude

**addition:** to join two or more numbers or quantities to get one number called a sum or total

**additive comparison problems:** the underlying question is what amount would be added to one quantity to result in the other

**algebraic expression:** a mathematical phrase combining numbers and/or variables; an expression does not contain equality or inequality signs but may include other operators and grouping symbols; both sides of an equation are expressions

**algebraic equation:** includes mathematical signs, symbols, and numbers connected with an equal sign (=); an algebraic equation contains an equal sign

**algorithm:** a step-by-step process for solving a problem

**angle:** a figure formed by two rays with a common endpoint called the vertex and it is measured in degrees ( $^\circ$ )

**angle ruler:** similar to a protractor and is used to measure and draw angles

**analog clock:** a clock with hour, minute, and, sometimes, second hands

**approximation:** the estimate a number, amount or total, often rounding it off to the nearest 10 or 100

**area:** the space occupied by a flat shape (closed two-dimensional shape) or the surface of an object; the number of unit squares that cover the surface of a closed figure; measured in square units such as square centimeters, square feet, square inches, etc.

**area models:** a model using area to show multiplication or division

**area of a circle:** the area of the interior of the circle, which can be found with  $A = \pi r^2$  where  $r$  is the radius and  $\pi$  the irrational number “pi”

**area of a parallelogram:** the area of the interior of the parallelogram; is measured in square units; can be found by using the formula  $A = bh$

**area of similar triangles:** if two similar triangles have sides in the ratio  $x:y$ , then their areas are in the ratio  $x^2:y^2$

**area of a square or rectangle:** the area of the interior of the square or rectangle; is measured in square units; can be found by using the formula  $A = l \times w$  or  $A = lw$ ; area of a square can also be found using the formula  $A = s^2$

**area of a trapezoid:** the sum of its bases multiplied by the height of the trapezoid then divided by 2; the area is measured in square units and can be found using the formula  $A = \frac{1}{2}(b_1 + b_2)h$

## OAS Mathematics Glossary

**area of triangles:** amount of surface a triangle covers and measured in square units; can be found using the formula  $A = \frac{1}{2}bh$

**arrays:** an orderly arrangement of objects arranged in rows or columns

**ascending:** increasing in size

**ascending order:** numbers arranged from smallest to largest

**associative property of addition:** states that the sum remains the same regardless of how they are grouped,  $(a + b) + c = a + (b + c)$

**associative property of multiplication:** states that the product remains the same regardless of how they are grouped,  $(a \times b) \times c = a \times (b \times c)$

**attributes:** characteristics

**average:** a number expressing the central or typical value in a set of data, in particular- the mode, median, or most commonly the mean, which is found by dividing the sum of the values in the set by the number of values in the set

**axis:** a real or imaginary reference line

### B

**bar graph:** a graph that compares data from several situations using vertical or horizontal bars

**bar notation:** a horizontal bar over decimals to indicate that they repeat

**base:** the number or variable representing the factor being multiplied

**base area:** the area of the base denoted with  $B$

**base 10 blocks:** blocks which show base-10 number values

**base of a figure:** a face on which the 3D figure sits

**benchmark:** something by which other things can be measured or compared

**benchmark fractions:** fractions that are easy to visualize or represent, such as,  $\frac{1}{4}$ ,  $\frac{1}{3}$ ,  $\frac{1}{2}$ ,  $\frac{2}{3}$ , and  $\frac{3}{4}$

**biased:** sample in which individuals, items, or data were not equally likely to have been chosen

**box and whisker plot:** a diagram or graph using a number line to show the distribution of a set of data which displays the median, upper and lower quartiles, and the maximum and minimum values of the data

### C

**calculate:** to work something out, a mathematical operation

**calculator:** electronic device used for making mathematical calculations

**capacity:** the maximum amount or number that can be contained or accommodated

**cent:** equals one hundredth of a dollar (100 cents equal one dollar)

**centimeter:** a length of measurement that is equal to 1/100 (0.01) of a meter; it is part of the metric system of measurement, which is used around the world

### W

**weight:** how heavy an object is, such as ounce (oz), pound (lb), and ton (T)

**whole number:** positive numbers, including zero, without any decimal or fractional parts. (ex: 0, 1,2,3,4,5, ....)

**whole number exponents:** the numbers 0, 1, 2, 3...that indicate how many times the base is used as a factor, e.g., in  $4^3 = 4 \times 4 \times 4 = 64$ , the exponent 3, indicating that 4 is repeated as a factor three times

**wide division:** a strategy to use to solve division problems, instead of long division

**width:** breadth/distance across from side to side

**withdrawal:** money taken out of a bank or money removed from a saving account or a checking account

**word form:** a number written out in words to represent the value of the digits

**word problem:** a math problem presented as a scenario in text form with a variety of number sentences

### X

**x-axis:** the horizontal number line of a coordinate plane used to show horizontal distance

**x-coordinate:** the first number in an ordered pair, it shows the distance a point is along the horizontal axis

**x-intercept:** where the line crosses the  $x$ -axis,  $y = 0$ , when in standard form it is  $C/A$

### Y

**y-axis:** the vertical number line of a coordinate plane used to show vertical distance

**y-coordinate:** the second number in an ordered pair, it shows the distance a point is along the vertical axis

**y-intercept:** where the line crosses the  $y$ -axis,  $x = 0$ , when in standard form it is  $C/B$ , when in slope-intercept form it is  $b$

**yard:** 1 yard is equivalent to 3 feet or 36 inches

### Z

**zero:** the numeral 0, used as a place holder (nothing, none, nil, naught)



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