



CCGPS Frameworks Student Edition

Mathematics

6th Grade

Unit 1: Number System Fluency



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"Making Education Work for All Georgians"

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Unit 1
Number System Fluency

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OVERVIEW

In this unit students will:

- Find the greatest common factor of two whole numbers less than or equal to 100
- Find the least common multiple of two whole numbers less than or equal to 12
- Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor.
- Interpret and compute quotients of fractions
- Solve word problems involving division of fractions by fractions using visual fraction models and equations to represent the problem.
- **Fluently** divide multi-digit numbers using the standard algorithm
- **Fluently** add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

At each grade level in the standards, one or two fluencies are expected. For sixth graders the expected fluencies are multi-digit whole number division and multi-digit decimal operations. Procedural fluency is defined by the Common Core as “skill in carrying out procedures flexibly, accurately, efficiently and appropriately”. Students may not achieve fluency within the scope of one unit but it is expected the fluency will be obtained by the conclusion of the course.

In the past fraction and decimal computation have been dominated by rules but research based best practices have proven that students who are taught to focus on the pencil-and-paper rules for decimal computation do not even consider the actual values of the numbers. Therefore a good place to begin decimal computation is with estimation. It helps children to look at answers in terms of a reasonable range.

Although the units in this instructional framework emphasize key standards and big ideas at specific times of the year, routine topics such as estimation, mental computation, and basic computation facts should be addressed on an ongoing basis. Ideas related to the eight practice standards should be addressed constantly as well. To assure that this unit is taught with the appropriate emphasis, depth, and rigor, it is important that the tasks listed under “Evidence of Learning” be reviewed early in the planning process. A variety of resources should be utilized to supplement this unit. This unit provides much needed content information, but excellent learning activities as well. The tasks in this unit illustrate the types of learning activities that should be utilized from a variety of sources.

STANDARDS ADDRESSED IN THIS UNIT

Mathematical standards are interwoven and should be addressed throughout the year in as many different units and activities as possible in order to emphasize the natural connections that exist among mathematical topics especially with respect to fluency.

KEY STANDARDS

Apply and extend previous understandings of multiplication and division to divide fractions by fractions.

MCC6.NS.1 Interpret and compute quotients of fractions, and solve word problems involving division of fractions by fractions, e.g., by using visual fraction models and equations to represent the problem. 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 $3/4$ of $8/9$ is $2/3$. (In general, $(a/b) \div (c/d) = ad/bc$.) How much chocolate will each person get if 3 people share $1/2$ lb. of chocolate equally? How many $3/4$ -cup servings are in $2/3$ of a cup of yogurt? How wide is a rectangular strip of land with length $3/4$ mi and area $1/2$ square miles?

Compute fluently with multi-digit numbers and find common factors and multiples

MCC6.NS.2 Fluently divide multi-digit numbers using the standard algorithm.

MCC6.NS.3 Fluently add, subtract, multiply, and divide multi-digit decimals using the standard algorithm for each operation.

MCC6.NS.4 Find the greatest common factor of two whole numbers less than or equal to 100 and the least common multiple of two whole numbers less than or equal to 12. Use the distributive property to express a sum of two whole numbers 1-100 with a common factor as a multiple of a sum of two whole numbers with no common factor. For example, express $36 + 8$ as $4(9 + 2)$.

STANDARDS FOR MATHEMATICAL PRACTICE

1. Make sense of problems and persevere in solving them. Students make sense of real-world fraction and decimal problem situations by representing the context in tactile and/or virtual manipulatives, visual, or algebraic models.

2. Reason abstractly and quantitatively. Students will apply the constructs of multiplication, division, addition, and subtraction of rational numbers to solve application problems.

3. Construct viable arguments and critique the reasoning of others. Students construct and critique arguments regarding the portion of a whole as represented in the context of real-world situations. Students explain why they do not always get a smaller number when dividing with fractions and decimals. Students have to reason the steps in modeling division of fractions.

4. Model with mathematics. Students will model real-world situations to show division of fractions. Students use number lines and tape diagrams to find least common multiple and greatest common factor.

5. Use appropriate tools strategically. Students will use visual or concrete tools for division of fractions with understanding.

6. Attend to precision. Students attend to the language of problems to determine appropriate representations and operations for solving real-world problems. In addition, students attend to the precision of correct decimal placement used in real-world problems.

7. Look for and make use of structure. Students examine the relationship of rational numbers (positive decimal and fraction numbers) to the number line and the place value structure as related to multi-digit operations. They also use their knowledge of problem solving structures to make sense of word problems.

8. Look for and express regularity in repeated reasoning. Students demonstrate repeated reasoning when dividing fractions by fractions and connect the inverse relationship to multiplication. Students also use repeated reasoning when solving real-world problems using rational numbers.

ENDURING UNDERSTANDINGS

- The meanings of each operation on fractions are consistent with the meanings of the operations on whole numbers. For example: It is possible to divide fractions without multiplying by the inverse or reciprocal of the second fraction.
- Least common multiple and greatest common factor are helpful when solving real-world problems.
- When dividing by a fraction, there are two ways of thinking about the operation – partition and measurement which will lead to two different thought processes for division.
- When we divide one number by another, we may get a quotient that is bigger than the original number, smaller than the original number or equal to the original number.

CONCEPTS & SKILLS TO MAINTAIN

It is expected that students will have prior knowledge/experience related to the concepts and skills identified below. It may be necessary to pre-assess in order to determine if time needs to be spent on conceptual activities that help students develop a deeper understanding of these ideas.

- number sense
- computation with multi-digit whole numbers and decimals (to hundredths), including application of order of operations
- addition, subtraction, multiplication, and division of common fractions
- familiarity with factors and multiples
- data usage and representations

SELECTED TERMS AND SYMBOLS

The following terms and symbols are often misunderstood. These concepts are not an inclusive list and should not be taught in isolation. However, due to evidence of frequent difficulty and misunderstanding associated with these concepts, instructors should pay particular attention to them and how their students are able to explain and apply them.

The definitions below are for teacher reference only and are not to be memorized by the students. Students should explore these concepts using models and real life examples. Students should understand the concepts involved and be able to recognize and/or demonstrate them with words, models, pictures, or numbers.

The websites below are interactive and include a math glossary suitable for middle school students. **Note – Different sources use different definitions. Please preview any website for alignment to the definitions given in the frameworks.**

<http://www.amathsdictionaryforkids.com/>

This web site has activities to help students more fully understand and retain new vocabulary

<http://intermath.coe.uga.edu/dictionary/homepg.asp>

Definitions and activities for these and other terms can be found on the Intermath website. Intermath is geared towards middle and high school students.

<http://www.corestandards.org/Math/Content/mathematics-glossary/glossary>

- **Algorithm:** a step-by-step solution to a problem.
- **Difference:** The amount left after one number is subtracted from another number.
- **Distributive Property:** The sum of two addends multiplied by a number equals the sum of the product of each addend and that number.
- **Dividend:** A number that is divided by another number.
- **Divisor:** A number by which another number is to be divided.
- **Factor:** When two or more integers are multiplied, each number is a factor of the product. "To factor" means to write the number or term as a product of its factors.

- **Greatest Common Factor:** The largest factor that two or more numbers have in common.
- **Least Common Multiple:** The smallest multiple (other than zero) that two or more numbers have in common.
- **Measurement Model of Division:** When we know the original amount and the size or measure of ONE part, we use measurement division to find the number of parts. Ex: 20 is how many groups of 4?
- **Minuend:** The number that is to be subtracted from.
- **Multiple:** The product of a given whole number and an integer.
- **Quotient:** A number that is the result of division.
- **Partitive Model of Division:** When we know the original amount and the number of parts, we use partitive division to find the size of each part. Ex: 20 is 4 groups of what unit?
- **Reciprocal:** Two numbers whose product is 1. The reciprocal of a fraction can be found by inverting that fraction (switching the denominator and numerator).
- **Sum:** The number you get by adding two or more numbers together
- **Subtrahend:** The number that is to be subtracted.
- **Product:** A number that is the result of multiplication.

MISCONCEPTIONS

- Students may believe that dividing by $\frac{1}{2}$ is the same as dividing in half. Dividing by half means to find how many one-halves there are in a quantity, whereas, dividing in half means to take a quantity and split it into two equal parts. $7 \div \frac{1}{2} = 14$ and $7 \div \frac{1}{2} \neq 3\frac{1}{2}$
- Students may understand that $1\frac{1}{2} \div \frac{1}{4}$ means, “How many fourths are in $1\frac{1}{2}$?” So, they set out to count how many fourths (6). But in recording their answer, they can get confused as to what the 6 refers to and think it should be a fraction, and they record $\frac{6}{4}$ when actually it is 6 groups of one-fourths, not 6 fourths (Cramer et al., 2010).
- As noted above, knowing what the unit is (the divisor) is critical and must be understood in giving the remainder. In the problem $3\frac{3}{8} \div \frac{1}{4}$, students are likely to count 4 fourths for each whole number (12 fourths) and one more for $\frac{2}{8}$, but then not know what to do with the extra eighth. It is important to be sure they understand the measurement concept of division. Ask, “How much of the next piece do you have?” Context can also help. In this case, if the problem was about pizza servings, there would be 13 full servings and $\frac{1}{2}$ of the next serving. (Van de Walle, vol. 3, Teaching Student-Centered Mathematics, p. 140).
- The most common error in adding fractions is to add both the numerators and the denominators. For example, one teacher asked her fifth graders if the following was correct: $\frac{3}{8} + \frac{2}{8} = \frac{5}{16}$. A student correctly replied, “No, because they are eighths (holds up one-eighth of a fraction circle). If you put them together, you still have eighths (shows this with the fraction circles). See, you didn’t make them into sixteenths when you put them together. They are still eighths.” (Mack, 2004, p. 229).
- Many students have trouble finding common denominators because they are not able to come up with common multiples of the denominators quickly. This skill requires having a good command of multiplication facts. Students benefit from knowing that *any* common denominator will work. Least common denominators are preferred because the computation is more manageable with smaller numbers, and there is less simplifying to do after adding or subtracting. Do not require least common multiples, support all common denominators, and through discussion students will see that finding the smallest multiple is more efficient. (Van de Walle, vol. 3, Teaching Student-Centered Mathematics, p. 128-129).

Formative Assessment Lessons (FALs)

Formative Assessment Lessons are intended to support teachers in formative assessment. They reveal and develop students' understanding of key mathematical ideas and applications. These lessons enable teachers and students to monitor in more detail their progress towards the targets of the standards. They assess students' understanding of important concepts and problem solving performance, and help teachers and their students to work effectively together to move each student's mathematical reasoning forward.

More information on types of Formative Assessment Lessons may be found in the Comprehensive Course Guide.

Name _____

TASK: FINDING COMMON FACTORS

Find a solution for the problems below. Draw pictures or use manipulatives to support your solutions

EXPLORATION PROBLEMS:

Two students are having a party. They want to make treat bags for their guests. They want each bag to be identical with nothing leftover. They have 36 Silly Bandz and 72 pieces of bubble gum to put in the bags. What is the greatest number of treat bags they can make and how many of each item will be in each treat bag?

Mitzi is making trail mix out of 48 bags of nuts and 32 bags of dried cranberries. She wants each new portion of trail mix to be identical containing the same combination of nuts and cranberries with nothing left over. What is the greatest number of portions of trail mix Mitzi can make and how much of each ingredient will be in each portion?

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The Junior Beta Club is making food baskets for the local homeless shelter. They asked for donations and they received 88 cans of food and 44 loaves of bread. If they want all the baskets to be the same with nothing left over, how many baskets can they make and how many of each item will be in each basket?

Keesha baked 4 dozen oatmeal cookies and 30 chocolate chip cookies. She wants to divide the cookies into plastic containers with the same amount of cookies in each container. If she wants the container to hold the greatest number of cookies possible how many containers does she need and how many of each cookie will be in each container?

Name _____

TASK: BACK TO SCHOOL

Part 1: Music

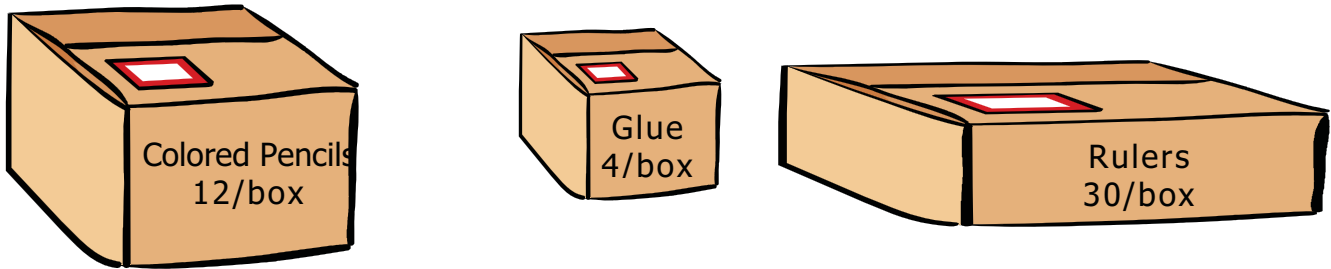
You and your friends have tickets to attend a music concert. While standing in line, the promoter states he will give a gift card for a free album download to each person that is a multiple of 2. He will also give a backstage pass to each fourth person and floor seats to each fifth person.

Which person will receive the free album download, backstage pass, and floor seats? Explain the process you used to determine your answer.



Part 2: School Supplies

The Parents Teachers Association (PTA) at your school donated school supplies to help increase student creativity and student success in the classroom. Your teacher would like you to create kits that include one package of colored pencils, one glue stick, and one ruler. When you receive the supplies, you notice the colored pencils are packaged 12 boxes to a case, the rulers are packaged 30 to a box, and glue sticks are packaged 4 to a box.



1. What is the smallest number of each supply you will need in order to make the kits and not have supplies left over? Explain your thought process.

2. How many packaged rulers, colored pencils, and glue sticks will you need in order to make the kits? Explain the process you used to determine how many packages are needed for each supply.

Name _____

TASK: SECRET NUMBER

Juanita has a secret number. Read her clues and then answer the questions that follow:
Juanita says, “Clue 1” My secret number is a factor of 60.”

1. Can you tell what Juanita’s secret number is? Explain your reasoning.

2. Daren said that Juanita’s number must also be a factor of 120. Do you agree or disagree with Daren? Explain your reasoning.

3. Malcolm says that Juanita’s number must also be a factor of 15. Do you agree or disagree with Malcolm? Explain your reasoning.

4. What is the smallest Juanita’s number could be? Explain.

5. What is the largest Juanita’s number could be. Explain.

Suppose for Juanita’s second clue she says, “Clue 2: My number is prime.”

6. Can the class guess her number and be certain? Explain your answer.

Suppose for Juanita’s third clue she says, “Clue 3: 15 is a multiple of my secret number.”

7. Now can you tell what her number is? Explain your reasoning.

Suppose for Juanita’s fourth clue she says, “Clue 4: My secret number is a factor of 20.”

8. What is Juanita’s secret number?

9. Your secret number is 36. Write a series of interesting clues using factors, multiples, and other number properties needed for somebody else to identify your number.

Name _____

TASK: LET'S DISTRIBUTE

$42 + 12 = 6(7+2)$ Is it true or false? Explain your thinking.

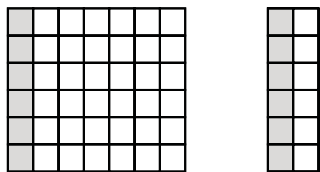
$6(7+2) = (6 \times 7) + (6 \times 2)$ Is it true or false? Explain your thinking.

$6(7 + 2) = (6 \times 7) + (6 \times 2) = 42 + 12$ Is it true or false? Explain your thinking.

Looking at the expression on the left side of the equation can you explain the use of the number 6?

How is 6 related to 42 and 12?

Look at the array model that illustrates the expression $42 + 12$ and shows the common factor is 6.



Use centimeter grid paper, color tiles or array models for each numerical expression.

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- A. Find all of the common factors for each of the expressions.
- B. For each common factor write a number sentence.
- C. Choose one common factor for each number sentence and draw a model.
- D. Decide which number sentence would help you do mental computation more easily and more accurately.

1. $64 + 32$

2. $72 + 12$

3. $45 + 18$

4. $51 + 21$

TASK: UNDERSTANDING THE LONG DIVISION ALGORITHM

A. Divide $3 \overline{)693}$

1. Highlight the place value representation of six 100s, nine 10s, and 3 ones.

100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1

2. How many groups of 3 can be made (circle them) from the 100s, the 10s, and the 1s?
3. Calculate:

$$3 \overline{)693}$$

B. Divide $5 \overline{)746}$

1. Highlight the place value representation of seven 100s, four 10s, and six 1s.

100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1

2. How many groups of 5 can be made (circle them) from the 100s, the 10s, and the 1s?

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3. Calculate: $5 \overline{)746}$

C. Model and calculate the following:

1. $6 \overline{)794}$

100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1

2. $2 \overline{)699}$

100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1

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3. $8 \overline{)848}$

100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1 1

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100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1

100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1
100	10 10 10 10 10 10 10 10 10 10	1 1 1 1 1 1 1 1 1 1

Name _____

TASK: DIVIDING FRACTIONS

Use a model (e.g., manipulative materials, pictures, number line) to find the answers to the problems below. Be sure to write a number sentence to illustrate each situation. Think about how the meaning of the operation is a bit different in the two problems.

- A. In preparing to make hair bows for friends, Samantha realizes she needs $\frac{2}{3}$ yard of ribbon for each bow. She has 2 yards of ribbon. Does she have enough ribbon for four bows?
- B. Samantha wants to make some hair bows for her friends. She has 2 yards of ribbon to be shared equally between 3 hair bows. How much ribbon will she use for each bow?

Name _____

TASK: FRACTIONAL DIVISORS

Partitive Interpretation of Division with Fractional Divisors

Use a model (e.g., manipulative materials, pictures, number line) to find the answers to the problems below. Be sure to write a number sentence to illustrate each situation.

1. Michael's mom paid \$2.40 for a $\frac{3}{4}$ - pound box of cereal. How much is that per pound?

2. Melitta found out that if she walks really fast during her morning exercise, she can cover $2\frac{1}{2}$ miles in $\frac{3}{4}$ of an hour. How fast is she walking in miles per hour?

Measurement Interpretation of Division with Fractional Divisor

Use a model (e.g., manipulative materials, pictures, number line) to find the answers to the problems below. Be sure to write a number sentence to illustrate each situation.

3. It's your birthday and you are going to have a party. From the grocery store you get 6 pints of ice cream. If you serve $\frac{3}{4}$ of a pint of ice cream to each of your guests, how many guests can be served?

4. Sam is a landscaper. He found that he had $2\frac{1}{4}$ gallons of liquid fertilizer concentrate. It takes $\frac{3}{4}$ gallon to make a tank of mixed fertilizer. How many tankfuls can he mix?

Name _____

TASK: UNDERSTANDING ALGORITHMS

1. Consider the expression $\frac{5}{3} \div \frac{1}{2}$. Using words explain what this problem means. Restate the expression with common denominators then solve the problem. Draw pictures first and then write number sentences.

2. Now try $1\frac{2}{3} \div \frac{3}{4}$ using the common-denominator approach.

3. Complete the following set of problems using the methods we have been using for the last several days. Make a table of your answers to each and look for a pattern.

- | | |
|-----------------------------------|--|
| $3 \div \frac{1}{2} =$ | How many servings of $\frac{1}{2}$ in 3 containers? |
| $5 \div \frac{1}{4} =$ | How many servings of $\frac{1}{4}$ in 5 containers? |
| $3\frac{3}{4} \div \frac{1}{2} =$ | How many servings of $\frac{1}{2}$ in $3\frac{3}{4}$ containers? |
| $6 \div \frac{1}{3} =$ | How many servings of $\frac{1}{3}$ in 6 containers? |
| $8 \div \frac{1}{5} =$ | How many servings of $\frac{1}{5}$ in 8 containers? |

4. Now try this set of problems:

$$\begin{array}{l} 5 \div \frac{3}{4} \\ 6 \div \frac{2}{3} \\ 8 \div \frac{2}{5} \end{array}$$

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5. Compare your responses from the second set of problems to the corresponding problems in the first set. What do you see?

6. Finally, try this partitioning problem:

You have $1\frac{1}{2}$ oranges, which is $\frac{3}{5}$ of an adult serving. How many oranges (and parts of oranges) make up 1 adult serving?

Name _____

TASK: DIY (DO IT YOURSELF)

With your group write a story problem for each of the expressions shown below.

$$1\frac{3}{4} \div \frac{1}{2}$$

$$\frac{11}{12} \div \frac{1}{4}$$

$$\frac{2}{3} \div \frac{3}{4}$$

Name _____

TASK: DIVIDING BY A FRACTION

Directions: Model each situation using squares; write the equation for each.

1. I have one-half of a square and I want to divide it by one-eighth. How many pieces would I have?

2. I have two and one half squares and I want to divide them by one-fourth. How many pieces would I have?

3. I have two-thirds of a square and I want to divide it by one-half. How many pieces would I have?

4. I have one-half of a square and I want to divide it by three-fourths. How many pieces would I have?

TASK: MODELS FOR DIVIDING FRACTIONS

Directions: Read the situation, draw a picture to represent the situation and then write an equation to represent the situation.

1. I have a one-half gallon container of ice cream and want to divide it into one-cup servings to share with the students in my class. A cup is one-sixteenth of a gallon. How many serving dishes would I need?

Model the problem situation.

Write an equation and show how to solve the problem.

2. I also have three large chocolate candy bars that are perforated into eight sections each. If I divide the bars into these sections how many sections will I have altogether?

Model the problem situation.

Write an equation and show how to solve the problem

3. Becca works for the Humane Society and had to buy food for the dogs. She bought $5\frac{1}{2}$ pounds of dog food. She feeds each dog about one-third of a pound. How many dogs can she feed?

Model the problem situation.

Write an equation and show how to solve the problem.

4. Julie goes to the park across the street from her house several times a day and jogs a total of six miles every day. She jogs three-fourths of a mile at a time. How many times each day

does she go to the park to run?

Model the problem situation.

Write an equation and show how to solve the problem.

For 5, 6, and 7 Model and solve each of the following equations.

5. $\frac{3}{4} \div \frac{1}{2}$

6. $\frac{5}{3} \div \frac{1}{3}$

7. $\frac{1}{2} \div \frac{4}{5}$

Name _____

TASK: ESTIMATION IS THE ROOT OF FLUENCY – MULTIPLICATION WITH DECIMALS

The water machine at the local grocery store fills a jug with 3.7 liters of water. If you fill 4 jugs, how many liters of water is that?

Begin with an estimate. Is it more than 12? What is the most it could be? Could it be 16 liters?

Now compute the exact answer.

Now let's compare two multiplication problems:

43.4×4.3 and 434×43

How are they alike? How are they different?

Compute the exact answer to the second problem.

Using only your powers of estimation, where does the decimal go in the product of the first problem?

What similarities do you see between the two products? What difference do you see between the two products?

EXPLORATION

Compute the following product: 35×37 .

Using only the result of this computation and estimation, give the exact answer to each of the following: For each computation write a rationale for how you made the placement of the decimal point in each answer. When you have finished, you make check your results with a calculator. Acknowledge any errors you may have made and adjust your rationale to correct the error.

0.35×3.7 35×0.37 3.5×37 0.35×0.37

Name _____

TASK: ESTIMATION IS THE ROOT OF FLUENCY – DIVISION WITH DECIMALS

Consider the number sentence $146 \div 7 = 20857$, is it true? If not use what you know about estimation to determine the correct placement of the decimal point. Justify your solution

The task is to use only this information and estimation to give a fairly precise answer to each of the following: Be sure to justify each of your solutions

$146 \div 0.7$

$1.46 \div 7$

$14.6 \div 0.7$

$1460 \div 70$