Nasco MATH Works

$a^2 + b^2 = c^2$

Dividing Whole Numbers by Unit Fractions

Developed by Kristin Ulrich
Grade 5

Time

45-60 minutes.

Objectives

Students will...
- Be able to create, construct, and sketch problems that involve dividing whole numbers by unit fractions.
- Be able to solve problems that involve dividing whole numbers by unit fractions when given a pictorial model.
- Be able to create pictorial models that represent various problems that divide whole numbers by unit fractions.

Materials

- Fraction Tiles with Tray (8 sets per group, Cat. No. TB15811T)
- Demonstration Magnetic Foam Fraction Tiles Set (optional, Cat. No. TB26299T)
- Activity Sheet, worksheet, and answer key (attached with lesson plan download)

Learning Standards

- Represent division of a unit fraction by a whole number and the division of a whole number by a unit fraction such as ⅓ divided by 7 and 7 divided by ⅓ using objects and pictorial models, including area models.
- Divide whole numbers by unit fractions and unit fractions by whole numbers.

Introduction

This activity is meant as an introduction to teaching the concepts mentioned above. It should be used early on in instruction to give students a visual model of dividing unit fractions by whole numbers. Each group needs to have at least eight sets of fraction tiles or towers. Students should be working in groups of 4-5 students.

1. Give each student an Activity Sheet. Have groups keep their fraction tiles organized, with all of their whole pieces in one pile, ½ pieces in another pile, etc. NOTE: For each problem you work on together, if you have the Magnetic Foam Fraction Demonstration Tiles Set, you may demonstrate each problem at the front of the room for the students as they work through it in their groups.

2. The first problem has 1 as the whole number in the problem. Tell students that the whole number always tells them how many of the fraction tiles that represent one whole they will need. In this case, they only need one of them. Have them take one of their whole fraction bars and put it in front of the group.

3. The fraction in the first problem is ⅛. This fraction tells students how many pieces they need to split each of their whole fraction tiles into. In this case, they have one whole that needs to be split into eight equal pieces. Students should use their ⅛ fraction tiles to do this. Have them lay out their ⅛ tiles so that they are lined up right under the whole fraction bar in front of them. It should look like the example to the right.

4. Ask students how many ⅛ pieces it takes to occupy the same amount of space as the one whole bar *(8 tiles)*. That means that 1 ÷ ⅛ = 8. Make sure students understand what they just did to get that answer. They looked at the whole number, which told them how many whole number tiles they needed *(1)*. Next, they looked at the fraction they were dividing by, which told them what other set of fraction tiles they would be working with. Since the fraction was ⅛, they used as many ⅛ fraction tiles as it took to make a tile as long as the one whole tile. It took eight ⅛ tiles, so that's why 8 is the answer to the problem.

5. Students should now draw the pictorial model for the problem, which should look exactly like what they have in front of them.

6. Ask students what would happen if the whole number in the problem had been 2 instead of 1. First, that would mean they would need two whole fraction tiles instead of one. Have them take a second whole fraction tile and place it under the row of eight ⅛ tiles. Then they will need to make another row of ⅛ tiles below the second whole fraction tile they just placed. They should know from the example above that they will need eight more ⅛ fraction tiles to make another row the same length as the whole fraction tile. Have them do so. When they are done, the example below is what should be on their desks.

7. Ask how many total ⅛ fraction tiles they have now *(16)*. That means that 2 ÷ ⅛ = 16. This isn't on the Activity Sheet, but point out that the next problem on the Activity Sheet is 3 ÷ ⅛. Since they have just figured out what 2 ÷ ⅛ equals, they should have an idea about what they need to do next, which is to add another whole fraction tile under the last row of ⅛ fraction tiles, then another row of ⅛ fraction tiles below the new whole tile. Make sure they understand that they have three whole number tiles now because 3 is the whole number in the problem. When complete, the example to the right is what each group should have in front of them.

8. Now it's time to count up all the ⅛ tiles. Many students will probably see a pattern in the tiles and not need to count. Either way, each group should know they have 24 of the ⅛ tiles. They should write 24 as the answer to problem 2 on the Activity Sheet, then draw their pictorial representation, which should look exactly like what's in front of each group. If there is not enough room on the sheet for students to draw it exact, they may place some rows next to others, as long as each whole fraction tile has a corresponding row of ⅛ fraction tiles directly under it.

Practice 1

Students should solve problems 3 together in their groups. Tell them they should solve it in the exact same manner that they have just solved the first two problems. Remind them that the whole number tells them how many whole fraction tiles they will need. The fraction tells them which fraction tiles go in the second row. After all groups are done with problem 3, utilize the Checking for Understanding (below) with them, then let them solve problems 4-6 together in their groups.

Checking for Understanding

After students have completed problem 3, check for understanding by using the following line of questioning:
1. How many whole fraction tiles do you need? *(7)*
2. What fraction pieces do you line up with each whole fraction tile? *(⅓)*
3. How many ⅓ pieces does it take to make a whole? *(3)*
4. If you have seven whole fraction tiles and it takes three ⅓ fraction tiles to fill the same amount of space, how many ⅓ fraction tiles do you have? *(21)*
5. What does your pictorial model look like? (See example to the right)

Practice 2

1. Distribute the worksheet. Ask students what is different about these problems compared to the ones they were just working on (the pictorial model is given). Then ask what students need to figure out for these problems (the equation and the answer).
2. Work problem 1 together. Ask how many whole tiles are included in the pictorial model *(2)*, then tell them that this means the whole number at the beginning of the problem will be a 2 to represent the two whole fraction tiles.
3. Ask students what else is needed in this problem *(the fraction, which is ⅕)*. They should now be able to write $2 \div ⅕ =$ ____. Ask how many ⅕ tiles it takes to fill up the same amount of space as the two whole fraction tiles, then have them write that number for the answer *(10)*.
4. Allow students to work on the rest of the problems in their groups.
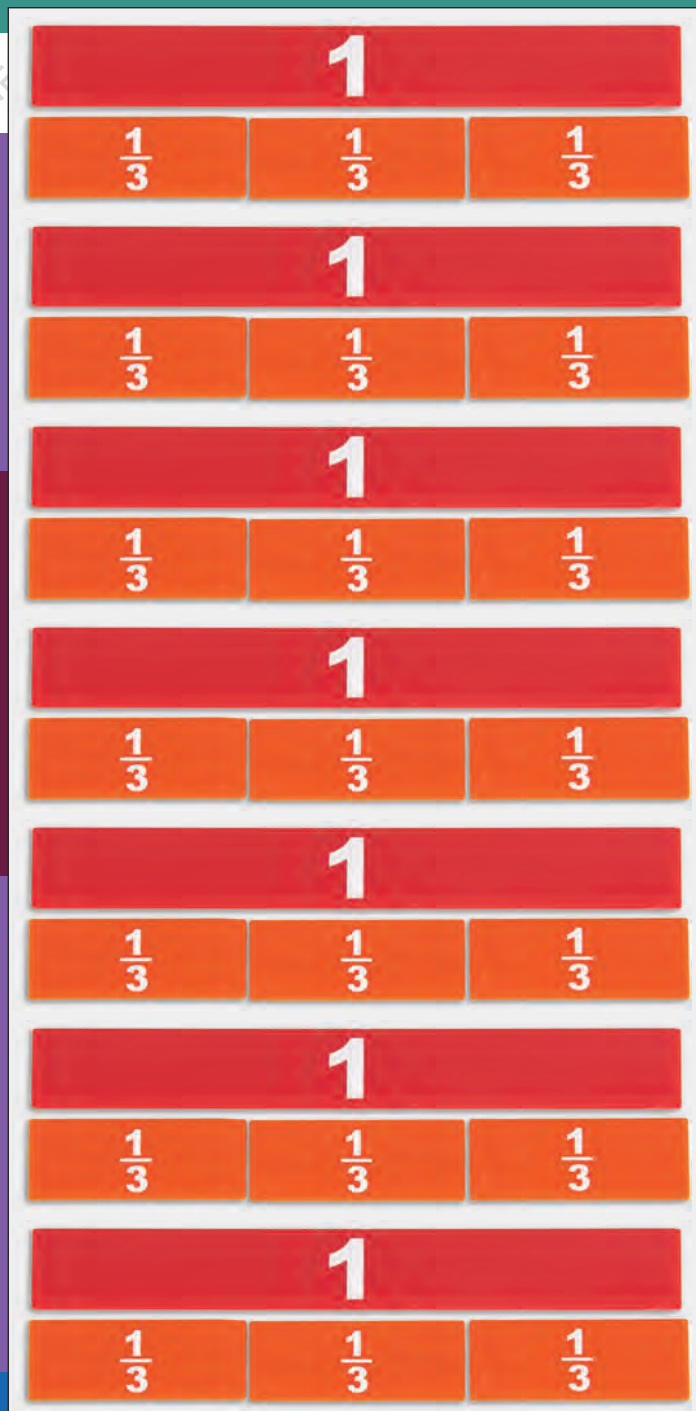
Intervention Possibilities

Have students practice further with the problems from the Activity Sheet, rather than the pictorial models provided in the worksheet.

Extension Possibilities

1. Give students an equation, have them draw the pictorial model that goes with that equation, then have them solve the problem.
2. Have students draw pictorial models and switch problems with a partner to solve.

Name: _____

Dividing Whole Numbers by Unit Fractions Activity Sheet

Directions: Use fraction tiles to solve each problem, then draw a pictorial model that represents the problem in the space provided below.

1. $1 \div \frac{1}{8}$ = _____

2. $3 \div \frac{1}{8}$ = _____

3. $7 \div \frac{1}{3}$ = _____

4. $5 \div \frac{1}{4}$ = _____

5. $3 \div \frac{1}{10}$ = _____

6. $4 \div \frac{1}{12}$ = _____

Dividing Whole Numbers by Unit Fractions
Activity Sheet Answer Key

Answers for problems 1-3 can be found in the Activity section of the lesson plan.

4. $5 \div \frac{1}{4} = 20$

1			
¼	¼	¼	¼

1			
¼	¼	¼	¼

1			
¼	¼	¼	¼

1			
¼	¼	¼	¼

1			
¼	¼	¼	¼

5. $3 \div \frac{1}{10} = 30$

1									
¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀

1									
¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀

1									
¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀	¹⁄₁₀

6. $4 \div \frac{1}{12} = 48$

1											
¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂

1											
¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂

1											
¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂

1											
¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂

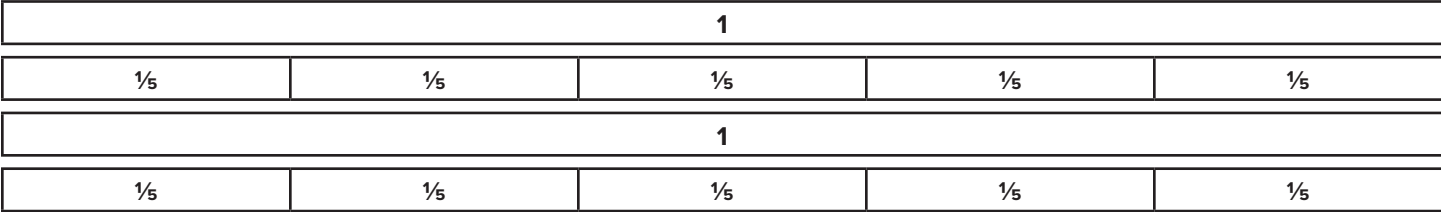**Name: _____**

Dividing Whole Numbers by
Unit Fractions Worksheet

Directions: Look at each pictorial model below. Determine the problem that's being shown. Write the answer to the given problem on the line.
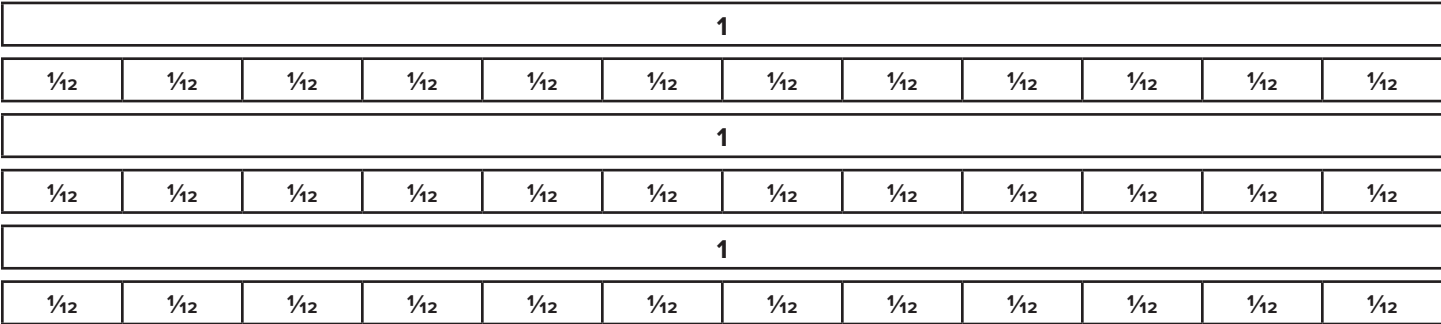
1.

1

⅕	⅕	⅕	⅕	⅕

1

⅕	⅕	⅕	⅕	⅕

What is the equation? _____   What is the answer? _____

2.

1

¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂

1

¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂

1

¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂	¹⁄₁₂

What is the equation? _____   What is the answer? _____

3.

1

⅙	⅙	⅙	⅙	⅙	⅙

1

⅙	⅙	⅙	⅙	⅙	⅙

1

⅙	⅙	⅙	⅙	⅙	⅙

1

⅙	⅙	⅙	⅙	⅙	⅙
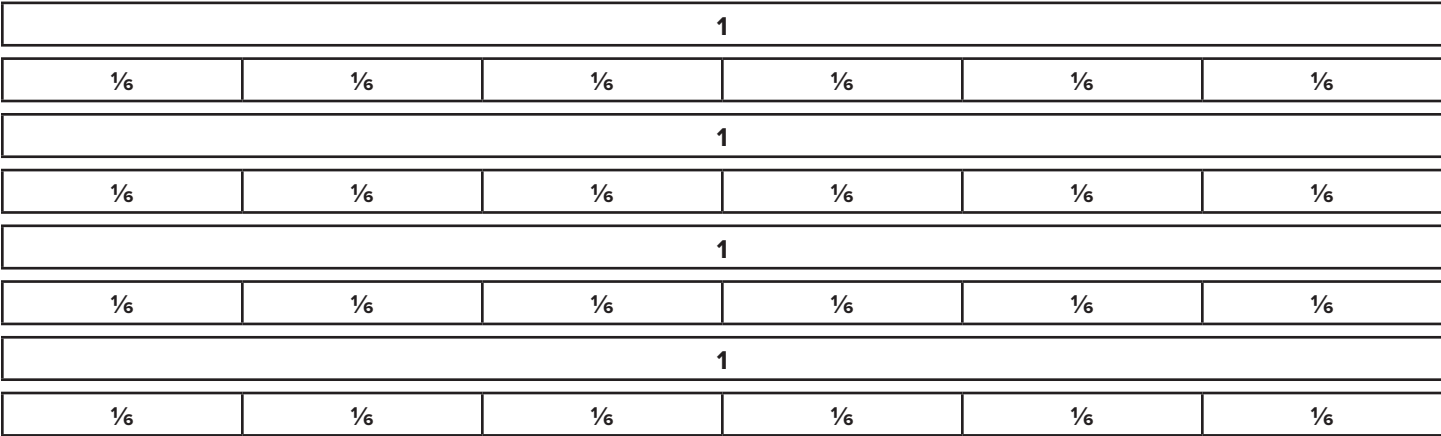
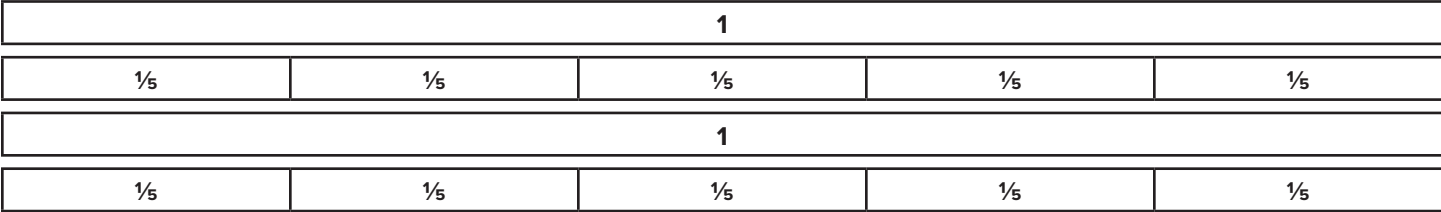What is the equation? _____   What is the answer? _____

Name: _____

Dividing Whole Numbers by Unit Fractions
Worksheet Answer Key

Directions: Look at each pictorial model below. Determine the problem that's being shown. Write the answer to the given problem on the line.
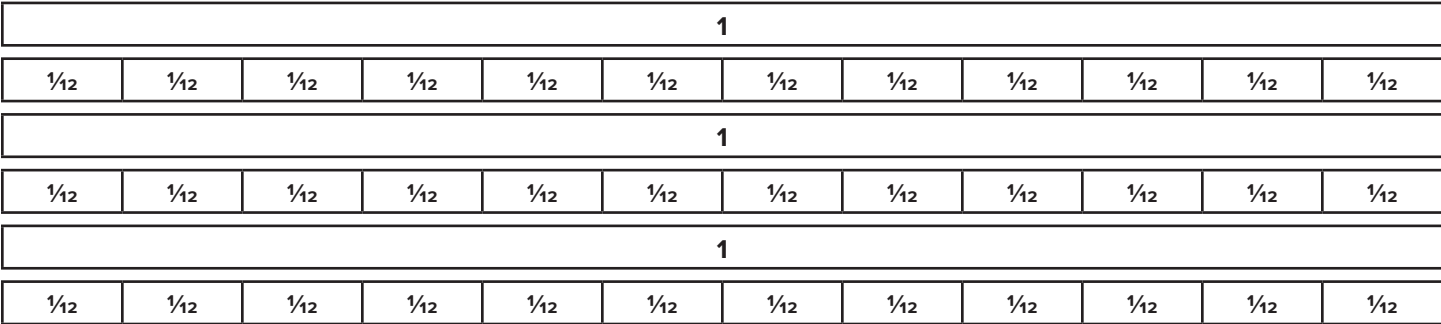
1.

1				
⅕	⅕	⅕	⅕	⅕

1				
⅕	⅕	⅕	⅕	⅕

What is the equation? _____2 ÷ ⅕_____   What is the answer? _____10_____

2.

1											
¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂

1											
¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂

1											
¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂	¹/₁₂

What is the equation? _____3 ÷ ¹/₁₂_____   What is the answer? _____36_____

3.

1					
⅙	⅙	⅙	⅙	⅙	⅙

1					
⅙	⅙	⅙	⅙	⅙	⅙

1					
⅙	⅙	⅙	⅙	⅙	⅙

1					
⅙	⅙	⅙	⅙	⅙	⅙

What is the equation? _____4 ÷ ⅙_____   What is the answer? _____24_____