Multiplication In Disguise

ID: 11917

Time required
45 minutes

Activity Overview

In this activity, students explore the transformation of a division problem into a multiplication problem. Students will see the transformation of dividing whole numbers as well as fractions. They also use the numerical algorithm used to divide fractions to discover patterns.

Topic: Numbers and Operations

- *Dividing fractions*
- *Multiplying fractions*

Teacher Preparation and Notes

- *Students should already be familiar with multiplying fractions.*
- *TI-Navigator is not required for this activity, but an extension is given for those teachers that would like to use it.*
- ***To download the student worksheet and TI-Navigator files, go to education.ti.com/exchange and enter "11917" in the quick search box.***

Associated Materials

- *MGAct10_InDisguise_worksheet_TI73.doc*
- *MGAct10_Nav01_TI73.act*
- *MGAct10_Nav02_TI73.act*
- *MGAct10_Nav03_TI73.act*

Suggested Related Activities

To download the activity listed, go to education.ti.com/exchange and enter the number in the quick search box.

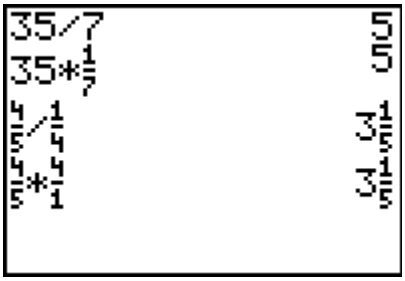
- *Dividing Fractions (TI-73 Explorer with TI-Navigator) — 6682*
- *Who Needs Mixed Numbers? (TI-34 MultiView) — 8936*
- *Fraction Operations (TI-73 Explorer with TI-Navigator) — 11057*

Before beginning the activity, have students think about the meaning of multiplication. Often, students misunderstand division of fractions because they simply memorize an algorithm. This activity is intended to help them internalize division of fractions by modeling the division with manipulatives and then looking for patterns to determine their own algorithm.

Problem 1 – Modeling Division

Questions 1–8

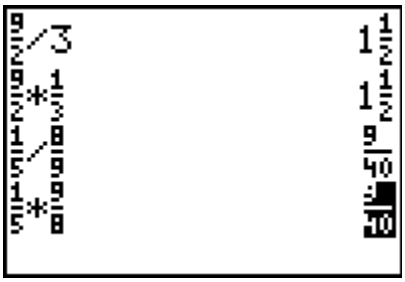
Help students understand that when dividing 35 by 7, they are finding how many 7s are in 35. The same applies when dividing a fraction (i.e., students are looking for how many $\frac{1}{4}$s are in 2).



Students should see that in each set of problems the division problem was transformed into a multiplication problem by "flipping" the second number.

Questions 9–10

These problems should confirm for students that all division problems can be rewritten as multiplication problems to produce the same answer.



Problem 2 – Looking for Patterns

Questions 12–13

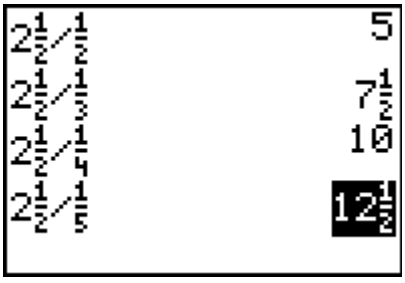
Students should use the TI-73 Explorer to evaluate each. Help students find a pattern for the answers for each.

Press the following to evaluate the first problem.
2 ÷ (1 b/c 2 ▶) ENTER.

They should see that all answers result in whole numbers because the fraction divides evenly into 2 and when written as a multiplication problem, 2 is multiplied by a whole number.

Questions 14–15

For this pattern, students should see that the answers that are whole numbers resulted because the denominator of the second number was a multiple of the denominator of the first number.



Problem 3 – Practice Makes Perfect

Questions 16–19

Students should show the related multiplication problem for the given division expression.

For example, for Question 16, the related multiplication sentence is $\frac{3}{2} \times \frac{3}{1}$.

Solutions – student worksheet

Problem 1

1. Division is changed to multiplication and the second number is flipped.
2. The answers are the same.
3. 5
4. 5
5. Division is changed to multiplication and the second number is flipped.
6. The answers are the same.
7. $3\frac{1}{5}$
8. $3\frac{1}{5}$
9. $1\frac{1}{2}$
10. $\frac{9}{40}$
11. Flip the second number by switching the numerator and denominator.

Problem 2

12. 4, 6, 8, 10
13. All of the answers are whole number. This happens because the fraction goes into the number 2 evenly.
14. 5, $7\frac{1}{2}$, 10, $12\frac{1}{2}$
15. Some of the answers are whole numbers because the denominator of the second number is a multiple of the denominator of the first number. The other answers are fractions because the second denominator is not a multiple of the first.

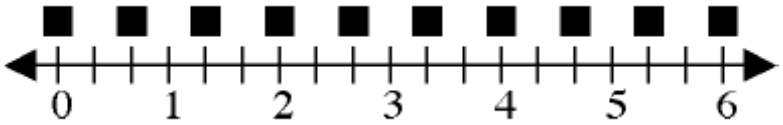
Problem 3

16. $\frac{3}{2} \times \frac{3}{1} = \frac{9}{2}$
17. $\frac{3}{5} \times \frac{6}{5} = \frac{18}{25}$
18. $\frac{9}{4} \times \frac{5}{2} = \frac{45}{8}$
19. $\frac{1}{3} \times \frac{2}{1} = \frac{2}{3}$

Extension – TI-Navigator™

1. Load the ***MGWeek10_Nav01_TI73.act*** activity settings file. Students will see a number line in Activity Center. Tell students that they have 6 feet of ribbon and you are going to cut the ribbon into $\frac{2}{3}$-foot ribbons can be made from the 6 feet of ribbon?

Start the activity and instruct students to place marks at $\frac{2}{3}$ intervals, starting with a mark at 0. You may 4 want to call on specific students to place the marks on the diagram so as to minimize any confusion. After students place marks, the screen should look like the one shown below. Students should recognize that the space between each mark represents $\frac{2}{3}$ and that there are 9 full $\frac{2}{3}$s in the number 6.

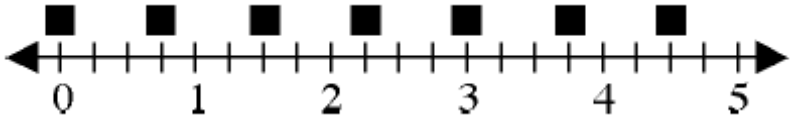


Use **Quick Poll** (with **Open Response**) to ask students how many $\frac{2}{3}$s there are in 6.

Follow up by asking them what operation was used to answer this question: addition, subtraction, multiplication, or division.

2. Load the ***MGWeek10_Nav02_TI73.act*** activity settings file. This time, tell students that they will be answering a very similar problem except that this time they need to find how many $\frac{3}{4}$-foot ribbons can be cut from the 5 feet of ribbon.

Start the activity and instruct students to place marks at $\frac{3}{4}$ intervals, similar to before. After students place marks, the screen should look like the one shown below.



Use **Quick Poll** (with **Open Response**) to ask students how many $\frac{3}{4}$s there are in the number 5. Instruct students to write their answer as a fraction by enclosing it in quotation marks (found by pressing [2nd][TEXT]). Most students will see that there are 6 full $\frac{3}{4}$s in the number 5. They will have more difficulty realizing that there is an additional $\frac{2}{3}$ of $\frac{3}{4}$

giving a final answer of $6\frac{2}{3}$. Use the diagram in **Activity Center** to show why this is true.

3. Load the ***MGWeek10_Nav03_TI73.act*** activity settings file. This time, tell students that they will be finding how many times the number $\frac{1}{2}$ goes into $\frac{7}{2}$. Run the activity as before and use **Quick Poll** to see if students obtained an answer of 7.

4. Write the results of each division problem from Part I on the board:

Tell students to log out of NavNet and use trial and error with the fraction feature of their calculators to find a way to obtain the above answers using the number pairs on the left side of each equal sign without using the division key. If a student thinks they have it, use **Screen Capture** to display the result for the rest of the class. Try not to provide too much input here; it's important that students discover the division algorithm for themselves.

Problem 1 – Division as Multiplication

1. How is Exercise 3 changed into Exercise 4?

_____

_____

2. Find the answers using the calculator. How do the answers to Exercises 3 and 4 compare?

_____

_____

3. $35 \div 7$

_____

4. $35 \times \frac{1}{7}$

_____

5. How is Exercise 7 changed into Exercise 8?

_____

_____

6. Find the answers using the calculator. How do the answers to Exercises 7 and 8 compare?

_____

_____

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

_____

8. $\frac{4}{5} \times \frac{4}{1}$

_____

Find the answers using the calculator and compare the following problems.

9. $\frac{9}{2} \div 3$

_____

$\frac{9}{2} \times \frac{1}{3}$

_____

10. $\frac{1}{5} \div \frac{8}{9}$

_____

$\frac{1}{5} \times \frac{9}{8}$

_____

11. How can all division problems be rewritten using multiplication?

_____

_____

Problem 2 – Looking for Patterns

Evaluate each division problem. Look for a pattern.

Press 2 ÷ (1 b/c 2) ENTER for the first problem in Exercise 12.

12. $2 \div \frac{1}{2}$ $2 \div \frac{1}{3}$ $2 \div \frac{1}{4}$ $2 \div \frac{1}{5}$

_____ _____ _____ _____

13. What do all of the answers have in common? Why do you think this happens?

_____

_____

_____

14. $2\frac{1}{2} \div \frac{1}{2}$ $2\frac{1}{2} \div \frac{1}{3}$ $2\frac{1}{2} \div \frac{1}{4}$ $2\frac{1}{2} \div \frac{1}{5}$

_____ _____ _____ _____

15. Why are some of the answers whole numbers and some of the answers fractions?

_____

_____

_____

Problem 3 – Practice Makes Perfect

Evaluate each using the algorithm for dividing fractions. Write the multiplication step for each. Check your work using the calculator.

16. $1\frac{1}{2} \div \frac{1}{3} =$ _____ **17.** $\frac{3}{5} \div \frac{5}{6} =$ _____

18. $2\frac{1}{4} \div \frac{2}{5} =$ _____ **19.** $\frac{1}{3} \div \frac{1}{2} =$ _____