

Fraction Fun

ID: 13434

Time required
45 minutes

Activity Overview

In this activity, students will explore patterns with fractions. The TI-73 Explorer will be used to facilitate the computations so students can concentrate on patterning.

Topic: Algebra

- *Finding patterns and expressing algebraically*
- *Estimating*
- *Making conjectures*

Teacher Preparation and Notes

- *Students should have previous experience with basic fraction addition and subtraction.*
- *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 “13434” in the quick search box.***

Associated Materials

- *MGAct09_FractionFun_worksheet_TI73.doc*
- *MGAct09_FractionFun_Nav_01_TI73.act*
- *MGAct09_FractionFun_Nav_02_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.

- *Skip Counting (TI-73 Explorer) — 4484*
- *Visual Fraction Exploration (TI-73 Explorer & TI-Navigator) — 8652*
- *Fraction Decimal Challenge (TI-73 Explorer) — 6681*

Problem 1 – Addition Patterns

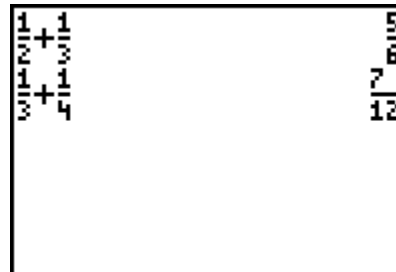
In this problem, students will look at addition of fractions with denominators separated by one digit. Each fraction will have a numerator of 1. Then, students will look at patterns created when subtracting fractions that do not have consecutive denominators.

Questions 1–3

In Question 1, have students enter the addition problems on the TI-73 to look for a pattern. To enter $\frac{1}{2} + \frac{1}{3}$ press

$\boxed{1} \boxed{\text{b/c}} \boxed{2} \boxed{\text{+}} \boxed{1} \boxed{\text{b/c}} \boxed{3} \boxed{\text{ENTER}}$. Repeat with the same general key presses for each addition problem.

Students should notice that the numerator is the denominators in the problem added together and the new denominator is the product of the two original denominators.

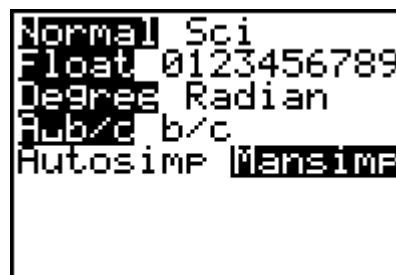


Questions 4–5

Students should create a table to keep track of the exploration done in this question. This will help them make a conjecture and see if a pattern exists. A student’s table might look as follows.

Addition Problem	Prediction	Actual Result
$\frac{1}{2} + \frac{1}{4}$	$\frac{6}{8}$	$\frac{3}{4}$
$\frac{1}{3} + \frac{1}{5}$	$\frac{8}{15}$	$\frac{8}{15}$

If you would like, students can also change the MODE of the TI-73 to not automatically simplify. To do this, press $\boxed{\text{MODE}}$ and then use $\boxed{\downarrow}$ and $\boxed{\rightarrow}$ to move to **Mansip** and press $\boxed{\text{ENTER}}$. This will change the mode to Manual Simplification and will not reduce fractions to simplest form automatically. (A down arrow will appear to the right of the answer, indicating that it can be further simplified.)



The problems that do not follow their expected pattern will be the fractions that were simplified by the TI-73 automatically.

Problem 2 – Subtraction Patterns

Questions 6–7

In Question 6, have students enter the subtraction problems on the TI-73 to look for a pattern. To enter $\frac{1}{2} - \frac{1}{3}$ press $\boxed{1} \boxed{\frac{b}{c}} \boxed{2} \boxed{\rightarrow} \boxed{-} \boxed{1} \boxed{\frac{b}{c}} \boxed{3} \boxed{\text{ENTER}}$. Repeat for each subtraction problem.



Students should notice that the numerator is a 1 and the new denominator is the product of the two original denominators.

Question 8–9

In Question 8, have students enter the subtraction problems on the TI-73 to look for a pattern. Repeat for each subtraction problem.

Students should notice a pattern. The new numerator is the difference in the numerators and the new denominator is the product of the two original denominators.

Extension

Have students look at multiplication and division patterns. What does division by fractions mean?

Change the fractions so that they share common denominators. Then divide the numerators. How does that answer compare to the calculator answer? Can you think why they are the same?

Extension – TI-Navigator™

- For Questions 1 and 6, use the activity settings file **MGAct09_FractionFun_Nav01_TI73.act** to allow students to show the result they get for each addition and subtraction problem. The number line goes from 0 to 1 with steps of $\frac{1}{12}$.
As students work different addition and subtraction problems, you may need to adjust the beginning and end of the number line and the step and tick mark settings below the number line.
- For Question 4, use the activity setting file **MGAct09_FractionFun_Nav02_TI73.act**. The activity is set up to allow students to input two lists, one element for the prediction and the other list for the actual result from the calculator screen. This will allow students to see their problems as well as other students' results to make predictions with more data.
- Use **Screen Capture** or **Quick Poll** to monitor student progress and understanding throughout the lesson.

Solutions – student worksheet
Problem 1

- Yes, students should see a pattern. Accept any description of pattern that fits the problem.
- Students should see that the new numerator is the sum of the original denominators and the new denominator is the product of the original denominators.
- $\frac{1}{a} + \frac{1}{a+1} = \frac{a+(a+1)}{a(a+1)}$

4.

Addition Problem	Prediction	Actual Result
$\frac{1}{2} + \frac{1}{4}$	$\frac{6}{8}$	$\frac{3}{4}$
$\frac{1}{3} + \frac{1}{5}$	$\frac{8}{15}$	$\frac{8}{15}$
Answers will vary based on problems created by students.	Predictions should follow algebraic pattern shown in Question 3.	

- Problems that do not follow the pattern at those that have been simplified by the calculator automatically.

Problem 2

- Yes, students should see a pattern. Accept any description of pattern that fits the problem. Students should see that the new numerator is 1 and the new denominator is the product of the original denominators.

- $\frac{1}{a} - \frac{1}{a+1} = \frac{1}{a(a+1)}$

- Students should see that the new numerator is the difference of the original denominators and the new denominator is the product of the original denominators. $\frac{1}{a} - \frac{1}{b} = \frac{b-a}{a \cdot b}$

- Check students' answers.



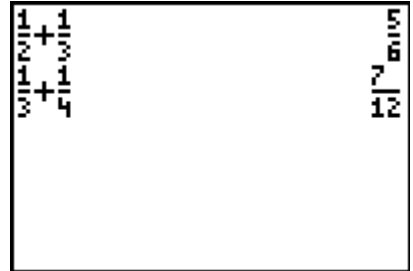
Problem 1 – Addition Patterns

You will explore patterns when you add fractions. First, work with fractions that have consecutive denominators and then look at fractions that do not have consecutive fractions.

1. Use the $\frac{b}{c}$ key on the TI-73 to find answers to the following addition problems.

Describe all patterns you see in the results (starting with the ones shown at the right).

$\frac{1}{2} + \frac{1}{3}$	$\frac{1}{3} + \frac{1}{4}$	$\frac{1}{4} + \frac{1}{5}$
$\frac{1}{5} + \frac{1}{6}$	$\frac{1}{6} + \frac{1}{7}$	$\frac{1}{7} + \frac{1}{8}$

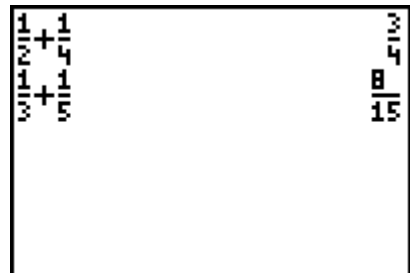


2. Write a conjecture about the numerator and the denominator. _____

3. Test your conjecture on several new problems with numerator 1 and denominators of consecutive integers different from those above. Did the conjecture work? Express the fraction addition pattern algebraically. _____

4. Will your pattern work for non-consecutive denominators? Investigate!

- ▶ Set up a table with three columns.
- ▶ In the column on the left, write an addition problem where the numerators are 1s and the denominators are any two nonconsecutive integers.
- ▶ In the middle column, first use your pattern to predict what you think the answer will be.
- ▶ Type the problem into the TI-73, and enter the result into column three.
- ▶ Compare columns two and three. Did your conjecture work? Did your pattern still work?



5. Circle those problems that gave answers you did not expect. What is the same?

What is different about these problems compared to the others?

What do the circled problems have in common?

Can you think of what the calculator did to change the answer?

Problem 2 – Subtraction Patterns

6. Change the first three addition problems that were done in Question 1 to subtraction problems. Perform the subtraction problems shown and describe the pattern you see. _____

$\frac{1}{2} - \frac{1}{3}$	$\frac{1}{6}$
$\frac{1}{3} - \frac{1}{4}$	$\frac{1}{12}$
$\frac{1}{4} - \frac{1}{5}$	$\frac{1}{20}$

7. Test the conjecture on the following problems. $\frac{1}{5} - \frac{1}{6}$ and $\frac{1}{6} - \frac{1}{7}$

Can you describe the pattern algebraically? _____

8. Try these problem sets, they have patterns too! Describe the pattern you see _____

$\frac{1}{10} - \frac{1}{9}$	$-\frac{1}{90}$
$\frac{1}{12} - \frac{1}{10}$	$-\frac{1}{60}$
$\frac{1}{10} - \frac{1}{8}$	$-\frac{1}{40}$

$\frac{1}{10} - \frac{1}{9}$	$\frac{1}{12} - \frac{1}{10}$	$\frac{1}{10} - \frac{1}{8}$	$\frac{1}{3} - \frac{1}{5}$	$\frac{1}{5} - \frac{1}{8}$
$\frac{1}{3} - \frac{1}{10}$	$\frac{1}{7} - \frac{1}{2}$	$\frac{1}{7} - \frac{1}{4}$	$\frac{1}{7} - \frac{1}{8}$	

9. Make up problems of your own and test your conjectures.

What if the numerators are not ones? _____

Make up some addition problems with numerator two, and look for a pattern. Write a conjecture. Make up additional problems and test your conjecture.