

Rational Number Project

Fraction Operations and Initial Decimal Ideas Lesson 6: Overview	Materials <ul style="list-style-type: none">• Fraction circles for students and teacher• Student Pages A and B
Students build on their understanding of adding fractions with symbols to subtract fractions.	

Teaching Actions

Warm Up

Explain how you would find the answer to the following problem using fraction circles.

$$\frac{5}{6} + \frac{1}{3} =$$

Large Group Introduction

1. Present these three story problems. Ask students to imagine using fraction circles to model each one. Which two problems have the same action? Which one is different? How is it different?
 - Kia spent $\frac{1}{2}$ of her total allowance on a movie and $\frac{1}{4}$ of her total allowance on a candy. What fraction of her allowance did she spend in all?
 - Ty had a bag of peanuts weighing about $\frac{3}{4}$ of a pound. He ate about $\frac{1}{3}$ of a pound? How much did he have left?
 - India ran $\frac{1}{2}$ mile and stopped for a few minutes to catch her breath. Then she ran another $\frac{1}{8}$ of a mile. How far did she run in all?

Comments

The main goal is for students to develop a deep understanding of how to add and subtract fractions using symbols. This knowledge with symbols should be connected to actions with the fraction circles. This understanding should be reflected in their ability to estimate and judge reasonableness of answers.

Teaching Actions

2. Suggest that you all solve the two addition problems using common denominators. But first ask students to please remind you as to why you decided to use common denominators to add fractions.
3. Record solutions using symbols and then verify the solutions using fraction circles.
4. Solve the subtraction problem using the fraction circles. The first step would be to show $\frac{3}{4}$ of a pound of peanuts using 3 blues. The whole circle is the unit. (Do this at the overhead). As it is difficult to take away $\frac{1}{3}$ of a pound of peanuts from $\frac{3}{4}$, ask how can they use equivalence ideas and common denominators to make this problem easier to solve.
5. Suggest that they list some fractions equivalent to $\frac{3}{4}$ and make another list of fractions equivalent to $\frac{1}{3}$.
Ask: What do you notice? ($\frac{3}{4} = \frac{9}{12}$ and $\frac{1}{3} = \frac{4}{12}$)
6. Explain that with circles, that means if you change the 3 blues to 9 reds it will be easier to take away $\frac{1}{3}$.
It is possible to take away $\frac{1}{3}$ as $\frac{4}{12}$. (Do this at the overhead)
7. Propose that they show what you did with the circles using symbols. Ask students to describe each step which you will record with symbols: ($\frac{3}{4} - \frac{1}{3}$ is the original task; change $\frac{3}{4}$ to $\frac{9}{12}$; change $\frac{1}{3}$ to $\frac{4}{12}$.
Take $\frac{4}{12}$ away from $\frac{9}{12}$. The answer is $\frac{5}{12}$).
8. $\frac{3}{4} = \frac{9}{12}$; $\frac{1}{3} = \frac{4}{12}$; $\frac{9}{12} - \frac{4}{12} = \frac{5}{12}$
9. Repeat for this problem: $\frac{5}{9} - \frac{1}{3}$. Show with the circles; make a list of equivalences for each fraction. Decide on changing $\frac{1}{3}$ to $\frac{3}{9}$. Subtract. Record steps with symbols.

Comments

The idea is to reinforce the notion that using common denominators makes it possible to name the amount as a single fraction.

Important Idea: What you are doing here is helping students use their symbolic skills to guide their use of manipulatives to act out this subtraction problem.

Teaching Actions

10. Summarize by asking students to help you write a class plan for subtracting fractions using symbols. Ask: What should this plan be?

- Find equivalent fractions for each fraction pair with the denominators the same.
- Subtract the numerators.
- Do not subtract the denominators.

Small Group/Partner Work

11. Give directions to students for pages A and B before students start to work on them.

- Direct students to work with a partner to complete Student Page A. Students are still using fraction circles but are using a symbolic method for finding common denominators.
- Read directions to Student Page B to students. Encourage them to imagine using the fraction circles to reinforce the need to find common denominators before subtracting.

Wrap Up

12. Ask: Do the answers you found for these problems make sense? Let's estimate a reasonable answer and check with your exact answer.

- $\frac{2}{3} - \frac{1}{4}$ Is the answer $> \frac{1}{2}$ or $< \frac{1}{2}$?
- $\frac{2}{3} - \frac{1}{2}$ Is the answer $> \frac{1}{2}$ or $< \frac{1}{2}$?
- $\frac{4}{5} - \frac{1}{2}$ Is the answer $> \frac{1}{2}$ or $< \frac{1}{2}$?
- $\frac{4}{7} - \frac{4}{14}$ Is the answer $> \frac{1}{2}$ or $< \frac{1}{2}$?
- $\frac{11}{12} - \frac{9}{12}$ Is the answer $> \frac{1}{2}$ or $< \frac{1}{2}$?
- $\frac{3}{4} - \frac{1}{5}$ Is the answer $> \frac{1}{2}$ or $< \frac{1}{2}$?
- $\frac{6}{10} - \frac{1}{3}$ Is the answer $> \frac{1}{2}$ or $< \frac{1}{2}$?

Comments

As you work with students on estimation you may notice some students have an understanding of the relative size of the fractions in the problem, but still have difficulty putting it altogether. Consider this discussion between a teacher and a student. The student stuck to his initial estimate even though he showed an understanding of the sizes of the fractions:

Estimate $\frac{14}{15} - \frac{5}{7}$

S: A little bit bigger than $\frac{1}{2}$. Because

$\frac{14}{15}$ is almost a whole and $\frac{5}{7}$ is a little bit over a half.

T: Is $\frac{14}{15}$ bigger than 1 or less than 1?

S: Less than 1.

T: and $\frac{5}{7}$

Teaching Actions

Comments

S: Close to $\frac{1}{2}$.

T: Is it bigger or less than $\frac{1}{2}$?

S: Probably bigger

T: So you are taking 1 and taking away more than $\frac{1}{2}$. Is the answer

going to be bigger than $\frac{1}{2}$ or less

than $\frac{1}{2}$?

S: Bigger than $\frac{1}{2}$.

In this next example, the teacher's questioning helped the student put together his understanding of the size of the fractions to provide a reasonable estimate.

Estimate $\frac{14}{15} - \frac{5}{7}$

S: It would be between 0 and $\frac{1}{2}$.

T: Can you explain your thinking?

S: Since $\frac{14}{15}$ is basically one whole. $\frac{5}{7}$

I can't figure out.

T: In terms of $\frac{1}{2}$, how big is it? Is it

bigger than $\frac{1}{2}$ or less than $\frac{1}{2}$?

S: More than $\frac{1}{2}$

T: Now put it all together for me.

S: So $\frac{14}{15}$ is basically a whole and $\frac{5}{7}$ is

basically $\frac{1}{2}$ so it would be between 0

and $\frac{1}{2}$.

Translations:

- Real Life to concrete to verbal to symbols
- Symbols to symbols to verbal
- Real life to symbols to verbal

Explain how you would find the answer to the following problem using fraction circles:

$$\frac{5}{6} + \frac{1}{3} =$$

Adding and Subtracting Fractions using Fraction Circles

Chee lives $\frac{2}{3}$ a mile from school. After going just about $\frac{1}{4}$ of a mile, his bike broke down and he has to walk the rest of the way. What fraction of one mile does Chee have to walk to get to school?

1. Show $\frac{2}{3}$ on your fraction circles.
2. List fractions equivalent to $\frac{2}{3}$:
3. List fractions equivalent to $\frac{1}{4}$:
4. Describe how you will change the two browns on your fraction circles so you can easily subtract $\frac{1}{4}$.
5. Describe how you will change $\frac{1}{4}$ so you can easily take away that amount from your fraction circle display.
6. What is your final answer?

India has $\frac{2}{3}$ of a cup of brown sugar left in the sugar bowl. Her recipe for chocolate chip cookies requires $\frac{1}{2}$ cup of brown sugar. How much brown sugar will she have left after making her chocolate chip cookies?

1. Show $\frac{2}{3}$ with your fraction circles.
2. List fractions equivalent to $\frac{2}{3}$:
3. List fractions equivalent to $\frac{1}{2}$:
4. Describe how you will change the two browns on your fraction circles so you can easily subtract $\frac{1}{2}$.
5. Describe how you will change $\frac{1}{2}$ so you can easily take away that amount from your fraction circle display.
6. What is your final answer?

Imagine setting up each problem using your fraction circles. Do you need to make changes to take away the amount shown in the problem? What will those changes be? Now solve using only symbols.

$\begin{array}{r} \frac{4}{5} \\ - \frac{1}{2} \\ \hline \end{array}$	$\begin{array}{r} \frac{1}{3} \\ - \frac{4}{15} \\ \hline \end{array}$
$\frac{5}{6} - \frac{1}{2}$	$\frac{11}{12} - \frac{9}{12}$
$\begin{array}{r} \frac{3}{4} \\ - \frac{1}{5} \\ \hline \end{array}$	$\frac{6}{10} - \frac{1}{3}$

Which problem was the easiest to solve? Why?

Which problems were the most difficult to solve? Why?

Were there any problems with different denominators that you could still solve easily? Why?

Post Lesson Reflection

Lesson _____

1) Number of class periods allocated to this lesson: _____

2) Student Pages used: _____

3) Adaptations made to lesson: (For example: added extra examples, eliminated certain problems, changed fractions used)

4) Adaptations made on Student Pages:

5) To improve the lesson I suggest: