Overview for Families

Mathematics in Context unit: ***Fraction Times***

Mathematical strand: **Number**

The following pages will help you to understand the mathematics that your child is currently studying as well as the type of problems (s)he will solve in this unit.

Each page is divided into three parts:

- *Section Focus*
  Identifies the mathematical content of each section.

- *Learning Lines*
  Describes the mathematical flow of each section.

- *Learning Outcomes*
  Outlines what students should know and be able to do at the end of each section.

"From the very beginning of his education, the child should experience the joy of discovery."

Alfred North Whitehead

Fraction Times

Section A Survey Results

Section Focus

Students use *segmented bars* to create pie charts and to compare survey results from different-sized classes. The focus of this section is to compare fractions with unlike denominators, which is continued in Section B and used to add fractions with unlike denominators informally.

Learning Lines

Number Sense

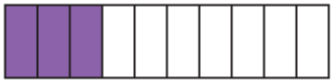
The relationship between ratios and fractions is made explicit in this section. The idea using a fraction to represent data is introduced. For example, simplifying that 10 out of 20 students prefer pizza is like saying that half of the students prefer pizza. The first relationship (10 out of 20 students) contains information about the actual number of students who prefer pizza. The second relationship (half of the students) is a simplified version of the first, but information about the actual data is lost.

Models

The bar model, developed in the unit *Models You Can Count On*, is reviewed in this section to represent part-whole relationships. The segmented bar model is designed to help students find exact answers to addition and subtraction problems involving fractions by generating common denominators tied to specific situations. The terms *numerator* and *denominator* are not explicitly used in this section yet.

Students first use segmented bars of varying lengths to write fractions for the survey results from two different-sized classes. For example, 3 out of 10 compared to 4 out of 15:

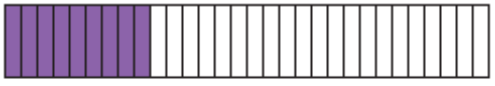
A bar of 10 segments

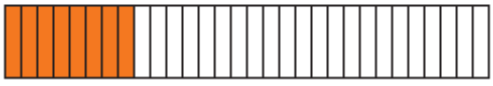


A bar of 15 segments

Students use two bars with an equal number of segments to represent the same survey result.

Two bars of 30 segments





Fraction Times

Section A Survey Results

To find this number of segments, students have to find the common multiple of the two denominators. In the example, 30 is a common multiple of 10 and 15. Students can use number sense and/or a ratio table to find this common multiple. Segmented bars are also used to create pie charts. These pie charts are used to derive fractions that describe survey results. These fractions serve to compare two different groups included in a survey.

Learning Outcomes

Students are able to create a pie chart using a segmented bar. They informally compare fractions with unlike denominators.

Fraction Times

Section B It Adds Up

Section Focus

Students compare and add fractions with unlike denominators using segmented and non-segmented bars and ratio tables. They use visual models to represent and solve problems.

Learning Lines

Fractions and Percents
Benchmark fractions and percents are reviewed when survey results are represented in percents. The relationships between fractions and decimals are made more explicit in Section C and between ratios, fractions, percents, and decimals in Section D.

Students start to use a fraction as an operator when they find out how many people represent 1/4 of 30. (See problem 3.)

Models: Bar
The use of non-segmented bars is introduced as another method for analyzing data expressed as fractions. For example: 1/4 of 40 segments is 10 segments on a non-segmented bar.

Models: Ratio Table
Instead of a bar, students learn that a ratio table is another model that can be used to represent part-whole relationships and to compare fractions. The ratio table model is developed in the unit *Models You Can Count On*.

Fractions: Add and Subtract
When the sample size (the number of people who are involved in a survey) is not given and students have to reason about a possible sample size, they will informally look for a common denominator of the fractions that summarize the survey. When students determine what fraction the remaining part represents, they start to add and subtract fractions informally. The non-segmented bars enable students to move closer to formalizing their understanding of fractions with unlike denominators. Addition and subtraction of fractions with unlike denominators is performed without the use of the conventional algorithm for converting these fractions into equivalent fractions.

Learning Outcomes

Students are able to choose a strategy to add, subtract, and compare fractions. They are able to choose an appropriate (visual) model or strategy to represent and solve problems in which ratios and fractions are involved.

Fraction Times

Section C Festival and the Decimal Connection

Section Focus

Students use their knowledge of benchmark fractions, money, and decimals. They informally convert fractions to decimals and decimals to fractions to solve problems involving money. Students develop strategies to add and multiply decimals. The distributive property is informally used but not made explicit to students.

Learning Lines

Number Sense: Decimals

Fractions and decimals arise now in a fair sharing situation. The fare share idea is connected to the context of money to develop students' understanding of decimals and the relationship between fractions and decimals. For example: \$1.00 shared among 10 people means that each person gets \$0.10, or one dime, or 1/10 of a dollar. This knowledge can be used to change 0.40 into a fraction. Students can think \$0.40 is four dimes. One dime is 1/10 of a dollar, so four dimes is 4/10 of a dollar.

To change fractions that are not related to benchmark fractions, the context of money is very helpful. For example to change 0.17 into a fraction: \$0.17 is 17 cents. One cent is 1/100 of a dollar, so 17 cents is 17/100 of a dollar.

When using a calculator to convert fractions into decimals, students find that some decimal equivalents have a finite number of digits, while others have an infinite number of digits, commonly referred to as repeating decimals such as $1/3 = 0.333\ldots$. A repeating decimal is usually indicated with a horizontal line over the digits that repeat:

$$1/7 = 0.142857142857142\ldots = 0.\overline{142857}$$

Strategies

Benchmark fractions such as $1/4 = 0.25$ are used to show the connection with decimals in the context of money. When changing a decimal to a fraction, the ratio table serves as a model. Repeated addition is introduced as an informal strategy to multiply a whole number by a decimal.

Learning Outcomes

Students are able to convert fractions to decimals and decimals to fractions informally. They have developed strategies to add and multiply decimals. They can use a calculator to convert fractions to decimals.

Fraction Times

Section D Ratios, Fractions, Decimals, and Percents

Section Focus

Students continue to summarize survey results as in Section A, but now percents are used to represent the respondents as well as fractions. Section D introduces strategies for converting fractions and ratios into percents. The relationship between percents and fractions with 100 as a denominator is stressed. Students also use a pie-chart meter to read and make pie charts.

Learning Lines

Number Sense, Fractions, and Percents

When using a calculator, a ratio is converted to a decimal using division. The decimal is then rounded to the nearest hundred and changed to a percent that can be used for a 100-segment circle. Larger numbers are used, for example, 182 out of 600 people. Students explore how some fractions have a finite number of digits when converted to a decimal while others show an infinite number of digits.

Models

A fraction bar serves as a visual model to help students estimate fractions. A ratio table and number sense can also be used for the same estimate. A 100-segment bar and a 100-segment circle are used to represent percents. The 100-segment circle is a more formalized model of the pie chart students used in Section A.

Learning Outcomes

Students have developed a better understanding of the relationship between ratios, fractions, decimals, and percents. They use estimates to find fractions and decimals and know when to use a calculator. They use a 100-segment bar and a 100-segment circle to represent percents of respondents to a survey.

Fraction Times

Section E Fractional Parts

Section Focus

In this section, informal strategies are used to multiply fractions. Students explore situations that require taking a fraction of a fraction. Only informal methods are used to build on the conceptual understanding related to finding the product of two fractions.

Learning Lines

Number Sense: Fractions

Students determine, for example, the weight of aluminum cans that are recycled in a local park by finding the weight of cans that make it into the recycle bins (4/5). They then find the weight of the cans that get lost on the way to the recycling center (1/10 of the cans in the bins). Students explain why the statement 9/10 of 4/5 represents the fraction of cans that actually gets recycled.

Models

To find a fractional part of a quantity, such as 4/5 of 250 kg, different models are available, such as a ratio table and a fraction bar. Other students may find 4/5 of 250 kg by reasoning 1/5 of 250 is 50, so 4/5 of 250 is 200 ($4 \times 50 = 200$).

Strategies

Students use a variety of strategies while working with fractions. To find a fraction of a fraction in a problem given without a context, students select "easy" numbers on which to operate to find a solution to the product. No formal algorithms are used, it is more important that students develop a conceptual understanding that can be built on in later units.

Learning Outcomes

Students have developed informal strategies to multiply fractions.