Split It Up
More Fractions, Decimals, and Percents

STUDENT BOOK

TERC

Mary Jane Schmitt, Myriam Steinback, Tricia Donovan, Martha Merson, and Marlene Kliman

Also available:
Watching what you eat and learning how to read and interpret nutrition labels is important for your overall health. Reading labels is one way to become informed about the nutritional content of foods.

In this lesson, you will read nutrition labels and compare fat calories with total calories per serving to determine the percent of calories from fat in various foods.

Using what you know about fractions, decimals, and percents, you will determine if a food is nonfat, low fat, medium fat, or high fat.
Activity 1: How Much Fat?

Part 1: Nutrition Facts

1. How many calories are there in a serving of walnuts? _______
2. How many of those calories are from fat? _______
3. What fraction of the calories comes from fat? _______
4. Is that fraction less than, equal to, or more than $\frac{1}{2}$? _______
   Explain.

5. Is the fraction more than $\frac{3}{4}$? _____ Explain.

Part 2: Nutrition Labels

The 2005 edition of the Dietary Guidelines for Americans, published by the Department of Health and Human Services (HHS) and the Department of Agriculture (USDA), gives advice about healthy dietary habits. One of the recommendations is as follows:

“Keep total fat intake between 20 to 35 percent of calories, with most fats coming from sources of polyunsaturated and monounsaturated fatty acids, such as fish, nuts, and vegetable oils.”

Although the recommended 20 to 35 percent of calories from fat is in reference to the daily total number of calories in a healthy diet, you might use these numbers as a guide when you look at individual food labels.
Look closely at the nutrition labels to determine the fat content.

1. Sort the labels into four groups: Nonfat (0%), low fat (less than 20% fat calories, but more then 0%), medium fat (20%–35%), or high fat (more than 35% calories from fat).

2. Complete the following chart with information from at least one of each type of fat category.

<table>
<thead>
<tr>
<th>Food</th>
<th>Total Calories per Serving</th>
<th>Calories from Fat</th>
<th>Estimated % Fat (Ballpark Guess!)</th>
<th>Benchmark Fraction</th>
<th>Percent of Fat Calories</th>
<th>High Fat, Medium Fat, Low Fat, or Nonfat</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

3. What food had the highest percent of fat content? How did you know?

4. Did the percent of fat content of any of the foods surprise you? Why?
5. What method did you use to determine the percent of fat? Show your work.

6. How can you check your work? Show another method.
Activity 2: Munching on Snacks

1. What is the percent of fat calories in these two snacks?

Snack 1

<table>
<thead>
<tr>
<th>Food</th>
<th>Calories per Serving</th>
<th>Calories from Fat per serving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Orange juice</td>
<td>120</td>
<td>0</td>
</tr>
<tr>
<td>Chocolate chip cookie</td>
<td>120</td>
<td>60</td>
</tr>
</tbody>
</table>

a. Percent of fat calories in Snack 1:

Snack 2

<table>
<thead>
<tr>
<th>Food</th>
<th>Calories per Serving</th>
<th>Calories from Fat per serving</th>
</tr>
</thead>
<tbody>
<tr>
<td>Milk</td>
<td>150</td>
<td>70</td>
</tr>
<tr>
<td>Chocolate chip cookie</td>
<td>120</td>
<td>60</td>
</tr>
</tbody>
</table>

b. Percent of fat calories in Snack 2:
Isadore’s Market

Isadore’s Market sells four kinds of lemon cookies.

<table>
<thead>
<tr>
<th>Cookie</th>
<th>Nutrition Facts</th>
</tr>
</thead>
</table>
| **Lucy’s Lemon Cookies**   | Serving Size 2 cookies  
                            | Calories 120  
                            | Calories from Fat 60 |
| **Lite Lemon Cookies**     | Serving Size 2 cookies  
                            | Calories 200  
                            | Calories from Fat 50 |
| **Diet Joy Lemon Cookies** | Serving Size 2 cookies  
                            | Calories 90  
                            | Calories from Fat 60 |
| **Little’s Tiny Lemon Cookies** | Serving Size 8 cookies  
                            | Calories 100  
                            | Calories from Fat 50 |

Decide which cookie is the best nutritionally. Take into account the calories from fat content, but use other information as well. Write a radio ad to convince the public that your cookie is nutritionally the best choice.
Refer to the lemon cookie labels from Isadore’s Market to answer Problems 1–6.

1. Which cookies have the highest percent of fat calories?

2. Which cookies have the lowest percent of fat calories?

3. Which two kinds of cookies have the same percent of fat calories?

4. Inez was so hungry that she ate two Lite Lemon Cookies and eight Little’s Tiny Lemon Cookies (one serving of each kind of cookie). What percent of fat calories was her snack?

5. Felipe also ate two kinds of cookies for a snack (one serving of each). His snack was more than 50% fat. What two kinds of cookies might he have eaten?

Find at least two different answers. For each answer, explain how you know the fat content is more than 50%.

6. Mahalia decided to eat only foods that have one-third or fewer calories from fat. She says that she can eat any of the lemon cookies sold at Isadore’s Market as long as she only eats half a serving. Do you agree? Why or why not?
Practice: Counting Calories

Ana: “I’m supposed to be on a low-fat diet, but my breakfast was 100% fat!”

Tina: “What happened?”

Ana: “I had peanut butter and toast. The peanut butter was 135 fat calories out of 180 calories in all. That’s 75% fat. The bread was 15 fat calories out of 60 calories in all—that’s 25%. Twenty-five percent and 75% is 100%.”

Tina: “You’re always exaggerating! The fat is high, but not that high. Your breakfast was less than 75% fat.”

Practice: What Percent?

Twenty students are in the learning center math class, 15 women and five men.

1. What percent of the students in the class are women?

2. What percent of the students in the class are men?

3. Nine of the women are over 30 years old. What percent of the women is that?

4. What percent of the whole class is made up of women over 30?

5. Four of the men in the class are over 30 years old. What percent of the men is that?

6. What percent of the whole class is made up of men over 30?
Practice: What Fraction?

1. There are two math classes that meet at the same time on Tuesday afternoons. One class has 14 students, of which six are male, and the other has 12 students, of which only two are male.

   a. What fraction of the first class is male?

   b. What fraction of the second class is male?

   c. What fraction of both classes is male?

   d. Show your work.

   e. Is that fraction more or less than $\frac{1}{3}$? Explain.
2. Saul sells fish on Wednesdays, when he goes fishing. Last week he caught 16 sea bass and sold 12. Two weeks ago, he caught 24 and sold 20.
   
a. What fraction of the sea bass did he sell last week?
   
b. What fraction of the fish did he sell two weeks ago?
   
c. What fraction of the fish he caught on both occasions did he sell? Show your work.
   
d. Is that fraction more or less than \( \frac{3}{4} \)? Explain.
Practice: Rounding to the Hundredths Place

When you use a calculator, the answer can have many decimal places. To make the numbers more manageable, round them to two decimal places.

If the digit in the thousandths place is 4 or less, round down: Drop it and use only the tenths and hundredths digits.

Examples:
0.164 rounds to 0.16
0.8739 rounds to 0.87
0.22222... rounds to 0.22

If the digit in the thousandths place is 5 or more, round up: Increase the digit in the hundredths place by 1.

Examples:
.125 rounds to .13
.3071 rounds to .31
.77777... rounds to .78
.297 rounds to .30

A “9” in the hundredths place changes to “0,” and the digit in the tenths place increases by 1.
## Rounding to the Hundredths Place (cont’d)

Round each decimal to the hundredths place.

<table>
<thead>
<tr>
<th>Decimal Number</th>
<th>Rounded</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.612</td>
<td></td>
</tr>
<tr>
<td>0.105</td>
<td></td>
</tr>
<tr>
<td>0.77777...</td>
<td></td>
</tr>
<tr>
<td>0.095</td>
<td></td>
</tr>
<tr>
<td>0.3005</td>
<td></td>
</tr>
<tr>
<td>0.396</td>
<td></td>
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<tr>
<td>0.999</td>
<td></td>
</tr>
<tr>
<td>1.334</td>
<td></td>
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<tr>
<td>1.909</td>
<td></td>
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<tr>
<td>8.998</td>
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</table>
Extension: What Is the Fat Content in My Food?

Keep track of the foods you eat for one meal.

Make a list of the foods.

When available, look at the nutrition labels and write down the total calories and calories from fat for your portion.

Calculate the total percent of fat calories in the meal.

Answer the question: What is the fat content in my food?
1. Mariza had a cup of soup for lunch. The total calories in that cup were 100, and the calories from fat were 25. What was the percent of fat calories?
   (1) 5%
   (2) 10%
   (3) 15%
   (4) 25%
   (5) 75%

2. Maia had a cup of miso soup for lunch. The total calories in her cup were 30, and the calories from fat were 10. What was the percent of fat calories?
   (1) 10%
   (2) 30%
   (3) 33%
   (4) 40%
   (5) 66%

3. Jon and his friends are munching on yogurt potato chips and pistachios. The yogurt potato chips have 130 calories per serving, 50 from fat. The pistachios have 170 calories per serving, 110 from fat. Jon calculates he ate one serving of each, yogurt potato chips and pistachios. Which best describes the total percent of fat calories in Jon’s snack?
   (1) About 33 \( \frac{1}{3} \) %
   (2) A little less than 50%
   (3) Just over 50%
   (4) Just about 100%
   (5) Just about 160%

4. Zach, who was with Jon, ate two servings of pistachios and one serving of yogurt potato chips. Which best describes the total percent of fat calories in Zach’s snack?
   (1) 30%
   (2) Just under 50%
   (3) Just over 50%
   (4) Almost 75%
   (5) Almost 100%

5. Rachel ate only half a serving of pistachios. The percent of fat calories for her snack is
   (1) The same as for one serving of pistachios.
   (2) Half as much as for one serving of pistachios.
   (3) Twice as much as for one serving of pistachios.
   (4) Four times as much as for one serving of pistachios.
   (5) One-fourth as much as for one serving of pistachios.

6. Luis has 24 pens on his desk. Three of his pens are red and six are blue. What fraction of his pens are red?
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TEACHER BOOK

TERC

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Also available:
Synopsis
In this lesson, students use nutrition labels to calculate the percent of calories from fat of various foods.

1. The whole group previews nutrition labels.
2. Student pairs sort food into groups according to fat content.
3. Students find the total percent of calories from fat in different foods, exploring individual percent of calories from fat and combined percent of calories from fat.
4. The whole class summarizes the ideas.

Objectives
• Compare a percent with a benchmark fraction
• Determine percents represented by a part and a whole
• Find the combined percent of two or more quantities

Heads Up!
Students will work with decimals and/or calculators and will need to know how to round to two places (hundredths) to state their answer in percents. If they need help or a refresher, refer them to Practice: Rounding to the Hundredths Place (Student Book, p. 116).
Materials/Prep

- Calculators
- Colored markers
- Newsprint or transparencies

Make copies of Nutrition Labels (Blackline Masters 12–14), one for each pair of students. Cut the sets of 18 labels out and place each set in an envelope. You might add to or replace these labels with some students have brought in, but each pair of students should have an envelope with the same set of nutrition labels.

Copy the following chart on newsprint or an overhead.

<table>
<thead>
<tr>
<th>Food</th>
<th>Total Calories per Serving</th>
<th>Calories from Fat</th>
<th>Estimated % Fat (Ballpark Guess!)</th>
<th>Benchmark Fraction</th>
<th>Percent of Fat Calories</th>
<th>High Fat, Medium Fat, Low Fat, or Nonfat</th>
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Heads Up!

This lesson focuses on calculating calories from fat out of total calories. Keep in mind that nutrition labels have more information than is needed for this lesson. Address nutrition questions, but keep the mathematical focus on the percent of fat calories.

Limit discussion of reasons for reading nutrition facts to five minutes. If students have questions about other information on the nutrition labels, fill in as time allows. See Context on p. 115 for Web sites students might find interesting.

Opening Discussion

Direct students to Nutrition Labels (Student Book, p. 106), and distribute envelopes of 18 cut up Nutrition Labels (Blackline Masters 12–14), one per pair. Ask:

What kind of information do you notice on nutrition labels?

Elicit a few examples. For instance, the nutrition label on French Twists includes information on serving size (13g), calories (40), and calories from fat (10).

Then ask why people look at nutrition facts. If no one mentions the relation of fat intake to certain medical conditions, raise this issue yourself. Some people need to limit their fat intake because of heart disease; some need to limit their sodium intake because of high blood pressure; those on weight loss diets need to limit calories.
Activity 1: How Much Fat?

Tell students that today they will work with the percent of calories from fat.

Lots of foods are labeled “fat free” or “low fat,” but plenty of foods have high fat content too. Doctors want us to make sure we do not have too much fat in our diets, so it is a good idea to look at the percent of calories from fat in foods.

What are some foods that you expect to have high fat content?

What about walnuts? Do you think nuts have a lot of fat?

Gather a few ideas, and then ask pairs of students to work together to look at the nutrition label for walnuts in Activity 1: How Much Fat? (Student Book, p. 106).

Together work through the steps for finding the percent of calories from fat, recording each step on the “Fat Facts” chart you prepared.

Check that students recognize there are 210 calories total: The whole is 210; the 180 calories from fat are part of that 210 (rather than in addition to 210).

Tell students they will look through the food labels and find foods with different amounts of fat.

In which category would you put walnuts?

How did that compare with your prediction?

Observe as students sort the labels and calculate fat content. Watch various approaches and offer support, using Looking Closely (p. 112) as a guide.

Heads Up!

Students might wonder about percent of calories from fat in relation to the serving size given. For example, if a serving size has 120 calories with 30 fat calories, and someone ate two servings, would the percent of fat from calories change? (No) What if someone ate only half a serving? (No)

When students have completed sorting the labels, call the group together to share solutions. For each food category, record a few foods and percents. If the following issues do not arise, bring them up yourself:

Did you do any calculations in your head without a calculator? What were the numbers? How did you find your answers?

Is there a way to tell whether a food has a low percent of fat from calories content without actually doing all the calculations? How?

Is a food always “low fat” if it has a small number of calories from fat? Why?

Did you think something would have a lower percent of fat than it really does? Which food and why?
Activity 2: Munching on Snacks

Direct students’ attention to Snack 1 in Activity 2: Munching on Snacks (Student Book, p. 109). Say:

Before class I had a glass of orange juice and a chocolate chip cookie. What percent of fat from calories was my snack?

As students share solutions and strategies, make sure the following concept is raised:

The fraction is the total number of calories from fat (60) over (out of) the total number of calories (240): \( \frac{60}{240} \). Because \( 4 \times 60 = 240 \), \( \frac{60}{240} = \frac{1}{4} \), which is 25%.

To familiarize students with calculations involving multiple servings, ask:

Suppose I had a second cookie. What would you need to change on the chart to show how much fat I ate? (For chocolate chip cookies, “60” would change to “120” and “120” to “240.”)

Would my two-cookie-and-juice snack still be 25% fat or more or less than 25% fat? How do you know? (120/360, which is 1/3 or 33 1/3%, so it would be more.)

Ask:

If instead of juice and a cookie I had a glass of milk and a cookie, what percent of fat from calories would my snack be?

The following error might arise:

“The fat in the milk is 70/150, which is almost 1/2; the fat in the cookie is 60/120, which is 1/2. So, if I combine them, I get almost 100%!”

Take the opportunity to talk about a key idea: The total percent of fat from calories takes into account all calories from fat and total calories. Say:

The fraction is the total calories from fat (70 + 60 = 130) over the total calories (150 + 120 = 270), or 130/270. Because twice 130 is 260, and the total is 270, the percent of fat from calories is a little less than 1/2 (it is exactly 48%).

Isadore’s Market

Form small groups of students. Ask each group to compare the brands of lemon cookies (Student Book, p. 110) and to write a radio ad explaining why one brand is the best. If you have access to recording equipment, tape students’ performances.

Before the ads are shared, ask all students to listen carefully as they will need to answer the question: “Were the ads accurate?”

After listening to all the ads, ask students to cast a secret ballot, voting for the ad they each thought was most convincing.

Next refer students to Problems 1–6, and ask them to work alone or in pairs. Some students will likely find Problem 6 challenging. Students who finish early could try to find all the possible solutions to Problem 5. They can also compare their solutions (in particular, solutions to Problems 5 and 6) with a partner’s.

Discuss Problems 1–4, posing the following questions:
Did anyone use fractions? How?

Did anyone use decimals? Percents?

How did you know which cookies had a higher or lower percent of fat from calories?

How did you know how many calories there were in all from fat?

Focus discussion of Problem 5 on the following:

What is one way you decided which two kinds of cookies Felipe ate? How did you know there was more than 50% fat? Does anyone have another way?

For Problem 6, encourage students to explain how they calculated the percent of fat from calories in half a serving.

Summary

Review what students accomplished: They found the percent of fat from calories of several foods and related them to benchmark fractions (e.g., less than, equal to, or more than 1/2); they found the percent of fat from calories in two servings and in half a serving; and they found the percent of fat from calories of several foods combined. Ask:

What other information could you find on the nutrition labels? When would that be helpful?

Then ask students to turn to a neighbor and share one idea about how what they learned today can help them think about healthy eating at home.

After a couple of minutes, ask for volunteers to share. If these ideas do not arise, raise them yourself:

• To determine a food’s percent of fat from calories content, compare calories from fat (the part) with total calories (the whole). Fat calories alone or total calories alone do not tell you the percent of fat from calories content; you need to look at both together.

• To get a general idea of whether a food is high, medium, or low fat, you can compare the fraction calories from fat/total calories to benchmarks such as 1/4, 1/2, and 3/4.

• Low fat foods are not necessarily low in calories.

Then direct students to Reflections (Student Book, p. 133), where they will investigate the foods in their home and determine fat (or other) content.
Practice

Counting Calories, p. 112
For practice determining fat content.

What Percent? p. 113
For practice finding percents, given the part and the whole.

What Fraction? p. 114

Rounding to the Hundredths Place, p. 116

Extension

What Is the Fat Content in My Food? p. 118
Students explore the fat content in some of the foods they eat.

Test Practice

Test Practice, p. 119

Looking Closely

Observe whether students are able to

Compare a percent with a benchmark fraction
As students find the percents, do they think of benchmarks? Encourage them to think of the benchmarks they know with questions such as “Is that more or less than 1/2?” and “Is it more or less than 3/4?” Students should know the percent equivalents for the benchmarks they have learned in this unit and the previous one, Using Benchmarks (25%, 50%, 75%, 10%, 12.5%, and 33 1/3%).

If a fraction is unfamiliar, do students have a way to think about it in easier terms? If the fraction is 11/45, help them reason it out by asking about the relationship between 11 and 45; is there a number that would make the comparison easier? (44). And if the denominator were 44, what would 11/44 be? (25%) With a number such as 110/117, probe by asking about its proximity to the half and to the whole.

Determine percents represented by a part and a whole
Can students identify the part and the whole? Check that they know that the percent of fat from calories is the number of fat calories out of the total number of calories. Some students may find it helpful to mark the relevant information on the labels with a highlighter or colored marker.

Do students use estimation skills in choosing foods to investigate? Note whether they use estimation to find foods with high or low fat before they do the exact calculations. For instance, do they look at both total calories and fat calories to determine whether there are relatively few (e.g., 15/120) or relatively many (e.g.,
15/20) calories from fat? Do they look only at fat calories? Or do they use a trial-and-error method, simply doing the calculations and then seeing in which category the food belongs?

If students are not looking at total calories and fat calories, encourage them to do so. Help them see that it is possible to accurately predict whether a food will be high or low in fat before doing the calculations. For instance, ask them to make predictions about a couple of foods that have relatively many fat calories and some that have relatively few, and then do the calculations.

Can students determine common decimals or percents without a calculator? Some students may work with foods whose fat percent content is 1/2, 1/4, or some other familiar fraction. Encourage them to build on what they already know.

**Find the combined percent of two or more quantities**

When combining servings, do students correctly find the percent of fat from calories for the new total, or do they mistakenly add the separate percents? Help them with an example: one serving of pistachios and one popped corn cake. The percent of fat calories from pistachios is 110/117, which is 94%; the percent of fat calories from popped corn cakes is 0/45, which is 0 or 0%. If students add the percents, they get about 94%. On the other hand, if they first combine the amounts, 110 + 0 = 110 and 117 + 45 = 162, then the percent of fat from calories is 110/162, or 67%. That is a big difference.
<table>
<thead>
<tr>
<th>WHAT TO LOOK FOR IN LESSON 8</th>
<th>WHO STANDS OUT? (LIST STUDENTS’ INITIALS)</th>
<th>NOTES FOR NEXT STEPS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>STRONG</td>
<td>ADEQUATE</td>
</tr>
<tr>
<td>Concept Development</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Associates benchmark fractions with percent equivalents</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Understands when the percent changes as the base and part change and when it does not</td>
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<td></td>
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<tr>
<td>Expressive Capacity</td>
<td></td>
<td></td>
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<tr>
<td>• Uses ideas about percents and fractions to make a strong case for a good nutritional choice</td>
<td></td>
<td></td>
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<tr>
<td>Use of Tools</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Uses mental math to arrive at good estimates of percent</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Uses calculators, number lines, or grid to find or check solutions</td>
<td></td>
<td></td>
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<tr>
<td>Notation Use</td>
<td></td>
<td></td>
</tr>
<tr>
<td>• Brings understanding of good nutrition to inform decisions</td>
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</tbody>
</table>
Rationale
Finding percents of a combination of items is a new concept. Although it is tempting to add percents together, much like adding whole numbers (i.e., 25% + 32% = 57%), one can only do that when the base (the whole) is the same for both or all items. Adding percents of two or more different amounts is not straightforward. It is therefore worthwhile to spend some time thinking through and solving these types of problems.

Facilitation
We provide numerous nutrition labels. If you bring your own and ask students to bring some too, the conversation will be that much more interesting to everyone in the room.

If students need a refresher on rounding decimals, refer them to Practice: Rounding to the Hundredths Place (Student Book, p. 116), and take time to ensure that they understand.

Math Background
Percentages are not additive when the bases are different. For example, if 50% of the people in one room are wearing tennis shoes and 20% of the people in another room are wearing tennis shoes, the percent of people wearing tennis shoes in the two rooms is not 70%. More information is needed to find that percent: the number of people in the two rooms and the total number wearing tennis shoes. Using visuals can aid reasoning.

Context
Nutrition labels are rich in mathematics, and each element on a label could provide a separate investigation. In this lesson, the focus is on fat content. Even so, the type of fat (saturated, polyunsaturated, or monounsaturated) is often of more concern than the total fat. Areas of concern change over time. When this book was written, for example, “low carb” diets were popular.

The Internet is a good source of information on nutrition.

The United States Department of Agriculture’s Web site (http://www.usda.gov/) is a good place to start for current recommendations.


Making the Lesson Easier
Use nutrition labels whose percent of fat from calories content results in familiar fractions at first. Then add other labels.

Making the Lesson Harder
The 20%–35% recommended fat content refers to a 2,000 calorie per day diet. Challenge students to use labels to come up with a 2,000 calorie per day diet that stays within that range.
Students shared their reasoning as they talked about total percent of fat from calories, and the teacher pushed for percent and fraction connections and was explicit about generalizations.

Activity 2: Lemon Cookies, Isadore’s Market

When Marilyn asked the percent of fat calories in Lucy’s lemon cookies, one student answered 50% (Josie corrected them—50% = 60 calories). The class reviewed all the labels and figured out all the percents. Marilyn asked what fraction could represent 67%, and Maria answered $\frac{60}{90} = \frac{2}{3}$.

**Problem 4:** Only one student added $25\% + 50\% = 75\%$. Kenia said that he needed to add $200 + 100$ calories and $50 + 50$ fat calories. Dividing 100 by $300 = 33\%$ fat calories.

**Problem 5:** Marilyn asked students whether they could possibly do this problem without a calculator: “If total calories are 210, what would 50% be?” Rose answered, “105,” and Marilyn asked, “Is that more or less than 50%?”

**Problem 6:** Kenia didn’t agree but could not elaborate. Vannie offered that the 67% fat content is the same for a half serving. Josie computed half the calories and fat calories and agreed with Vannie. Malia concurred. Marilyn did several examples on the board showing that the percent of fat from calories does not change with serving size.

*Marilyn Moses, observed by Marilyn Matzko
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