

Materials

- **BLM** – Country Percents, City Percents
- Four-function calculators -- one per student pair

Math Vocabulary

unlike denominators
like denominators
unit price
ratio
proportion
percent
greatest common factor
least common multiple

Literature Vocabulary

moral
trait
patient
impatient
greedy
generous
adventurous
cautious

ELPS (*English Language Proficiency Standards*)
2C, 2E, 2G, 3E, 3G, 3H, 4G, 4I, 4K, 5B

CCRS (*College and Career Readiness Standards*)
I – BC
VIII – A1, A2, A3, A4, A5, B1, B2, C1, C2, C3
IX – A1, A2, A3, B1, B2, C1, C2, C3
X – B1

Unit 4, Lesson 3**TV Lesson****Grades 5-6****Math Objectives:**

- Solve real-world problems to find the whole given a part and the percent, to find the part given the whole and the percent, and to find the percent given the part and the whole, including the use of concrete and pictorial models.

Language Objectives:

- Discuss problem solving strategies with peers.
- Write out solutions for solving problems.
- Justify their thinking and strategies.

Building Background

Your story about the City Mouse and the Country Mouse was very interesting. The story does demonstrate how each of us has our own likes and dislikes and own wants and needs.

I was thinking about the different ways that math is used in the city and in the country, particularly fractions, ratio, and percent. So today during our time together we'll investigate one of the ways percent is used, "percent of." We are going to visualize each problem to find our solution. We'll take our math movie and draw it out in a special way. And you'll be solving problems that your older brothers and sisters have difficulty doing!

Comprehensible Input**VISUALIZE IT!**

When we work with "percent of" something, I like to think of a rectangle that is divided into equal portions. The rectangle equals the WHOLE, whatever the whole is.



Let's read our first problem together. (*Do so.*)

- What is the math movie you see when you read this problem? (*pause*) I see a big sack of flour, and Mrs. Rico uses some of it.
- What do we know? (*pause*)
 - She used 20% of the flour.
 - She had 10 pounds left over after she took out 20%.
- I want to visualize this problem. Let's use the rectangle.

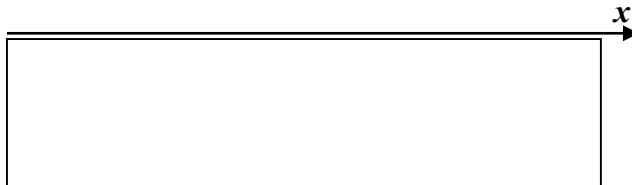
Unit 4, Lesson 3
TV Lesson - continued

Grades 5-6



First, draw your visualization rectangle under problem #1 on your problem sheet. Let's draw in what we know and what we want to know.

- Do we know the total amount of flour that was in the new bag?
(pause) No, so that is our x , our unknown.



You can mark that any way you want. I like to use an arrow to show that I mean the WHOLE rectangle. Whatever works for you is fine. Make it yours. Make it simple.

- Let's start marking the rectangle with what we DO know.
 - We know that she used 20%. How can I visualize 20%? I want to think in fractional parts. What is an equivalent fraction for 20%? Talk with your partner and see if you can find a simplified equivalent fraction for 20%. (*generous pause, then talk through the following*)
 - Let's find a factor that divides into both the numerator and denominator. Remember, we have to divide by a form of ONE to keep the value the same. Well, I see that 10 is a factor of both 20 and 100. Let's try 10.

$$\begin{array}{l} \underline{20 \div 10 = 2} \\ 100 \div 10 = 10 \end{array}$$

- Hmm, my equivalent fraction is $2/10$. I see that both the numerator and denominator are even numbers. I know that two is a factor of both. Let's divide both the numerator and denominator by two. Please do that while I do it.

$$\begin{array}{l} \underline{20 \div 10 = 2 \div 2 = 1} \\ 100 \div 10 = 10 \div 2 = 5 \end{array}$$

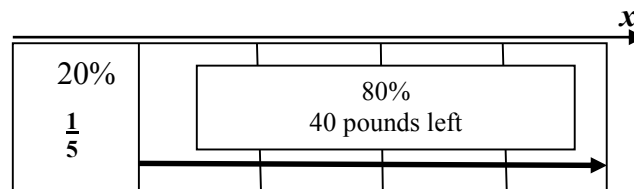
- Now I have a unit fraction, or a fraction with one in the numerator. I KNOW this is in simplest terms.
- Now I know that 20% is equivalent to $1/5$. You know, boys and girls, 20% is a benchmark percent. Many of you might have already known that 20% is equivalent to $1/5$. When you know your benchmarks, it saves you a lot of steps later!! $20\% = 1/5$. I'll remember that one!

Unit 4, Lesson 3
TV Lesson - continued

Grades 5-6



- Since we know that 20%, or $\frac{1}{5}$, of the flour has been used, what percent or fraction do we know is LEFT in the bag? (pause) 80%, or $\frac{4}{5}$, of the flour is left in the bag. Let's divide this rectangle into the fifths, or the 20% portions. (Do so -- to divide the rectangle into fifths easily, first visualize the fifths and mark off the first portion on the left; then divide the portion on the right into fourths. Just model it, don't explain it to the students)

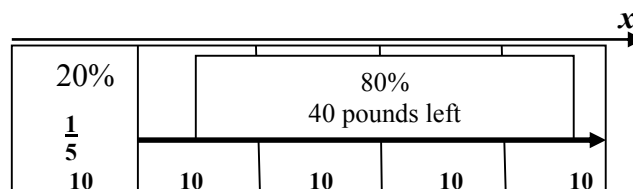


- She used 20%, so I can mark that.
- Since I know she used 20%, I know that 80%, or $\frac{4}{5}$, of the flour is left in the bag; and I know that the remainder is 40 pounds, so I can mark that, too.

This is what makes sense to me. This is my description of the story. I am looking at my description, and I can see:

- How much flour is in each one of those imaginary fifths or 20%
- How much flour she took out at first
- And how much flour was in the bag to begin with

Can YOU see it? Talk to your class about the rectangle description of the problem. See if you can find all of those quantities. (Project the rectangle and the three bullets above. Give a generous pause, then answer each question)



- **How much flour is in each one of those imaginary fifths or 20%?**

(I have 40 pounds left over. Look at the imaginary spaces in the left over portion -- how many spaces are there? (4) Well, if I divide that 40 pounds equally into those 4 spaces, how many pounds will be in each space? (10 pounds – mark each section with 10)

Unit 4, Lesson 3
TV Lesson - continued

Grades 5-6



- **How much flour did she take out at first?**
(If each of the spaces is equal, then there must be 10 pounds in what she took out, too.)
- **And how much flour was in the bag to begin with?**
(Pretty easy to see now how much flour was in the sack, wasn't it.)

DESCRIBE WITH NUMBER AND VARIABLES

We have the visual. Now let's see what we did and describe it with a number sentence.

We know we're trying to find the total amount of flour. That's x . And we know that if we take the flour she had left over, that's 40, and add it to what she took out, and that is 20% of the total, we'll have the total. And I know that I want to use either the decimal or fraction representation of the percent so I can compute with it.

$$x = 40 + .20x$$

Can you see that in the rectangle visualization? *(Point to each part in the picture and tie it back to the equation.)*

Now, let's solve for x .

I want to get the x 's on one side of the equation and the whole numbers on the other. I see that I have $1x$ on the left and $.20x$ on the right. What am I doing with the $.20x$ on the right side of the equation? *(adding)* So, I can subtract the $.20x$ from the right to get the 40 by itself.

But, I have to subtract the $.20x$ from the left side also, or else I won't be treating each side equally. *(Show out to the side subtracting .20 from 1.00)*

$$\begin{aligned}x &= 40 + .20x \\x - .20x &= 40 + .20x - .20x \\ .80x &= 40\end{aligned}$$

Take look at our equation. We do not have x by itself yet. We are MULTIPLYING by .80. Well if we are multiplying, how can we get rid of the .80 on the left side of the equation? *(Divide by .80.)* And if we divide by .80 on the left, we have to divide by .80 on the right so that we treat each side equally.

$$\begin{aligned}x &= 40 + .20x \\x - .20x &= 40 + .20x - .20x \\ \frac{.80x}{.80} &= \frac{40}{.80} \\ .80 &= .80\end{aligned}$$

Unit 4, Lesson 3
TV Lesson - continued

Grades 5-6


As 5th and 6th graders, we haven't experienced multiplying and dividing decimals yet, so we can use this handy tool, the calculator to do that arithmetic for us!

First, put in 40 into your calculator. Now hit the division key and put in decimal 80. Hit equals. What do you get? (*pause*) Your answer should have matched our picture -- 50. What does that 50 stand for? (*the pounds of flour in the bag when it was first bought*)

Especially as we are beginning our work with “percent of,” it is very important that you visualize the problem. Even grown-ups get lost in percent because they forget what each part of the problem represents. We have visualized the problem, described the problem in numbers and variables, then used a tool to help solve the problem when the arithmetic is beyond our level. We've done a great job today!

Pirate's Corner

Explain your solution strategy for today's Fraction Action. How many different strategies were there in the room?

Objectives

Read through the math and language objectives, making sure that students understand how they accomplished each.



Country Percents, City Percents

Work with your teacher and in groups to solve the problems.

1. Mrs. Rico bought a sack of flour. She used 20% of the flour from the sack and still had 40 pounds left. How many pounds of flour were in the bag when she bought it? *Use the rectangle model to visualize and solve this problem.*

2. Henry stayed with his parents in a hotel in Hannibal, MO to visit the Mark Twain Museum. The room cost \$80 dollars, and there was a hotel tax added of 5%. What was the cost of the room with hotel tax? *Use the rectangle model to visualize, then solve this problem with a number/variable equation and a calculator.*

3. Mari ate lunch in the local café. Her total food and beverage bill with tax was \$10.50. She left the waitress a 20% tip. What was her total bill? *Use the rectangle model to visualize, then solve this problem with a number/variable equation and a calculator.*



Country Percents, City Percents

1. La Sra. Rico trajo un saco de harina. Usó el 20% de la harina del saco y todavía le quedaban 40 libras. ¿Cuántas libras de harina había en la bolsa cuando ella la compró? *Utiliza el modelo de rectángulo para visualizar y resolver este problema.*

2. Henry se quedó con sus padres en un hotel en Hannibal, MO, para visitar el Mark Twain Museum. La habitación cuesta \$80 dólares, y se agregaba un impuesto hotelero del 5%. ¿Cuál era el costo de la habitación incluido el impuesto hotelero? *Utiliza el modelo de rectángulo para visualizar; luego, resuelve este problema con una ecuación de números/variable y una calculadora.*

3. Mari almorzó en la cafetería local. La cuenta total por los alimentos y la bebida que consumió fue de \$10.50. Le dejó a la mesera una propina de 20%. ¿Cuánto fue el total de su cuenta? *Utiliza el modelo de rectángulo para visualizar; luego, resuelve este problema con una ecuación de números y variable más una calculadora.*