DOINGWHATW⬀RKS

VIDEO
5:50 min

Full Details and Transcript

Multiply or Divide?

Tollgate Elementary School, Colorado
February 2011

Topic	**DEVELOPING EFFECTIVE FRACTIONS INSTRUCTION FOR K-8**
Practice	**OPERATIONS WITH FRACTIONS**
Highlights	» Facilitator Clare Heidema works with mathematics coaches in a professional development session, challenging them to figure out whether a series of story problems is solved by multiplying or dividing one and three-quarters by one-half.
	» The math coach participants work in pairs to think through what the problems require.
	» The trainer then debriefs the experience of figuring out whether a problem calls for multiplication or division.
	» She describes the partitive notion of division (in contrast to a measurement notion).
	» Participants are challenged to write a real-world story problem for the partitive example of 4 1/2 divided by 2/3.
	» The participants share their story problems, and the facilitator helps reframe the language to frame them in practical real-world contexts.

About the Site

Tollgate Elementary School
Aurora, Colorado

Demographics

» 45% Hispanic

» 31% Black

» 18% White

» 5% Asian/Pacific Islander

» 2% American Indian/Alaska Native

» 65% Free or Reduced-Price Lunch

Tollgate Elementary School focuses on developing mathematically powerful students using the districtwide curriculum developed by Aurora Public Schools. Features of the program include the following:

» A district mathematics coach and a school teacher leader who support classroom instruction, including collaborative lesson planning and demonstration lessons;

» Use of models, manipulatives, and visual representations to support fractions instruction;

» Ninety-minute blocks of math instruction, which allow for a number talk, whole-group lesson, small-group work, independent work time, and assessment; and

» Emphasis on mathematical discourse and communication to explain reasoning.

Full Transcript

📺 00:05 Clare Heidema: Here are some problems, five of them. There may be other ways you would think about solving them. But if you were going to solve them using either one and three-fourths times one-half or one and three-fourths divided by one-half, which one would you use?

Teacher 1 📺 00:24 It feels like multiplication, but now, I'm thinking…

Teacher 2 That's multiplication.

Teacher 1   Right? But does that solve the problem?

Teacher 2   Yep.

Teacher 1   Three-quarters of a half...

Teacher 2   📺 00:44 Because it means that right here, of this half, right to here, there is one and three-quarters pounds of birdseed. Right? No...no. One and three-fourths pounds of half a bird feeder. Can you put it like that?

Teacher 1   But what I want to do is one and three-fourths times two. So maybe it is divide because that would be the reciprocal, right?

Heidema   📺 01:22 Before we talk about all of them, let me just ask, what was an easy one? Number four? Why was four easy? Because it was...?

Teacher 3   Area.

Heidema   Area, and so what would you do? Which one of those calculations would you do for that problem?

Teacher 3   Multiply.

Heidema   Multiply one and three-fourths times one-half. Was there anything else that was fairly easy to think about?

Teacher 1   📺 01:47 Number five.

Heidema   Number five? And tell me about number five.

Teacher 1   It was, basically, how many groups of half a cup are in one and three-quarter cups.

Heidema   📺 01:57 So it was fairly easy when it was the lemonade that you had one and three-fourths cups of and you were trying to take out servings of size one-half that you could think about how many halves there were in. And I think, how many times did we hear that as—when you do one and three-fourths divided by one-half, it means how many halves are in one and three-fourths? What about number one?

Teacher 2 📺 **02:24** I thought that one was fairly simple just because it's telling you to take half of a whole already, because it says how many cups of sugar do you need to make half a batch of cookies if the full batch takes one and three-fourths cups. So I already knew that for the whole thing I needed one and three-fourths, so half I would have to split that in half.

Heidema And so which of these two calculations did you use?

Teacher 2 The division. I divided.

Heidema You divided, one and three-fourths divided by one-half?

Teacher (off camera) I think you divide it by two but you multiply it by half.

Heidema 📺 **02:58** And so what you have been talking about all along with fractions has been a measurement notion of division. But there is also with fractions, just like with whole numbers, there is what is called a partitive notion. It's parts, putting it into—in the case of dividing by two—into two parts. If we were dividing by one-half, it just sounds different because you can't think so easily about half parts. Okay? But that's the kind of thing that you are doing here is a partitive division problem.

📺 **03:33** I would like you to write a story problem that's not a "How many two-thirds are there in…," not the measurement story type problem, but a partitive problem. Four and one-half divided by two-thirds. Partly because it was so difficult, that problem, in terms of just thinking about it that I thought maybe if we have a collection of them that you have thought about that it will sound a little easier, if you like, to think about it as a division—dividing by a fraction problem.

📺 **04:09** You want to start us off here?

Teacher 2 Four and a half cups of flour is enough for two-thirds batch of cookies. How much flour is needed for the full batch?

Teacher 4 How many gallons of gas fill a gas can if four and half gallons fills a gas can two-thirds full?

Heidema   📺 **04:43**   We have something that, as you said, fills a part of it, but what do we need for the whole? And the part is the two-thirds part; we are going to divide by two-thirds. And there is lots of context, lots of things like that, real kind of problem sometimes, right? I don't know how real this is, but you could imagine. I have got four and a half yards, that's only going to get me two-thirds of the way, or if that four and a half gallons only filled up two-thirds of. That's a real problem.

I have gone four and a half miles, and I have only gone two-thirds of the way. I have got four and a half cups but that's only going to make two-thirds of my batch. So they can be very real-sounding problems.