

Problem of the Week Teacher Packet

Pizza Night

Every Friday night, Drew's family makes pizza for dinner. This week, Drew wants pepperoni and his sister wants extra cheese. His parents both want mushrooms as a topping.

Since they couldn't agree, they decided to divide the pizza into four equal parts so everyone could have the topping of their choice.

What would their pizza look like? Draw a picture of it.

Now use your illustration to answer the following questions:

- What fraction of this pizza has pepperoni?
- What fraction has extra cheese?
- What fraction has mushrooms?



Answer Check

After students submit their solution, they can choose to "check" their work by looking at the answer that we provide. Along with the answer itself (which never explains how to actually get the answer) we provide hints and tips for those whose answer doesn't agree with ours, as well as for those whose answer does. You might use these as prompts in the classroom to help students who are stuck and also to encourage those who are correct to improve their explanation.

1/4 of the pizza has pepperoni.

If your answer does not match our answer, did you

- draw a picture?
- use a circle or a rectangle as a model to think about the pizza?
- talk in your group?

If your answer does match ours,

- explain?
- write a number sentence?
- help anyone in your group?
- make sure to also answer the other two questions?

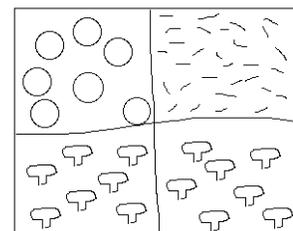
Our Solutions

Method 1: Draw a Picture

My teacher read the story to us about the family making pizza. I drew this picture:

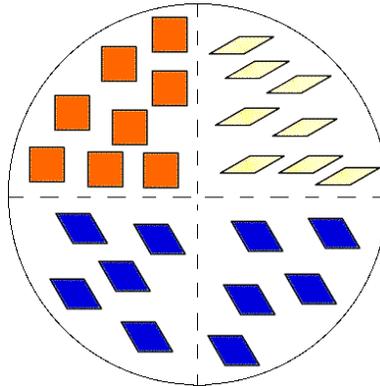
I know the story said the pizza was divided into 4 equal parts. 1 of the 4 parts has pepperoni. 1 of the 4 parts has extra cheese and 2 of the 4 parts has mushrooms. The fractions are:

$\frac{1}{4}$ and $\frac{1}{4}$ and $\frac{2}{4}$ or $\frac{1}{2}$.



Method 2: Use a Paper Model with Pattern Blocks

Our group used a circle piece of paper to think about the problem. We folded the circle in half and then in half again and when we opened it up and put it on the table we pretended it was the pizza. We took orange pieces to pretend they were pepperoni. We took yellow pieces to pretend that was the extra cheese and we took blue pieces to pretend they were mushrooms.



We could see that $\frac{1}{2}$ of the pizza was covered with blue mushrooms, $\frac{1}{4}$ of the pizza was covered with orange pepperoni, and $\frac{1}{4}$ of the pizza was covered with yellow cheese.

Method 3: Write Number Sentences

Four people in the family get one equal part of a pizza:

$$\frac{1}{4} + \frac{1}{4} + \frac{1}{4} + \frac{1}{4} = 1 \text{ whole pizza}$$

One of the pieces has pepperoni. One of the pieces has extra cheese and two of the pieces have mushrooms.

$$\frac{1}{4} + \frac{1}{4} + (\frac{1}{4} + \frac{1}{4}) = 1 \text{ whole pizza}$$

$$\frac{1}{4} + \frac{1}{4} + (\frac{2}{4}) = 1 \text{ whole pizza}$$

$$\frac{1}{4} + \frac{1}{4} + (\frac{1}{2}) = 1 \text{ whole pizza}$$

mushroom pizza = $\frac{1}{2}$

extra cheese pizza = $\frac{1}{4}$

pepperoni pizza = $\frac{1}{4}$

Method 4: Algebraic Reasoning

After reading the problem, I used this reasoning:

one of the four pieces has pepperoni
one of the four pieces has extra cheese
two of the four pieces have mushrooms

The three fractions are $\frac{1}{4}$, $\frac{1}{4}$, and $\frac{1}{2}$.

Method 5: Algebraic

Let p = the total amount of pizza

I know

there are four people in the family
the pizza was divided into four equal parts
two people like mushroom topping
one person likes extra cheese
one person likes pepperoni

I can write this equation:

$$p = (\frac{2}{4})p + (\frac{1}{4})p + (\frac{1}{4})p$$

$\frac{1}{4}$ of the pizza is pepperoni, $\frac{1}{4}$ of the pizza has extra cheese, and $\frac{1}{2}$ of the pizza has mushrooms.

Standards

If your state has adopted the [Common Core State Standards](#), you might find the following alignments helpful.

Grade 1: Geometry

Partition circles and rectangles into two and four equal shares, describe the shares using the words *halves*, *fourths*, and *quarters*, and use the phrases *half of*, *fourth of*, and *quarter of*. Describe the whole as two of, or four of the shares. Understand for these examples that decomposing into more equal shares creates smaller shares.

Grade 2: Geometry

Partition circles and rectangles into two, three, or four equal shares, describe the shares using the words halves, thirds, half of, a third of, etc., and describe the whole as two halves, three thirds, four fourths. Recognize that equal shares of identical wholes need not have the same shape.

Mathematical Practices

1. Make sense of problems and persevere in solving them.
2. Reason abstractly and quantitatively.
3. Construct viable arguments and critique the reasoning of others.
4. Model with mathematics.

Teaching Suggestions

This problem is one that was discussed during an online course offered to a group of primary level teachers from Montgomery County, Maryland. Here are some thoughts that were shared in the course about this particular problem:

Kimberly's Thoughts

Last week, I introduced the scenario for Pizza Night with my fourth graders. We read the problem as a whole class, then the students worked with their table groups to share and write some "I notice, I wonder" statements. Each student had their own copy of the scenario and was charged with writing at least one "I notice, I wonder" statement, whether it was their own or someone's from their table. This took just under 10 minutes.

The next day, the students shared their statements and I made a list on chart paper. As some students shared statements, others would think of a new statement to notice or wonder. By the end of this activity, they were using math vocabulary and I could tell they were really thinking about the problem.

Many of them began guessing what they thought the question would be, and they got rather close! We have not yet completed the problem, but I can already see that they are using more specific vocabulary during math class in general! They are also starting to apply the "I notice, I wonder" strategy in other areas, even with reading! I'm looking forward to finishing the problem in the upcoming week.

Deborah's Thoughts

I selected Pizza Night because it is a good stepping stone to review fractions using a real-life situation. I think there are a number of connections that students can make to help them solve this problem since they have had similar experiences-sharing food.

These are questions I'm thinking I'll use:

- What is a fraction?
- Are $\frac{1}{2}$ or $\frac{1}{4}$ always the same amount of the whole?
- What is another way to show $\frac{1}{2}$?
- How could you use this problem to help you solve other problems such as - how could you share a sandwich among 3 people?
- What fraction of M and M's would you get if you shared a set of 12 M and M's with 3 other people?

The readings had a number of points that relate to my thoughts. One point is that teachers need to know the curriculum of the grade above and the grade below, in addition to the current grade they

teach, to make effective connections. This is important because of the wide variety of abilities and content knowledge that the children bring to the classroom.

Suzanne's Thoughts

I actually used Pizza Night which is a 2nd grade PrimaryPoW in a 6th grade class last week. I used the Scenario Only linked to that problem.

I said, "I'm going to tell you a story!" I read the Pizza Night "scenario" aloud. I asked the students, "What did you hear?" I called on students quickly and they told me things like "pizza" "4 parts" "4 equal parts" "pepperoni" I said, "I'm going to read the story again. Listen to see if what you heard is really in the story." I read the Pizza Night "scenario" again and then said, "Now tell me what you heard. Did anything change?" And again the students told me things. Important was that I didn't say anything was right or wrong. The students were just "getting into the story."

Next, I asked them to draw a picture of the pizza. You'll notice on the scenario I didn't include the pizza graphic. The reason was that I was interested to see if anyone would draw different shapes.

Once we had pictures, we used a document camera to display them and we talked about them. The sixth graders described them using fractions and also percents and decimals and ratios (since we're using all four in the unit we're working on) but I would expect younger students to use this problem just for the fraction vocabulary it affords.

Now that the students are "into" the problem, you could project the full problem that includes the three questions. I actually didn't do that because the conversations that the 6th graders got to were far more in depth than the questions on that problem.

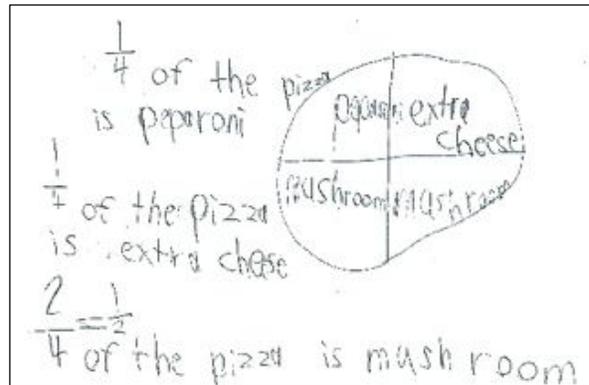
Student Solutions

This problem has received a few online solutions. We've included some here to give you an idea of how students might approach the problem. As you can see all of these samples could benefit from additional explanation of the student's thinking ... but ... all have a start on that process.

Henry, age 8

$\frac{1}{4}$ of the pizza has pepperoni. $\frac{1}{4}$ of the pizza is extra cheese. $\frac{1}{2}$ of the pizza is mushroom.

I drew a picture of the pizza and there were 4 sections. One said pepperoni, one said extra cheese and two said mushroom.



Marcy, age 7

$\frac{1}{4} + \frac{1}{4} + \frac{1}{2} = 1$ whole.

$\frac{1}{4}$ for drew, $\frac{1}{4}$ for his sister, $\frac{1}{4} + \frac{1}{4} = \frac{1}{2}$ (for mom & dad)

Ashley, age 11

$\frac{1}{4}$ of the pizza has pepperoni, $\frac{1}{4}$ of the pizza has extra cheese, and $\frac{1}{2}$ of the pizza has mushrooms.

one person (one section of the pizza) wanted pepperoni so that is one section out of four, one person (one section) wanted extra cheese so that is one section out of four, and both of his parents wanted mushrooms so that is two sections out of four, which will reduce to one half.

We hope this information is useful in helping you make the most of this Primary Problems of the Week. If you have stories to tell about this or other problems, we'd love to hear from you.

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