

4.1 Cafeteria Actions and Reactions

A Develop Understanding Task



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Elvira, the cafeteria manager, has just received a shipment of new trays with the school logo prominently displayed in the middle of the tray. After unloading 4 cartons of trays in the pizza line, she realizes that students are arriving for lunch and she will have to wait until lunch is over before unloading the remaining cartons. The new trays are very popular and in just a couple of minutes 24 students have passed through the pizza line and are showing off the school logo on the trays. At this time, Elvira decides to divide the remaining trays in the pizza line into 3 equal groups so she can also place some in the salad line and the sandwich line, hoping to attract students to the other lines. After doing so, she realizes that each of the three serving lines has only 12 of the new trays.

"That's not many trays for each line. I wonder how many trays there were in each of the cartons I unloaded?"

1. Help the cafeteria manager answer her question using the data in the story about each of the actions she took. Explain how you arrive at your solution.

12 trays per line
3 (12) 3 groups of 12 trays
36 total in 3 lines ✓

✓ 36 + 24 24 trays being used
✓ 60 total trays
✓ $\frac{60}{4} = 15$ trays per carton

Elvira is interested in collecting data about how many students use each of the tables during each lunch period. She has recorded some data on Post-It Notes to analyze later. Here are the notes she has recorded:

- Some students are sitting at the front table. (I got distracted by an incident in the back of the lunchroom, and forgot to record how many students.)
- Each of the students at the front table has been joined by a friend, doubling the number of students at the table.
- Four more students have just taken seats with the students at the front table.

SECONDARY MATH I // MODULE 4
EQUATIONS AND INEQUALITIES - 4.1

- The students at the front table separated into three equal-sized groups and then two groups left, leaving only one-third of the students at the table.
- As the lunch period ends, there are still 12 students seated at the front table.

Elvira is wondering how many students were sitting at the front table when she wrote her first note. Unfortunately, she is not sure what order the middle three Post-It Notes were recorded in since they got stuck together in random order. She is wondering if it matters.

2. Does it matter which order the notes were recorded in? Determine how many students were originally sitting at the front table based on the sequence of notes that appears above. Then rearrange the middle three notes in a different order and determine what the new order implies about the number of students seated at the front table at the beginning.

3. Here are three different equations that could be written based on a particular sequence of notes. Examine each equation, and then list the order of the five notes that is represented by each equation. Find the solution for each equation.

$$\bullet \frac{2(x+4)}{3} = 12$$

$$\frac{2(x+4)}{3}$$

$$2\left(\frac{x}{3} + 4\right)$$

$$\frac{2x+8}{3}$$

$$\frac{2x}{3} + 8$$

$$\bullet 2\left(\frac{x}{3} + 4\right) = 12$$

$$\frac{2x}{3} + \frac{8}{3}$$

not Equivalent

not Equivalent

$$\bullet \frac{2x+4}{3} = 12$$

$$\frac{2x}{3} + \frac{4}{3}$$

Which ~~two~~ expressions are the same?

$$\frac{4x-24}{3}$$

$$\frac{4}{3}x - 24$$

$$\frac{4}{3}x - 8$$

$$\frac{4x}{3} - \frac{24}{3}$$

$$\frac{4x}{3} - 8$$

Expressions that look different but are the same are called equivalent expressions.

Let x be the # of students at the table to start.

$2x$ # of students dined

$2x+4$ 4 more students came

$\frac{2x+4}{3}$ divided into 3 groups. 1 stayed

$\frac{2x+4}{3} = 12$ 12 students were left

$$\frac{3}{1} \left(\frac{2x+4}{3} \right) = 12 \cdot 3$$

$$2x+4 = 36$$

$$-4 \quad -4$$

$$2x = 32$$

$$\frac{2x}{2} = \frac{32}{2}$$

$$x = 16 \text{ students}$$

Check

$$\frac{2(16)+4}{3} = 12$$

$$\frac{32+4}{3} = 12$$

$$\frac{36}{3} = 12$$

$$12 = 12$$