

Warmup

34) $(n-5) \xrightarrow{5} (n-5) \xrightarrow{10}$

$$10(n-5) = 5(n-5) \quad \boxed{n=5}$$

$$10n - 50 = 5n - 25$$

+50 +50

$$\frac{5n = 25}{5 \quad 5}$$

$$10n = 5n + 25$$

~~-5n~~ ~~-5n~~

44) $\boxed{X} - c = d + r$ for \boxed{X}

~~+c~~ +c

$$\boxed{X = d + r + c}$$

37) $\frac{ka}{k} = \frac{v+w}{k}$ for \boxed{a}

$$a = \frac{v+w}{k} \text{ OR } \frac{v}{k} + \frac{w}{k}$$

49) Multiply $(3p-5)(8p+5)$

| | | |
|------|---------|--------|
| | $3p$ | -5 |
| $8p$ | $24p^2$ | $-40p$ |
| 5 | $15p$ | -25 |

$$\boxed{24p^2 - 25p - 25}$$

4.2 Elvira's Equations

A Solidify Understanding Task



Elvira, the cafeteria manager, likes to keep track of the things she can count or measure in the cafeteria. She hopes this will help her improve the efficiency of the cafeteria. To remind herself to keep track of important quantities, she has made a table of variables and descriptions of the things she wants to record. Here is a table of things she has decided to keep track of.

| Symbol | Meaning (description of what the symbol means in context) | Units (what is counted or measured) |
|--------|--------------------------------------------------------------|----------------------------------------|
| S | Number of students that buy lunch in the salad line | students who buy salad |
| W | Number of students that buy lunch in the sandwich line | studs who buy sandwiches |
| P | Number of students that buy lunch in the pizza line | studs who buy pizza |
| F | Number of food servers in the cafeteria | food servers (people) |
| M_T | Number of minutes it takes to serve lunch to all students | time \rightarrow mins |
| C | Number of classes in the school | classrooms/classes |
| Pl | Price per lunch | money |
| A | Avg # of studs per class who bought food | students |
| R | | |
| T | | |
| D_F | | |
| M | | |

Elvira has written the following equation to describe a cafeteria relationship that seems meaningful to her. She has introduced a new variable A to describe this relationship.

$$A = \frac{S + W + P}{C}$$

$\frac{\text{studs salad} + \text{studs wich} + \text{studs pizza}}{\text{\# classes}}$

1. What does A represent in terms of the school and the cafeteria? Record this information in the table above.

Average # of students per class who bought Food

2. Using what you know about manipulating equations, solve this equation for S . Your solution will be of the form $S = \text{an expression written in terms of the variables } A, C, W \text{ and } P$.

$$C \cdot A = \frac{S + W + P}{C} \cdot C$$

$$C \cdot A = S + W + P$$

$-W$ $-W$

$$C \cdot A - W = S + P$$

$-P$ $-P$

$$C \cdot A - W - P = S$$

3. Does your expression for S make sense in terms of the meanings of the other variables? Explain why or why not.

classes \cdot Avg # studs bought lunch $-$ sand studs $-$ pizza kids = studs salad

$$64 \cdot 12 - 300 - 150 = 318$$

Here is another one of Elvira's equations.

$$R = P_L(S + W + P)$$

4. What does R represent in terms of the school and the cafeteria? Record this information in the table above.

Price per lunch (salad + sand + pizza) kids kids kids How much school made (Revenue)

5. Using what you know about manipulating equations, solve this equation for P_L .

$$R = P_L(S + W + P) \quad \frac{R}{S + W + P} = P_L$$

6. Does your expression for P_L make sense in terms of the meanings of the other variables? Explain.

$$\frac{5000}{550} = \$9.09 \text{ for lunch}$$

7. Elvira notices that she uses the expression $S + W + P$ a lot in writing other expressions. She decides to represent this expression using the variable T , so that $T = S + W + P$. What does T represent in terms of the school and the cafeteria? Record this information in the table above.

$$T = S + W + P \quad \text{total sold lunches}$$

8. Elvira is having a meeting with the staff members who work in the lunchroom. She has created a couple of new equations for the food servers.

$$D_F = \frac{T \cdot P_L}{F} \quad M = \frac{M_T}{T}$$

a. What does D_F represent in terms of the school and the cafeteria? Record this information in the table above.

total lunches sold • Price/lunch how much \$ each Food server line makes

b. Solve this equation for P_L . Describe why your solution makes sense in terms of the other variables.

$$F \cdot D_F = \frac{T \cdot P_L}{F} \cdot F \quad \frac{F \cdot D_F}{T} = P_L$$

9 a. What does M represent in terms of the school and the cafeteria? Record this information in the table above.

mins serve lunch to all students = how long it takes total lunches sold 4 each lunch to get served.

b. Solve this equation for T . Describe why your solution makes sense in terms of the other variables.

$$T \cdot M = \frac{M_T}{T} \cdot T \quad T = \frac{M_T}{M}$$

10. One of the staff members suggests that they need to write expressions for each of the following. Using the variables in the table, what would these expressions look like?

a. The average number of students served each minute

$$\frac{T}{M}$$

b. The average number of minutes students wait in the pizza line

$$\frac{P}{M}$$

$$\frac{W}{M} \quad \text{Sandwiches}$$

$$\frac{S}{M} \quad \text{Salads}$$