Warmup

31) $\frac{x+2}{x+10} = \frac{6}{7}$ $x = 46$

$7x + 140 = 7x + 14$

$-6x \quad -14 \quad -7x \quad -14$

42) $\frac{y}{z} = \frac{xm}{y}$ for x

$\cdot y \quad \cdot y$

$\frac{zy}{m} = \frac{xm}{m} \rightarrow \frac{zy}{m} = x$

39) $g = cxy$ for x

$\frac{g}{cy} = \frac{cxy}{cy}$

$x = \frac{g}{cy}$

50) $(8n-5)(3n^2-7n-5)$

	$3n^2$	$-7n$	-5
$8n$	$24n^3$	$-56n^2$	$-40n$
-5	$-15n^2$	$35n$	25

$24n^3 - 71n^2 - 5n + 25$

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 buy salad
W	Number of students that buy lunch in the sandwich line	studs buy sand
P	Number of students that buy lunch in the pizza line	studs buy pizza
F	Number of food servers in the cafeteria	# servers
M_T	Number of minutes it takes to serve lunch to all students	Mins - time
C	Number of classes in the school	classes/rooms
P_L	Price per lunch	money
A		
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.

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

studs salads + studs wichs + studs pizza / # classes

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

Average # of students in each class who buy lunch

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

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

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

Salad studs = Avg # studs • # classes − sand studs − pizza studs

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/lunch (salads studs + wich studs + pizza studs) Money coming from lunch room Revenue

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

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

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

$\frac{\text{total \$}}{\text{All students eat}} = \text{Price/lunch}$ $\frac{10000}{700} = \$14.28$

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.

$T = S+W+P$ total students who buy lunch

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.

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

a. What does D_F represent in terms of the school and the cafeteria? Record this information in the table above. $\frac{\text{total studs \$ Lunch} \cdot \text{Price/lunch}}{\text{\# servers}} = \text{Average \$ each serving line makes}$

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

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

9 a. What does M represent in terms of the school and the cafeteria? Record this information in the table above. $\frac{\text{\# mins to serve all studs}}{\text{total \# bought lunch}} = \frac{\text{mins}}{\text{stude}} = \text{average amt of time to serve a stud}$

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

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

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 $\frac{T}{M_T}$ $\frac{\text{total studs}}{\text{total time}}$

b. The average number of minutes students wait in the pizza line P M $\frac{P}{M}$