

## 4.2 Elvira's Equations

### *A Solidify Understanding Task*



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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.

<b>Meaning</b> (Description of what the symbol means in context)	<b>Units</b> (What is counted or measured)
Number of students that buy lunch in the salad line	students
Number of students that buy lunch in the sandwich line	students
Number of students that buy lunch in the pizza line	students
Number of food servers in the cafeteria	people
Number of minutes it takes to serve lunch to all students	minutes
Number of classes in the school	classes
Price per lunch	Dollars

~~STC~~  
STW

Symbol	Meaning (Description of what the symbol means in context)	Units (What is counted or measured)
<i>S</i>	Number of students that buy lunch in the salad line	
<i>W</i>	Number of students that buy lunch in the sandwich line	
<i>P</i>	Number of students that buy lunch in the pizza line	
<i>F</i>	Number of food servers in the cafeteria	
<i>M<sub>T</sub></i>	Number of minutes it takes to serve lunch to all students	
<i>C</i>	Number of classes in the school	
<i>P<sub>L</sub></i>	Price per lunch	
<i>A</i>	Average number of students buying lunch per class	Students
<i>R</i>		
<i>T</i>		
<i>D<sub>F</sub></i>		
<i>M</i>		

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

**What does A represent?**

all students buying lunch

$$A = \frac{\begin{array}{l} \# \text{ of students} \\ \text{in salad line} \end{array} + \begin{array}{l} \# \text{ of students} \\ \text{in sandwich line} \end{array} + \begin{array}{l} \# \text{ of students} \\ \text{in pizza line} \end{array}}{\text{total \# classes}}$$

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	
$W$	Number of students that buy lunch in the sandwich line	
$P$	Number of students that buy lunch in the pizza line	
$F$	Number of food servers in the cafeteria	
$M_T$	Number of minutes it takes to serve lunch to all students	
$C$	Number of classes in the school	
$P_L$	Price per lunch	
$A$		
$R$		
$T$		
$D_F$		
$M$		

Per = divide

$$C \cdot A = \frac{S+W+P}{e} \cdot \frac{1}{T}$$

$$CA = \frac{S+W+P}{e}$$

$$CA - P = S + \frac{W}{e}$$

**Solve for S**

$$CA - P - W = S$$

Classes in school  $\left( \frac{\text{Student}}{\text{class}} \right)$  - Pizza students - Sandwich students = Salad students

<b>Symbol</b>	<b>Meaning</b> (Description of what the symbol means in context)	<b>Units</b> (What is counted or measured)
<b><i>S</i></b>	Number of students that buy lunch in the salad line	
<b><i>W</i></b>	Number of students that buy lunch in the sandwich line	
<b><i>P</i></b>	Number of students that buy lunch in the pizza line	
<b><i>F</i></b>	Number of food servers in the cafeteria	
<b><i>M<sub>T</sub></i></b>	Number of minutes it takes to serve lunch to all students	
<b><i>C</i></b>	Number of classes in the school	
<b><i>P<sub>L</sub></i></b>	Price per lunch	
<b><i>A</i></b>		
<b><i>R</i></b>		
<b><i>T</i></b>		
<b><i>D<sub>F</sub></i></b>		
<b><i>M</i></b>		

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

**What does *R* represent?**

<b>Symbol</b>	<b>Meaning</b> (Description of what the symbol means in context)	<b>Units</b> (What is counted or measured)
<b><i>S</i></b>	Number of students that buy lunch in the salad line	
<b><i>W</i></b>	Number of students that buy lunch in the sandwich line	
<b><i>P</i></b>	Number of students that buy lunch in the pizza line	
<b><i>F</i></b>	Number of food servers in the cafeteria	
<b><i>M<sub>T</sub></i></b>	Number of minutes it takes to serve lunch to all students	
<b><i>C</i></b>	Number of classes in the school	
<b><i>P<sub>L</sub></i></b>	Price per lunch	
<b><i>A</i></b>		
<b><i>R</i></b>		
<b><i>T</i></b>		
<b><i>D<sub>F</sub></i></b>		
<b><i>M</i></b>		

$$R = P_L(S + W + P) \quad \text{Solve for } P_L$$

<b>Symbol</b>	<b>Meaning</b> (Description of what the symbol means in context)	<b>Units</b> (What is counted or measured)
<b><i>S</i></b>	Number of students that buy lunch in the salad line	
<b><i>W</i></b>	Number of students that buy lunch in the sandwich line	
<b><i>P</i></b>	Number of students that buy lunch in the pizza line	
<b><i>F</i></b>	Number of food servers in the cafeteria	
<b><i>M<sub>T</sub></i></b>	Number of minutes it takes to serve lunch to all students	
<b><i>C</i></b>	Number of classes in the school	
<b><i>P<sub>L</sub></i></b>	Price per lunch	
<b><i>A</i></b>		
<b><i>R</i></b>		
<b><i>T</i></b>		
<b><i>D<sub>F</sub></i></b>		
<b><i>M</i></b>		

$$T = S + W + P$$

**What does *T* represent?**

<b>Symbol</b>	<b>Meaning</b> (Description of what the symbol means in context)	<b>Units</b> (What is counted or measured)
<b><i>S</i></b>	Number of students that buy lunch in the salad line	
<b><i>W</i></b>	Number of students that buy lunch in the sandwich line	
<b><i>P</i></b>	Number of students that buy lunch in the pizza line	
<b><i>F</i></b>	Number of food servers in the cafeteria	
<b><i>M<sub>T</sub></i></b>	Number of minutes it takes to serve lunch to all students	
<b><i>C</i></b>	Number of classes in the school	
<b><i>P<sub>L</sub></i></b>	Price per lunch	
<b><i>A</i></b>		
<b><i>R</i></b>		
<b><i>T</i></b>		
<b><i>D<sub>F</sub></i></b>		
<b><i>M</i></b>		

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

**What does  $D_F$  represent?**



<b>Symbol</b>	<b>Meaning</b> (Description of what the symbol means in context)	<b>Units</b> (What is counted or measured)
<b><i>S</i></b>	Number of students that buy lunch in the salad line	
<b><i>W</i></b>	Number of students that buy lunch in the sandwich line	
<b><i>P</i></b>	Number of students that buy lunch in the pizza line	
<b><i>F</i></b>	Number of food servers in the cafeteria	
<b><i>M<sub>T</sub></i></b>	Number of minutes it takes to serve lunch to all students	
<b><i>C</i></b>	Number of classes in the school	
<b><i>P<sub>L</sub></i></b>	Price per lunch	
<b><i>A</i></b>		
<b><i>R</i></b>		
<b><i>T</i></b>		
<b><i>D<sub>F</sub></i></b>		
<b><i>M</i></b>		

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

**Solve for  $P_L$**

<b>Symbol</b>	<b>Meaning</b> (Description of what the symbol means in context)	<b>Units</b> (What is counted or measured)
<b><i>S</i></b>	Number of students that buy lunch in the salad line	
<b><i>W</i></b>	Number of students that buy lunch in the sandwich line	
<b><i>P</i></b>	Number of students that buy lunch in the pizza line	
<b><i>F</i></b>	Number of food servers in the cafeteria	
<b><i>M<sub>T</sub></i></b>	Number of minutes it takes to serve lunch to all students	
<b><i>C</i></b>	Number of classes in the school	
<b><i>P<sub>L</sub></i></b>	Price per lunch	
<b><i>A</i></b>		
<b><i>R</i></b>		
<b><i>T</i></b>		
<b><i>D<sub>F</sub></i></b>		
<b><i>M</i></b>		

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

**What does *M* represent?**

<b>Symbol</b>	<b>Meaning</b> (Description of what the symbol means in context)	<b>Units</b> (What is counted or measured)
<b><i>S</i></b>	Number of students that buy lunch in the salad line	
<b><i>W</i></b>	Number of students that buy lunch in the sandwich line	
<b><i>P</i></b>	Number of students that buy lunch in the pizza line	
<b><i>F</i></b>	Number of food servers in the cafeteria	
<b><i>M<sub>T</sub></i></b>	Number of minutes it takes to serve lunch to all students	
<b><i>C</i></b>	Number of classes in the school	
<b><i>P<sub>L</sub></i></b>	Price per lunch	
<b><i>A</i></b>		
<b><i>R</i></b>		
<b><i>T</i></b>		
<b><i>D<sub>F</sub></i></b>		
<b><i>M</i></b>		

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

**Solve for *T***

**Practice solving equations with lots of letters and few or no numbers.**

Solve for  $y$

$$10 + 5y = 20$$

$$Ax + By = C$$

$-Ax$   $-Ax$

$$By = \frac{C - Ax}{B}$$

$$y = \frac{C - Ax}{B}$$

Solve for  $x$

$$y = m(x - 5) + 7$$

$$y - 7 = m(x - 5)$$

$$y - 7 = mx - 5m$$

$$\frac{y - 7 + 5m}{m} = \frac{mx}{m}$$

$$\frac{y - 7 + 5m}{m} = x$$

$$\frac{y - 7}{m} = \frac{m(x - 5)}{m}$$

$$\frac{y - 7}{m} = x - 5$$

$$\frac{y - 7}{m} + 5 = x$$

Solve for  $m$

$$y = m(x - 5) + 7$$

$$A = \pi r^2$$

Solve for R



