

# Serving Up Symbols

## A Develop Understanding Task



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As you look around your school cafeteria, you may see many things that could be counted or measured. To increase the efficiency of the cafeteria, the cafeteria manager, Elvira, decided to take a close look at the management of the cafeteria and think about all the components that affect the way the cafeteria runs. To make it easy, she assigned symbols for each count or measurement that she wanted to consider, and made the following table:

<b>Symbol</b>	<b>Meaning</b>
$S$	Number of students that buy lunch in the cafeteria each day
$S_c$	Average number of students per class that eat lunch each day
$S_M$	Number of students who have passed through a line in $M$ minutes
$C$	Number of classes per lunch period
$P$	Number of lunch periods per day
$B$	Number of boys that buy lunch each day
$G$	Number of girls that buy lunch each day
$F$	Number of food servers in the cafeteria
$T$	Total number of food items in one lunch (Each entrée, side dish, or beverage counts as 1 item.)
$M$	Number of minutes passed since the beginning of the lunch period
$N_e$	Number of entrees in each lunch
$N_s$	Number of side dishes in each lunch
$N_b$	Number of beverages in each lunch
$C_e$	Cost of each entrée
$C_s$	Cost of each side dish
$C_b$	Cost of each beverage
$L$	Number of lines in the cafeteria
$W$	The number of food workers (servers) per line
$i$	Average number of food items that a worker can serve each minute (Each entrée, side dish, or beverage counts as 1 item.)
$H$	Number of hours each food worker works each day
$P_L$	Price per lunch





## Serving Up Symbols – Teacher Notes

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**Purpose:** The purpose of the task is to develop understanding of the use of variables given a story context. Students are asked to interpret expressions written with variables, which will open up strategies for using units to analyze expressions. Students will also combine variables to make meaningful expressions and describe the meaning of the expressions that they have written.

**Core Standards:**

A.SSE.1: Interpret expressions that represent a quantity in terms of its context.

- a. Interpret parts of an expression, such as terms, factors, and coefficients.
- b. Interpret complicated expressions by viewing one or more of their parts as a single entity. *For example, interpret  $P(1+r)^n$  as the product of  $P$  and a factor not depending on  $P$ .*

N.Q.1: Use units as a way to understand problems and to guide the solution of multi-step problems; choose and interpret units consistently in formulas.

**Launch (Whole Class):** Start by familiarizing students with the context of the problem. Before giving the task to students, ask them to think of some of the things that could be counted or measured in the cafeteria. Hand out the task and ask them to read through the list of variables identified by the cafeteria manager to see if they can find the things that they thought of. You may need to explain the use of subscripts for some of the variables, since many students may not have used them previously.

Introduce students to the idea that variables can be combined to make meaningful expressions. Using question #1, ask students what the expression  $\frac{G+B}{C \times P}$  means. Help students to break down the various parts of the expression. In this case,  $G + B$  represents the number of students that eat lunch in the cafeteria each day. Since  $C$  represents the number of classes per lunch period and  $P$  represents the number of lunch periods,  $C \times P$  represents the number of classes and the expression  $\frac{G+B}{C \times P}$  represents the average number of students served lunches per class.

Give students a few minutes to think individually about the meaning of #2,  $S + F + L$ . After they have translated each of the variables, ask what they believe the sum of these expressions means. They should recognize that the expression formed by adding these variables doesn't make sense.

Introduce their task, which is to write as many meaningful expressions as they can. As they have seen in #2, they must be careful to combine the variables with operations that make sense in the context.

**Explore (Small Group or Pairs):** Assign students to work on the remainder of the task. Monitor their work, pressing students to make sense of each expression they write. Encourage students to use as many of the variables as they can in their expressions. Be prepared to record interesting expressions and their descriptions so that they can be used later in the discussion.



**Discuss (Whole Group):** Using the expressions that students have written, facilitate the first part of the discussion by giving several expression, one at a time, and asking the whole class to interpret them. Switch to giving the students several descriptions that student have written and see if the class can come up with an expression that goes with it. Ask students to volunteer the most complicated meaningful expression they could create.

Close the discussion with the last two questions. There may be several different expressions for each of the questions. If this occurs, ask students if the expressions are equivalent, and how they know.

**Aligned Ready, Set, Go: Getting Ready 3**

