

Try Your

THE HARDEST MATH PROBLEM

GRADE 8



At Solutions middle School, Ms. Heim's class is branching off from the study of food webs in nature to investigate food access for humans. Her students are dismayed that food insecurity is a reality in the U.S. Two of the students, Aliza and Darius, present their research on a poster board:

- **Food insecurity** is a lack of consistent access to enough food for an active, healthy life.
- **Causes of food insecurity** include poverty, climate change, health issues, and unemployment. The COVID-19 pandemic worsened food insecurity.
- **Tens of millions of people** live in a food desert, per U.S. census data.
- **Communities respond** by providing food access through multiple pathways.

"What's a food desert?" Ji-Hoon asks.

"Great question," Aliza replies. "A **food desert** refers to an area where it's hard to find fresh, nutritious food - like vegetables, fruits, and meats - at affordable prices."

Darius adds, "Instead, food deserts tend to have processed foods that are high in sugar and fats. That's a health issue."

Solve the Problem

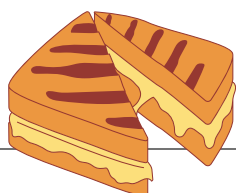


Ji-Hoon and his best friend, Camila, decide to volunteer at the local soup kitchen, which provides free, nutritious hot meals four evenings a week. Camila eyes the long line of hungry families. "I think we might run out of dinner tonight!"

The director, Ms. Hinojosa, responds that this is a common problem, and she is trying to secure additional funding for more meals. She asks Ji-Hoon and Camila to help her determine the number of additional hot meals that the soup kitchen could serve each of the four nights if the overall food budget was increased by 40% with the following parameters.

The current annual food budget is \$70,000; three-fourths of the budget is spent on the hot meals served four evenings per week, and one-fourth of the budget is spent on nonperishable, nutritious snacks that are distributed weekly. The proposed budget would follow the same proportions. The soup kitchen receives regular donations from local merchants. As a result, the projected meal costs that Ms. Hinojosa uses for planning are \$0.59 per meal per day for the first 150 meals and \$2.72 per meal for each meal over 150 per day.

SOLVE IT: How many additional hot meals can be served each of the four nights each week if the annual food budget is increased by 40% with these parameters? Please round all work to the hundredths place when working out solutions. Round the final answer down to the nearest whole number since it represents a number of hot meals within a budget.



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CHALLENGE 1 ANSWER KEY – GRADE 8

Although each problem has one correct numeric solution, there are multiple pathways students can take to arrive at the answer. Students who answered Challenge 1 correctly are invited to enter Challenge 2!

Sample Solution

Step 1: First I need to find a , the amount of the increased annual food budget based on a 40% increase over the current annual food budget of \$70,000.

$$a = 70,000 + 0.4(70,000)$$

$$a = \$98,000$$

Step 2: Next, I need to determine the dollar amount designated for hot meals each week for the current budget and the proposed increased budget. There will be two separate, but parallel calculations.

Let b = the weekly dollar amount designated for hot meals in the current budget

Let c = the weekly dollar amount designated for hot meals in the increased budget

$$52b = (70,000)(0.75)$$

$$52b = 52,500$$

$$b = 52,500 / 52$$

$$b = \$1,009.62$$

$$52c = (98,000)(0.75)$$

$$52c = 73,500$$

$$c = 73,500 / 52$$

$$c = \$1,413.46$$

Step 3: Now I need to find the dollar amount designated for hot meals for each of the four nights for the current budget and the proposed increased budget. These will be two separate, but parallel equations.

Let e = the nightly dollar amount designated for hot meals in the current budget

Let f = the nightly dollar amount designated for meals in the increased budget

$$4e = 1,009.62$$

$$e = 1,009.62 / 4$$

$$e = \$252.41$$

$$4f = 1,413.46$$

$$f = 1,413.46 / 4$$

$$f = \$353.37$$

Step 4: I need to verify that the current and projected nightly budget dollar amounts, e and f , allow for at least 150 meals. (Note: The cost for the first 150 meals is \$0.59 per meal.)

Let g = the cost of the first 150 meals

$$g = 150(0.59)$$

$$g = \$88.50$$

$e > g$ ($\$252.41 > \88.50) and $f > g$ ($\$353.37 > \88.50); therefore, the nightly budget amounts allow for at least 150 meals.

(solution continued on next page)

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(...sample solution continued...)

Step 5: Next, I need to determine the number of hot meals that can be served each day for both the current budget and the proposed increased budget based on the projected meal costs that Ms. Hinojosa currently uses. These will be two separate, but parallel equations.

Let x = the number of hot meals that can be served each of the four days with the current budget

Let y = the number of hot meals that can be served each of the four days with the increased budget

$$\begin{aligned} 0.59(150) + 2.72(x-150) &= 252.41 \\ 88.5 + 2.72x - 408 &= 252.41 \\ 2.72x - 319.5 &= 252.41 \\ + 319.5 &+ 319.5 \end{aligned}$$

$$\begin{aligned} \underline{2.72x} &= \underline{571.91} \\ 2.72 & \quad 2.72 \\ x &= 210.26 \end{aligned}$$

$$\begin{aligned} 0.59(150) + 2.72(y-150) &= 363.37 \\ 88.5 + 2.72y - 408 &= 363.37 \\ 2.72y - 319.5 &= 363.37 \\ + 319.5 &+ 319.5 \end{aligned}$$

$$\begin{aligned} \underline{2.72y} &= \underline{672.87} \\ 2.72 & \quad 2.72 \\ y &= 247.38 \end{aligned}$$

Step 6: I now need to find the difference between the two meal counts using the values of x and y that I determined above.

Let z = the number of additional hot meals that can be served each of the four nights every week with the proposed increased budget

$$\begin{aligned} z &= y - x \\ z &= 247.38 - 210.26 \\ z &= 37.12 \text{ additional nightly meals as described above} \end{aligned}$$

Step 7: Finally, I will round the answer, z , to the nearest whole number of meals less than or equal to its calculated value since I must stay within a budget.

The nearest whole number of meals less than or equal to 37.12 is 37 meals.

FINAL ANSWER: Based on the parameters provided by Ms. Hinojosa, increasing the annual food budget by 40% would enable the soup kitchen to serve **37 additional hot meals each of the four nights every week of the year.**