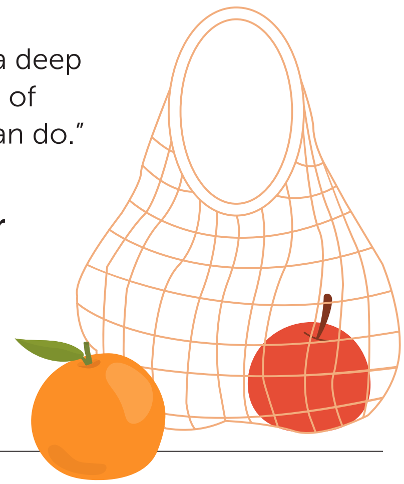
SCHOLASTIC

Try your
THE HARDEST MATH PROBLEM
GRADE 6

After Aliza and Darius give a presentation to their class about food access, they head to lunch. While Pizza Day is normally a cause for excitement, both teens are preoccupied, thinking about the **tens of millions of people in the U.S. living with food insecurity—the lack of consistent access to enough food**.

Thinking of their classmates, teammates, and neighbors being hungry makes a deep impression on Aliza and Darius. "I know that we can't solve the *entire* problem of food insecurity ourselves," says Aliza, "but there must be *something* that we can do."



"I agree," Darius responds. **"Let's think about different solutions, then use our school community service hours to take action."**

"I believe in us—we can make a difference!" Aliza says.

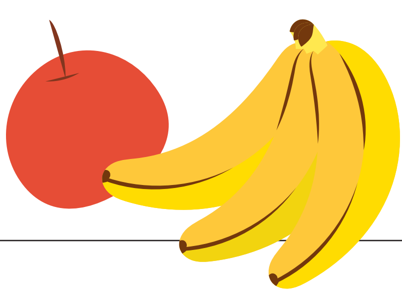
Solve the Problem

Aliza and Darius read about the Weekend Snack Sack program, which provides nutritious snacks each weekend to students in food-insecure households. Their principal, Mr. Fendley, gives them permission to bring the program to their school.

Ms. Jacobson, the director of the local food pantry, tells Aliza and Darius that she will give them 75 apples, 75 oranges, 75 bananas, and 75 lunch sacks each week if they can obtain the additional required items. **The program guidelines specify that the ratio of protein:fruit:vegetables must be 5.5:16:20.** For ratio calculation purposes, Ms. Jacobson says they should use 12 oz. for an apple, 10 oz. for an orange, and 6 oz. for a banana.

Aliza and Darius reach out to the community. A local grocery will donate 8 oz. bags of dried fruit for each sack. Camila's Uncle Nicolás will provide vegetables from the community greenhouse at a discounted price of $0.13/oz. Mr. Fendley will ask the school board to cover that cost, as well as provide jerky for the protein, which a distributor will supply at a discounted price of $1.12/oz.

SOLVE IT: If each of the 75 Weekend Snack Sack bags has 1 apple, 1 orange, 1 banana, and an 8 oz. bag of dried fruit, how much money is needed from the school board for the vegetables and jerky each week in total? Please round all work to the thousandths place when working out solutions. Provide the final answer to the nearest cent.



THE HARDEST MATH PROBLEM

CHALLENGE 2 ANSWER KEY — GRADE 6

Although the problem has one correct numeric solution, there are multiple pathways students can take to arrive at the answer.

Step 1: Determine the total ounces of fruit that will be in one Weekend Snack Sack.

Let *f* = the total ounces of fruit in 1 Weekend Snack Sack bag

Each snack sack will have 1 apple (12 oz.), 1 orange (10 oz.), 1 banana (6 oz.) and an 8 oz. bag of dried fruit.

$f = 12 + 10 + 6 + 8$

$f = 36$ oz. of fruit

Step 2: Set up a ratio to determine the number of ounces of jerky and vegetables that are needed for **each bag** to satisfy the required ratios of protein:fruit:vegetables.

Let *j* = the number of ounces of **jerky** needed for **1 snack sack**

Let *v* = the number of ounces of **vegetables** needed for **1 snack sack**

$$\frac{j}{36} = \frac{5.5}{16}$$

$$\frac{v}{36} = \frac{20}{16}$$

Step 3: Solve these two proportions.

$$\frac{j}{36} = \frac{5.5}{16}$$

$$\frac{v}{36} = \frac{20}{16}$$

$16j = (36)(5.5)$

$16j = 198$

$j = 12.375$ oz.

$16v = (36)(20)$

$16v = 720$

$v = 45$

Step 4: Determine the total number of ounces of jerky needed each week.

I will use the ounces of jerky and ounces of vegetables per single snack sack, and multiply that by the total number of snack sacks.

Let *t* = the number of ounces of **jerky** needed for **each week**

Let *w* = the number of ounces of **vegetables** needed for **each week**

t = (**12.375** oz. of jerky)(**75** snack sacks)

t = 928.125 oz.

w = (**45** oz. of vegetables per sack)(**75** snack sacks)

w = 3,375 oz.

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SCHOLASTIC

THE HARDEST MATH PROBLEM
CHALLENGE 2 ANSWER KEY — GRADE 6

Although the problem has one correct numeric solution, there are multiple pathways students can take to arrive at the answer.

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Step 5: Calculate the cost of the weekly amount of jerky and vegetables.
Let c = the weekly cost of the jerky and vegetables for 75 snack sacks.

$c = 1.12t + 0.13w$
$c = 1.12(928.125) + 0.13(3{,}375)$
$c = 1{,}039.5 + 438.75$
$c = \$1{,}478.25$

Final Answer: A total of **$1,478.25** is needed each week to purchase the jerky and vegetables for 75 Weekend Snack Sacks.

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SCHOLASTIC

THE *Try Your* HARDEST MATH PROBLEM

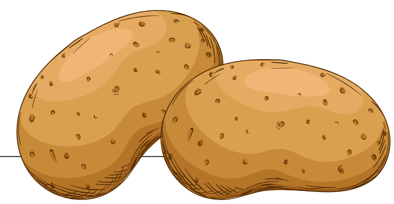
GRADE 7

After Aliza and Darius give a presentation to their class about food access, they head to lunch. While Pizza Day is normally a cause for excitement, both teens are preoccupied, thinking about the **tens of millions of people in the U.S. living with food insecurity—the lack of consistent access to enough food**.

Thinking of their classmates, teammates, and neighbors being hungry makes a deep impression on Aliza and Darius. "I know that we can't solve the *entire* problem of food insecurity ourselves," says Aliza, "but there must be *something* that we can do."

"I agree," Darius responds. **"Let's think about different solutions, then use our school community service hours to take action."**

"I believe in us—we can make a difference!" Aliza says.

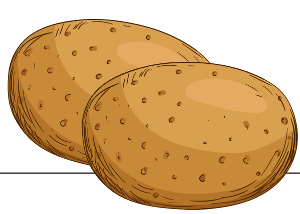


Solve the Problem

Aliza and Darius decide to volunteer with Ji-Hoon and Camila at the community greenhouse, which is run by Camila's uncle, Nicolás. One day, Nicolás asks Aliza and Darius to help him plan for the potato crop. "This year, I want to increase the production of total pounds of potatoes by 25%. Based on soil tests, the production per acre is expected to decrease by 8% compared to last year's production. Last year, we planted 12 acres of potatoes, and the crop yielded an average of 28,471 pounds per acre. Will you help me determine how many additional acres of potatoes to plant this year to reach my goal?"

At harvest time, Nicolás finds the duo again and shares a concern, "Sadly, a chemical spill contaminated 50% of the additional acres that we planted with potatoes. The chemical company offered to compensate us by providing an equal quantity of pounds of wholesale brown rice to replace the contaminated pounds of potatoes. Will you calculate how many pounds of brown rice are needed?"

SOLVE IT: Determine how many pounds of brown rice should be provided to replace the contaminated potatoes. Please round all work to the thousandths place when working out solutions and providing your final answer.



SCHOLASTIC

THE HARDEST MATH PROBLEM
CHALLENGE 2 ANSWER KEY — GRADE 7

Although each problem does have a correct numeric solution, there are multiple pathways students can take to arrive at the answer.

Step 1: Identify the expression that represents the goal number of pounds of potatoes for this year.
Let g = goal number of pounds of potatoes this year, a 25% increase from last year

g = (28,471 lbs/acre × 12 acres) + 0.25(28,471 lbs/acre × 12 acres)

I notice the expression inside the parentheses is the same, so I want to simplify the expression. There's an unwritten 1 multiplier in front of the first parenthetical, and a 0.25 multiplier in front of the second parenthetical. I'll combine them to 1.25 and simplify the expression as follows:
g = (1.25)(28,471)(12)

Step 2: Next, identify the expression that represents the yield of pounds of potatoes per acre this year, which is an 8% decrease from last year.
Let e = expected yield of pounds of potatoes per acre this year

Percentage of expected yield compared to last year: 100% – 8% = 92%
e = (0.92)(28,471 lbs/acre)

Step 3: Now set up an equation, using e and g defined above to determine the additonal acres of potatoes Nicolás needs to plant to reach his desired goal under the given conditions—where the goal equals the expected yield per acre multiplied by the previous 12 acres and the additional acres.
Let x = the additional acres of potatoes needed
$e(12 + x) = g$
$(0.92)(28{,}471)(12 + x) = (1.25)(28{,}471)(12)$

Step 4: Solve the equation in the previous step for x, using the distributive property as needed.
$(0.92)(28{,}471)(12 + x) = (1.25)(28{,}471)(12)$
$314{,}319.84 + 26{,}193.32x = 427{,}065$
$26{,}193.32x = 112{,}745.16$
x = 4.304 acres

Step 5: Determine the number of acres of potatoes that were contaminated by the chemical spill (50%, or half, of the additional acres of potatoes were contaminated).
Let c = the number of contaminated acres of potatoes
$c = 4.304/2$
c = 2.152 acres

Step 6: Determine the pounds of potatoes that were contaminated by the chemical spill.

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SCHOLASTIC

THE HARDEST MATH PROBLEM

CHALLENGE 2 ANSWER KEY — GRADE 7

Although each problem does have a correct numeric solution, there are multiple pathways students can take to arrive at the answer.

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Let p = the pounds of contaminated potatoes based on e, the expected yield per acre, and c, the number of contaminated acres of potatoes

Note: Therefore, p also equals the pounds of brown rice that should be purchased.

$p = (e)(c)$

$p = (0.92)(28{,}471)(2.152)$

$p = 56{,}368.02464$ pounds

Step 7: Round the answer, p, to the nearest thousandth.

$p = 56{,}368.02464$ pounds of potatoes contaminated

Since the digit to the right of the thousandths place is a 6, the 4 in the thousandths place rounds up to a 5, making the answer 56,368.025 pounds.

Final Answer: A total of **56,368.025 pounds** of brown rice should be provided to replace the equivalent pounds of contaminated potatoes.

SCHOLASTIC

THE *Try your* HARDEST MATH PROBLEM

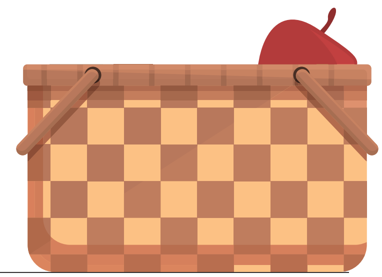
GRADE 8

After Aliza and Darius give a presentation to their class about food access, they head to lunch. While Pizza Day is normally a cause for excitement, both teens are preoccupied, thinking about the **tens of millions of people in the U.S. living with food insecurity—the lack of consistent access to enough food**.

Thinking of their classmates, teammates, and neighbors being hungry makes a deep impression on Aliza and Darius. "I know that we can't solve the *entire* problem of food insecurity ourselves," says Aliza, "but there must be *something* that we can do."

"I agree," Darius responds. **"Let's think about different solutions, then use our school community service hours to take action."**

"I believe in us—we can make a difference!" Aliza says.



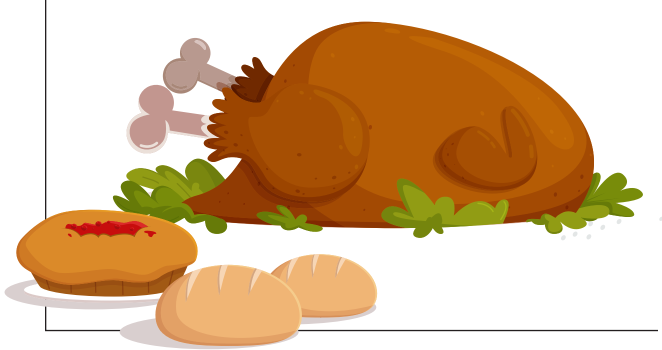
Solve the Problem

Aliza and Darius develop a plan. They decide to launch Operation Turkeytime, a project that will donate 100 Thanksgiving baskets to local families experiencing food insecurity.

Aliza reports, "The community greenhouse will donate 100 wicker baskets and the fresh vegetables. Plus, the bakeries in town will collectively donate 100 packages of rolls and 100 pies." Darius replies, "That's great! **The owner of the poultry farm will sell us fresh 10-pound turkeys for $9.25 each and 14-pound turkeys for $12.75 each**, plus donate stuffing ingredients with each turkey. Ten local businesses donated $100 each for the money to purchase the turkeys."

Darius wondered, "How many 10-pound turkeys and how many 14-pound turkeys do we want to purchase?" Aliza replied thoughtfully, "I'd like to purchase as many of the larger turkeys as possible with the money that we have, yet we need to buy 100 total turkeys... Oh, hey! This situation reminds me of the systems of equations problems that we've been doing in Mrs. Cavazos' math class!"

SOLVE IT: What is the maximum number of 14-pound turkeys that can be purchased with the donated money while still purchasing 100 total turkeys? Round the final answer to the nearest whole number since it represents whole turkeys.



THE HARDEST MATH PROBLEM
CHALLENGE 2 ANSWER KEY — GRADE 8

Although the problem has one correct numeric solution, there are multiple pathways students can take to arrive at the answer.

Step 1: Identify the equation for the number of 10-pound turkeys and the number of 14-pound turkeys to be purchased.

Let x = the number of 10-pound turkeys purchased
Let y = the number of 14-pound turkeys purchased

$x + y = 100$ turkeys

Step 2: Determine the amount of money available to spend on purchasing turkeys.
Let m = the total amount of money donated to buy turkeys for the baskets

m = (\$100)(10 donations)
m = \$1,000

Step 3: Identify the inequality for the cost of the turkeys purchased
Note: m is the maximum amount that can be spent on turkeys.

Let x = the number of 10-pound turkeys purchased
Let y = the number of 14-pound turkeys purchased

$9.25x + 12.75y \leq \$1,000$

Step 4: Set up a system of linear equations for the situation.
Note: Since two conditions must be met for the solution, a system exists. Furthermore, since we are looking for the maximum number of 14-pound turkeys that can be bought and the maximum would be found when the inequality equals \$1,000, the inequality will be rewritten as an equation for calculation purposes. Based on the previous steps, the two equations in the system are:

$x + y = 100$
$9.25x + 12.75y = \$1,000$

Step 5: Solve the system of linear equations for the situation.
I need to eliminate one of the variables as I combine the two equations, then solve the resulting equation for the remaining variable. I'll do that in three parts:

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THE HARDEST MATH PROBLEM
CHALLENGE 2 ANSWER KEY — GRADE 8

Although each problem does have a correct numeric solution, there are multiple pathways students can take to arrive at the answer.

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- **Step 5.1:** If I multiply the first equation by -9.25 (multiplying on both sides of the equals sign to keep it balanced), then the *x* variables for the first and second equations will end up with opposite coefficients (same number, but opposite signs).
- **Step 5:2:** Then, when I combine the two equations, the *x* variables will be eliminated.
- **Step 5.3:** Now, with only one variable in play, I can solve the resulting equation for *y*.

Step 5.1:

First equation: $x + y = 100$ turkeys → $-9.25(x + y) = -9.25(100)$

$\mathbf{-9.25x} - 9.25y = -925$

Second equation: $\mathbf{9.25x} + 12.75y = \$1{,}000$

Step 5.2:

$$\begin{array}{rcrcr} -9.25x & - & 9.25y & = & -925 \\ +\ 9.25x & + & 12.75y & = & 1{,}000 \\ \hline 0 & + & 3.5y & = & 75 \end{array}$$

Step 5.3:

$3.5y = 75$

$\frac{3.5y}{3.5} = \frac{75}{3.5}$

$y = 21.429$ 14-pound turkeys

Step 6: Finally, round the answer, *y*, to the nearest whole number of turkeys. Round down to 21 because the budget wouldn't cover a complete 22nd turkey. (Therefore, *x*, the number of 10-pound turkeys, is 79, because 100 total turkeys minus 21 is 79.)

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CHALLENGE 2 ANSWER KEY — GRADE 8

Although each problem does have a correct numeric solution, there are multiple pathways students can take to arrive at the answer.

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Step 7: I'll check my work to make sure these numbers fit into the $1,000 budget.
14-pound turkeys cost $12.75 and 10-pound turkeys cost $9.25.

$12.75 × 21 turkeys = $267.75 $9.25 × 79 turkeys = $730.75

$267.75 + $730.75 = $998.50
This is within budget, and no greater number of turkeys can be purchased within this budget.

Final Answer: Aliza and Darius may purchase a maximum of **21** 14-pound turkeys while still purchasing 100 total turkeys for the Thanksgiving baskets.