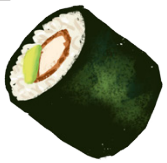
SCHOLASTIC

THE HARDEST MATH PROBLEM
STUDENT CONTEST

Carlita Kahn has become the world's latest celebrity chef! She ditched boring old menu items like hamburgers and spaghetti for a style of cooking known as fusion cuisine. Carlita mixes bold flavors from around the world, and people line up around the block for her spicy barbecued chicken sushi and squid pudding.

The business has grown so quickly that Carlita is having trouble maintaining the excellent quality of the food while serving so many people. So she's hired an assistant—that's you! Help Carlita run her restaurant by answering the question that matches your grade level.



GRADE 6

Carlita has received her very first celebrity birthday party reservation for tomorrow night, so she needs you to act fast! Carlita wants to make her signature dish, Turkey Surprise, but needs it to be 225% of the original recipe to feed the large crowd.

Secret Recipe for Turkey Surprise (Original)

- 2½ pounds turkey
- Cherries, equal to ¼ of the amount of turkey
- Chocolate drops, equal to 0.35 of the amount of cherries

How many ounces of chocolate drops will Carlita need?

Hint: One pound is the same as 16 ounces.

GRADE 7

Carlita has received an offer to bottle her Spicy Secret Sauce (better not to know what's in it!) and sell it in stores. Here are the details:

Carlita pays:

- $7,500 in design fees for packaging and labeling
- For the first 10,000 bottles, 5% of the sale price of each bottle in delivery fees
- For each bottle over 10,000, 3.5% of the sale price of each bottle in delivery fees
- $0.87 per bottle to pay for the ingredients, glass bottle, etc.

Carlita plans to sell the sauce for $1.49 per bottle. **If she sells 26,000 bottles, how much profit will she make?**

Hint: Profit = sales minus expense. Sales = price per bottle times the number of bottles sold.

GRADE 8

Carlita plans to establish a second restaurant, open five days a week, 50 weeks a year. Here are her costs:

- Rent: $7,200/month
- The average customer pays $45.47
- Carlita's average food cost per customer: $20.18
- Insurance: $4,200/year
- Carlita hires 2 servers for 8 hours/day and a part-time helper for 4 hours/day. She pays $15 per hour and pays employer Social Security tax (6.2% of gross pay) and Medicare tax (1.45% of gross pay).

How many customers would Carlita need to serve each year for the restaurant to break even? Round to the nearest whole number.

Hint: "Break even" means sales and expenses are equal and the owner neither makes nor loses money.

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THE HARDEST MATH PROBLEM STUDENT CONTEST
CHALLENGE 1 ANSWER KEY

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

Teachers, if your student(s) answered Challenge 1 correctly, they are invited to enter Challenge 2! Get the Challenge 2 materials at **scholastic.com/hardestmathcontest**.

GRADE 6

Step 1: Since I need to find out how many ounces of chocolate drops Carlita needs for her recipe, and I see that the quantities of each ingredient are given as a multiple of the amount of turkey, I'll start with the weight of the turkey. To get the amount of turkey into the same measurement units as what the question calls for, I'm going to convert 2½ pounds of turkey to ounces (oz) by multiplying 2.5 pounds (lbs) by 16 (oz per lb).

2.5 lbs x 16 oz/lb = 40 oz of turkey

Step 2: Given that the amount of cherries equals ¼ the amount of turkey, I'll convert ¼ to its decimal equivalent of 0.25 and multiply it by 40 oz of turkey.

0.25 x 40 oz = 10 oz of cherries

Step 3: Since the amount of chocolate drops equals 0.35 of the amount of cherries, I'll multiply 0.35 by the amount of cherries.

0.35 x 10 oz = 3.5 oz of chocolate drops

Step 4: Finally, I need to adjust the basic recipe to feed all the additional people. Since the party will require 225% of the original recipe, I'll first convert 225% to its decimal equivalent of 2.25 and multiply it by the amount of chocolate drops.

2.25 x 3.5 oz = 7.875 oz of chocolate drops

Therefore, Carlita will need 7.875 ounces of chocolate drops to use for her recipe.

GRADE 7

Step 1: To figure out how much profit Carlita will make by selling 26,000 bottles of her Spicy Secret Sauce, I know I'll eventually have to set up an equation based on the fact that profit equals sales minus expenses. First, I'll determine total sales. Since sales equals the number of bottles sold times the price per bottle, I'll multiply 26,000 bottles by the price of $1.49 per bottle.

26,000 bottles x $1.49 per bottle = $38,740 in total sales

Step 2: Then, I'll start to accumulate the expenses to subtract from sales. The delivery fee for the first 10,000 bottles is 5% of the price per bottle. I'll convert 5% to 0.05 and multiply that by 10,000 bottles and the $1.49 price per bottle.

10,000 bottles x $1.49 per bottle x 0.05 = $745 total delivery fee for the first 10,000 bottles

Step 3: Then, I'll calculate the delivery fee for the rest of the bottles. I calculated the delivery fee for the first 10,000 bottles in Step 2, so if Carlita sold 26,000 bottles in all, then the 3.5% fee is for 16,000 bottles (26,000 – 10,000). I'll convert 3.5% to 0.035 and multiply it by 16,000 bottles and $1.49 per bottle.

16,000 bottles x $1.49 per bottle x 0.035 = $834.40 total delivery fee for the last 16,000 bottles

Step 4: Next, I'll calculate the cost of ingredients, glass bottle, etc., which is $0.87 per bottle multiplied by the 26,000 bottles.

26,000 bottles x $0.87 per bottle = $22,620 total cost of ingredients, glass bottle, etc.

Step 5: Now that I've determined all the individual expenses, I can add up the total expenses.

$745.00 (delivery fee for the first 10,000 bottles) + $834.40 (delivery fee for the next 16,000 bottles) + $7,500.00 (package design fee given in the problem) + $22,620.00 (cost of ingredients, bottles, etc.) = $31,699.40

Step 6: Now that I know the total expenses, I can subtract them from sales to determine the profit.

$38,740.00 (total sales) – $31,699.40 (total expenses) = $7,040.60 (profit)

Therefore, Carlita will make $7,040.60 in profit by selling 26,000 bottles.

GRADE 8

Step 1: To find out how many customers Carlita would need to serve each year for the restaurant to break even, I want to find the number of customers when sales = expenses.

Step 2: First, I'll determine total sales. Sales equals the average customer payment times the number of customers each year. So sales equals $45.47*c*, where the variable *c* equals the number of customers each year.

Step 3: Next, I'll calculate total expenses. I'll start with salary costs. Two employees work 8 hours per day and one works 4 hours per day, so employees work 20 hours per day. The restaurant is open 5 days a week and 50 weeks per year, and Carlita pays $15 per hour, so I'll multiply these to find annual salary costs.

$15/hour x 20 hours/day x 5 days/week x 50 weeks/year = $75,000.00 total annual salary costs

Step 4: Then, I'll calculate tax expenses. First, I'll convert 6.2% and 1.45% to their decimal forms, 0.062 and 0.0145. Annual salary tax will be a percentage of annual salary costs, so I'll multiply the taxes by the salary costs.

$75,000.00 x (0.062 + 0.0145) = $5,737.50 total annual salary tax expenses

Step 5: Other expenses include rent and insurance. I know that insurance is $4,200.00 annually. To find the annual rent expense, I must multiply the monthly rent expense times 12 months per year.

$7,200.00 x 12 months = $86,400.00 annual rent

Step 6: Now I'm ready to determine total expenses, which are $75,000.00 (salaries) + $5,737.50 (salary tax) + $86,400.00 (rent) + $4,200.00 (insurance) + $20.18*c*, where *c* equals the number of customers per year. That adds up to:

$171,337.50 + $20.18*c* = total expenses

Step 7: Now I can set up an equation to find the number of customers each year when sales equals expenses (break even). If sales = expenses at the break-even point, then $45.47*c* = $171,337.50 + $20.18*c*. I can simplify by subtracting $20.18 from both sides, which will result in:

$25.29*c* = $171,337.50

Step 8: I can solve for *c* by dividing both sides by $25.29 to isolate the variable:

***c* = $171,337.50 / $25.29**

***c* = 6,774.9 (rounded to the nearest tenth). Since Carlita can't serve 0.9 of a customer, I rounded this up to 6,775 customers.**

Therefore, Carlita must serve 6,775 customers per year for her restaurant to break even.