When will the chocolate milk run out?

Here is the invoice for chocolate milk purchases at school. Use this invoice to answer these questions.

Items	Quantity	Price (USD)	Amount
Account Deposit	1	($30.00)	($30.00)
Chocolate Milk	1	$0.70	$0.70
Chocolate Milk	1	$0.70	$0.70
Chocolate Milk	1	$0.70	$0.70
Chocolate Milk	1	$0.70	$0.70
Chocolate Milk	1	$0.70	$0.70
	Total:		**($26.50)**
	Amount Due (USD):		**($26.50)**

1. What will the balance be after purchasing 1, 2, 3, 4, 5, 6, 7 and 8 chocolate milks? Use an effective way to organize the information to answer this question.

Number of chocolate milks bought	Total cost of all chocolate milks	Money left in account
0	$0.00	$30.00
1	$0.70	$29.30
2	$1.40	$28.60
3	$2.10	$27.90
4	$2.80	$27.20
5	$3.50	$26.50
6	$4.20	$25.80
7	$4.90	$25.10
8	$5.60	$24.40

2. After how many chocolate milks will this account run out of money? How do you know?

Let x = the number of chocolate milk

$0.70 \times x = 30$

$x = \frac{30}{0.7} = 42.85714...$ but since we cannot buy 42 and 0.9 of chocolate milk (cannot buy a fraction of milk), I rounded down to 42 because that's the last whole number of milk I can afford. In other words, after the 42nd milk, the account will have some money left: 30 - (42 × 0.70) = $0.60, but it's not enough to buy another chocolate milk.

3. Write an equation to model the balance remaining after buying any number of chocolate milk. Explain what each part of the equation (variables, constants, and operations) represents.

Variables: Let x = the number of chocolate milk and y= remaining balance in USD

Constant: the price of chocolate milk = 70 cents or $0.70 and the starting account balance

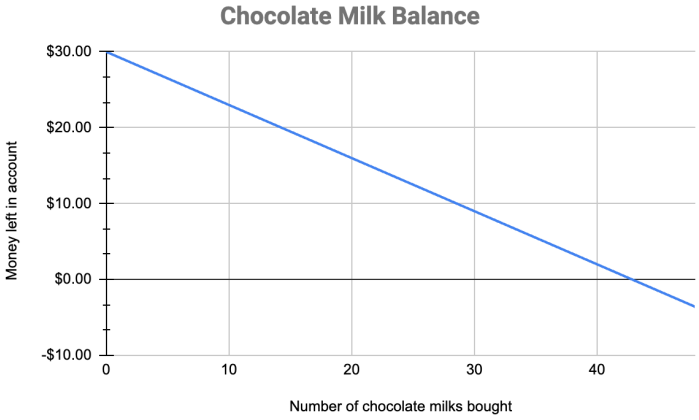
$y = 30 - 0.70x$

Or the equation can be modified so that if the starting account balance is different, this can also be considered as a variable (D)

$y = D - 0.70x$

The equation shows that as the number of chocolate milks (**x**) increases, the remaining balance (**y**) decreases this makes sense as you would be spending money to purchase chocolate milks.

4. Draw a graph that models the relationship between the number of chocolate milk and the balance. Does it include all the key parameters?



- ☐ **Clear Labels on Axes**
- ☐ **Title**
- ☐ **Appropriate Scale**
- ☐ **Correct Units**
- ☐ **Key Parameters: starting balance, rate of change (slope), and the point where the balance runs out**

Link to the sheets

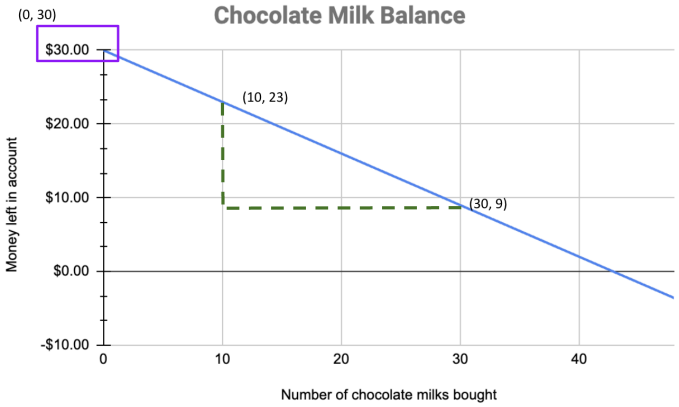
5. How do you see the parts of your equation in your graph? Color-code them. For example, color-code the rate of change in the equation, graph and table.

Equation: y = **30** - **0.70**x

Table:

Number of chocolate milks bought	Total cost of all chocolate milks	Money left in account
0	$0.00	$30.00
1	$0.70	$29.30
2	$1.40	$28.60
3	$2.10	$27.90
4	$2.80	$27.20
5	$3.50	$26.50
6	$4.20	$25.80
7	$4.90	$25.10
8	$5.60	$24.40

Graph:



As you can see in the table, the cost of each chocolate milk increases by $0.70 with each additional purchase. This represents a constant rate of change (positive slope) in the total cost. However, when we consider the overall account balance, the relationship changes to a negative slope because each additional milk decreases the remaining balance by that amount, reflecting how much you are spending.

Using the points from the graph, the rate of change (slope) = $\frac{y2-y1}{x2-x1} = \frac{9-23}{30-10}$ = - $0.7/chocolate milk. It makes sense that it's a negative slope since each time you buy a chocolate milk, you are subtracting this amount from the balance.

6. At this rate how much do you think a whole school year worth of chocolate milk costs for this account? Explain.

Answers will vary. Be sure to support your explanation by using thoughtful reasoning and providing clear calculations.

Sample answer:

Based on the invoice, the person seems to be buying chocolate milk every 3-5 days, I'll estimate buying it every 4 days. There are about 180 school days in a year.

$\frac{180}{4} = 45\ days$; so 45 x 0.70 = 31.50$ so we'd need $1.50 more to the starting account balance to have chocolate milk every 4 days.

7. Let's say you can only deposit money in increments of $10, determine the possible balances that so that your account balance reaches exactly $0 after purchasing chocolate milks. Would you consider making such a deposit? Why or why not? Discuss your reasoning and any factors that would influence your decision.

Answers will vary for the discussion part:

To reach exactly $0, need to consider higher multiples of $10 that lead to a total cost that is also a multiple of $0.70:

$\frac{70}{0.70} = 100\ chocolate\ milks$ and total cost is 70 so that the balance is 0.

"While it might seem like a lot to deposit all at once, I think it could be worth it if I really enjoy chocolate milk and plan to drink it often. However, I would also consider whether I need that much and if I could spend my money on other things too. Maybe I would choose to deposit smaller amounts and buy milk as needed instead."

"That seems like way too much for me! I don't drink chocolate milk every day, so I wouldn't want to spend that much money all at once. Instead, I think I would prefer to deposit smaller amounts, like $10 or $20, and buy a few milks at a time as I need them"