

MATHCOUNTS® Problem of the Week Archive

A Tasty Treat – October 3, 2022

Problems & Solutions

Isabella went to the local ice cream shop with her three children, Marcos, Nina and Perry. Isabella and the kids each ordered a sundae with two scoops of ice cream and various toppings. A sundae with two scoops of ice cream costs \$2.99, but the final cost of each sundae varies based on the number of toppings added. If the average cost, including sales tax, of the sundaes Isabella and her children ordered was \$3.73, what was the total cost for all four sundaes?

Let T represent the total cost for all four sundaes. Since the average cost per sundae was \$3.73, we can write $T/4 = 3.73$. It follows, then, that the total cost for the four sundaes was $T = (4)(3.73) = \$14.92$.

If the total cost determined in the previous problem includes a 5% sales tax, in cents, what was the total amount of sales tax charged for the four sundaes?

In the previous problem, we determined that the total cost, including tax, for the four sundaes was \$14.92. Let A represent the cost of the four sundaes before tax. Since the tax rate is 5%, we can write $(1.05)A = 14.92 \rightarrow A = 14.92/1.05$. Dividing, we see that the cost of the four sundaes, before tax, was \$14.21. Therefore, the total amount of sales tax charged for the four sundaes was $14.92 - 14.21 = 0.71 = 71$ cents.

None of the sundaes ordered by Isabella, Marcos, Nina and Perry had the same number of toppings. The number of toppings Nina added to her sundae was two fewer than the number of toppings Isabella added to hers, and two more than the number of toppings Marcos added to his. Perry added three more toppings to her sundae than Marcos added to his. Based on the previous problems, if the cost for each topping is 25 cents, how many toppings did Marcos add to his sundae?

Let the number of toppings added by Isabella, Marcos, Nina and Perry be represented by I , M , N and P , respectively. From the first problem, we were told that the cost of each sundae before adding toppings was \$2.99. We also know that the cost of all four sundaes before tax was \$14.21, and the cost of each added topping was \$0.25. We can write the following equation: $0.25(P + N + M + I) + 4(2.99) = 14.21 \rightarrow 0.25(P + N + M + I) + 11.96 = 14.21 \rightarrow 0.25(P + N + M + I) = 2.25 \rightarrow P + N + M + I = 9$. That means the total number of toppings added among the four sundaes was 9 toppings. Since the number of toppings Nina added was two fewer than the number of toppings Isabella added and two more than the number of toppings Marcos added, we can write $N = I - 2$ and $N = M + 2$. Setting these equations equal to each other, we can derive an equation for I in terms of M : $I - 2 = M + 2 \rightarrow I = M + 4$. Lastly, since Perry added three more toppings than Marcos, we can write $P = M + 3$. We can now substitute these expressions for N , P and I in the equation $P + N + M + I = 9$ to get $M + (M + 2) + (M + 3) + (M + 4) = 9$. Simplifying, and solving for M , we have $4M + 9 = 9 \rightarrow 4M = 0 \rightarrow M = 0$. So, Marcos added 0 toppings to his sundae. Substituting, we see that Nina added $N = M + 2 = 0 + 2 = 2$ toppings; Perry added $P = M + 3 = 0 + 3 = 3$ toppings; and Isabella added $I = M + 4 = 0 + 4 = 4$ toppings.

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