

# MATHCOUNTS<sup>®</sup> Problem of the Week Archive

## *Apples, Apples, Apples! – October 14, 2024*

### **Problems & Solutions**

The Farmers Market sells apples by the bushel, and each bushel of apples weighs 42 lbs. A bushel of large apples contains 84 apples. If a bushel of small apples contains twice as many apples as a bushel of large apples, how many small apples are in 1 lb of apples?

*We are told that there are twice as many small apples in a bushel as there are large apples. So, there are  $84 \times 2 = 168$  small apples in a bushel. A bushel of apples weighs 42 lbs, which means 1 lb of small apples is  $168 \div 42 = 4$  small apples.*

Megan purchased a bushel of apples from the Farmers Market that contained only large and small apples. There were exactly 129 apples in the bushel Megan purchased. Based on this and information from the previous problem, what is the positive difference between the number of large apples and the number of small apples in the bushel of apples Megan purchased?

*Let  $S$  and  $L$  represent the number of small and large apples, respectively. We know that  $S + L = 129$ , or  $L = 129 - S$ . From the previous problem, we know that  $84 \div 42 = 2$  large apples weigh 1 lb, and 4 small apples weigh 1 lb. It follows that each large apple weighs  $1/2$  lb, and each small apple weighs  $1/4$  lb. Since each bushel of apples weighs 42 lbs, we can write  $(1/4)S + (1/2)L = 42$ . Let's multiply each side of this equation by 4 so we don't have to work with the fractions. We have  $S + 2L = 168$ , and we already know  $S + L = 129$ . It follows that the extra  $L$  in the first equation is the reason for the difference of  $168 - 129 = 39$  on the right-hand sides of the equations. So,  $L = 39$ . Thus,  $S + 39 = 129 \rightarrow S = 90$ . Therefore, the positive difference between the number of large apples and the number of small apples in the bushel of apples Megan purchased is  $90 - 39 = 51$  apples.*

Megan used 18 of the large apples she purchased to make a few batches of apple sauce. She used  $4 \frac{1}{2}$  lbs of small apples to make two apple pies. Megan used  $1/3$  of the remaining small apples to make several batches of apple butter. After making the apple sauce, apple pies and apple butter, Megan saved the leftover apples for the upcoming harvest festival. In the apples that Megan had left over what is the ratio of large apples to small apples? Express your answer as a common fraction.

*From the previous problem, we know that there were 90 small apples and 39 large apples in the bushel of apples Megan purchased. After using 18 large apples to make apple sauce, Megan had  $39 - 18 = 21$  large apples remaining. From the previous problem, we also know that each small apple weighs  $1/4$  lb. So, in  $4 \frac{1}{2}$  lbs of small apples, there are  $(4 \frac{1}{2}) \div (1/4) = (9/2) \times 4 = 18$  small apples. So, after using 18 small apples to make apple pies, Megan was left with  $90 - 18 = 72$  small apples. Then, Megan used  $(1/3) \times 72 = 24$  small apples to make apple butter. That left her with  $72 - 24 = 48$  small apples. With 21 large apples and 48 small apples remaining, the ratio of the large to small apples left over is  $21/48 = 7/16$ .*

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