

MATHCOUNTS® Problem of the Week Archive

Holidays Are A Special Time – December 16, 2019

Problems & Solutions

During this time of year, people around the world will be celebrating different holidays. Many of these holidays include getting together with family, exchanging gifts, eating special foods, celebrating, and remembering the reason for the holiday.

Holidays can also bring on stress! Kathryn realized that she is in a time-crunch to get some of her holiday shopping completed. She needs to have all of it done by this time tomorrow. As she looks over her schedule for the next 24 hours, she sees that she will be spending $\frac{1}{3}$ of it sleeping, $\frac{1}{3}$ of it at school and $\frac{1}{8}$ of it working at her part-time job. How much of the next 24 hours is left over for shopping? Express your answer as a common fraction.

Kathryn is doing three activities during the next 24 hours that are taking up $\frac{1}{3}$, $\frac{1}{3}$, and $\frac{1}{8}$ of that time. We know that $\frac{1}{3} = \frac{8}{24}$, and $\frac{1}{8} = \frac{3}{24}$. So, adding these together, we see that $\frac{19}{24}$ of her day will be taken up by sleeping, attending school, and working. This leaves $(\frac{24}{24}) - (\frac{19}{24}) = \frac{5}{24}$ of the next 24 hours to do her shopping.

Kathryn was given a \$25 gift certificate to the music store for her birthday last month. She decides to use it to buy her brother a CD for the holidays. The tax on her purchase will be 4.5%. If Kathryn wants to ensure that her gift certificate covers her entire purchase (including the tax), what is the most amount of dollars that can be in the price of her purchase before the tax is added? Express your answer to the nearest hundredth.

*First, it's important to see that if you know the price of an item, x , you can see what you will be charged after adding on 4.5% tax by simply multiplying x by 1.045. Therefore, we are trying to find the greatest number that, when multiplied by 1.045, is still less than or equal to 25. The equation $1.045x \leq 25$ will get us our answer. By dividing both sides by 1.045, we see that the cost of Kathryn's purchase, before tax, can be no more than **\$23.92**.*

When Kathryn came home from shopping, she saw her mother baking holiday cookies in the kitchen. Just as she walked in, she saw her mother get out the baking soda and put 4 teaspoons of it into the bowl. She told her mother that she thought her mom had made a mistake. The recipe only called for $1\frac{1}{3}$ teaspoons of baking soda. Her mother told her that she had not made a mistake, she was just making more than one batch at a time. If the recipe calls for $\frac{1}{2}$ teaspoon of vanilla, how many teaspoons of vanilla does Kathryn now expect her mother to put into the bowl?

*If Kathryn's mother put in 4 teaspoons instead of $1\frac{1}{3}$, then we can find out how many recipes she is making at one time by dividing 4 by $1\frac{1}{3}$ (which is the same as dividing 4 by $\frac{4}{3}$). So, $4/(\frac{4}{3}) = 4 \times (\frac{3}{4}) = 3$. Kathryn's mother is making 3 recipes at once. Therefore, rather than putting in a $\frac{1}{2}$ teaspoon of vanilla, Kathryn can expect her to put in $3 \times \frac{1}{2} = 1\frac{1}{2}$ **teaspoons of vanilla**.*

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