

MATHCOUNTS[®] Problem of the Week Archive

Cider – September 25, 2023

Problems & Solutions

Nancy and Tim have an apple cider stand at their school every morning during the fall to raise money for their club. Since September 23 is the Autumnal Equinox, the first day of fall and their first day of business will be September 23.

Several weeks ago, in preparation for their 2023 opening, Nancy and Tim went to pick their apples from a local orchard (all of their cider is homemade). Nancy picked apples at a rate of 30 apples per hour and Tim picked apples at a rate of 25 apples per hour. Tim and Nancy picked the same number of apples. Nancy picked apples for 5 hours, so how many hours must Tim have spent picking apples?

If Nancy picked 30 apples per hour for 5 hours, Nancy picked $5 \times 30 = 150$ apples. If Tim picks apples at a rate of 25 apples per hour, we can divide 150 apples by his rate of 25 and get $150 \div 25 = 6$ hours.

Each gallon of cider produced requires one bushel of apples (40 apples), which cost Nancy and Tim \$30 at the orchard. Anxious to calculate how much they will make, Nancy decides to calculate their profits, based on serving 6 oz cups of cider (in cups that were donated by a friend) and charging \$2.00 per cup. Assuming they sell all of the cider they can make, how much profit will they make from the apples they picked? Note: There are 128 oz in 1 gallon.

First, take Nancy and Tim's total of 300 apples and divide that by 40 apples per bushel to get 7.5 bushels of apples that they picked. Since one gallon of cider requires one bushel of apples, 7.5 bushels would produce 7.5 gallons of cider. Knowing there are 128 ounces per gallon, Nancy and Tim can make $7.5(128) = 960$ ounces of cider. Since each cup is 6 ounces, Nancy and Tim have $960/6 = 160$ cups of cider to sell. At \$2.00 per cup, Nancy and Tim would make $160(\$2.00) = \320.00 . They spent \$30 per bushel, so in total, $\$30 \times 7.5$ bushels = \$225.00. Therefore, in profits, Nancy and Tim would make $\$320 - \$225 = \$95$.

Hoping to make more than what the calculations show, Nancy ponders what will happen if they add some water to the cider. She decides to calculate how much they would profit if they added 1.5 gallons of water to the 7.5 gallons of cider. If they sell the diluted cider for the same price as they had planned to sell for (\$2.00 per 6-ounce cup), how much additional profit will be made?

Since they are adding 1.5 gallons of water, they will have an additional 1.5 gallons of liquid to sell without any additional expenses. Thus, those $(1.5 \text{ gallons})(128 \text{ oz/gal})/(6 \text{ oz per cup}) = 32$ extra cups are pure profit. This will result in an additional profit of $32(\$2.00) = \64.00 .

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