MATHCOUNTS® Problem of the Week Archive

Worth the Weight – December 5, 2022

Problems & Solutions

Margo has some coins consisting of only pennies and nickels. These coins have a combined weight of 1500 g that is evenly distributed between the two types of coins. If each penny weighs 2.5 g and each nickel weighs 5 g, what is the total value of Margo's coins?

*We know that the total weight of Margo's coins is 1500 g, and the weight is evenly divided between the pennies and nickels. That means Margo has 750 g of pennies and 750 g of nickels. Since each penny has a weight of 2.5 g, Margo has a total of 750 ÷ 2.5 = 300 pennies, with a value of 300 × 0.01 = $3.00. Similarly, since each nickel weighs 5 g, Margo has a total of 750 ÷ 5 = 150 nickels with a value of 150 × 0.05 = $7.50. The total value of Margo's coins is $3.00 + $7.50 = $**10.50**.*

One common misconception is that a penny is primarily composed of copper, based on appearance. In fact, a penny is 2.5% copper and 97.5% zinc. One might also think that a nickel is composed of mostly nickel. However, a nickel is 25% nickel and 75% copper. What percent of the total weight of Margo's coins is copper? Express your answer as a percent to the nearest hundredth.

From the previous problem, we know that Margo's pennies have a total weight of 750 g. If 2.5% of that weight is copper, that's a total of 750 × 0.025 = 18.75 g of copper. We also know that Margo's nickels have a total weight of 750 g. If 75% of that weight is copper, that's a total of 750 × 0.75 = 562.5 g of copper. That means the total weight of the copper in Margo's coins is 18.75 + 562.5 = 581.25 g, which is 581.25/1500 = 0.3875 = ***38.75****% of the total weight of Margo's coins.*

Constance has some coins, also consisting only of pennies and nickels. Her coins also have a combined weight of 1500 g, but Constance has an equal number of pennies and nickels. What is the absolute difference between the total value of Margo's coins and the total value of Constance's coins?

*Suppose Constance has n nickels and p pennies. We are told that n = p. From the previous problem, we know that each penny weighs 2.5 g, and each nickel weighs 5 g. Because the total weight of Constance's coins is 1500 g, we have the following equation: 2.5p + 5n = 1500. Since n = p, we can rewrite the equation as 2.5n + 5n = 1500. Solving for n, we get 7.5n = 1500 → n = 200. So, Constance has a total of 200 pennies and 200 nickels. The value of Constance's pennies is 200 × 0.01 = $2.00, and the value of her nickels is 200 × 0.05 = $10.00. That means Constance has coins with a total value of $2.00 + $10.00 = $12.00. Therefore, the difference between the total value of Margo's coins and the total value of Constance's coins is $12.00 – $10.50 = $**1.50**.*

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