

# MATHCOUNTS® Problem of the Week Archive

## Travel Rewards – July 24, 2023

### Problems & Solutions

Phoenix earns hotel rewards points whenever she stays at a participating hotel. She can then use these points to pay for future hotel stays. For instance, a stay that costs \$500 could be paid for using 500 of her accumulated points. Phoenix does not earn rewards points for stays purchased with rewards points.

For a stay of less than 5 nights that costs Phoenix \$548, she earns 548 points. If Phoenix's hotel stay is more than 5 nights, she earns double points. So, for a stay of 7 nights that costs Phoenix \$720, she would earn 1440 points.

In June, Phoenix used rewards points to fully pay for a \$798 hotel stay. During that same month she stayed at a participating hotel for 6 nights which cost her \$844. What was Phoenix's net gain in rewards points during the month of June?

*Phoenix used 798 points, which we can write as  $-798$ . For her 6-night stay, she earned double points, so her \$844 stay earned her  $844 \times 2 = 1688$  points, which we can write as  $+1688$ . That means her net gain in rewards points for June was  $-798 + 1688 = 890$  points.*

Ariel participates in a similar rewards program with her favorite airline. She earns rewards points equivalent to the miles she flies that can be used to buy airline tickets. In addition to earning points for flying, Ariel is awarded points for purchases made with her credit card, where each dollar spent earns 1 point. Ariel only uses her credit card to pay bills and has it set up to automatically charge a total of \$970 each month.

At the end of June, Ariel had a total of 20,250 rewards points. The next flight Ariel plans to take is for her vacation to Cancun. After how many months will Ariel have enough rewards points to pay for the flight to Cancun, which requires 28,500 points?

*Since Ariel doesn't plan to fly anywhere before her vacation, she will only be awarded rewards points for purchases made with her credit card. At the end of June, Ariel had 20,250 points, which means she needs an additional  $28,500 - 20,250 = 8250$  points. If she charges \$970 each month, she will earn 970 points each month. Since  $8250 \div 970 \approx 8.5$ , we know that after 8 months, she still will be a little short. Therefore, Ariel will have accumulated enough points to purchase the airline ticket for her flight to Cancun after 9 months.*

Saxon participates in the same rewards program as Ariel. He is purchasing an airline ticket for his Bermuda vacation, but his accumulated 18,500 rewards points are not enough to purchase his plane ticket, which requires 24,000 rewards points. The airline will allow Saxon to purchase his ticket using both rewards points and money. After applying rewards points, the airline determines what percent of the total points required is left to be paid and charges a dollar amount equivalent to that percent of the actual ticket cost. If the flight to Bermuda actually costs \$340, how much money will Saxon need to pay for his plane ticket after applying all of his accumulated points?

*Since Saxon's ticket requires 24,000 points, after he applies all of his accumulated points, he will still be short  $24,000 - 18,500 = 5500$  points. The amount Saxon will need to pay for his plane ticket is  $340(5500/24,000) \approx 77.916 = \$77.92$ .*

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### ***Problems***

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