MATHCOUNTS® Problem of the Week Archive

Valentine's Day Treats – February 12, 2024

Problems

According to "A History of Valentine's Day Cards in America" by T.M. Wilson, in 1847 Esther Howland was the first to mass-produce Valentine's Day cards. She made them out of lace, paint and expensive paper, and each one was individually written by a skilled calligrapher. The average card sold for $7.50 while others cost as much as $50. If 10 cents in 1847 would be equivalent to $3.74 today, how much would the average card and most expensive card have cost today?

*Since we are given a ratio of 10 cents to $3.74, we can set up 2 more ratios to find what $7.50 and $50 would convert to. Just remember to convert 10 cents to $0.10 before beginning. An extended proportion would say that 0.10/3.74 = 7.50/x = 50/y. By cross-multiplying and solving for x and y, we would see people were spending what would be equivalent to $**280.50** and $**1,870** for us today!*

Kelly decided to celebrate Valentine's Day for an entire month. She started giving her Valentine 1 candy heart on Jan. 14th, 2 candy hearts on Jan. 15th, 4 candy hearts on Jan. 16th, and continued doubling the number of hearts each day until Feb. 14th. If 200 candy hearts come in a bag, how many bags of candy hearts would Kelly need **just** for Feb. 14th?

*This is an exponential growth problem that shows how quickly an amount can grow when repeatedly doubled. The first day, she gave 1 candy. The second day, she gave 1 × 2 candies. The third day, she gave 1 × 2 × 2 candies. She will keep multiplying by 2 until she gets to the 32nd day. Therefore, the amount of candy she'll need **just** for Feb. 14th is 1 × 2^{31}. This is 2,147,483,648 pieces of candy. Dividing this by 200 for each bag of candy means she'll need **10,737,419** bags just to cover Valentine's Day!*

For Valentine's Day, Kevin wanted to send Mary Beth 11 balloons, since that was her favorite number. In the store, plain-colored balloons cost $0.75, multi-colored balloons cost $1.30, and extra-large balloons cost $1.50. How many different combinations of 11 balloons can Kevin buy if he only has $12.00?

*Making an orderly chart may be the best way to approach this problem. Start with buying as many of the extra-large balloons as possible, then methodically subtract an extra-large balloon, and so on. Though he can afford 8 extra-large balloons, he then could not afford 3 more to make the 11 balloons needed, So, the most extra-large balloons he can afford is 5 ($7.50), leaving him just enough to buy 6 plain-colored balloons ($4.50). Then, find possibilities with 4 extra-large balloons. Notice exchanging a multi-colored balloon for a plain-colored balloon raises the cost $0.55. This may help when determining possibilities and finding patterns. Eventually, you will find **24** possible combinations!*

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Join us next week, February 19 – 26, for Engineers Week 2024! Each weekday, we'll be posting an engineering activity or Problem of the Day to celebrate engineers. Learn more at www.mathcounts.org/eweek!