MATHCOUNTS® Problem of the Week Archive

Let It Snow! – December 6, 2021

Problems & Solutions

While snowstorms in Middle Town, USA routinely leave up to 5 feet of snow on the ground, the first winter snowstorm deposits, on average, 18.7 inches of snow. According to the public works department, the snow removal rate is directly proportional to the number of inches of fallen snow. For the town's fleet of snowplows to clear all the roads after a storm leaving 10 inches of fresh snow on the ground it takes 25 minutes. It takes one hour to clear the town's roads of 24 inches of freshly fallen snow. If the rate of snow removal remains constant, how many minutes will it take to clear all the roads in the town after the first winter snowstorm, assuming it deposits 18.7 inches of snow? Express your answer to the nearest minute.

To determine the time it will take to clear the roads of 18.7 inches of snow, we can set up a proportion using either of the two rates given since the rate of snow removal is constant. Let M represent the number of minutes to clear 18.7 inches of snow. Using the fact that 10 inches of snow is cleared in 25 minutes, we have 10/25 = 18.7/M. Cross-multiplying results in 10M = 25(18.7) → 10M = 467.5. Finally, dividing each side of the equation by 10 yields M = 46.75. Therefore, the roads in Middle Town, USA can be cleared after a snowfall of 18.7 inches in about ***47*** *minutes.*

After each snowstorm in Big City, USA, plows remove snow from 762 lane miles of road, which is equivalent to about 48,000,000 square feet. The snowfall total was 34.2 inches in Big City, USA last winter. Suppose every snowfall evenly blanketed all road surfaces. How many cubic feet of snow were plowed last winter in Big City, USA?

We are asked to determine the number of cubic feet, but the snowfall total is given as 34.2 inches. Dividing by 12, we see that this is equivalent to 2.85 feet. So, the volume of snow plowed last winter in Big City, USA is 48,000,000(2.85) = ***136,800,000*** *cubic feet.*

Now suppose that 1 cubic foot of snow weighs about 15 pounds. Based on this information and the last problem, approximately how many tons of snow were plowed in Big City, USA last winter?

In the previous problem, we determined that there were a total of 136,800,000 cubic feet of snow plowed. That is equivalent to 136,800,000(15) = 2,052,000,000 pounds of snow. Recall that there are 2000 pounds in 1 ton. Dividing by 2000, we see that there were 2,052,000,000/2000 = ***1,026,000*** *tons of snow plowed in Big City, USA last winter.*

Twin brothers, Kenny and Isaiah, live in Small Town, USA where it snows an average of 55 days each winter. They take turns shoveling the walkway after each snowfall. Kenny can shovel the walkway in 22 minutes, while it takes Isaiah only 14 minutes to shovel the same walkway. How many minutes will it take to shovel the walkway if they work together? Express your answer as a decimal to the nearest tenth.

*If Kenny can shovel the walkway in 22 minutes, he can complete 1/22 of the task in 1 minute. Similarly, if it takes Isaiah 14 minutes to shovel the walkway, he can complete 1/14 of the job in 1 minute. Let X represent the amount of time it will take Kenny and Isaiah to shovel the walkway together. Together, they can complete 1/X of the job in one minute. So, 1/22 + 1/14 = 1/X. Simplifying the left side of the equation, we have 11/154 + 7/154 = 1/X → 18/154 = 1/X → 9/77 = 1/X. Cross-multiplying yields 9X = 77. Dividing each side of the equation by 9 gives us X = 77/9 = 8.$\overline{55}$. So, together, Kenny and Isaiah can shovel the walkway in **8.6** minutes.*

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