

MATHCOUNTS[®] Problem of the Week Archive

Get Out Your Shovels – December 14, 2020

Problems & Solutions

For many of us, the thought of snow brings hopes of snow days, sledding or skiing. For others it means traffic jams and shoveling. Unfortunately for Roger's father, he is in this second category. It usually takes Roger's father 35 minutes to get to work. However, after the snowstorm it took him an hour and 15 minutes to get to work. What was the percent increase in his commute time to work? Express your answer to the nearest whole number.

*It usually takes 35 minutes to commute to work, but on this particular day, it took 1 hour and 15 minutes, which is 75 minutes. This is 40 more minutes than it usually takes. Adding just 35 minutes to his original commute would have been an increase of 100%, so we can see that the increase of 40 minutes will be a little more than 100%. The question we need to answer is, "40 is what percent of 35?" We can calculate that it is $(40 \div 35) \times 100 \approx 1.14 \times 100 = 114\%$, to the nearest percent. His commute was increased by **114%** due to the snow.*

While his dad was at work, Roger and his brother were asked to shovel the driveway. It took the two of them three hours to complete the job together. However, because Roger is older and stronger, he shoveled twice as much of the driveway as his brother. If Roger had worked alone and maintained his same pace, how many hours would it have taken him to do the entire job by himself? Express your answer as a decimal to the nearest tenth.

We know that Roger shoveled twice as much of the driveway as his brother. So, when they were finished, Roger had shoveled $\frac{2}{3}$ of the driveway and his brother had shoveled $\frac{1}{3}$. If Roger were working on his own, he would have to shovel another $\frac{1}{3}$ of the driveway. This is half of what he shoveled in 3 hours, so it would take him another 1.5 hours to finish the job. This is a total of $3 + 1.5 = 4.5$ hours to shovel the entire driveway on his own.

After shoveling the driveway, Roger and his brother decided to have fun in the snow and went sledding at a hill near their house. They estimated that the sledding path down the hill was about 40 yards long. Roger timed his brother's first trip down the hill, and it took him 5 seconds to go from the top to the bottom. Later that night, they wanted to figure out his brother's average speed in miles per hour. What was his average speed in miles per hour? Express your answer as a decimal to the nearest hundredth.

*We know that he went 40 yards in 5 seconds. Dividing both values by 5, we find that this is equivalent to going 8 yards in 1 second. Multiplying both by 60, this is 480 yards in 60 seconds or 480 yards in 1 minute. Multiplying again by 60, this is 28,800 yards in 60 minutes or 28,800 yards in 1 hour. Each yard is 3 feet, so 28,800 yards is $(28,800)(3) = 86,400$ feet. Now, we know he would go 86,400 feet in 1 hour, so his rate would be 86,400 feet per hour. Finally, there are 5280 feet in every mile. So, dividing 86,400 feet by 5280 gives 16.36 miles, to the nearest hundredth. This means that Roger's brother traveled at a rate of **16.36** miles per hour (mi/h).*

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