

# MATHCOUNTS<sup>®</sup> Problem of the Week Archive

## ***Fairy Tales, Nursery Rhymes and Spells – November 16, 2020***

### ***Problems & Solutions***

*November 9 – November 15 was Children’s Book Week! Here are some problems to celebrate.*

When I was going to St. Ives, I met a man with seven wives. Each wife had seven sacks and each sack had seven cats. How many legs were there in the group of people and cats that I encountered on my trip to St. Ives? Assume that no one in the group is missing any limbs.

*The man I met had 2 legs. There were seven wives, each with 2 legs, so  $7 \times 2 = 14$  legs. Each of the seven wives had seven sacks, and each sack had seven cats, so  $(7 \text{ wives}) \times (7 \text{ sacks}) \times (7 \text{ cats}) = 343$  cats. Each cat has 4 legs, so  $343 \times 4 = 1372$  legs. Adding together the number of human legs and cat legs, we get  $2 + 14 + 1372 = \mathbf{1388}$  legs.*

Most of us know the story of Cinderella. Cinderella has an evil stepmother who treats her like a servant. When the prince invites all of the eligible young women to the castle for a ball (and to look for a bride), Cinderella’s stepmother doesn’t let her go. Fortunately for Cinderella, she has a fairy godmother who swoops in and, with the wave of her wand, turns Cinderella’s rags into a ball gown and sends her off to meet the prince. At this point Cinderella’s evil stepsisters are already there and standing in line to greet the prince. How long, in minutes, did the first step-sister wait to meet the prince if, when the line formed,  $\frac{2}{3}$  of the line was in front of her, each greeting takes 20 seconds and there was a total 150 young women in line? Express your answer as a decimal to the nearest tenth.

*If  $\frac{2}{3}$  of the line was in front of the sisters,  $(\frac{2}{3}) \times 150 = 100$  young women were ahead of them. Since each greeting took 20 seconds, it took  $20 \times 100 = 2000$  seconds for the sisters to reach the front of the line. Therefore, the first stepsister waited  $2000 \div 60 \approx \mathbf{33.3}$  minutes, to the nearest tenth.*

When Cinderella’s fairy godmother sent her off to the ball to meet the prince, she had one stipulation: Cinderella had to leave by the stroke of midnight. By the time Cinderella got to the castle, moved through the crowd and found the prince, it was 10:30pm when she finally had her first dance with him. If each song lasted 3.5 minutes and they danced the rest of the evening, except for a 20-minute walk they took outside, how many songs did they dance to between 10:30pm and midnight?

*From 10:30pm to midnight, the prince and Cinderella had 90 minutes together. Having taken a 20-minute walk, they would have had  $90 - 20 = 70$  minutes left to dance. At 3.5 minutes per song, they were able to dance to  $70 \div 3.5 = \mathbf{20}$  songs.*

When the students in Harry Potter’s Spells class at Hogwarts started the year, they knew an average of 10 spells each. Hermione knew the most, 19, and Ron knew the least, 7. If Harry knew 12 spells, what

was the average number of spells that each of Hermione, Ron and Harry's 21 classmates knew at the start of the year? Express your answer as a decimal to the nearest hundredth.

*Since we know that the Spells class knew an average of 10 spells each and there were 24 students in total (21 + Hermione + Ron + Harry), we can say that (sum of the spells known by each individual student)  $\div$  24 = 10, and therefore, this sum =  $10 \times 24 = 240$ . Now, we can subtract the number of spells known by Hermione, Ron and Harry ( $19 + 7 + 12 = 38$  spells) to get  $240 - 38 = 202$  spells known by the other students. Finally, to find the average number of spells known by each of the other students, we can simply divide  $202 \div 21$  to get an average of **9.62** spells per student, to the nearest hundredth.*

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