

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

## Hot Air Balloons – November 27, 2023

### Problems & Solutions

Melrose's hot air balloon is a sphere of diameter 100 feet. How many cubic feet of air will Melrose's hot air balloon hold when completely filled? Express your answer as a decimal to the nearest tenth.

*The formula for the volume of a sphere is  $(4/3) \times \pi \times r^3$ . Since we know the diameter of the balloon is 100 feet and the radius  $r$  is half the diameter, it follows that the radius is 50 feet. Substituting, we see that, completely filled, Melrose's balloon will hold  $(4/3) \times \pi \times (50)^3 = 523,598.8$  ft<sup>3</sup> of air.*

Coco takes a hot air balloon trip over part of the Alleghany Mountains with her dad. They travel at an average speed of 40 mi/h for 120 miles before they land to take a 45-minute lunch break. After lunch, they fly 175 miles at an average speed of 35 mi/h. Including the lunch break, how many hours was their entire trip? Express your answer as a decimal to the nearest hundredth.

*To solve this problem, we will be using the equation distance = rate  $\times$  time. We'll let  $T_1$  be the number of hours it took them to travel 120 miles at an average speed of 40 mi/h. So, we have  $120 = 40T_1 \rightarrow T_1 = 120/40 = 3$  hours. We'll let  $T_2$  be the number of hours it took them to travel 175 miles at an average speed of 35 mi/h. So, we have  $175 = 35T_2 \rightarrow T_2 = 5$  hours. The lunch break was 45 minutes =  $45/60 = 0.75$  hours. Therefore, the entire trip, including the lunch break, took  $3 + 0.75 + 5 = 8.75$  hours.*

Rhonda found that 10 super-sized helium balloons provide just enough lift to carry her 3-pound toy. At that same rate, how many super-sized balloons would be required to carry Rhonda's 81-pound Alaskan malamute?

*If 10 balloons lift exactly 3 pounds, then each balloon lifts the equivalent of  $3/10$  pound. Dividing 81 pounds by  $3/10$  pound, we see that the number of balloons required to lift her dog is  $81/(3/10) = 81 \times 10/3 = 810/3 = 270$  balloons.*

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