MATHCOUNTS® Problem of the Week Archive

It's Marathon Season – November 5, 2001

Problems & Solutions

It's marathon season! In October, the 26th annual Marine Corps Marathon and the Chicago Marathon were scheduled, and the first weekend in November featured the New York City Marathon. That's a lot of people all trying to run 26.2 miles, and a lot of spectators trying to watch those runners! I attended the Marine Corps Marathon (MCM) to watch my husband attempt the task. I was able to see him at the 8-mile marker at 9:53 a.m. and then hurried over to mile 15.3, hoping to see him as he passed. If he was running at a pace of 9 ½ minutes per mile, at what time should I have seen him at mile 15.3, to the nearest second?

We know the distance that he covered (15.3 – 8 = 7.3 miles) and the rate at which he was running (9.5 minutes per mile). Therefore, if it took 9.5 minutes for every mile, that's 9.5 × 7.3 = 69.35 minutes. We are not finished, though – 69.35 minutes are equal to 1 hour and 9.35 minutes. How many seconds is .35 of a minute (or 60 seconds)? We can figure this out by doing .35 × 60 = 21 seconds. So, we should expect to see him 1 hour, 9 minutes and 21 seconds after 9:53 a.m. That would be at ***11:02:21 a.m.***

The winner of the MCM was running at an average speed of 10.59 miles per hour and finished in 2:28:28 (2 hours, 28 minutes, 28 seconds). The winner of the wheelchair division finished in 1:58:17. What was his average rate of speed, in miles per hour to the nearest tenth?

This is a rate × time = distance problem. We know his distance was 26.2 miles and his time was 1 hour, 58 minutes and 17 seconds. If we are trying to find his rate in miles per hour, we need to change his time to hours. We're going to have to do the reverse of what we did in the first problem. Let's start with the seconds: 17 seconds is 17 ÷ 60 = .283 minutes. Then, 58.283 minutes is 58.283 ÷ 60 = .971 hours. So, his complete time was 1.971 hours. Now, to find his rate, we will do distance ÷ time = 26.2 ÷ 1.971 = ***13.3*** *miles per hour, to the nearest tenth.*

Most runners don't run the second half of the marathon at the same speed that they were able to run the first half. If a marathoner goes out too quickly and runs the first half at a speed of 6.95 miles per hour, but can only run the second half at 5.37 miles per hour, what was her average speed, in miles per hour to the nearest hundredth, over the entire marathon?

It may appear that you just have to average the two rates given, but that is not the case. She will not be doing the two rates for the same amount of time, so you can't just average them. Notice her average rate for the entire race should be her distance for the entire rice divided by her time for the entire race. We know her distance is 26.2 miles, but we don't know how long it took her. We can figure this out, though. It took her 13.1 miles ÷ 6.95 mph = 1.885 hours to do the first half and 13.1 miles ÷ 5.37 mph = 2.439 hours to do the second half. That is a total of 1.885 + 2.439 = 4.324 hours to run the entire race. Her average rate for the entire race is equal to 26.2 miles ÷ 4.324 hours = ***6.06*** *miles per hour.*

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