Distance and Rate

Richard Yang

June 2022

1 Problems

1. Julian and Joshua each maintain a constant speed as they run laps around a 400-meter track. In the time it takes Julian to complete two laps, Joshua completes three laps. Julian runs each mile in 12 minutes. How many minutes does it take Joshua to run exactly one mile? (2007 MATHCOUNTS State Countdown)

2. Rico can run 5 miles in the same amount of time that Donna can run 3 miles. Rico runs a rate 4 miles per hour faster than Donna. At that rate, what is the number of miles that Rico runs in 1 hour and 30 minutes? (Alcumus)

3. Cassandra sets her watch to the correct time at noon. At the actual time of 1:00 PM, she notices that her watch reads 12:57 and 36 seconds. Assuming that her watch loses time at a constant rate, what will be the actual time when her watch first reads 10:00 PM? (2003 AMC 12)

4. One complete lap around a particular circular track is 400 meters. Jun and Quan each start running at the starting line and run around the track; Jun runs clockwise at 3 meters per second, and Quan runs counterclockwise at 5 meters per second. When they meet for the sixth time after starting, they stop and both walk back together along the track to the starting line. What is the shortest distance they could walk back on the track together? (2006 MATHCOUNTS State Target)

5. At Pizza Perfect, Ron and Harold make pizza crusts. When they work separately Ron finishes the job of making 100 crusts 1.2 hours before Harold finishes the same job. When they work together they finish making 100 crusts in 1.8 hours. How many hours, to the nearest tenth of an hour, does it take Ron working alone to make 100 crusts?

6. The students in Mrs. Reed's English class are reading the same 760-page novel. Three friends, Alice, Bob and Chandra, are in the class. Alice reads a page in 20 seconds, Bob reads a page in 45 seconds and Chandra reads a page in 30 seconds.

Before Chandra and Bob start reading, Alice says she would like to team read with them. If they divide the book into three sections so that each reads for the same length of time, how many seconds will each have to read? (2006 AMC 8)

7. Yan is somewhere between his home and the stadium. To get to the stadium he can walk directly to the stadium, or else he can walk home and then ride his bicycle to the stadium. He rides 7 times as fast as he walks, and both choices require the same amount of time. What is the ratio of Yan's distance from his home to his distance from the stadium? (2007 AMC 10/12)

8. At 9:00 am, an empty water tank begins to be filled with water flowing through a hose at a rate of five gallons per minute. Seven hours later, water flowing through a second hose also starts to fill the tank at a rate of eight gallons per minute. Some time later, the first hose is turned off but the second hose continues to be used to fill the tank. At midnight the 7740-gallon tank is finally full. At what time was the first hose turned off? (MATHCOUNTS)

9. Two trains are approaching one another from opposite directions on parallel tracks. Each train is 150 ft long, but one of the trains is moving at 50 ft/sec, while the other is traveling at only 30 ft/sec. How many seconds elapse from the time the trains first begin to overlap to the time they have completely passed one another?

10. Wilma and Betty ran a 100-meter race at top speed, and Wilma finished when Betty had 10 meters to go. They decided to run again, but this time Wilma gave Betty an advantage. Wilma's starting point was 10 meters behind the original starting point. Given that Wilma and Betty run at the same speeds as the previous race, how many meters will Betty be from the finish line when Wilma crosses it? (MATHCOUNTS)