
MOTION PROBLEMS – TWO-PART JOURNEY

A limousine traveled at 29 mph for the first part of a 540-mile trip, and then increased its speed to 53 mph for the rest of the trip. How many hours were traveled at each rate if the total trip took 12 hours?



Solution: The rates for each part of the trip are given, so just put them in the table in the right places. Let x be the travel time for the first part of the trip and let y be the travel time for the second part of the trip. Finally, the Distance column is the product of the Rate and Time columns.

	Rate $\times$ Time = Distance		
1st part	29	x	$29x$
2nd part	53	y	$53y$

The total travel is given to be 12 hours. Therefore,

$$x + y = 12$$

Since the total distance traveled was 540 miles, adding the distance of the 1st part of the trip plus the distance of the 2nd part of the trip should give a total of 540:

$$29x + 53y = 540$$

Solving the first equation for y gives $y = 12 - x$. Substituting $12 - x$ for y in the second equation gives:

$$\begin{aligned}
& 29x + 53(12 - x) = 540 \\
\Rightarrow & 29x + 636 - 53x = 540 && \text{(distribute)} \\
\Rightarrow & -24x + 636 = 540 && \text{(combine like terms)} \\
\Rightarrow & -24x = -96 && \text{(subtract 636)} \\
\Rightarrow & \underline{x = 4}
\end{aligned}$$

This means that the first part of the limo trip took 4 hours. Using the equation $y = 12 - x$, we calculate the time for the rest of the trip as $y = 12 - x = 12 - 4 = 8$. In short,

4 hours at 29 mph and 8 hours at 53 mph

Homework

1. A 1096-mi trip took a total of 16 hours. The speed was 71 mph for the first part of the trip, and then decreased to 67 mph for the rest of the trip. How many hours were traveled at each speed?
2. A 730-mi trip took a total of 11 hours. The speed was 68 mph for the first part of the trip, and then decreased to 59 mph for the rest of the trip. How many hours were traveled at each speed?
3. A 664-mi trip took a total of 12 hours. The speed was 30 mph for the first part of the trip, and then increased to 68 mph for the rest of the trip. How many hours were traveled at each speed?
4. A 489-mi trip took a total of 9 hours. The speed was 45 mph for the first part of the trip, and then increased to 59 mph for the rest of the trip. How many hours were traveled at each speed?
5. A 556-mi trip took a total of 14 hours. The speed was 38 mph for the first part of the trip, and then increased to 42 mph for the rest of the trip. How many hours were traveled at each speed?

Solutions

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|--------------------------|-------------------------|-------------------------|
| 1. 6 hrs & 10 hrs | 2. 9 hrs & 2 hrs | 3. 4 hrs & 8 hrs |
| 4. 3 hrs & 6 hrs | 5. 8 hrs & 6 hrs | |