
MOTION PROBLEMS – ROUND TRIP

It takes a helicopter a total of 13 hours to travel from the mountain to the valley at a speed of 30 mph and return at a speed of 35 mph. How long does it take to get from the mountain to the valley?



Solution: We'll let x represent the time it takes to go from the mountain to the valley (since this is what's being asked for). Let's also choose y to stand for the time it takes to return from the valley to the mountain. The two rates (speeds) are given, and we know that each distance is the product of the rate and the time. So here's the table:

	Rate $\times$ Time = Distance		
to valley	30	x	$30x$
to mtn	35	y	$35y$

Since the total travel time is 13 hours, we get our first equation:

$$x + y = 13 \quad \text{[Equation 1]}$$

Now what about the distances, $30x$ and $35y$? Wouldn't you agree that the distance the mountain to the valley is the same as the distance the valley to the mountain? That is, $30x$ and $35y$ must be equal:

$$30x = 35y \quad \text{[Equation 2]}$$

To solve this system of two equations in two unknowns, let's take Equation 1 and solve it for y :

$$x + y = 13 \quad \text{(Equation 1)}$$

$$\Rightarrow y = 13 - x \quad (\text{subtract } x \text{ each side})$$

We now replace the variable y in Equation 2 with the result just obtained:

$$30x = 35(13 - x)$$

$$\Rightarrow 30x = 455 - 35x \quad (\text{distribute})$$

$$\Rightarrow 65x = 455 \quad (\text{add } 35x \text{ to each side})$$

$$\Rightarrow \underline{x = 7} \quad (\text{divide each side by } 65)$$

Now, what did x represent? Go back to the table and see that x represented the travel time the mountain to the valley. Since this is exactly what was being asked for in the problem, we're done.

It takes 7 hours to travel from the mountain to the valley.

Homework

1. A helicopter traveled the hospital to the battlefield at a speed of 22 mph and returned at a speed of 44 mph. If the entire trip took 18 hours, find the travel times to and the battlefield.
2. A hang glider traveled the oceanside to the mountaintop at a speed of 18 mph and returned at a speed of 21 mph. If the entire trip took 13 hours, find the travel times to and the mountaintop.
3. A helicopter traveled the hospital to the battlefield at a speed of 36 mph and returned at a speed of 24 mph. If the entire trip took 20 hours, find the travel times to and the battlefield.
4. A tractor traveled the wheat field to the chicken coop at a speed of 27 mph and returned at a speed of 36 mph. If the entire trip took 21 hours, find the travel times to and the chicken coop.

5. A hang glider traveled the oceanside to the mountaintop at a speed of 34 mph and returned at a speed of 51 mph. If the entire trip took 15 hours, find the travel times to and the mountaintop.

Solutions

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| 1. 12 hrs & 6 hrs | 2. 7 hrs & 6 hrs | 3. 8 hrs & 12 hrs |
| 4. 12 hrs & 9 hrs | 5. 9 hrs & 6 hrs | |