
MOTION PROBLEMS: SAME DIRECTION

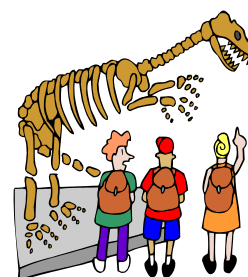
□ INTRODUCTION

Homework

1. Mutt and Jeff leave the mall at the same time and head in the same direction. Jeff's speed is 9 mph more than 6 times Mutt's speed. Four hours later Jeff is 1036 miles ahead of Mutt. If d_1 is the distance Mutt traveled, and if d_2 is the distance Jeff traveled, write an appropriate equation.

□ SAME DIRECTION

EXAMPLE 1: Six hours after Mary and Moe leave the museum at the same time and head in the same direction, Moe is 252 miles ahead of Mary. If Moe's speed is 8 mph less than 3 times Mary's speed, find the speeds of Mary and Moe.



Solution: Mary and Moe left the museum at the same time and each traveled for 6 hours, so both times in the table must be 6. Since the rates are unknown, we let x represent Mary's speed and let y represent Moe's speed.

| | Rate × Time = Distance | | |
|------|-------------------------------|---|------|
| Mary | x | 6 | $6x$ |
| Moe | y | 6 | $6y$ |

First, we need an equation relating x and y . The phrase “Moe’s speed is 8 mph less than 3 times Mary’s speed” translates to

$$y = 3x - 8 \quad \text{[First equation]}$$

Now, according to the table, Mary traveled $6x$ miles, while Moe traveled $6y$ miles. The problem says that at the end of the 6 hours, Moe is 252 miles ahead of Mary. This means that Moe’s distance ($6y$) is 252 miles more than Mary’s distance ($6x$), which translates into our second equation:

$$6y = 6x + 252 \quad \text{[Second equation]}$$

Substituting the first equation into the second equation gives us

$$\begin{aligned} 6(3x - 8) &= 6x + 252 \\ \Rightarrow 18x - 48 &= 6x + 252 && \text{(distribute)} \\ \Rightarrow 12x &= 300 && \text{(subtract } 6x \text{ and add } 48) \\ \Rightarrow \underline{x = 25} &&& \text{(divide by } 12) \end{aligned}$$

which implies that Moe’s rate is $y = 3x - 8 = 3(\mathbf{25}) - 8 = 67$.

Mary’s speed was 25 mph and
Moe’s speed was 67 mph.

Homework

2. Moe and Curly leave the airport at the same time and head in the same direction. Curly's speed is 8 mph less than 3 times Moe's

speed. Five hours later Curly is 430 miles ahead of Moe. Find the speeds of Moe and Curly.

3. Sally and Maria leave the mall at the same time and head in the same direction. Maria's speed is 6 mph less than 2 times Sally's speed. Ten hours later Maria is 410 miles ahead of Sally. Find the speeds of Sally and Maria.

4. Lucy and Ethyl leave the mall at the same time and head in the same direction. Ethyl's speed is 4 mph more than 4 times Lucy's speed. Four hours later Ethyl is 604 miles ahead of Lucy. Find the speeds of Lucy and Ethyl.



5. George and Gracie leave the stadium at the same time and head in the same direction. Gracie's speed is 3 mph less than 4 times George's speed. Eight hours later Gracie is 1080 miles ahead of George. Find the speeds of George and Gracie.
6. Mutt and Jeff leave the stadium at the same time and head in the same direction. Jeff's speed is 8 mph less than 3 times Mutt's speed. Ten hours later Jeff is 660 miles ahead of Mutt. Find the speeds of Mutt and Jeff.

Solutions

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|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------|
| <p>1. $d_1 + 1036 = d_2$ OR $d_2 - d_1 = 1036$ OR $d_2 - 1036 = d_1$</p> <p>2. 47 mph & 133 mph</p> <p>4. 49 mph & 200 mph</p> <p>6. 37 mph & 103 mph</p> | <p>3. 47 mph & 88 mph</p> <p>5. 46 mph & 181 mph</p> |
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