Another Passing Train Puzzle

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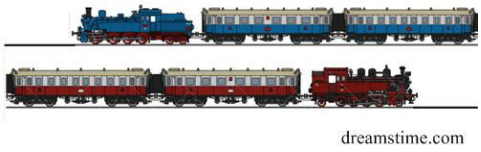

This is another take on the passing train type puzzle from the Moscow Puzzles ([1]).

A train moving 45 miles per hour meets and is passed by a train moving 36 miles per hour. A passenger in the first train sees the second train take 6 seconds to pass him. How long is the second train?

My Solution

Let v_1 = 45 mph be the speed of the first train and v_2 = = 36 mph be the speed of the second. Let L be the length of the second train. Then from the space-time diagram (Figure 1) we see that the length is given by

$L = v_1\ 6\ \text{sec} + v_2\ 6\ \text{sec}$

$= (45/3600\ \text{mi/sec} + 36/3600\ \text{mi/sec})\ 6\ \text{sec}$

$= 81 \times 5280/3600\ \text{ft/sec} \times 6\ \text{sec}$

$= 81 \times 5280/(3 \times 200)\ \text{ft/sec}$

$= 27 \times 26.4\ \text{ft}$

$= 712.8\ \text{ft}$

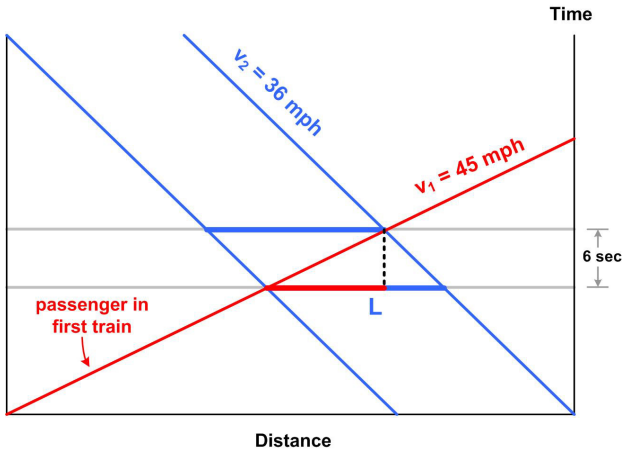

Figure 1

Moscow Puzzles Solution

This solution is virtually the same with a slight twist in perspective.

The speed of the passenger in the first train, in relation to the movement of the second train, is 45 + 36 = 81 miles per hour, or:

$$(5280 \times 81)/(60 \times 60) = 118.8 \text{ feet per second.}$$

Therefore, the length of the second train is $6 \times 118.8 = 712.8$ feet.

References

[1] Kordemsky, Boris A., *The Moscow Puzzles, 359 Mathematical Recreations,* (1972) edited with introduction by Martin Gardner, trans. Albert Perry, Dover Publications, Garden City, New York, 1992. Problem 82.