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Rectilinear Motion Problems And Solutions

Problem#3
Train's relative motion with kilometer marks

Abstract:
A group of students were subjected to monitor the velocity profile of a train. They were taking readings of velocity and time at the kilometer marks. A bunch of information was gathered and it was required to find out the pattern for the increment of velocity. Combining all the information, it was possible to obtain a velocity graph and total time taken while passing by three kilometer marks which make a total distance of 2 kilometers.

Problem Statement:
12-30 As a train accelerates uniformly, it passes successive kilometer marks while travelling at velocities of 2 m/s and 10 m/s. Determine the train's velocity when it passes the next kilometer mark and the time it takes to travel the 2 km distance.

Numerical Solution:

Motion A to B
 $V = 2 \text{ m/s}$
 $V = 10 \text{ m/s}$
 $S = 1 \text{ km}$ or 1000 m
Using Newton's equation of Motion,
 $2as = v^2 - u^2$
 $a = \frac{v^2 - u^2}{2s}$
 $a = 0.048 \text{ m/s}^2$