Motion in 1D and 2D

Date: 27/07/2022

Subject: Physics | Class: Standard XI

Topic : Relative motion | Time: 00:20 hrs

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1. A train travels at $60\ \mathrm{m/s}$ to the east with respect to the ground. A businessman on the train runs at $5\ \mathrm{m/s}$ to the west with respect to the train. Find the velocity of the man with respect to the ground.

   A. $5\ \mathrm{m/s}$

   B. $55\ \mathrm{m/s}$

   C. $60\ \mathrm{m/s}$

   D. $65\ \mathrm{m/s}$

2. Two trains are moving eastward with velocities $10\ \mathrm{ms^{-1}}$ and $15\ \mathrm{ms^{-1}}$ on parallel tracks. Calculate the relative velocity of the slow train w.r.t. the fast train.

   A. $5\ \mathrm{ms^{-1}}$ towards west.

   B. $5\ \mathrm{ms^{-1}}$ towards east.

   C. $25\ \mathrm{ms^{-1}}$ towards west.

   D. $25\ \mathrm{ms^{-1}}$ towards east.

3. Two cars start off to race with velocities $4\ \mathrm{m/s}$ and $2\ \mathrm{m/s}$ and travel in a straight line with uniform accelerations $1\ \mathrm{m/s^2}$ and $2\ \mathrm{m/s^2}$ respectively. If they reach the final point at the same time instant, then what is the length of the path?

   A. $12\ \mathrm{m}$

   B. $18\ \mathrm{m}$

   C. $24\ \mathrm{m}$

   D. $30\ \mathrm{m}$

4. In a bicycle competition called Tour De France, two riders; A and B are riding bicycles at constant acceleration of magnitude $1\ \mathrm{m/s^2}$ and $3\ \mathrm{m/s^2}$ respectively, in the North direction. Their initial speeds are $15\ \mathrm{m/s}$ and $10\ \mathrm{m/s}$ respectively while they were heading in the North direction. Find the separation between them after $t = 10\ \mathrm{s}$.

   A. $80\ \mathrm{m}$

   B. $95\ \mathrm{m}$

   C. $50\ \mathrm{m}$

   D. $125\ \mathrm{m}$

5. One body is dropped, while a second body is thrown downward with an initial velocity of $1\ \mathrm{m\ s^{-1}}$ simultaneously. The separation between these is $18\ \mathrm{m}$ after a time

   A. $4.5\ \mathrm{s}$

   B. $4.5\ \mathrm{s}$

   C. $18\ \mathrm{s}$

   D. $36\ \mathrm{s}$