Module 01

Introduction to Motion

QUESTIONS

Question 1 (LV1): Jake throws a ball at a 60° angle above the horizontal. The ball is caught by Jim. Draw a motion diagram of the ball.

Question 2 (LV2): What is the displacement of a cross-country skier if he begins at the start of a trail, skies 10 km and finishes back at the start of the trail?

Question 3 (LV3): During a 5K race, the velocities of runners are taken at the beginning and end of the 3rd km. One of the runners completes 3 km of the race in 15 min. What is her average velocity?

Question 4 (LV4): A car advertisement states that a certain car can accelerate from rest to 70 km/h in 7 seconds. Find the car's average acceleration.

Question 5 (LV5): A bicycle travels with a velocity $v_1 = 2$ m/s for 30 minutes in the positive x-direction. Then,it turns around and travels at $v_2 = -3$ m/s for 20 minutes. Calculate the average acceleration of the bicycle in the first 30 minutes and the average acceleration for the entire trip.

PROBLEMS

Problem 1 (LV5): Fig. 1 shows the first 5 points of a particle's motion. (a) Calculate the average velocity and average acceleration for each 1-s interval. (b) Complete the motion diagram showing the velocity and acceleration vectors.
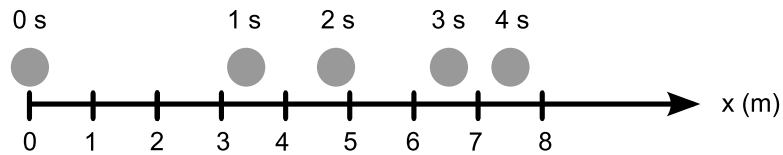

FIG. 1: Particle motion diagram

Problem 2 (LV2): A car travels on a semi-circular track that is exactly half of a circle of 200 m. (a) Find the displacement of the car between the initial and final point of the semi-circular track. (b) If the car travels at a constant speed of 50 km/h, calculate the average velocity between the start and end point on the circular track.