

Year 4 Math Assignment 24: Kinematics

Q1 A particle P travels in a straight line so that its distance, s m, from a fixed point O is given by $s = 2t + \frac{18}{t+1}$,

where t is the time in seconds measured from the start of the motion. Calculate

- (i) the initial acceleration of P ,
- (ii) the velocity of P when it is next at starting point,
- (iii) the value of t when the particle is instantaneously at rest,
- (iv) the total distance traveled in the first 5 seconds.

Q2 A particle moves in a straight line so that at time t seconds after passing through a fixed point, its velocity v ms⁻¹ is given by $v = 6 \cos 2t$. Find

- (i) the two smallest positive values of t for which the particle is at instantaneous rest,
- (ii) the distance between the position of the particle at instantaneous rest corresponding to these two values of t .

Q3 A particle moves in a straight line so that, t seconds after passing a fixed point O on the straight line, its velocity v ms⁻¹ is given by $v = t^2 - 14t + 48$.

- (i) Find the minimum velocity,
- (ii) Find the values of t when the particle is instantaneously at rest,
- (iii) Find the distance travelled in the first 7 seconds.
- (iv) Show that the particle will not return to O .

Q4 A particle moves in a straight line so that its velocity after t seconds is v m/s, where $v = mt + nt^3$ where m, n are constants. Given that the acceleration is zero when $t = 2$ and that the distance traveled in the 3rd second is $2\frac{3}{4}$ metres, find the values of m and n .

Q5 A particle moves in a straight line so that t seconds after passing through O , its velocity, v ms⁻¹ is given by $v = t^2 - 8t + 7$. The particle comes to instantaneous rest, first at A and then at B . Find

- (i) an expression for the displacement, x m, of the particle from O at time t ,
- (ii) the distance AB ,
- (iii) the total distance travelled in the first 9 seconds after passing through O .

Given that C is the point at which the particle has zero acceleration, determine whether C is nearer to O or to B . Show your working clearly.