

Gold

A particle, P , moves along the x -axis. At time, t seconds, $t \geq 0$, the displacement, x metres, of P from the origin, O , is given by $x = \frac{1}{3}t^2(t^2 - 6t + 10)$.

a Show that P will never move along the negative x -axis. **(2 marks)**

Paula substitutes $t = 3$ into the expression for x and obtains an answer of 3. She states that the particle has moved a total distance of 3 m in the first three seconds of its motion.

b i Explain the mistake Paula has made.

ii Determine the distance the particle travels in the first three seconds of its motion. **(7 marks)**

Problem solving Set B

Bronze

A particle starts from a point, P , and moves in a straight line. At time, t seconds, after the beginning of its motion, the acceleration of the particle, a m s⁻², is given by $a = 5 - 2t$ for $t \geq 0$. When $t = 0$, $v = 6$ m s⁻¹. Find:

a the time when the particle is instantaneously at rest **(6 marks)**

b the displacement of the particle from P at that time. **(3 marks)**

Silver

A particle starts from rest and moves in a straight line from a point, P . At time, t seconds, after the beginning of its motion, the acceleration of the particle, a m s⁻², is given by $a = 9 - 6t$ for $0 \leq t \leq 3$. Find:

a the greatest speed of the particle **(6 marks)**

b the total distance travelled by the particle in the interval $0 \leq t \leq 3$. **(4 marks)**

Gold

A particle starts from rest and moves in a straight line from a point, P . At time, t seconds, after the beginning of its motion, the acceleration of the particle, a m s⁻², is given by $a = 26 - 12t$. Find:

a the total distance travelled by the particle in the first 5 seconds **(7 marks)**

b the time taken for the particle to return to P . **(5 marks)**