

Kinematics

Problems involving two vehicles

Example 4

Two particles A and B are traveling along a straight path PQ of length 20m. A leaves P, heading for Q, from rest with acceleration of 2ms^{-2} and at the same time B leaves Q, in the direction of P, from rest with a constant acceleration of 5ms^{-2} . Find how far from A the two particles collide?

Let the point of collision be x metres from P and hence $(20 - x)\text{m}$ from Q.

So for particle A: $u = 0$ $a = 2$ $t = T$ $s = x$

Using:

$$s = ut + \frac{1}{2}at^2$$

$$x = t^2 \quad (i)$$

So for particle B: $u = 0$ $a = 5$ $t = T$ $s =$

$20 - x$

Using

$$s = ut + \frac{1}{2}at^2$$

$$20 - x = 2.5t^2$$

Substituting (i) gives:

$$20 - t^2 = 2.5t^2$$

$$t = 2.39\text{sec}$$

Using (i) again:

$$x = 2.39^2$$

$$x = 5.71\text{m}$$