

# Solutionbank M1

Heinemann Modular Maths for Edexcel AS and A-level

## 5 Newton's laws of motion

### Exercise B, Question 16

#### Question:

A particle of mass 500 grams starts from rest at the point  $A$  which has position  $(4\mathbf{i} + 2\mathbf{j})$  m. The resultant force on the particle is  $(\mathbf{i} + 2\mathbf{j})$  N. Find the position vector of the particle after 3 seconds.

#### Solution:

$$m = 500 \text{ grams} = 0.5 \text{ kg}$$

$$\text{Newton's 2nd Law } \mathbf{i} + 2\mathbf{j} = 0.5 \times \mathbf{a}$$

$$\therefore \text{acceleration } \mathbf{a} = \frac{\mathbf{i} + 2\mathbf{j}}{0.5}$$

$$\mathbf{a} = 2\mathbf{i} + 4\mathbf{j} \text{ m s}^{-2}$$

$$\text{but } \mathbf{u} = 0\mathbf{i} + 0\mathbf{j}, \mathbf{r}_0 = 4\mathbf{i} + 2\mathbf{j}, t = 3$$

$$\therefore \mathbf{r} = \mathbf{u}t + \frac{1}{2}\mathbf{a}t^2 + \mathbf{r}_0$$

$$\mathbf{r} = (0\mathbf{i} + 0\mathbf{j}) \times 3 + \frac{1}{2}(2\mathbf{i} + 4\mathbf{j}) \times 3^2 + (4\mathbf{i} + 2\mathbf{j})$$

$$\text{gives } \mathbf{r} = 13\mathbf{i} + 20\mathbf{j} \text{ metres}$$

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