



Topic: Vectors

Chapter Reference: Mechanics 2, Chapter 8

8 minutes

1. A particle P moves with constant acceleration. At time $t = 0$ , the particle is at O and is moving with velocity $(2\mathbf{i} - 3\mathbf{j})\text{ms}^{-1}$ . At time $t = 2$ seconds, P is at the point A with position vector $(7\mathbf{i} - 10\mathbf{j})\text{m}$ .		
a. Show that the magnitude of the acceleration of $P$ is $2.5 \mathrm{ms}^{-2}$	(4	
t the instant when $P$ leaves the point $A$ , the acceleration of $P$ changes so that $P$ now moves with constant celeration $(4\mathbf{i} + 8.8\mathbf{j})\text{ms}^{-2}$		
At the instant when $P$ reaches the point $B$ , the direction of motion of $P$ is north east.		
(b) Find the time it takes for P to travel from A to B.	(4	
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## **Solutions**

1a.

$\mathbf{r} = \mathbf{u}\mathbf{t} + \frac{1}{2}\boldsymbol{a}t^2$	M1
$(7\mathbf{i} - 10\mathbf{j}) = 2(2\mathbf{i} - 3\mathbf{j}) + \frac{1}{2}a2^2$	M1
$\mathbf{a} = (1.5\mathbf{i} - 2\mathbf{j})$	M1
$\mathbf{a} = \sqrt{1.5^2 + (-2)^2} = 2.5 \mathrm{ms}^{-2}$	M1

1b.

$\mathbf{v} = \mathbf{u} + \mathbf{a}\mathbf{t}$	M1
$\mathbf{v} = (2\mathbf{i} - 3\mathbf{j}) + 2(1.5\mathbf{i} - 2\mathbf{j})$ $\mathbf{v} = (5\mathbf{i} - 7\mathbf{j})$	M1
$\mathbf{v} = (5\mathbf{i} - 7\mathbf{j}) + t(4\mathbf{i} + 8.8\mathbf{j})$ = $(5 + 4t)\mathbf{i} + (8.8t - 7)\mathbf{j}$	M1
(5+4t) = (8.8t-7) t = 2.5  s	M1

