

Vectors 2D SUVAT Example Question

SUVAT Equations

$$v = u + at$$

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

$$s = vt - \frac{1}{2}at^2$$

$$s = \frac{u+v}{2}t$$

$$v^2 = u^2 + 2as$$

$$\underline{v} = \underline{u} + \underline{a}t$$

$$\underline{s} = \underline{u}t + \frac{1}{2}\underline{a}t^2$$

$$\underline{s} = \underline{v}t - \frac{1}{2}\underline{a}t^2$$

$$\underline{s} = \frac{\underline{u} + \underline{v}}{2}t$$

$$\underline{v}^2 = \underline{u}^2 + 2\underline{a}s$$

6 The points A and B have position vectors $(3\mathbf{i} + 2\mathbf{j})$ metres and $(6\mathbf{i} - 4\mathbf{j})$ metres respectively. The vectors \mathbf{i} and \mathbf{j} are in a horizontal plane.

- (a) A particle moves from A to B with constant velocity $(\mathbf{i} - 2\mathbf{j}) \text{ m s}^{-1}$. Calculate the time that the particle takes to move from A to B . (3 marks)
- (b) The particle then moves from B to a point C with a constant acceleration of $2\mathbf{j} \text{ m s}^{-2}$. It takes 4 seconds to move from B to C .
- (i) Find the position vector of C . (4 marks)
- (ii) Find the distance AC . (2 marks)

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6(a)	$\mathbf{d} = 3\mathbf{i} - 6\mathbf{j}$ $3\mathbf{i} - 6\mathbf{j} = (\mathbf{i} - 2\mathbf{j})t$ $t = 3$	B1 M1 A1	3	Accept $\pm\mathbf{d}$ or displacements of 3, 6 shown on a diagram Or equivalent method for t Accept ratio of vectors leading directly to ± 3 CAO
(b)(i)	$\mathbf{r} = (\mathbf{i} - 2\mathbf{j}) \times 4 + \frac{1}{2} \times 2\mathbf{j} \times 16$ $+6\mathbf{i} - 4\mathbf{j}$ $= 10\mathbf{i} + 4\mathbf{j}$	M1 A1 M1 A1F	4	Full method for vector expression giving change in position For correct subs (gives $4\mathbf{i} + 8\mathbf{j}$) FT slip provided obtain vector expression ($\mathbf{u} = 0$ gives $6\mathbf{i} + 12\mathbf{j}$)
(ii)	$A(3,2) \quad C(10,4)$ $\mathbf{d} = 7\mathbf{i} + 2\mathbf{j}$ $ \mathbf{d} = \sqrt{7^2 + 2^2}$ $AC = \sqrt{53} = 7.28$	M1 A1F	2	Attempt to find vector \overline{AC} or \overline{CA} (using candidate's C) FT \mathbf{d} provided two non-zero components Accept $\sqrt{53}$
Total			9	