

| Question Number | Scheme   | Marks         |
|-----------------|--|---------------|
| 6.(a)           | $(4\mathbf{i} - 6\mathbf{j}) + (p\mathbf{i} + q\mathbf{j}) = (4 + p)\mathbf{i} + (q - 6)\mathbf{j}$  | M1            |
|                 | $\frac{(4+p)}{(q-6)} = \frac{2}{1} \text{ or } -\frac{2}{1} \text{ (or } \frac{1}{2} \text{ or } -\frac{1}{2})$  | DM1 A1        |
|                 | $2q - 12 = 4 + p$  |               |
|                 | $p - 2q = -16$ GIVEN ANSWER  | DM1 A1<br>(5) |
| (b)             | $q = 3 \Rightarrow p = -10$  | B1            |
|                 | <b>EITHER</b> $0.5\mathbf{a} = -6\mathbf{i} - 3\mathbf{j}$ <b>OR</b> $ \mathbf{R}  = \sqrt{(-6)^2 + (-3)^2}$   | M1            |
|                 | $\mathbf{a} = -12\mathbf{i} - 6\mathbf{j}$ $= \sqrt{45} \text{ oe}$  | A1            |
|                 | $ \mathbf{a}  = \sqrt{(-12)^2 + (-6)^2}$ $0.5a = \sqrt{45}$  | M1            |
|                 | $a = \sqrt{180} = 13.4\text{ms}^{-2}$ $a = \sqrt{180} = 13.4\text{ms}^{-2}$  | A1 (5)        |
| (c)             | e.g. $\tan \theta = \frac{12}{6} \Rightarrow \theta = 63.4^\circ$  | M1A1          |
|                 | Bearing $= 180^\circ + 63.4^\circ = 243^\circ$ (nearest degree)  | A1cao<br>(3)  |
|                 |  | (13)          |
|                 | <b>Notes for Qu 6</b>  |               |
|                 | <b>Allow column vectors throughout</b>   |               |
|                 | <b>6(a)</b><br>First M1 for adding the two forces, with <b>i</b> 's and <b>j</b> 's collected, seen or implied<br>Second DM1, dependent on first M1, for an equation in $p$ and $q$ only.<br>Allow $\frac{1}{2}$ or $-\frac{1}{2}$ or $-\frac{2}{1}$ instead of $\frac{2}{1}$<br>First A1 for a correct equation in any form<br>Third DM1, dependent on the second M1, for (at least) one <b>correct</b> intermediate line of working<br>Second A1 for correct <b>given answer</b> |               |
|                 | <b>6(b)</b><br>B1 for $p = -10$ seen or implied<br><br><b>EITHER</b><br>First M1 for use of $\mathbf{F} = 0.5\mathbf{a}$ with their <u>resultant force (must be a sum of the two forces)</u><br>First A1 for $\mathbf{a} = -12\mathbf{i} - 6\mathbf{j}$<br>Second M1 (independent) for finding magnitude of their <b>a</b><br>Second A1 for $\sqrt{180}$ oe or 13.4 or better  |               |