| Day 293 | A Level Maths: C Tier 10-a-day |
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| **1** The velocity of a ball is $(-4\mathbf{i} + 3\mathbf{j})$ m s$^{-1}$, where $\mathbf{i}$ and $\mathbf{j}$ are perpendicular unit vectors.<br>(a) Find the speed.<br>(b) Find the acute angle between the direction of motion and the line of $\mathbf{i}$. Give 1 d.p. | |
| **2** A line has equation $\mathbf{r} = \begin{pmatrix} -2 \\ 4 \\ 1 \end{pmatrix} + t\begin{pmatrix} 3 \\ 1 \\ -1 \end{pmatrix}$.<br>Show that the point $(-8, 2, 3)$ lies on the line. | |
| **3** Find the sum of the first 10 terms of the series $10 + 11 + 12 + 13 + ...$ | |
| **4** Find the gradient of the curve $y = \ln(2x + 2)$ at the point where $x = 2$. | |
| **5** The mean of 40 times (seconds) of the Class A is 43. The mean of 50 times (seconds) of the Class B is 52.<br>Find the mean of all 90 values. | |

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| **6** Express $3 \sin x + 4 \cos x$ in the form $R \cos(x - \alpha)$, where $R > 0$ and $0° < \alpha < 90°$.<br>Give $\alpha$ to 1 decimal place. | |
| **7** Sketch $y = \frac{6}{x + 4} + 1$.<br>Write down the equations of the asymptotes and the coordinates where the curve meets the axes. | |
| **8** A researcher wants to find out the views of the students at a college.<br>Give one advantage and one disadvantage of using systematic sampling. | |
| **9** A particle moves in a straight line. Its displacement from O at time t seconds is s metres, where $s = t^3 - 3t^2 + 6t$.<br>Find its velocity when $t = 3$. | |
| **10** Express $\frac{4x + 26}{(x + 5)(x + 2)}$ in partial fractions. | |