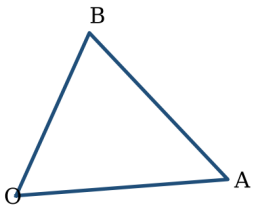
Day 224 **A Level Maths: B Tier 10-a-day**

1 In triangle OAB, OA = a and OB = b. M lies on AB with AM : MB = 3 : 2, and N lies on OB with ON : NB = 3 : 2.
Find OM and NM in terms of a and b.



2 The random variable X has E(X) = 5 and Var(X) = 3.
Find (a) E(2X + 2),
(b) Var(2X + 2), (c) $E(X^2)$.

3 Solve $2^{2x+2} = 102$, giving your answer to 3 s.f.

4 Find the term independent of x in the expansion of
$(4x - \frac{3}{x})^4$.

5 A particle moving in a straight line with constant acceleration increases its speed from 15 m s^{-1} to 21 m s^{-1} while covering 108 m.
Find (a) the acceleration, (b) the time taken.

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6 The equation $x^2 + 2kx + (k + 2) = 0$ has two distinct real roots. Find the possible values of k.	
7 A particle has velocity $(2\mathbf{i} - 4\mathbf{j})$ m s^{-1} at time t = 0 and moves with constant acceleration $(-2\mathbf{i} + 2\mathbf{j})$ m s^{-2}. Find its velocity and speed when t = 5.	
8 (a) Expand $(1 - 4x)^{-2}$ in ascending powers of x up to and including the term in x^3. (b) State the range of values of x for which the expansion is valid.	
9 Line l_1: $\mathbf{r} = \begin{pmatrix} 0 \\ -1 \\ -3 \end{pmatrix} + \lambda \begin{pmatrix} 0 \\ 1 \\ -2 \end{pmatrix}$. Line l_2: $\mathbf{r} = \begin{pmatrix} -6 \\ 2 \\ -7 \end{pmatrix} + \mu \begin{pmatrix} 3 \\ -2 \\ 3 \end{pmatrix}$. Show that l_1 and l_2 intersect and find the point.	
10 The scores on a test are normally distributed. P(X < 50) = 0.1587 and P(X > 70) = 0.1587. Find the mean and standard deviation (3 s.f.).	