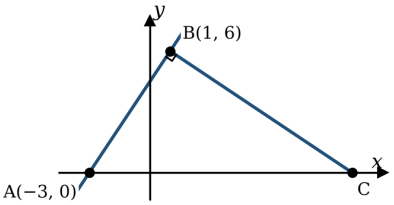
Day 40	A Level Maths: S Tier 10-a-day

1 15 recorded masses (grams) have mean 45 and standard deviation 4.
One value was recorded as 34 but should have been 26.
Find the correct mean and the correct standard deviation.

2 Find the exact value of

$$\int_1^e \frac{1}{x(\ln x + 2)}\,dx$$

3 In the diagram, line l_1 passes through A and B. Line l_2 is perpendicular to l_1 at B and meets the x-axis at C. Find the coordinates of C and the area of triangle ABC.



4 (a) Show that $\tan\theta + \cot\theta \equiv 2\,\text{cosec}\,2\theta$.
(b) Hence solve $\tan\theta + \cot\theta = 8$ for $0 \leq \theta < 360°$ (1 d.p.).

5 $g(x) = x^2 + 1$. Also $fg(x) = -2x^2 + 2$, where f is a linear function. (a) Find f(x).
(b) Solve $gf(x) = 5$.

Day 40	A Level Maths: S Tier 10-a-day
6 A train accelerates uniformly from rest at 1 m s^{-2} to a speed of V m s^{-1}, travels at this speed, then decelerates uniformly at 2.5 m s^{-2} to rest. The journey takes 55 s and covers 820 m. Find V and the time spent at constant speed.	
7 A(−7, 12) and B(3, 12). The point C lies on the x-axis and CA = CB. Find the coordinates of C and the area of triangle ABC.	
8 $f(\theta) = \frac{1}{34 + 20\sin\theta + 21\cos\theta}$ (a) Write $20\sin\theta + 21\cos\theta$ as $R\sin(\theta + \alpha)$, $R > 0$, $0 < \alpha < 90°$. (b) Find the greatest and least values of $f(\theta)$, and the smallest positive θ at which the greatest value occurs, to 1 d.p.	
9 The pdf of X is $f(x) = a + bx$ for $0 \leq x \leq 3$, and 0 otherwise, where a and b are constants. $E(X) = \frac{33}{20}$. (a) Find a and b. (b) Find $P(X < 1.5)$.	
10 A ball is projected from a point O on horizontal ground with speed 24.5 m s^{-1} at an angle θ above the horizontal, where $\tan\theta = \frac{3}{4}$. Find (a) the greatest height, (b) the speed when it is at half of this height (3 s.f.). Take g = 9.8 m s^{-2}.	