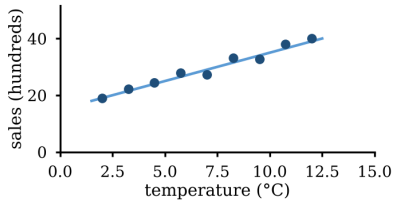
Day 203	A Level Maths: A Tier 10-a-day
1 Particles A (5 kg) and B (5 kg) move towards each other on a smooth horizontal line at 10 m s^{-1} and 4 m s^{-1}. They collide directly, and A then moves in the opposite direction at 1 m s^{-1}. Find (a) the speed of B after the collision, (b) the magnitude of the impulse of A on B.	
2 Solve $2\sin^2\theta + 5\cos\theta - 4 = 0$ for $0° \leq \theta \leq 180°$.	
3 A cyclist passes P with speed 4 m s^{-1} and accelerates uniformly. She travels 84 m in the next 12 s, reaching Q. Find (a) her acceleration, (b) her speed at Q, (c) her speed at the midpoint of PQ. Give answers to 3 s.f. if not exact.	
4 X, the mass (g), is normally distributed with mean 61 and standard deviation 5. Find (a) P(X > 68.5) (b) P(68.5 < X < 76), each to 3 s.f.	
5 Solve $\cos 2\theta - 5\cos\theta = -3$ for $0 \leq \theta \leq 2\pi$.	

Day 203 **A Level Maths: A Tier 10-a-day**

6 $f(x) = x^3 + 3x^2 - x - 6$.
(a) Show that $(x + 2)$ is a factor of $f(x)$.
(b) Solve $f(x) = 0$, giving surds in simplest form.

7 The diagram shows data and the regression line $y = 15 + 2x$.
(a) Interpret the gradient.
(b) Estimate y when $x = 5$ and comment.



8 Solve $x(\sqrt{5} - 2) = -1 - 4\sqrt{5}$, writing x in the form $p + q\sqrt{5}$.

9 $u_1 = 40$ and $u_{n+1} = \frac{1}{4} u_n + 15$.
(a) Find the limit L of the sequence as $n \to \infty$.
(b) Find the least n for which $|u_n - L| < 0.1$.

10 $l_1: \mathbf{r} = \begin{pmatrix} -1 \\ 1 \\ 1 \end{pmatrix} + \lambda \begin{pmatrix} 2 \\ -1 \\ -2 \end{pmatrix}$
$l_2: \mathbf{r} = \begin{pmatrix} 6 \\ -4 \\ -1 \end{pmatrix} + \mu \begin{pmatrix} -2 \\ 3 \\ -2 \end{pmatrix}$
Determine whether l_1 and l_2 intersect. If they do, find the point of intersection.