Day 179 **A Level Maths: B Tier 10-a-day**

1 The table shows the number of siblings, x, of 40 students.
Calculate the mean and standard deviation (3 s.f.).

x	0	1	2	3	4
Frequency	7	11	3	8	11

2 Solve $\cos 2x = -0.6$ for $0 \leq x \leq \pi$, giving answers to 3 significant figures.

3 A box of mass 12 kg rests on a rough horizontal floor, with coefficient of friction 0.3. A horizontal force of 42 N is applied to the box. Take $g = 9.8$ m s^{-2}.
Determine whether the box moves. Find the friction force, or the acceleration if it moves.

4 Points A and B have position vectors $\begin{pmatrix} -2 \\ 4 \\ 2 \end{pmatrix}$ and $\begin{pmatrix} 10 \\ 1 \\ 6 \end{pmatrix}$.
Find AB and the distance AB.

5 The points A and B have coordinates $(-6, 2)$ and $(3, -3)$.
(a) Find the midpoint of AB.
(b) Find the line AB as $ax + by + c = 0$, with integer a, b, c.

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6 A particle P moves on a straight line from O. At time t s its velocity is $3t^2 - 18t + 24$ m s^{-1}. Find the first time P is at instantaneous rest, and its distance from O then.	
7 Bottle volumes are normal, s.d. 10 ml. Set mean 50 ml; 16 bottles have mean 52.6 ml. Test at the 5% level whether the true mean differs from 50.	
8 The line $3x + 4y = k$ is a tangent to the circle $x^2 + y^2 = 25$. Find the two possible values of k.	
9 Squares of side x cm are cut from the corners of a square card of side 24 cm and the sides are folded up to make an open box. Find x for the greatest volume, and that volume.	
10 A geometric series has first term 5 and common ratio 2. Find the smallest value of n for which the sum of the first n terms exceeds 500.	