Day 190	A Level Maths: B Tier 10-a-day

1 A sledge of mass 8 kg is pulled across smooth horizontal ice by a rope with tension 39 N, inclined at α above the horizontal, where $\tan\alpha = \frac{5}{12}$.
Take $g = 9.8$ m s^{-2}.
Find (a) the acceleration of the sledge, (b) the normal reaction of the ice.

2 A sports club has 20 junior members, 25 senior members and 80 veteran members.
A stratified sample of size 25 is taken. Find the number selected from each group.

3 A puck of mass 5 kg is moving on a smooth horizontal surface at 4 m s^{-1} when a constant horizontal force of 20 N, in the direction of motion, acts for 7 s.
Find the speed of the puck at the end of this time and the distance it moves.

4 Prove that $(2n + 2)^2 - (2n - 2)^2$ is a multiple of 16 for all integer values of n.

5 A has position vector $\begin{pmatrix} -4 \\ -4 \end{pmatrix}$ and B has position vector $\begin{pmatrix} 0 \\ -4 \end{pmatrix}$.
The point P lies on AB with AP : PB = 3 : 1.
Find the position vector of P.

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6 Find the term independent of x in the expansion of

$(x^2 - \frac{3}{x})^6$.

7 (a) Show that $x^3 - 4x - 2 = 0$ can be written as $x = \sqrt[3]{4x + 2}$.

(b) Use $x_{n+1} = \sqrt[3]{4x_n + 2}$ with $x_0 = 2$ to find x_1, x_2, x_3 to 4 d.p.

8 (a) Expand $(4 - 3x)^{\frac{3}{2}}$ 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 Differentiate $y = 3 \sec 4x$ with respect to x, and find the exact gradient when $x = \frac{\pi}{12}$.

10 The table shows the number of siblings, x, of 54 students.

Calculate the mean and standard deviation (3 s.f.).

x	0	1	2	3	4	5
Frequency	11	12	4	11	12	4