Day 95	A Level Maths: A Tier 10-a-day
1 A club has 288 members: 36 Bronze, 156 Silver and 96 Gold. A stratified sample of size 24 is taken. Find the number of members sampled from each group.	
2 Find the quotient and the remainder when $x^4 + 3x^3 + x^2 - 10x - 9$ is divided by $(x^2 - 3)$.	
3 Particles A (7 kg) and B (1 kg) hang on a light string over a smooth pulley, A being 2.5 m above the ground. Released from rest; A lands without rebounding. Find (a) the tension while both move, (b) the greatest height of B above its start. Take $g = 9.8$.	
4 Solve $\cos 2\theta + \cos \theta = 0$ for $0° \leq \theta \leq 360°$.	
5 The line l has equation $x - y = 5$. (a) Find the coordinates of the foot of the perpendicular from $P(-4, 3)$ to l. (b) Hence find the shortest distance from P to l, in exact form.	

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6 A curve has parametric equations $x = t^2 - 1$, $y = t^3 - 3t$.
Find $\frac{dy}{dx}$ in terms of t, and the equation of the normal at the point where $t = -2$, in the form $ax + by + c = 0$ (integers).

7 A 5 kg box is pulled from rest along rough horizontal ground by a horizontal force of 17.7 N and moves 7.5 m in 5 s. Find (a) the coefficient of friction. The force is then removed; (b) find the further distance moved. Take g = 9.8. Give answers to 3 s.f. if not exact.

8 X ~ B(20, 0.3). Find $P(X = 7 \mid X \geq 4)$ to 3 significant figures.

9 $l_1: \mathbf{r} = \begin{pmatrix} -7 \\ 8 \\ 8 \end{pmatrix} + \lambda \begin{pmatrix} 2 \\ -1 \\ -2 \end{pmatrix}$
$l_2: \mathbf{r} = \begin{pmatrix} 1 \\ 5 \\ 0 \end{pmatrix} + \mu \begin{pmatrix} 2 \\ 0 \\ -2 \end{pmatrix}$
Determine whether l_1 and l_2 intersect. If they do, find the point of intersection.

10 The diagram shows the curve y = f(x), with turning points A and B.
Find the coordinates of the turning points of (a) y = f(x) − 4 (b) y = 3f(x)

