Day 279	A Level Maths: A Tier 10-a-day
1 Solve $2\cos^2\theta - \sin\theta - 2 = 0$ for $0° \leq \theta \leq 360°$.	
2 Find the quotient and the remainder when $2x^3 + 11x^2 + 11x - 15$ is divided by $(x + 3)$.	
3 A particle of mass 2 kg is acted on by forces $F_1 = (7\mathbf{i} + 4\mathbf{j})$ N and F_2. Its acceleration is $(2\mathbf{i} + 4\mathbf{j})$ m s^{-2}. Find (a) F_2, (b) the angle between F_2 and $\mathbf{i}$, to 1 d.p.	
4 Given that $\sum_{r=1}^{n}(4r - 2) = 722$, find the value of n.	
5 A hemispherical bowl of radius 6 cm is filled at 50 cm^3s^{-1}. When the depth is h, $V = \pi(6h^2 - \frac{1}{3}h^3)$. Find $\frac{dh}{dt}$ when h = 2 cm.	

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6 Particle A (7 kg) rests on a smooth table, joined by a light string over a smooth pulley at the edge to particle B (1 kg), hanging 1.2 m above the floor. Released from rest. Find (a) the tension, (b) the speed of B as it hits the floor. Take g = 9.8. Give answers to 3 s.f. if not exact.

7 The line l has equation $\mathbf{r} = \begin{pmatrix} -3 \\ 6 \\ 7 \end{pmatrix} + t\begin{pmatrix} 1 \\ -2 \\ -2 \end{pmatrix}$.
Find the coordinates of the foot of the perpendicular from P(2, 3, −1) to l, and the exact distance from P to l.

8 The random variable X has pdf $f(x) = \frac{2}{9}(3 - x)$ for $0 \leq x \leq 3$, and 0 otherwise.
(a) Find the cumulative distribution function F(x) for $0 \leq x \leq 3$.
(b) Find $P(X > \frac{3}{2})$. (c) Find the median of X to 3 s.f.

9 Solve $x - 9\sqrt{x} + 20 = 0$.

10 The tree diagram shows probabilities for events R and S.
(a) Find P(S).
(b) Find P(R | S).

