Day 28	A Level Maths: A Tier 10-a-day
1 A cyclist passes P with speed 7 m s^{-1} and accelerates uniformly. She travels 94.4 m in the next 8 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.	
2 $f(x) = 2x^3 + 8x^2 - 16$. (a) Show that $(x + 2)$ is a factor of $f(x)$. (b) Solve $f(x) = 0$, giving surds in simplest form.	
3 $P(B) = 0.1$, $P(A) = 0.8$ and $P(A \mid B) = 0.3$. (a) Find $P(A \cap B)$ and $P(A \cup B)$. (b) Find $P(B \mid A)$. (c) Determine whether A and B are independent.	
4 A stone is dropped from rest from the top of a cliff. In the last second before it hits the sea it falls 49 m. Find the height of the cliff. Take $g = 9.8$.	
5 The line l has equation $3x - y = -4$. (a) Find the coordinates of the foot of the perpendicular from $P(3, -3)$ to l. (b) Hence find the shortest distance from P to l, in exact form.	

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6 Solve $2\sec^2\theta + 3\tan\theta - 1 = 0$ for $-180° \leq \theta \leq 180°$. Give answers to 1 d.p.	
7 3% of people have a disease. The screening test is positive for 90% of those who have it and for 2% of those who do not. (a) Find the probability that a person tests positive. (b) Given a positive test, find the probability that the person has the disease (3 s.f.).	
8 $l_1: \mathbf{r} = \begin{pmatrix}0\\7\\4\end{pmatrix} + \lambda\begin{pmatrix}2\\3\\1\end{pmatrix}$ $l_2: \mathbf{r} = \begin{pmatrix}1\\0\\5\end{pmatrix} + \mu\begin{pmatrix}1\\-2\\1\end{pmatrix}$ Determine whether l_1 and l_2 intersect. If they do, find the point of intersection.	
9 The points A, B and C have coordinates (3, 0, 2), (−1, 0, −1) and (2, 2, 1). Find angle ABC, in degrees to 1 d.p.	
10 $f(x) = \frac{-6x - 7}{(1 + 3x)(1 - 2x)}$. (a) Express f(x) in partial fractions. (b) Hence expand f(x) up to x^2. (c) State the range of x for which the expansion is valid.	