Day 199	A Level Maths: A Tier 10-a-day
1 A cyclist passes P with speed 2 m s^{-1} and accelerates uniformly. She travels 35.2 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 Find the sum of all the multiples of 6 that lie strictly between 53 and 600.	
3 Solve $2\cos^2 x - \sin x - 1 = 0$ for $0° \leq x \leq 180°$.	
4 A particle P has position vector $\mathbf{r} = (t^3 - 5t)\mathbf{i} + (t^2 - 2t)\mathbf{j}$ metres at time t s. Find (a) the speed of P when t = 4, (b) the value of t when P is moving parallel to **i**. Give answers to 3 s.f. if not exact.	
5 The points A, B and C have coordinates (2, 0, 2), (−1, −2, −3) and (−3, 3, 0). Find angle ABC, in degrees to 1 d.p.	

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6 $f(x) = 3x^2 - 6x - 3$, $x \geq 1$.
Find $f^{-1}(x)$ and state its domain.

7 l_1: $\mathbf{r} = \begin{pmatrix} 1 \\ 2 \\ 12 \end{pmatrix} + \lambda \begin{pmatrix} -1 \\ -1 \\ 3 \end{pmatrix}$
l_2: $\mathbf{r} = \begin{pmatrix} 7 \\ 7 \\ 10 \end{pmatrix} + \mu \begin{pmatrix} 2 \\ 1 \\ 2 \end{pmatrix}$
Determine whether l_1 and l_2 intersect. If they do, find the point of intersection.

8 The random variable X has pdf $f(x) = \frac{4}{16}x^3$ for $0 \leq x \leq 2$, and 0 otherwise.
(a) Find the cumulative distribution function F(x) for $0 \leq x \leq 2$.
(b) Find $P(X > 1)$. (c) Find the median of X to 3 s.f.

9 0.5% of people have a fault. The inspection test is positive for 90% of those who have it and for 5% 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 fault (3 s.f.).

10 Express $\frac{x^2 - 3x + 5}{(x-3)(x-2)}$ in the form $1 + \frac{A}{(x-3)} + \frac{B}{(x-2)}$, where A and B are constants to be found.