Day 169	A Level Maths: A Tier 10-a-day
1 X, the journey time (minutes), is normally distributed with mean 39 and standard deviation 6. Find (a) P(X > 30) (b) P(30 < X < 37.8), each to 3 s.f.	
2 $y = \cos^2(x)$. Find $\frac{dy}{dx}$ and its exact value at $x = \frac{\pi}{3}$.	
3 Forces $F_1 = (9\mathbf{i} + 5\mathbf{j})$ N, $F_2 = (5\mathbf{i} - 12\mathbf{j})$ N and $F_3 = (a\mathbf{i} + b\mathbf{j})$ N keep a 3 kg particle in equilibrium. Find (a) a and b. F_2 is then removed; (b) find the magnitude of the acceleration. Give answers to 3 s.f. if not exact.	
4 Find the coordinates of the stationary points of $y = \frac{x^2 + 24}{x + 1}$.	
5 $f(x) = \frac{-x + 5}{x - 4}$, $x \in \mathbb{R}$, $x \neq 4$. Find $f^{-1}(x)$ and state its domain.	

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6 2% 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.).	
7 Use the substitution $u = x + 4$ to find the exact value of $\int_0^{32} \frac{x}{\sqrt{x+4}}\,dx$.	
8 $u_1 = 12$ and $u_{n+1} = \frac{1}{3}u_n + 4$. (a) Find the limit L of the sequence as $n \to \infty$. (b) Find the least n for which $\lvert u_n - L\rvert < 0.01$.	
9 Find the coefficient of x^4 in the expansion of $(4 + x)^9$.	
10 At t = 0, P and Q have position vectors $(-23\mathbf{i} + 6\mathbf{j})$ m and $(-3\mathbf{i} - 4\mathbf{j})$ m and velocities $(6\mathbf{i} - 7\mathbf{j})$ m s^{-1} and $(3\mathbf{i} - 3\mathbf{j})$ m s^{-1}. Find (a) the time when they are closest, (b) the least distance between them.	