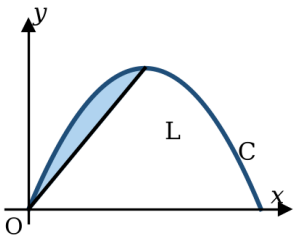
Day 161 **A Level Maths: A Tier 10-a-day**

1 A cyclist passes P with speed 3 m s^{-1} and accelerates uniformly. She travels 40 m in the next 10 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 Solve $8^{3x-3} = 16^{2x+2}$.

3 The diagram shows the curve C: $y = x(6 - x)$ and the line L: $y = 3x$.
Find the area of the shaded region between C and L.



4 Solve $x(\sqrt{3} - 3) = 3 - 3\sqrt{3}$, writing x in the form $p + q\sqrt{3}$.

5 A stone is projected vertically upwards from the ground. It passes a ledge 4 s after projection and again 7 s after projection. Find (a) the speed of projection, (b) the height of the ledge, (c) the greatest height. Take g = 9.8.

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6 X ~ B(60, 0.3). Use a normal approximation to estimate P(X ≤ 19) to 3 significant figures.	
7 Solve the differential equation $\frac{dy}{dx} = 2xy^2$, given that y = 1 when x = 0. Give y in terms of x.	
8 X ~ B(40, p). H_0: p = 0.5 is tested against H_1: p < 0.5 using a 5% significance level. (a) Find the critical region. (b) State the probability of a Type I error. (c) Find the probability of a Type II error when p = 0.35 (3 s.f.).	
9 $f(x) = \frac{3x}{(1 + 2x)(1 + x)}$. (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.	
10 θ is small and measured in radians. Use small angle approximations to show that $4\sin 3\theta + 4\cos \theta = 7.5$ can be written as $a\theta^2 + b\theta + c = 0$ with integers a, b, c. Hence find the approximate solution with $0 < \theta < 0.8$, to 3 s.f.	