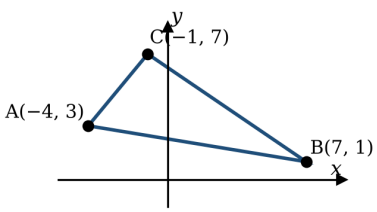
Day 76	A Level Maths: A Tier 10-a-day
1 A cyclist passes P with speed 5 m s^{-1} and accelerates uniformly. She travels 165 m in the next 15 s, reaching Q. Find (a) her acceleration, (b) her speed at Q, (c) her speed at the midpoint of PQ. Give answers to 3 s.f. if not exact.	
2 $f(x) = e^x - 5x - 8$. Show that the equation $f(x) = 0$ has a root α in the interval [3, 4].	
3 A 5 kg particle rests on a rough plane inclined at α, $\tan\alpha = \frac{15}{8}$, $\mu = 0.5$. A force of P N acts up a line of greatest slope and the particle stays at rest. Find the range of values of P. Take g = 9.8. Give answers to 3 s.f. if not exact.	
4 Find the least integer n for which $3^n > 10^8$.	
5 The diagram shows triangle ABC. (a) Find the equation of the line through C perpendicular to AB. (b) Hence find the coordinates of D, the foot of the perpendicular from C to AB, and the area of triangle ABC. 	

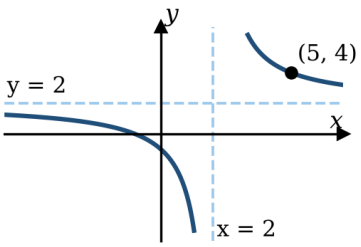
Day 76 **A Level Maths: A Tier 10-a-day**

6 Solve the differential equation

$(1 + x^2)\frac{dy}{dx} = xy$,

given that $y = 2$ when $x = 0$ ($y > 0$). Give y in terms of x.

7 The diagram shows the curve $y = \frac{k}{x - a} + b$ with asymptotes as shown. Find the values of k, a and b, and the coordinates where the curve crosses the axes.



8 Parts are defective with probability 0.3, independently. A box of 10 parts is rejected if it has at least 4 defective.
From 9 such boxes, find the probability that exactly 3 are rejected (3 s.f.).

9 Customers enter a shop at random at an average of 10 per hour.
Find the probability that in a 120-minute period there are (a) zero events (b) at least 1.
(c) Find the probability that at least one occurs in each of two separate 120-minute periods.

10 $f(x) = \frac{13x + 1}{(1 + x)(1 - 3x)}$.
(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.