Day 39	A Level Maths: S Tier 10-a-day

1 A(5, −5) and B(9, −3). The point C lies on the x-axis and CA = CB. Find the coordinates of C and the area of triangle ABC.

2 A radioactive sample has mass $m = m_0e^{-kt}$ grams, t in days.

Initially m = 200 and after 5 days $m = \frac{200}{3}$.

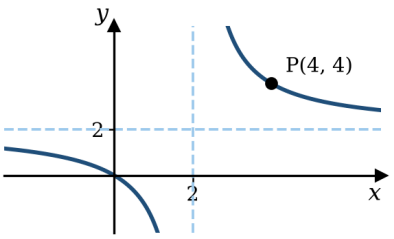
Find k, and the time for the mass to fall to 20 grams, to 3 s.f.

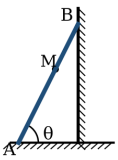
3 Solve $|-3x + 1| < |-2x + 4|$.

4 $y = e^{2x} \cos 3x$. Show that $dy/dx = e^{2x}(2 \cos 3x - 3 \sin 3x)$.

Find the x coordinate of the stationary point with the smallest positive x (3 s.f.), and its nature.

5 The diagram shows the curve C, its asymptotes (dashed) and a point P. C has equation $y = \frac{a}{x + p} + q$. Find a, p and q.



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6 Large Data Set, daily total sunshine (hours), Leuchars, July 2015 (n = 92): mean 7.3, sd 3.5. (1 hour = 60 minutes) (a) Find the mean and sd in minutes. (b) Is a reading of 15.7 more than 2 sd above the mean?	
7 A drink cools according to $\theta = 25 + Ae^{-kt}$, where θ °C is the temperature after t minutes. Initially $\theta = 85$, and after 4 minutes $\theta = 61$. Find A and k, then find when $\theta = 29$ (3 s.f.).	
8 A uniform ladder AB of length 5 m and weight 100 N has A on rough ground ($\mu = 0.25$) and B against a smooth vertical wall. It makes angle θ with the ground, $\tan\theta = 2.5$. A man of weight 500 N climbs the ladder. How far along the ladder can he go before it slips? 	
9 A test of H_0: $p = 0.5$ against H_1: $p > 0.5$ uses a sample of 50 at the 10% level. (a) Find the critical region for X, the number of successes. (b) Find the actual significance level. (c) Find P(Type II error) when in fact $p = 0.65$.	
10 A stone is projected from level ground with horizontal and vertical velocity components 19.6 and 34.3 m s^{-1}. Find (a) the two times at which it moves at 45° to the horizontal, (b) the horizontal distance between those two points. Take $g = 9.8$ m s^{-2}.	