Day 147	A Level Maths: A Tier 10-a-day
1 A sector of a circle has area 16 cm^2 and angle 0.5 radians. Find the radius, the arc length and the perimeter of the sector.	
2 A 2 kg particle is in equilibrium on a rough plane inclined at α, $\tan\alpha = \frac{15}{8}$, $\mu = \frac{1}{3}$. A horizontal force of P N, in the vertical plane through a line of greatest slope, pushes it towards the plane. Find the least and greatest values of P. Take g = 9.8. Give answers to 3 s.f. if not exact.	
3 $f(x) = -2x^2 - 8x - 3$. (a) Write f(x) in the form $a(x + p)^2 + q$. (b) State the maximum value of f(x) and the value of x at which it occurs. (c) Solve f(x) = 0, giving surds in simplest form.	
4 Find the exact value of $\sin(2 \arccos \frac{12}{13})$.	
5 A curve has parametric equations $x = 2t^2 + 4$, $y = -2t(t^2 - 1)$. Find the coordinates of the points where the curve meets the x-axis.	

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6 A 2 kg block is released from rest on a rough plane inclined at α, $\tan\alpha = \frac{4}{3}$, $\mu = 0.5$, and slides 10 m down a line of greatest slope. Use work and energy to find (a) the work done against friction, (b) its speed after 10 m. Take $g = 10$.	
7 A bag has 6 red and 3 blue counters. Two are taken at random without replacement. Given that the counters are different colours, find the probability that the first is red.	
8 A window is a rectangle of width $2x$ m and height h m, topped by a semicircle of radius x m. Its perimeter is 60 m. Show that its area is $A = 60x - (2 + \frac{\pi}{2})x^2$, and find the maximum area to 3 s.f.	
9 $X \sim B(9, 0.2)$. Find $P(X = 4 \mid X \geq 3)$ to 3 significant figures.	
10 A circle touches both coordinate axes and passes through the point $(6, -3)$. Its centre lies in the fourth quadrant. Find the equations of the two possible circles.	