Day 215	A Level Maths: A Tier 10-a-day
1 A driver at constant speed sees a hazard 26.4 m ahead. After a reaction time of 1 s she brakes with deceleration 5 m s^{-2} and stops exactly at the hazard. Find (a) her initial speed, (b) the total time from seeing the hazard to stopping.	
2 X, the journey time (minutes), is normally distributed with mean 35 and standard deviation 6. Find (a) P(X > 22.4) (b) P(22.4 < X < 26.6), each to 3 s.f.	
3 By writing 165° as 120° + 45°, find the exact value of sin 165°, in the form $\frac{\sqrt{a} \pm \sqrt{b}}{c}$.	
4 The equation $3x^2 + (k)x + (k) = 0$ has no real roots. Find the set of possible values of k.	
5 $f(x) = x^2 - 3$. Show that the Newton-Raphson formula gives $x_{n+1} = \frac{1}{2}(x_n + \frac{3}{x_n})$, and use it with $x_0 = \frac{5}{2}$ to find x_2 as an approximation to $\sqrt{3}$, to 4 d.p.	

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6 The line $-4x + 3y = k$ is a tangent to the circle $(x + 4)^2 + (y - 4)^2 = 16$.
Find the two possible values of k.

7 A 5 kg particle moves on a smooth horizontal line. At time t s a single force of $(24 - 4t)$ N acts along the line. When $t = 0$ its speed is 4 m s^{-1}. Find (a) its speed when $t = 2$, (b) its greatest speed.

8 Solve the differential equation
$\frac{dy}{dx} = 4xy^2$,
given that $y = 2$ when $x = 0$. Give y in terms of x.

9 A curve has parametric equations $x = t^2 - 3$, $y = t(t^2 - 16)$.
Find the coordinates of the points where the curve meets the x-axis.

10 The histogram shows the masses of apples, m (in grams), of a sample.
(a) How many were in the class $40 \leq m < 60$?
(b) Estimate how many had $20 < m < 50$.

