Day 256	A Level Maths: A Tier 10-a-day
1 Express $\frac{-5x + 8}{(x - 2)(x - 4)}$ in partial fractions.	
2 Solve $3^{3x + 3} = 2^{2x + 1}$. Give your answer to 3 significant figures.	
3 A systematic sample is taken from a numbered list of 850 items. The 3th item chosen is number 65 and the 8th item chosen is number 190. Find the sampling interval, the number of the first item chosen and the size of the sample.	
4 The equation $e^x = 3x + 1$ has a root α. Use the iteration $x_{n+1} = \ln(3x + 1)$ with $x_0 = 2$ to find x_1, x_2 and x_3 to 4 d.p., and hence the value of α to 2 d.p. (continue until the 2 d.p. value is settled).	
5 A 10 kg box is pulled from rest along rough horizontal ground by a horizontal force of 35.4 N and moves 19.2 m in 8 s. Find (a) the coefficient of friction. The force is then removed; (b) find the further distance moved. Take g = 9.8. Give answers to 3 s.f. if not exact.	

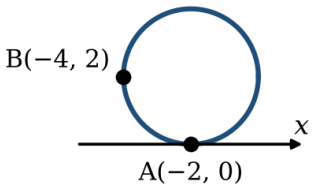
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6 P(A) = 0.5 and P(A ∪ B) = 0.9.
(a) Given that A and B are independent, find P(B).
(b) Given instead that A and B are mutually exclusive, find P(B).
(c) In the case in (a), find P(A′ ∩ B).

7 A non-uniform rod AB (length 5 m, mass 6 kg) has its centre of mass at G, AG = 2 m. It hangs horizontally from vertical strings at A and B. A particle of mass m kg is fixed at P, AP = 3 m, making the tensions equal. Find (a) m, (b) the tension. Take g = 9.8.

8 Express $\frac{x^2 - 3x + 4}{(x - 3)(x - 2)^2}$ in the form $\frac{A}{(x - 3)} + \frac{B}{(x - 2)} + \frac{C}{(x - 2)^2}$, and find A, B and C.

9 The diagram shows a circle that touches the x-axis at A(−2, 0) and passes through B(−4, 2).
Find the equation of the circle.



10 The line l has equation $\mathbf{r} = \begin{pmatrix} 6 \\ -6 \\ 0 \end{pmatrix} + t\begin{pmatrix} 3 \\ -3 \\ 3 \end{pmatrix}$.
Find the coordinates of the foot of the perpendicular from P(3, 0, 0) to l, and the exact distance from P to l.