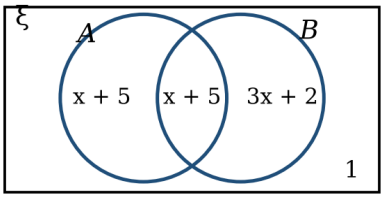
Day 210	A Level Maths: A Tier 10-a-day
1 Find the set of values of k for which the line $y = 2x + k$ meets the curve $y = 2x^2 + x + 1$ at two distinct points.	
2 £10000 is invested at 8% compound interest per year. Find the smallest whole number of years for the value to exceed £20000.	
3 A circle has equation $x^2 + y^2 + 6x - 8y + 16 = 0$. (a) Find the centre and radius of the circle. (b) Determine whether $P(-1, 5)$ lies inside or outside the circle.	
4 Use integration by parts to find the exact value of $\int_0^1 x\, e^{-x}\, dx$.	
5 A driver at constant speed sees a hazard 22.5 m ahead. After a reaction time of 1 s she brakes with deceleration 4 m s^{-2} and stops exactly at the hazard. Find (a) her initial speed, (b) the total time from seeing the hazard to stopping.	

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6 The Venn diagram shows the numbers of 43 students in sets A and B.
(a) Find the value of x.
(b) A student is chosen at random. Find P(A | B′).



7 $f(x) = x^2 - 4$, $x \geq 0$.
Find $f^{-1}(x)$ and state its domain.

8 A drink at 95°C is left in a room at 15°C. Its temperature θ °C satisfies $\frac{d\theta}{dt} = -k(\theta - 15)$.
After 5 minutes the temperature is 65°C. Find k, then the time for it to reach 25°C, to 3 s.f.

9 X ~ B(37, p). H_0: p = 0.5 is tested against H_1: p < 0.5 using a 5% significance level.
(a) Find the critical region. (b) State the probability of a Type I error.
(c) Find the probability of a Type II error when p = 0.35 (3 s.f.).

10 A uniform rod AB (10 kg, 2 m) is smoothly hinged at A to a vertical wall, with a 6 kg particle at B. A light string from B to the wall above A holds the rod horizontal, at angle θ to it, $\tan\theta = \frac{4}{3}$. Find (a) the tension, (b) the magnitude of the hinge force. Take g = 9.8. Give answers to 3 s.f. if not exact.