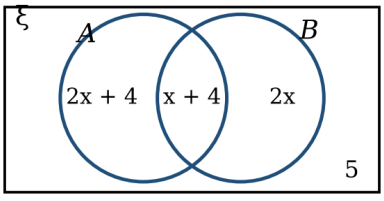
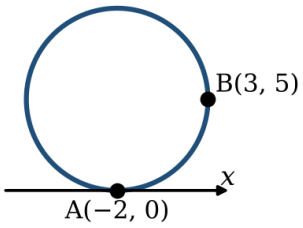
Day 121	A Level Maths: A Tier 10-a-day
1 The 5th term of an arithmetic sequence is 36 and the 13th term is 76. Find the first term and common difference, and the sum of the first 20 terms.	
2 A college has 135 students: 20 Arts, 40 Science and 75 Humanities. A stratified sample of size 27 is taken. Find the number of students sampled from each group.	
3 $f(x) = x^3 - 4x - 5$. Show that the equation $f(x) = 0$ has a root α in the interval $[2, 3]$.	
4 A ball is thrown vertically upwards at 9.8 m s^{-1} from a point h m above horizontal ground, and hits the ground 6 s later. Find (a) h, (b) the greatest height above the ground. Take g = 9.8.	
5 The Venn diagram shows the numbers of 53 students in sets A and B. (a) Find the value of x. (b) A student in B is chosen at random. Find P(A). 	

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6 The diagram shows a circle that touches the x-axis at A(−2, 0) and passes through B(3, 5). Find the equation of the circle.



7 Car A passes P at constant speed 16 m s^{-1}. 12 s later car B leaves P from rest, in the same direction, with acceleration 2 m s^{-2}. B overtakes A at Q. Find (a) the time B takes to reach Q, (b) PQ, (c) the speed of B at Q.

8 $g(\theta) = \frac{1}{23 + 12\sin\theta + 9\cos\theta}$

(a) Write $12\sin\theta + 9\cos\theta$ in the form $R\sin(\theta + \alpha)$, with α acute.

(b) Find the greatest and least values of $g(\theta)$ and the smallest positive θ at which the greatest value occurs (1 d.p.).

9 $u_1 = 0$ and $u_{n+1} = \frac{1}{3}u_n + 10$.

(a) Find the limit L of the sequence as $n \to \infty$.

(b) Find the least n for which $|u_n - L| < 0.1$.

10 A, B and C have position vectors $\begin{pmatrix} -2 \\ 4 \\ -4 \end{pmatrix}$, $\begin{pmatrix} -2 \\ 3 \\ -6 \end{pmatrix}$ and $\begin{pmatrix} -2 \\ k \\ -2 \end{pmatrix}$ relative to O, where k is a constant. Given that A, B and C are collinear, find k and the ratio AB : BC.