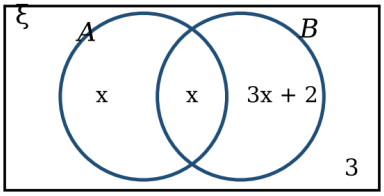
Day 146	A Level Maths: A Tier 10-a-day
1	
	$\lvert a\rvert = 5$, $\lvert b\rvert = 2$ and the angle between a and b is 135°. Find the exact values of $a \cdot b$ and $\lvert a + b\rvert$.
2	
	A circle has equation $x^2 + y^2 - 4x + 2y - 29 = 0$. (a) Find the centre and radius of the circle. (b) Determine whether P(1, 3) lies inside or outside the circle.
3	
	A driver at constant speed sees a hazard 41.6 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.
4	
	A data set has lower quartile 35 and upper quartile 44. A value is an outlier if it is more than 1.5 × IQR above Q_3 or below Q_1. Which of 19, 24, 36, 61 are outliers?
5	
	Express $\frac{x^2 - 2x - 6}{(x - 4)(x - 3)}$ in the form $1 + \frac{A}{(x - 4)} + \frac{B}{(x - 3)}$, where A and B are constants to be found.

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6 A curve has parametric equations $x = 4\sin t$, $y = \cos 2t$.
Find $\frac{dy}{dx}$ in terms of t and the exact equation of the tangent at the point where $t = \frac{\pi}{6}$, in the form $y = mx + c$.

7 The Venn diagram shows the numbers of 40 students in sets A and B.
(a) Find the value of x.
(b) A student in B is chosen at random. Find P(A).



8 The line l has equation $\mathbf{r} = \begin{pmatrix} 12 \\ 6 \\ -1 \end{pmatrix} + t\begin{pmatrix} -3 \\ -3 \\ 1 \end{pmatrix}$.
Find the coordinates of the foot of the perpendicular from P(4, −4, 2) to l, and the exact distance from P to l.

9 A circle passes through A(3, 9) and B(−7, −15).
Its centre lies on the line $y = -x - 5$.
Find the equation of the circle.

10 A uniform ladder AB (5 m, 15 kg) rests with A on rough ground, $\mu = 0.25$, and B against a smooth wall, B being 4 m above the ground. A man of mass 75 kg climbs the ladder. How far along the ladder from A can he climb before it slips?