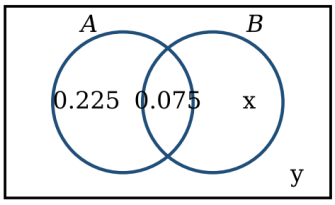
Day 46	A Level Maths: B Tier 10-a-day
1 A cup of tea cools in a room at 10°C: $\frac{dT}{dt} = -k(T - 10)$. Initially T = 70 and after 10 minutes T = 50. Find k to 3 s.f. and the time to cool to 20°C, to 3 s.f.	
2 A toy car slides from rest down a line of greatest slope of a smooth plane inclined at 30° to the horizontal. Take g = 9.8 m s^{-2}. Find its acceleration, and the distance it travels in 3 s.	
3 Statement: "6n + 11 is prime for every positive integer n." Show that this statement is false by finding a counter-example.	
4 Differentiate y = 3 cosec x with respect to x, and find the exact gradient when $x = \frac{\pi}{6}$.	
5 The Venn diagram shows probabilities for events A and B, which are independent. Find the values of x and y. 	

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6 A particle moves so that at time t s its velocity is $\mathbf{v} = (2t^2 + 4)\mathbf{i} + (5t - 20)\mathbf{j}$ m s^{-1}. Find the time when the particle is moving in the direction of $\mathbf{i}$, and its speed then.	
7 The line l has equation $y = -\frac{3}{2}x - 10$. The point P is (0, 3). (a) Find the line through P perpendicular to l, as $ax + by + c = 0$ with integer a, b, c. (b) Find the foot F and the exact distance PF.	
8 Points A, B and C have position vectors $\begin{pmatrix} 3 \\ 3 \\ -2 \end{pmatrix}$, $\begin{pmatrix} 6 \\ 3 \\ -1 \end{pmatrix}$ and $\begin{pmatrix} 0 \\ 3 \\ r \end{pmatrix}$ respectively. Given that A, B, C are collinear, find r.	
9 The line $y = x - 9$ meets the circle $(x - 2)^2 + (y - 2)^2 = 125$ at the points A and B. Find the coordinates of A and B, and the exact length of the chord AB.	
10 The random variable X is normally distributed. $P(X < 75) = 0.1587$ and $P(X > 90) = 0.0228$. Find the mean and standard deviation (3 s.f.).	