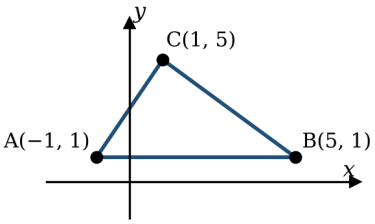
Day 345 **A Level Maths: A Tier 10-a-day**

1 P(A) = 0.45, P(B) = 0.5 and P(A ∩ B) = 0.15.
Find
(a) P(A ∪ B)
(b) P(A | B′)
(c) P(A | B)

2 The vectors $\begin{pmatrix} k \\ k \\ 4 \end{pmatrix}$ and $\begin{pmatrix} k \\ -6 \\ 2 \end{pmatrix}$ are perpendicular.
Find the possible values of k and, for the larger value, the exact length of the first vector.

3 The diagram shows triangle ABC.
(a) Find the equation of the line through C perpendicular to AB.
(b) Hence find the coordinates of D, the foot of the perpendicular from C to AB, and the area of triangle ABC.



4 For small θ (in radians), use the small angle approximations to find the value that
$\frac{\sin 4\theta \tan \theta}{1 - \cos \theta}$
approaches as $\theta \to 0$.

5 A 4 kg block is released from rest on a rough plane inclined at α, $\tan \alpha = \frac{3}{4}$, μ = 0.25, and slides 8 m down a line of greatest slope. Use work and energy to find (a) the work done against friction, (b) its speed after 8 m. Take g = 10.

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6 The number of fish in a lake is modelled by $N = 500\,e^{kt}$, where t is time in years. After 4 years, N = 1000. Find (a) the exact value of k, (b) the time for N to reach 50000, to 3 s.f.	
7 3% of people have a disease. The screening test is positive for 80% of those who have it and for 10% of those who do not. (a) Find the probability that a person tests positive. (b) Given a positive test, find the probability that the person has the disease (3 s.f.).	
8 Find the coefficient of x^4 in the expansion of $(2 - 3x)(1 - x)^6$.	
9 Particle A (3 kg) lies on a rough table, $\mu = 0.1$, joined by a light string over a smooth pulley to particle B (5 kg), 2 m above the floor. Released from rest; B lands without rebounding. Find (a) the acceleration of A before B lands, (b) the further distance A moves. Take g = 9.8. Give answers to 3 s.f. if not exact.	
10 The line l has equation $2x - y = 7$. (a) Find the coordinates of the foot of the perpendicular from $P(-1, -4)$ to l. (b) Hence find the shortest distance from P to l, in exact form.	