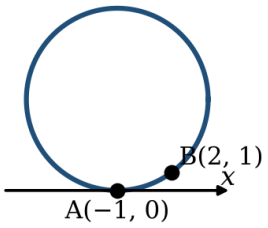
Day 69	A Level Maths: A Tier 10-a-day
1 A closed cylinder has radius r cm and volume 128π cm^3. Show that its surface area is $A = 2\pi r^2 + \frac{256\pi}{r}$, and find the minimum value of A in terms of π.	
2 Forces $F_1 = (-4\mathbf{i} - 4\mathbf{j})$ N, $F_2 = (5\mathbf{i} + 12\mathbf{j})$ N and $F_3 = (a\mathbf{i} + b\mathbf{j})$ N keep a 2 kg particle in equilibrium. Find (a) a and b. F_2 is then removed; (b) find the magnitude of the acceleration.	
3 Show that $\frac{4}{\sqrt{5} - 2} + \frac{2}{\sqrt{5} + 2}$ can be written as $p + q\sqrt{5}$, and find p and q.	
4 A particle of mass 3 kg is acted on by forces $F_1 = (7\mathbf{i} - 9\mathbf{j})$ N and F_2. Its acceleration is $(4\mathbf{i} + \mathbf{j})$ m s^{-2}. Find (a) F_2, (b) the angle between F_2 and $\mathbf{i}$, to 1 d.p.	
5 How many arrangements of the letters of CHAMPION begin and end with a consonant?	

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6 The diagram shows a circle that touches the x-axis at A(−1, 0) and passes through B(2, 1). Find the equation of the circle.  	
7 X ~ B(80, 0.6). Use a normal approximation to estimate P(X ≥ 50) to 3 significant figures.	
8 A drink at 102°C is left in a room at 22°C. Its temperature θ °C satisfies $\frac{d\theta}{dt} = -k(\theta - 22)$. After 15 minutes the temperature is 67°C. Find k, then the time for it to reach 32°C, to 3 s.f.	
9 The population of a town is modelled by $P = 500\,e^{kt}$, where t is time in years. After 6 years, P = 2500. Find (a) the exact value of k, (b) the time for P to reach 5000, to 3 s.f.	
10 The line $y = kx - 1$ is a tangent to the curve $y = x^2 - 2x + 15$. (a) Find the possible values of k. (b) For the larger value of k, find the coordinates of the point of contact.	