Day 185	A Level Maths: S Tier 10-a-day
1 A die is said to show heads with probability 0.25. In 20 trials it does so 2 times. Test at the 10% level whether the probability is different from 0.25.	
2 A(−17, −5) and B(−5, 13). The point C lies on the x-axis and CA = CB. Find the coordinates of C and the area of triangle ABC.	
3 The fill volume of a bottle is N(μ, 64) with known variance 64. The mean was claimed to be 46 ml. A random sample of 9 has mean 50. Test at the 1% level whether the mean is greater than 46.	
4 A stone is thrown vertically upwards with speed 14 m s^{-1} from the top of a cliff. The top of the cliff is 52.5 m above the sea. Find (a) the time taken for the stone to reach the sea, (b) the total distance travelled by the stone, to 3 s.f. Take g = 9.8 m s^{-2}.	
5 A drink cools according to $\theta = 15 + Ae^{-kt}$, where θ °C is the temperature after t minutes. Initially θ = 90, and after 6 minutes θ = 65. Find A and k, then find when θ = 47 (3 s.f.).	

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6 $f(x) = x^3 + ax^2 + bx + 40$, where a and b are constants. $(x + 4)$ is a factor of $f(x)$, and $f(x)$ leaves remainder 40 when divided by $(x + 3)$. Find a and b, and hence solve $f(x) = 0$.	
7 The curve $y = 2x^2\sqrt{5 - x}$, for $0 < x < 5$, has one stationary point. Find its exact coordinates and determine its nature.	
8 A ball is projected from a point O on horizontal ground at 28 m s^{-1}, at angle θ above the horizontal. It passes through the point P, 32 m horizontally and 14 m vertically from O. Find the two possible values of $\tan\theta$, and the two possible values of θ to 1 d.p. Take $g = 9.8$ m s^{-2}.	
9 A circle passes through A(8, −1), B(1, 16) and C(−9, −8). Find its equation.	
10 Line l_1: $\mathbf{r} = \begin{pmatrix}2\\2\\1\end{pmatrix} + s\begin{pmatrix}2\\-2\\0\end{pmatrix}$, line l_2: $\mathbf{r} = \begin{pmatrix}7\\3\\4\end{pmatrix} + t\begin{pmatrix}3\\3\\3\end{pmatrix}$. Show whether the lines meet, giving the point of intersection if they do, and find the acute angle between them to 1 d.p.	