Day 9	A Level Maths: A Tier 10-a-day
1 A cyclist passes P with speed 4 m s^{-1} and accelerates uniformly. She travels 105.6 m in the next 12 s, reaching Q. Find (a) her acceleration, (b) her speed at Q, (c) her speed at the midpoint of PQ. Give answers to 3 s.f. if not exact.	
2 Solve $\lvert x^2 - 10x \rvert = 24$.	
3 For a sample of 25 pairs of values of age of a car and its price, $r = -0.46$. The critical value for a two-tailed test at the 5% level is 0.3961. Test, at this level, whether there is any correlation between the two variables.	
4 A crate of mass 12 kg is pulled at constant speed along rough horizontal ground, $\mu = 0.3$, by a force of P N at angle θ above the horizontal, $\tan\theta = \frac{5}{12}$. Find P and the normal reaction. Take g = 9.8. Give answers to 3 s.f. if not exact.	
5 Expand $(1 - x)^{\frac{3}{2}}$ in ascending powers of x up to and including the term in x^2. State the range of values of x for which the expansion is valid.	

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6 Find the exact coordinates of the stationary point of $y = \frac{\ln x}{x^2}$ for $x > 0$.	
7 Accidents occur as a Poisson process at a mean rate of 8 per week. After a change, the number recorded in one week is 5. Test at the 10% level whether the mean rate has decreased.	
8 Water pours into a cone, vertex down, at 40 cm^3s^{-1}. The surface radius is always $\frac{h}{4}$. Find the rate at which the depth is rising when h = 2 cm.	
9 Use the trapezium rule with 4 strips to estimate $\int_1^3 \frac{1}{x}\,dx$, giving your answer to 3 s.f. State, with a reason, whether your estimate is an overestimate or an underestimate.	
10 A geometric sequence has first term 200 and common ratio $\frac{4}{5}$. Find the first term of the sequence that is less than 10.	