Day 304 **A Level Maths: A Tier 10-a-day**

1 The table summarises the journey time, t minutes of 55 items.
Use linear interpolation to estimate the median.

Class	Frequency
$50 \le t < 55$	5
$55 \le t < 60$	15
$60 \le t < 65$	12
$65 \le t < 70$	18
$70 \le t < 75$	5

2 Solve $\cos 2\theta + 2\cos\theta = -1$
for $-180° \le \theta \le 180°$.

3 A crate of mass 10 kg is pulled at constant speed along rough horizontal ground, $\mu = 0.5$, by a force of P N at angle θ above the horizontal, $\tan\theta = \frac{12}{5}$. Find P and the normal reaction. Take g = 9.8. Give answers to 3 s.f. if not exact.

4 X has a binomial distribution with mean 15 and variance 7.5.
(a) Find n and p.
(b) Find P(X = 13) to 3 significant figures.

5 The curve with equation $y = x^2 + x + 1$ is transformed by a reflection in the x-axis, followed by a reflection in the y-axis.
Find the equation of the image curve.

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6 Solve $3\sec^2\theta - 6\tan\theta - 12 = 0$ for $0° \leq \theta \leq 360°$. Give answers to 1 d.p.	
7 Find the coefficient of x^{-2} in the expansion of $(2x^3 - \frac{1}{x^2})^6$.	
8 A uniform ladder AB (5 m, 25 kg) rests with A on rough ground, $\mu = 0.5$, and B against a smooth wall, B being 4 m above the ground. A man of mass 50 kg climbs the ladder. How far along the ladder from A can he climb before it slips?	
9 $f(x) = \frac{-24x - 2}{(1 - 3x)(1 + 3x)}$. (a) Express f(x) in partial fractions. (b) Hence expand f(x) up to x^2. (c) State the range of x for which the expansion is valid.	
10 $l_1: \mathbf{r} = \begin{pmatrix}2\\4\\3\end{pmatrix} + \lambda\begin{pmatrix}-2\\0\\1\end{pmatrix}$ $l_2: \mathbf{r} = \begin{pmatrix}1\\4\\3\end{pmatrix} + \mu\begin{pmatrix}-3\\1\\-1\end{pmatrix}$ Determine whether l_1 and l_2 intersect. If they do, find the point of intersection.	