Day 101 **A Level Maths: B Tier 10-a-day**

1 The vector $\mathbf{a} = \begin{pmatrix} -4 \\ -3 \\ 12 \end{pmatrix}$.

Find $|\mathbf{a}|$ and a unit vector in the direction of $\mathbf{a}$.

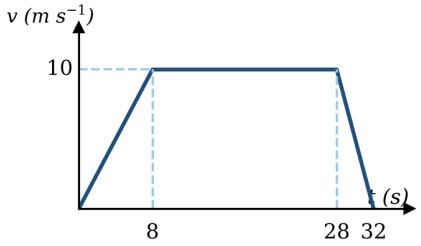
2 7 values of x are coded using $y = \frac{(x - 100)}{5}$.

$\Sigma y = -4$ and $\Sigma y^2 = 66$.

Find the mean and standard deviation of x (3 s.f.).

3 The diagram shows the speed-time graph of a train between two stations.

Find (a) the acceleration in the first 8 s, (b) the distance between the stations.



4 The line $y = -7x - 35$ meets the circle $(x + 1)^2 + (y + 3)^2 = 125$ at the points A and B. Find the coordinates of A and B, and the exact length of the chord AB.

5 A box of mass 5 kg rests on a rough horizontal floor, with coefficient of friction 0.4. A horizontal force of 24 N is applied to the box.

Take $g = 9.8$ m s^{-2}.

Determine whether the box moves. Find the friction force, or the acceleration if it moves.

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6 $f(x) = 2x^3 - 4x^2 - 22x + k$. Given that $(x - 1)$ is a factor of $f(x)$, (a) find the value of k, (b) factorise $f(x)$ completely.	
7 Find the exact value of $\int_0^{\frac{\pi}{4}} \sin 2x \cos 2x \, dx$.	
8 Find the coefficient of x^2 in the expansion of $(2 + x)(3 - 3x)^4$.	
9 Line l_1: $\mathbf{r} = \begin{pmatrix} 2 \\ -5 \\ -2 \end{pmatrix} + \lambda \begin{pmatrix} -2 \\ 3 \\ -1 \end{pmatrix}$. Line l_2: $\mathbf{r} = \begin{pmatrix} 4 \\ -2 \\ -7 \end{pmatrix} + \mu \begin{pmatrix} 2 \\ 0 \\ -2 \end{pmatrix}$. Show that l_1 and l_2 intersect and find the point.	
10 The random variable X is normally distributed. $P(X < 56) = 0.0228$ and $P(X > 92) = 0.1587$. Find the mean and standard deviation (3 s.f.).	