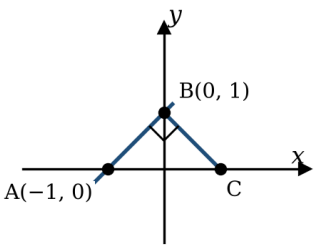
| Day 88 | A Level Maths: S Tier 10-a-day |
|---|---|

**1** A van costs £12000 and loses 10% of its value each year.
Find the least whole number of years after which its value is below £3000.

**2** A particle P moves on a straight line. At time t seconds its velocity is v m $s^{-1}$, where
$v = t^2 - 8t + 12$ for $0 \leq t \leq 8$
Find (a) the times at which P is at instantaneous rest, (b) the total distance travelled by P in the first 8 seconds.

**3** Solve $\log_5(x + 3) + \log_5(x - 1) = 1$,
justifying clearly any root that you reject.

**4** In the diagram, line $l_1$ passes through A and B. Line $l_2$ is perpendicular to $l_1$ at B and meets the x-axis at C. Find the coordinates of C and the area of triangle ABC.



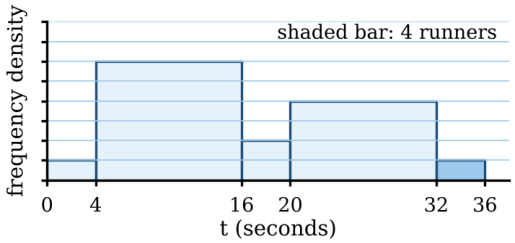

**5** (a) Show that $\frac{\sin 2\theta}{1 + \cos 2\theta} \equiv \tan \theta$.

(b) Hence solve $\frac{\sin 2\theta}{1 + \cos 2\theta} = -3$ for $0 \leq \theta < 360°$ (1 d.p.).

**Day 88** **A Level Maths: S Tier 10-a-day**

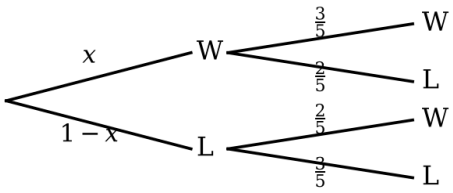
**6** A particle of weight W N is on a rough plane inclined at α to the horizontal, where $\sin\alpha = \frac{4}{5}$.
A force P N acts up a line of greatest slope; the particle stays at rest for $31.8 \leq P \leq 64.2$.
Find (a) W, (b) the coefficient of friction, (c) the acceleration when P = 128.4. Take g = 9.8 m $s^{-2}$.

**7** The histogram shows the times, t seconds, of some runners.
Find (a) the total number of runners, (b) an estimate of the number with $9 \leq t < 35$.




**8** The curve $y = x^2 + 4x + 4$ is translated by $\begin{pmatrix} -2 \\ -3 \end{pmatrix}$ and then a reflection in the y-axis.
Find the equation of the resulting curve in the form $y = ax^2 + bx + c$.

**9** The tree diagram shows two games played in turn.
Given the second is a W, P(first was a W) = $\frac{1}{3}$.
Find x.




**10** $f(x) = \frac{-5x - 3}{(1 + 3x)(1 - x)}$.
(a) Express f(x) in partial fractions.
(b) Hence expand f(x) in ascending powers of x up to $x^3$, stating the range of validity.