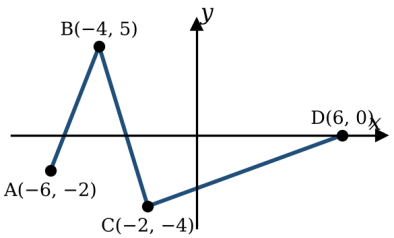
Day 200 **A Level Maths: S Tier 10-a-day**

1 The diagram shows y = f(x), made of three straight line segments. Find the coordinates of the images of A, B, C and D on the graph of $y = -2f(-\frac{1}{2}x - 2) + 1$.



2 A data set has lower quartile 13 and upper quartile 22. An outlier is a value more than 1.5 × IQR beyond the nearest quartile.
(a) Find the range of values that are not outliers.
(b) 10 observations have mean 22. The largest is 41, an outlier, and it is removed. Find the new mean.

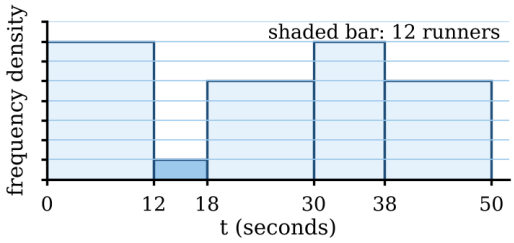
3 Solve $\log_2(x + 3) + \log_2(x - 12) = 4$, justifying clearly any root that you reject.

4 Given that $\sum_{r=1}^{n}(4r + 4) = 2808$, find n.

5 (a) Show that $\cos^4\theta - \sin^4\theta \equiv \cos 2\theta$.
(b) Hence solve $\cos^4\theta - \sin^4\theta = -\frac{1}{3}$ for $0 \leq \theta < 360°$ (1 d.p.).

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6 The histogram shows the times, t seconds, of some runners.
Find (a) the total number of runners, (b) an estimate of the number with $16 \leq t < 48$.



7 A uniform plank AB of length 8 m and mass 30 kg rests on supports at C and D, where AC = 3 m and DB = 3 m. A girl of mass 50 kg stands on it at distance x m from A.
Find the range of x for which the plank stays in equilibrium on both supports.

8 The curve C has parametric equations $x = t$, $y = 4t^2$. The line $y = -8x + 32$ meets C at A and B. Find the exact length AB.

9 Three forces $(5\mathbf{i} - 5\mathbf{j})$ N, $(2\mathbf{i} + k\mathbf{j})$ N and $(-2\mathbf{i} + 8\mathbf{j})$ N act on a particle of mass 2 kg. The resultant is parallel to $(5\mathbf{i} + 9\mathbf{j})$.
Find (a) the value of k, (b) the magnitude of the acceleration of the particle, to 3 s.f.

10 Line l_1: $\mathbf{r} = \begin{pmatrix} -7 \\ -4 \\ -7 \end{pmatrix} + s\begin{pmatrix} 1 \\ 3 \\ 3 \end{pmatrix}$,
line l_2: $\mathbf{r} = \begin{pmatrix} -4 \\ -1 \\ -4 \end{pmatrix} + t\begin{pmatrix} 0 \\ -3 \\ -3 \end{pmatrix}$.
Show whether the lines meet, giving the point of intersection if they do, and find the acute angle between them to 1 d.p.