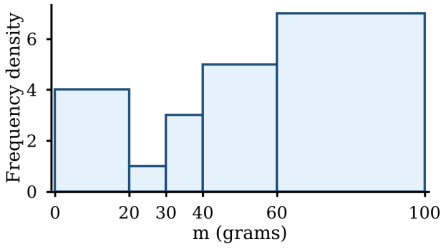
Day 328 **A Level Maths: A Tier 10-a-day**

1 The histogram shows the masses of apples, m (in grams), of a sample.
(a) How many were in the class $40 \leq m < 60$?
(b) Estimate how many had $35 < m < 55$.



2 A particle of mass 2 kg is acted on by forces $F_1 = (14\mathbf{i} - 11\mathbf{j})$ N and F_2. Its acceleration is $(\mathbf{i} - 3\mathbf{j})$ m s^{-2}. Find (a) F_2, (b) the angle between F_2 and $\mathbf{i}$, to 1 d.p.

3 A and B have position vectors $\begin{pmatrix} 0 \\ -5 \end{pmatrix}$ and $\begin{pmatrix} 0 \\ 5 \end{pmatrix}$.
The point P lies on AB with AP : PB = 2 : 3.
Find the position vector of P and the exact distance OP.

4 Particles A (6 kg) and B (3 kg) move towards each other on a smooth horizontal line at 5 m s^{-1} and 4 m s^{-1}. They collide and coalesce. Find (a) the speed of the combined particle, (b) the kinetic energy lost in the collision.

5 $y = \cot(2x)$.
Find $\frac{dy}{dx}$ and its exact value at $x = \frac{\pi}{6}$.

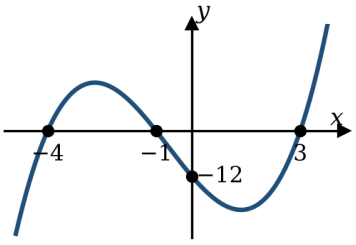
Day 328 **A Level Maths: A Tier 10-a-day**

6 A sequence is defined by $u_1 = k$ and $u_{n+1} = 3u_n - 4$.
Given that $u_3 = -61$, find (a) the value of k, (b) $\sum_{r=1}^{4} u_r$.

7 Parts are defective with probability 0.25, independently. A box of 9 parts is rejected if it has at least 4 defective.
From 9 such boxes, find the probability that exactly 2 are rejected (3 s.f.).

8 The second term of a geometric series is 6 and its sum to infinity is 27.
Find the two possible values of the first term.

9 The diagram shows a sketch of the curve y = f(x), where f(x) is a cubic.
Find f(x), giving your answer in expanded form.



10 The line l has equation $\mathbf{r} = \begin{pmatrix} -2 \\ -4 \\ -5 \end{pmatrix} + t\begin{pmatrix} 1 \\ 2 \\ 2 \end{pmatrix}$.
Find the coordinates of the foot of the perpendicular from P(−1, 1, −6) to l, and the exact distance from P to l.