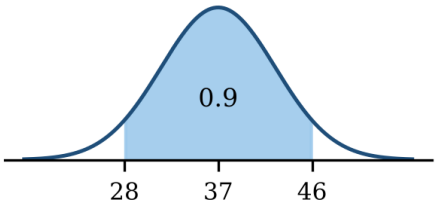
Day 347 **A Level Maths: S Tier 10-a-day**

1 A lift of mass 500 kg, carrying a passenger of mass 85 kg, is supported by a vertical cable. The lift is moving upwards and accelerating at 1.2 m s^{-2}.
Find (a) the force the floor exerts on the passenger, (b) the tension in the cable. Take g = 9.8 m s^{-2}.

2 The pdf of X ~ N(37, σ^2) is shown; the shaded area is symmetrical.
(a) Find σ. (b) Find P(X > 54).



3 $f(x) = 2x^3 + ax^2 + bx + 24$, where a and b are constants.
(x + 2) is a factor of f(x), and f(x) leaves remainder −60 when divided by (x + 3).
Find a and b, and hence solve f(x) = 0.

4 A ball is projected horizontally at 19.6 m s^{-1} from the top of a vertical cliff of height 78.4 m, and lands on horizontal ground.
Find (a) the time of flight and the distance from the cliff, (b) the speed and direction on landing. Take g = 9.8 m s^{-2}.

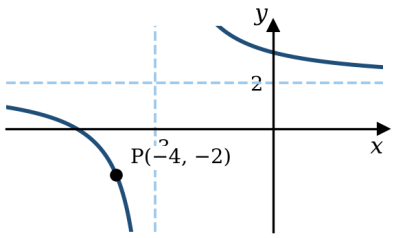
5 Find the exact value of
$\tan(\tan^{-1}(\frac{4}{7}) + \tan^{-1}(2))$.

Day 347 **A Level Maths: S Tier 10-a-day**

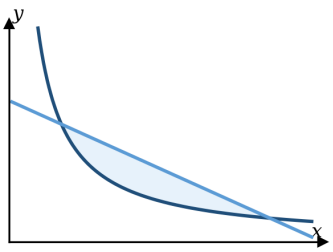
6 Each seed is faulty with probability 0.12, independently.
Find the least number n of seeds that must be tested so that the probability of finding at least two faulty is greater than 0.95.

7 Two boats P and Q move so that, t hours after noon, their position vectors in km are
$\mathbf{r}_P = \begin{pmatrix} -3 \\ 5 \end{pmatrix} + t\begin{pmatrix} -3 \\ -2 \end{pmatrix}$ and $\mathbf{r}_Q = \begin{pmatrix} -9 \\ 5 \end{pmatrix} + t\begin{pmatrix} 0 \\ 1 \end{pmatrix}$.
Find the time at which they are closest and the exact minimum distance between them.

8 The diagram shows the curve C, its asymptotes (dashed) and a point P. C has equation $y = \frac{a}{x + p} + q$. Find a, p and q.



9 The diagram shows the curve $y = \frac{5}{x}$ and the line $y = 6 - x$.
Find the exact area of the shaded region enclosed by
the curve and the line.



10 $u_{n+1} = -\frac{1}{2}u_n + \frac{27}{2}$, $u_1 = 33$.
(a) Find the limit L of the sequence.
(b) Find the least n such that $|u_n - L| < 0.001$.