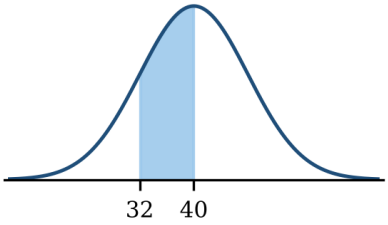
Day 323	A Level Maths: B Tier 10-a-day
1 Points A, B and C have position vectors $\begin{pmatrix} 3 \\ -3 \\ -3 \end{pmatrix}$, $\begin{pmatrix} 3 \\ 0 \\ 0 \end{pmatrix}$ and $\begin{pmatrix} 3 \\ q \\ 6 \end{pmatrix}$ respectively. Given that A, B, C are collinear, find q.	
2 Items numbered 1 to 180; systematic sample of size 20. (a) Find the sampling interval. (b) The first item is number 5. Find the 4-th item.	
3 Given that $y = x^4 \ln x$, find $\frac{dy}{dx}$, and its value when $x = 1$.	
4 A remote-control car moves with constant velocity $(10\mathbf{i} - 24\mathbf{j})$ m s^{-1}, where $\mathbf{i}$ and $\mathbf{j}$ are unit vectors east and north. Find its speed and the acute angle its direction makes with $\mathbf{i}$, to 1 d.p.	
5 A curve has equation $y = \frac{4}{x-2} + 1$. (a) Write down the asymptotes. (b) Find where the curve crosses the axes.	

Day 323 **A Level Maths: B Tier 10-a-day**

6 $X \sim N(40, 8^2)$. The shaded area on the diagram represents the probability that X lies between two values.
Find this probability to 3 significant figures.



7 $\mathbf{a} = \begin{pmatrix} 0 \\ 2 \\ 1 \end{pmatrix}$ and $\mathbf{b} = \begin{pmatrix} -1 \\ 5 \\ -1 \end{pmatrix}$.
Find the angle between a and b, to 1 d.p.

8 A sledge of mass 4 kg is pulled across smooth horizontal ice by a rope with tension 5 N, inclined at α above the horizontal, where $\tan\alpha = \frac{4}{3}$.
Take $g = 9.8$ m s^{-2}.
Find (a) the acceleration of the sledge, (b) the normal reaction of the ice.

9 A sequence is defined by $u_{n+1} = \frac{1}{1 - u_n}$, $u_1 = 4$.
(a) Show that the sequence is periodic, stating the period.
(b) Find u_{40} and $\sum_{r=1}^{40} u_r$.

10 Solve the equation $2^{2x} - 12\times2^x + 32 = 0$.