An Important Theorem.

If $(\sqrt{A}+B)^n = I+f$ where I and n are positive integers, n being odd and $0 \le f < 1$ then $(I+f).f = K^n$ where $A-B^2 = K > 0$ and $\sqrt{A}-B<1$.

Note: If n is even integer then $(\sqrt{A}+B)^n + (\sqrt{A}-B)^n = I+f+f'$

Hence L.H.S. and I are integers.
$\therefore f+f'$ is also integer; $\Rightarrow f+f'=1$; $\therefore f'=(1-f)$
Hence $(I+f)(1-f)=(I+f)f' = (\sqrt{A}+B)^n(\sqrt{A}-B)^n = (A-B^2)^n = K^n$.