Problem 2. A frog jumps in the plane with the first jump from the origin. The frog jumps distance 1 on the first jump, distance 2 on the second jump, distance 4 on the third jump and in general jumps distance $2^{n-1}$ in the $n^{\text{th}}$ jump. For each jump, the frog jumps in a straight line but can jump in any direction. Can the frog, by a judicious choice of directions, end up back at the origin on its $2012^{\text{th}}$ jump?

What is the answer if the frog jumps distance $1.5^{n-1}$ on its $n^{\text{th}}$ jump? Your answers must include complete supporting work.