Let S_n be the set of all sums $\sum_{k=1}^{n} x_k$, where $n \geq 2$, $0 \leq x_1, x_2, \ldots, x_n \leq \frac{\pi}{2}$ and

$$\sum_{k=1}^{n} \sin x_k = 1.$$

a) Show that S_n is an interval.

b) Let l_n be the length of S_n. Find $\lim_{n\to\infty} l_n$.