$$S_n = \frac{1}{n}\Re\left(\sum_{k=0}^{n-1}\left(\mathrm{e}^{\mathrm{i}\frac{\pi}{2n}}\right)^k\right)$$

sum of terms of a geometric progression of ratio $\mathrm{e}^{\mathrm{i}\frac{2\pi}{n}}$

$$= \frac{1}{n}\Re\left(\frac{1-\left(\mathrm{e}^{\mathrm{i}\frac{\pi}{2n}}\right)^n}{1-\mathrm{e}^{\mathrm{i}\frac{\pi}{2n}}}\right)$$

This line has been wrapped automatically.

$$= \frac{1}{n}\Re\left(\frac{1-\mathrm{i}}{1-\mathrm{e}^{\mathrm{i}\frac{\pi}{2n}}}\right)$$