Provide a clear and organized presentation. Show all of your work and give exact values only, unless otherwise specified. Consider the integral $\int_0^{\pi} \sin\left(\frac{1}{2}x\right)dx$

1. Use S_6 to approximate the value of this integral.
2. Use our error formula to determine how accurate this approximation is.
3. How many subdivisions do we need to guarantee that S_n approximates the true value of this integral accurately to within $\frac{1}{1{,}000{,}000}$ units?