Step-1

Now consider the following:

$$\begin{aligned}\left(FEF^{-1}\right)x &= (FE)\left(F^{-1}x\right) \\ &= F\left(E\left(F^{-1}x\right)\right)\end{aligned}$$

We know that when the product of either F or F^{-1} with x is carried out, a total of $\frac{1}{2}n\log_2 n$ multiplications are required.

Step-2

Thus, to obtain $F^{-1}x$, we need $\frac{1}{2}n\log_2 n$ number of multiplications. After that, we have to calculate $E\left(F^{-1}x\right)$. Now E is an n by n diagonal matrix. Thus, $E\left(F^{-1}x\right)$ needs n more multiplications. Finally, we carry out $F\left(E\left(F^{-1}x\right)\right)$, which further requires $\frac{1}{2}n\log_2 n$ number of multiplications.

Therefore, in total, we require $\frac{1}{2}n\log_2 n+n+\frac{1}{2}n\log_2 n=n\log_2 n+n$ number of multiplications.

Step-3

Out of these, $\boxed{\frac{1}{2}n\log_2 n}$ multiplications come from each F and F^{-1} and the remaining n multiplications come from E.