54. $|\mathbf{adj}.\ \mathbf{A}| = |\mathbf{A}|^2$, where A is a square matrix of order two.

Ans: Here, A is square matrix of order two

We know that,

$\Rightarrow A.\ Adj\ A = \ |A|\ I$

$\Rightarrow |A.\ Adj\ A| = \ ||A|\ I|$

$\Rightarrow |A|\,|\ Adj\ A| = \ |A|^n$

$\Rightarrow |\ Adj\ A| = \dfrac{|A|^n}{|A|}$

$\Rightarrow |\ Adj\ A| = |A|^{n-1}$

Here, $n = 2$

$\Rightarrow |\ Adj\ A| = |A|^{2-1}$

$\Rightarrow |\ Adj\ A| = |A|$

Hence, the given statement is false.