multiplication of ideals

Let A be a ring. Given two-sided ideals $\mathfrak{a}, \mathfrak{b} \subset A$, one can multiply them.

$$\mathfrak{a}\mathfrak{b}$$

denotes the two-sided ideal generated by

$$\{ab\colon a \in \mathfrak{a}, b \in \mathfrak{b}\}.$$

Two sided ideals in a given ring form a monoid. The unit is given by the unit ideal; A.

Question

$\mathfrak{ab} \subset \mathfrak{a} \cap \mathfrak{b}$ but equality does not hold in general. Check this by considering $\mathfrak{a} = \mathfrak{b} = 2\mathbb{Z} \subset \mathbb{Z}$.