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product of left and right ideal

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Let  $\mathfrak{a}$  and  $\mathfrak{b}$  be ideals of a ring  $R$ . Denote by  $\mathfrak{ab}$  the subset of  $R$  formed by all finite sums of products  $ab$  with  $a \in \mathfrak{a}$  and  $b \in \mathfrak{b}$ . It is straightforward to verify the following facts:

- If  $\mathfrak{a}$  is a <http://planetmath.org/Idealleft> and  $\mathfrak{b}$  a right ideal,  $\mathfrak{ab}$  is a two-sided ideal of  $R$ .
- If both  $\mathfrak{a}$  and  $\mathfrak{b}$  are two-sided ideals, then  $\mathfrak{ab} \subseteq \mathfrak{a} \cap \mathfrak{b}$ .