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opposite ring

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If  $R$  is a ring, then we may construct the *opposite ring*  $R^{op}$  which has the same underlying abelian group structure, but with multiplication in the opposite order: the product of  $r_1$  and  $r_2$  in  $R^{op}$  is  $r_2r_1$ .

If  $M$  is a left  $R$ -module, then it can be made into a right  $R^{op}$ -module, where a module element  $m$ , when multiplied on the right by an element  $r$  of  $R^{op}$ , yields the  $rm$  that we have with our left  $R$ -module action on  $M$ . Similarly, right  $R$ -modules can be made into left  $R^{op}$ -modules.

If  $R$  is a commutative ring, then it is equal to its own opposite ring.

Similar constructions occur in the opposite group and opposite category.