

Addition is Commutative in Rings

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$$\begin{aligned}a + b &= \\&= 0 + a + b + 0 = \\&= (-a) + a + a + b + b + (-b) = \\&= (-a) + (1 \times a) + (1 \times a) + (1 \times b) + (1 \times b) + (-b) = \\&= (-a) + ((1 + 1) \times a) + ((1 + 1) \times b) + (-b) = \\&= (-a) + ((1 + 1) \times (a + b)) + (-b) = \\&= (-a) + (1 \times (a + b)) + (1 \times (a + b)) + (-b) = \\&= (-a) + (1 \times a) + (1 \times b) + (1 \times a) + (1 \times b) + (-b) = \\&= (-a) + a + b + a + b + (-b) = \\&= 0 + b + a + 0 = \\&= b + a\end{aligned}$$