Minus times minus

From time to time, when a downturn loomed, every 3¾ years in fact, rather like a lemming explosion, the company in whose IT Department I toiled from 1981 to 2009, would ritually shed its junior members (as being less productive, in consequence of being totally inexperienced and uninitiated) rather like Herod's Massacre of the Innocents, or an oak tree dropping its acorns.

Later on, it ejected its non-managerial senior members as well, this being more cost-efficient. It thereby managed to strip itself of all perceptible creative talent, and is now ancient history.

In between whiles however, the recruitment of new staff, whether experienced or (more frequently) straight off the street, brought me into contact with fresh faces (generally speaking the managerial staff simply rotated their bums as in a game of musical chairs).

One new colleague in particular, a physics graduate, was possessed of an unusually enquiring mind, and we discussed a lot of work-unrelated issues in the course of our duties. On one occasion, he confessed that he'd never understood why minus one times minus one made plus one. Did I know ?

So I improvised as best I could, as follows:

01.00] $(-1 + 1) = 0$

01.10] $\therefore\ (-1) \times (-1 + 1) = 0$ (anything times nought is nought)

01.20] $\therefore\ (-1) \times (-1) + (-1) \times (+1) = 0$ (multiplying-out the bracket)

01.30] $\therefore\ (-1) \times (-1) + (-1) = 0$ (anything times +1 is unchanged)

01.40] $\therefore\ (-1) \times (-1) = +1$ (adding +1 to both sides) QED

Some modern maths teachers like to distinguish between –1 as a subtraction of positive 1 (ie $^{+}1$), and -1 as intrinsically negative 1 (ie $^{-}1$), and I think that can be quite helpful in certain contexts such as this.

The crux of this proof is of course the third step, which invokes the **distributive law of multiplication**

$$c \times (a + b) = c \times a + c \times b$$

$$\text{eg } 5 \times (3 + 4) = 5 \times 3 + 5 \times 4 = 15 + 20 = 35$$
$$\text{just as } 5 \times (3 + 4) = 5 \times 7 = 35$$

Minus times minus has to be plus, otherwise arithmetic wouldn't work consistently.