1. For this machine, ab always equals to ba. Because the only chance which makes the result change in this machine is the rounding step. However, the same number will be rounded by the same manner. So, we have the conclusion that for this machine, ab equals to ba.
2. On the other hand, (ab)c does not equal to a(bc). For we need to do two steps of calculation , which means in some cases we may have 2 times of rounding and in other cases we may have only one time of rounding.

Here is the example.

Let’s say a = 2, b = 72, c = 658

|  |  |  |  |
| --- | --- | --- | --- |
| Step1 | ab = 2 x 72 = 144 | bc = 72 x 658 = 47376 |  |
| Round result | 1.44 x 102 | 4.738 x 105 |  |
| Step 2 | 144 x 658=94752 | 47380 x 2 = 94760 |  |
| Round result | 9.475 x 104 | 9.476 x 104 |  |

1. Because we have 4 mantissa digits, which represents x.xxx, so the machine epsilon should be 0.0005. This is the min value which makes round happen.