THE EASY MULTIPLICATION TABLES

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An Important Problem

Worldwide children in elementary school have to learn by heart the multiplication tables, namely they should be able to immediately tell the result, without computing it, of all products $a \times b$, where a and b are numbers from 1 to 10. This is important because to multiply two natural numbers one needs in general to compute several multiplications between single-digit numbers (notice that the multiplication by 0 has always zero as a result, so it is not part of the multiplication tables but it is a fact which is learned independently). How can we help children memorizing their multiplication tables?

Model

Research results in cognitive psychology confirm what is actually intuitively clear, namely that the use of posters in classrooms (or at home) helps familiarising with the topic in question and facilitates its learning. Since the topic of the multiplication tables is mostly only a matter of memorizing (we do not intend to discuss here the parity rule, or skip-counting, or other mathematical facts which let children verify if their results are correct), a poster can be particularly useful.

Multiplication tables posters are usually divided into ten columns, which contain respectively the multiplication by a, where a is a fixed number from 1 to 10. So one has a total of 100 multiplications displayed. However, the multiplication by 1 could be learned, rather than memorized, as it was done with the multiplication by 0. So children can learn that $1 \times a = a \times 1 = a$ independently of the number a which is chosen. Moreover, children can (and must) learn that the multiplication is commutative, namely that $a \times b = b \times a$ independently of the chosen numbers a and b. If one takes into account the commutativity of the multiplication, many informations in the multiplication tables are a repetition. For example, if one knows $6 \times 8 = 48$, then one does not need to know $8 \times 6 = 48$, because this is automatic from the commutativity.

So in the multiplication tables it is sufficient to display all products $a \times b$ where a is less than or equal to b. This allows sparing 45 multiplications. Since, as argumented above, we do not need to display the multiplication by 1, we can omit 10 further multiplications. In total we are left with only 45 multiplications out of 100, whose set we call *Easy Multiplication Tables*. The visual advantage of the Easy Multiplication Tables with respect to the classic multiplication tables is evident because we have only 135 numbers displayed in the operations rather than 300.

We acknowledge that the use of classic multiplication tables in schools is useful because for each a from 1 to 10 one wants to teach the skip-counting by a and introduce the children to the sequence of multiples of a. Nevertheless, when it comes to memorizing the multiplication tables, the Easy Multiplication Tables have two didactical advantages. Firstly, there are a lot less formulas to memorize (there is no reduntant information, one sees exactly what one needs to memorize). Secondly, children are encouraged to swap factors while taking products, so they train the commutativity of the multiplication.

The distribution of the Easy Multiplication Tables (in the form of posters and mugs) has received positive feedback from teachers, children, and parents alike.

References

Free images of the Easy Multiplication Tables for posters and mugs (also with cartoons) can be found on the webpage of the author `https://www.antonellaperucca.net`

The Easy Multiplication Tables

2

$2 \times 2 = 4$
$2 \times 3 = 6$
$2 \times 4 = 8$
$2 \times 5 = 10$
$2 \times 6 = 12$
$2 \times 7 = 14$
$2 \times 8 = 16$
$2 \times 9 = 18$
$2 \times 10 = 20$

3

$3 \times 3 = 9$
$3 \times 4 = 12$
$3 \times 5 = 15$
$3 \times 6 = 18$
$3 \times 7 = 21$
$3 \times 8 = 24$
$3 \times 9 = 27$
$3 \times 10 = 30$

4

$4 \times 4 = 16$
$4 \times 5 = 20$
$4 \times 6 = 24$
$4 \times 7 = 28$
$4 \times 8 = 32$
$4 \times 9 = 36$
$4 \times 10 = 40$

5

$5 \times 5 = 25$
$5 \times 6 = 30$
$5 \times 7 = 35$
$5 \times 8 = 40$
$5 \times 9 = 45$
$5 \times 10 = 50$

6

$6 \times 6 = 36$
$6 \times 7 = 42$
$6 \times 8 = 48$
$6 \times 9 = 54$
$6 \times 10 = 60$

7

$7 \times 7 = 49$
$7 \times 8 = 56$
$7 \times 9 = 63$
$7 \times 10 = 70$

8

$8 \times 8 = 64$
$8 \times 9 = 72$
$8 \times 10 = 80$

9

$9 \times 9 = 81$
$9 \times 10 = 90$

10

$10 \times 10 = 100$