

Mental Strategies for Multiplication

From research by Ian Thompson, Visiting Professor, Northumbria University, UK, shared at ICME-10, Copenhagen, 2004

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Multiplication

Repeated Addition

Mary (16 x 3)

16 and 16 and 16... That's 30 and 12, 13, 14, 15, 16, 17, 18, ...48.

This is repeated addition using partitioning and counting on. This is not an efficient strategy in the way that Mary has carried it out, but does show an elementary understanding of multiplication. Mary now needs experiences to help her refine her strategy and make it more efficient.

Partial Products

Elizabeth (28 x 5)

140 ... I put 20 times 5 would be a hundred and 8 x 5 is 40... that's how I found out.

The partial products 20 x 5 and 8 x 5 have been calculated separately, and then added together to give the final total. This strategy involves an implicit understanding of the distributive property.

Compensation

Sean (12 x 9)

12 x 10 is 120 ... and take away 9 is 110...111.

Sean has made the common error of subtracting the multiplier rather than the multiplicand. The strategy is an efficient one, but students must have experiences to lead them to the appropriate use of it.

Note that in none of these strategies do the children make use of what is commonly understood as “place value” – they do not talk in terms of “tens and ones” but in terms of the value of the numbers. Some researchers* make the distinction between *quantity value* (e.g., 78 is 70 and 8) and *column value* which involves knowing that the 7 is in the tens place and the 8 is in the ones or units place, a small but subtle difference.

*Thompson and Bramald, (2002) *An Investigation of the Relationship Between Young children's Understanding of the Concept of Place Value and their Competence at Mental Addition* (Report for the Nuffield foundation). Newcastle upon Tyne: University of Newcastle upon Tyne.

Do these work? Why or why not?

1
2

a)
$$\begin{array}{r} 45 \\ \times 35 \\ \hline \end{array}$$

225

$$\begin{array}{r} 135 \\ \hline \end{array}$$

245

b)
$$\begin{array}{r} 45 \\ \times 35 \\ \hline \end{array}$$

305

$$\begin{array}{r} 155 \\ \hline \end{array}$$

1855

c)
$$\begin{array}{r} 45 \\ \times 35 \\ \hline \end{array}$$

1225

d)
$$\begin{array}{r} 45 \\ \times 35 \\ \hline \end{array}$$

120025

e)
$$\begin{array}{r} 45 \\ \hline \end{array}$$

$$\begin{array}{r} \times 35 \\ \hline \end{array}$$

145

f)
$$\begin{array}{r} 45 \\ \times 35 \\ \hline \end{array}$$

1350

$$\begin{array}{r} 750 \\ \hline \end{array}$$

1575

g)
$$\begin{array}{r} 45 \\ \times 35 \\ \hline \end{array}$$

175

$$\begin{array}{r} 1400 \\ \hline \end{array}$$

1575

h)
$$\begin{array}{r} 45 \\ \times 35 \\ \hline \end{array}$$

25

200

150

$$\begin{array}{r} 1200 \\ \hline \end{array}$$

1575