

Efficient multiplication

Notes and guidance

In this small step, children consolidate their knowledge and understanding of multiplication and begin to make decisions regarding the most efficient or appropriate methods to use in a range of contexts.

Children look at times-tables facts, building strategies for finding unknown facts that will support them to strengthen their fluency of times-tables. They then examine a range of strategies for multiplying a 2-digit number by a 1-digit number. Finally, they use arrays to explore multiplicative structure, in particular the associative law and distributive law.

Things to look out for

- Children may conflate different methods, leading to misunderstanding.
- Children may partition the numbers correctly, but then multiply the tens as if they are ones, for example $34 \times 6 = 3 \times 6 + 4 \times 6$
- Children may attempt to learn the different methods procedurally. It is vital that children understand how they are manipulating the numbers, rather than try to remember a long series of instructions.

Key questions

- Which method do you find most efficient? Explain how this method works.
- What is the most efficient way to work out $\text{_____} \times \text{_____}$?
- What happens if you double one factor and halve the other?
- How could you use factor pairs to help you calculate?

Possible sentence stems

- $\text{_____} \times \text{_____} = \text{_____} \times \text{_____} + \text{_____} \times \text{_____}$
- $\text{_____} \times \text{_____} = \text{_____} \times \text{_____} - \text{_____} \times \text{_____}$
- $\text{_____} \times \text{_____} = \text{_____} \times \text{_____} \times 2$
- $\text{_____} \times \text{_____} = \text{_____} \times \text{_____} \div 2$

National Curriculum links

- Solve problems involving multiplying and adding, including using the distributive law to multiply 2-digit numbers by 1 digit, integer scaling problems and harder correspondence problems such as n objects are connected to m objects

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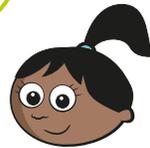
Key learning

- Jack and Sam are working out 7×6



Jack

To work out 7×6 ,
I do $7 \times 3 = 21$,
then double $21 = 42$



Sam

To work out 7×6 ,
I do $7 \times 5 = 35$,
then add $7 = 42$

- ▶ Use Jack's method to work out 8×6
- ▶ Use Sam's method to work out 9×6

- For each calculation, show two ways that you could find the answer if you do not know the times-table fact.

9×4

9×7

4×7

7×8

- Work out the missing numbers.

▶ $5 \times 8 = 5 \times 4 \times \underline{\quad}$

▶ $16 \times 5 = 16 \times 10 \div \underline{\quad}$

▶ $7 \times 4 = 7 \times 2 \times \underline{\quad}$

▶ $19 \times 7 = 20 \times 7 - \underline{\quad} \times 7$

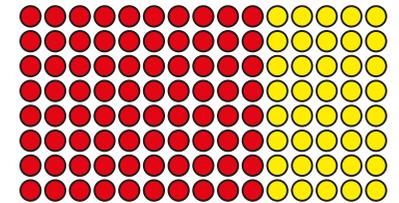
- Here are four different ways of working out 15×8 mentally. Complete the calculation in each method.

Method 1

$$15 \times 8 = 10 \times 8 + 5 \times 8$$

$$= 80 + \underline{\quad}$$

$$= \underline{\quad}$$

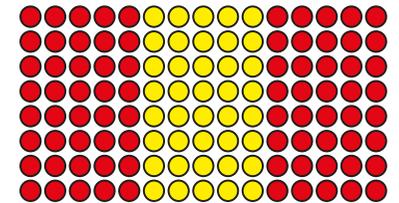


Method 2

$$15 \times 8 = 3 \times 5 \times 8$$

$$= 3 \times \underline{\quad}$$

$$= \underline{\quad}$$

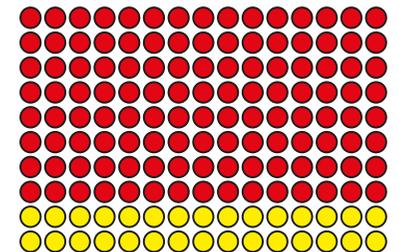


Method 3

$$15 \times 8 = 15 \times 10 - 15 \times 2$$

$$= \underline{\quad} - \underline{\quad}$$

$$= \underline{\quad}$$



Method 4

$$15 \times 8 = 30 \times 8 \div 2$$

$$= \underline{\quad} \div 2$$

$$= \underline{\quad}$$

Efficient multiplication

Reasoning and problem solving

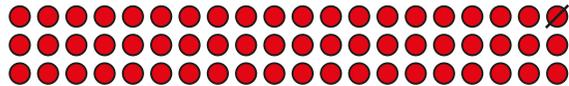
Find four different ways to work out 18×5

Compare methods with a partner.



multiple possible answers, e.g. $(18 \times 10) \div 2$

Kim uses an array to help her work out 19×3



$$\begin{aligned} 20 \times 3 &= 60 \\ 60 - 1 &= 59 \\ 19 \times 3 &= 59 \end{aligned}$$

What mistake has Kim made?
Draw or make the array correctly.



Kim has subtracted one counter, rather than one group of 3 counters.



Teddy, Eva and Amir choose one of the number cards each.

They multiply their number by 5

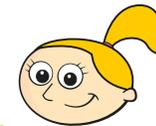


I did 40×5 and then subtracted 2 lots of 5

Teddy

42

I multiplied my number by 10 and then divided 210 by 2



Eva

Which number card has Amir got?

Talk about the different methods Amir could have used.

