

Check-Up

24

More multiplication strategies

A headteacher is calculating the total cost of 47 days' supply cover for a term on the basis of £128 per day. Without using a calculator, what does this come to?

Answer to check-up 24

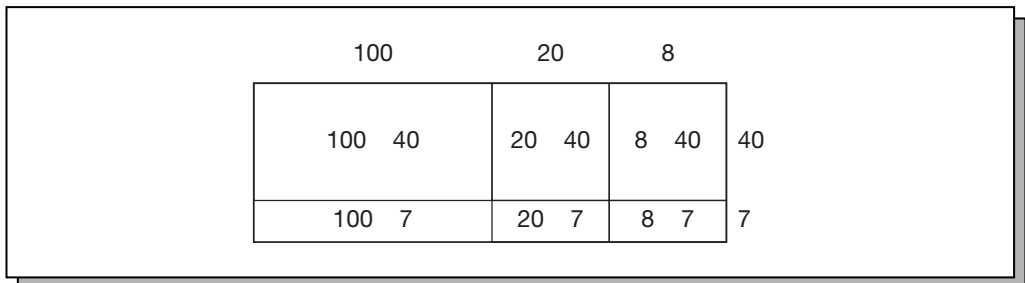
£6016.

Discussion and explanation of check-up 24

Sometimes you will find yourself in the position of having to do a multiplication calculation like this without a calculator available. Even though the numbers are quite large, you should still be able to tackle it using informal methods. However, you may appreciate having available a formal written method. You may be familiar with the method known as long multiplication. This is shown below on the left. The procedure here first multiplies 128 by 40, then multiplies 128 by 7, and then adds the results. The problem is that calculations like 128 by 40 and 128 by 7 are quite tricky to handle mentally when you are in the middle of a longer calculation.

$\begin{array}{r} 128 \\ \hline 47 \\ \hline \end{array}$	this is 128 40 this is 128 7	$\begin{array}{r} 100 \ 40 = 4000 \\ 100 \ 7 = 700 \\ 20 \ 40 = 800 \\ 20 \ 7 = 140 \\ 8 \ 40 = 320 \\ 8 \ 7 = 56 \\ \hline 6016 \end{array}$
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An alternative, simpler procedure is shown on the right. In this method we partition the 128 into $100 + 20 + 8$ as well as the 47 into $40 + 7$. This then gives us, in this example, six separate multiplications to do, but they are all very easy! The diagram below (not drawn to scale) is a useful picture of what is going on here: each one of the six multiplications involved in finding 128 47 is represented by one of the six areas in the rectangle.



If you were multiplying two two-digit numbers, there would be only four areas involved (e.g. for 47×59 you would need 40×50 , 40×9 , 7×50 and 7×9). With two three-digit numbers, there would be nine areas involved. Any more than this and you really should find the calculator.

Summary of key ideas

- ◆ When a written method is needed for a multiplication calculation, an alternative to long multiplication is to partition each number into hundreds, tens and units and multiply each part of one number by each part of the other, and add all the results.
- ◆ This procedure can be represented as finding areas of parts of a rectangle, produced by dividing up the sides into hundreds, tens and units.

Further practice

Try using the 'areas' method to find the answers to these questions.

- 24.1** A school secretary is contracted to work 28 hours per week for 39 weeks of the year. How many hours is this in total?
- 24.2** The school sports field is a rectangle, 142 metres long and 72 metres wide. Is this more or less than 1 hectare in area? (1 hectare = 10 000 square metres)