

## long multiplication : farming times

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Many people in the countryside like to read a newspaper called *Farming Times*.

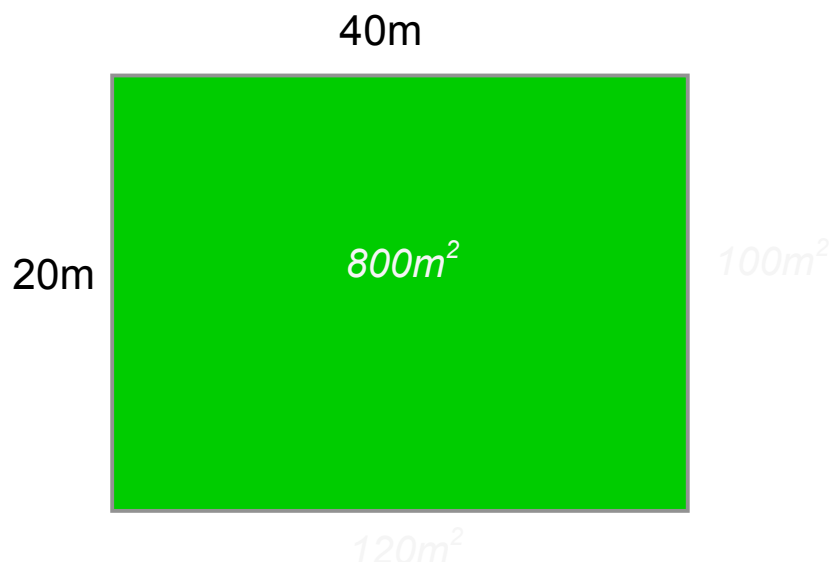
Here's George. He's a farmer and he enjoys reading *Farming Times*.



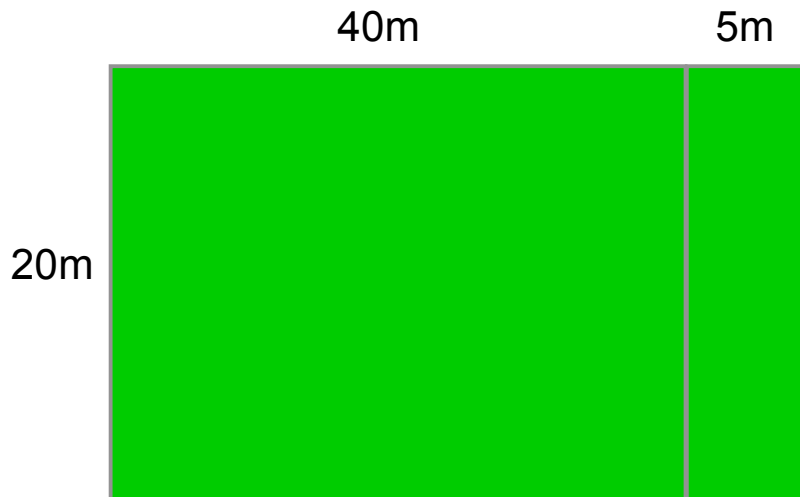
On his farm he's got a field which is 20m by 40m :



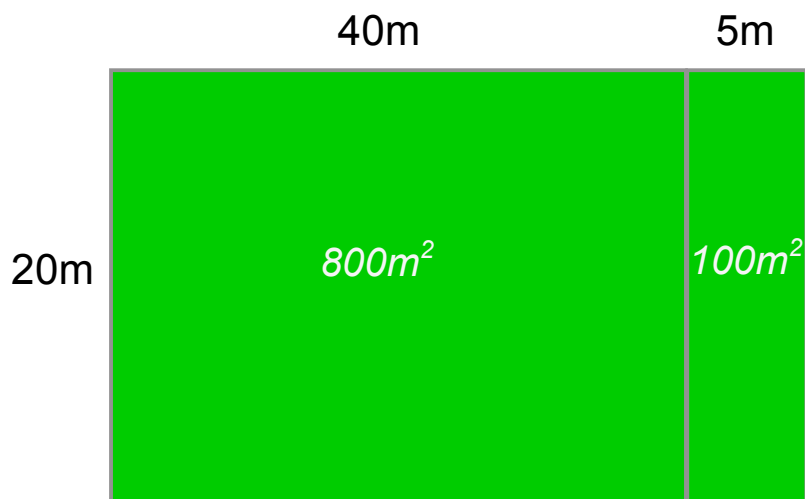
By multiplying, we can get the *area* of this field :



George would love to make his field a bit bigger and one day he manages to persuade a neighbouring farmer to sell him a small strip of land measuring 5m by 20m :

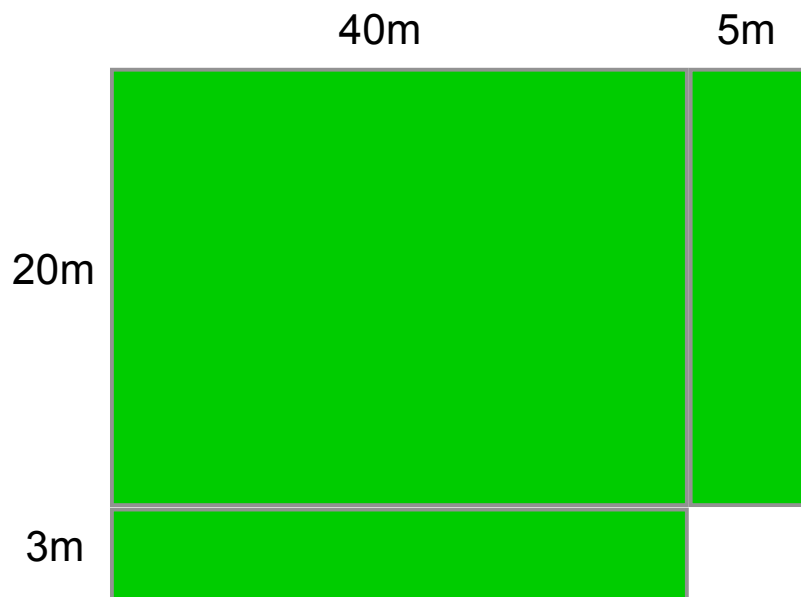


So now there's an extra  $100\text{m}^2$  for George to farm (as we can easily work out):

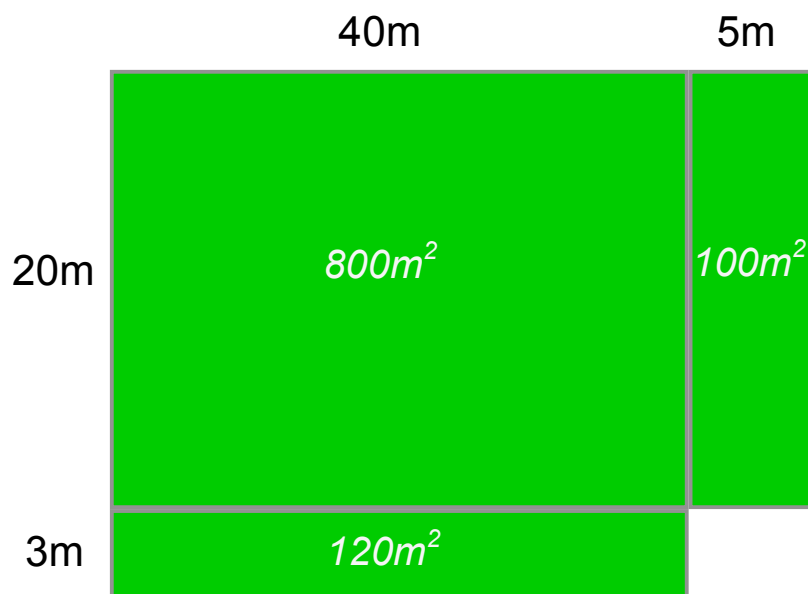


Before long George is lucky again. Another neighbour offers to sell him a strip of land next to

his field, this time to the south. The new strip measures 40m long by 3m wide :



We know that  $3 \times 40 = 120$ , so George has added another  $120\text{m}^2$  to the area he can farm :



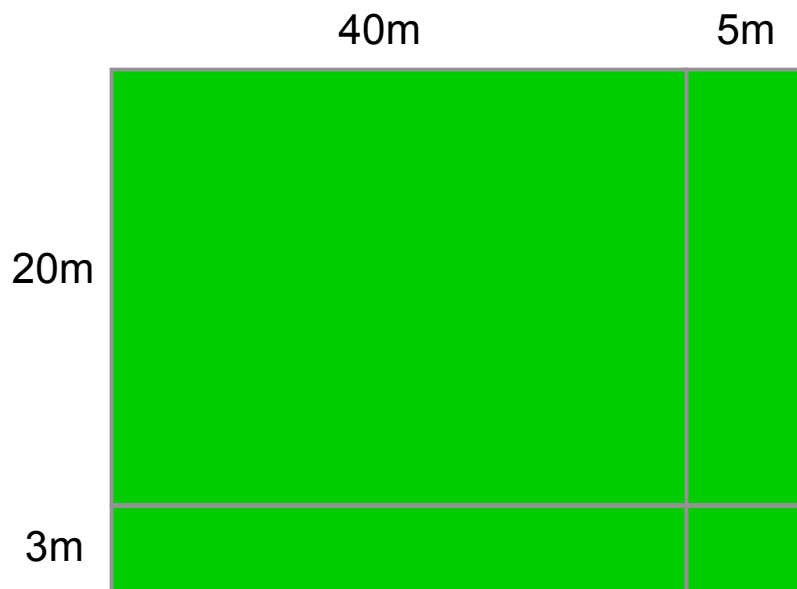
Obviously George would love to fill in the small corner you can see in the diagram.

This small corner belongs to an old lady who lives in a cottage next to George's farm.



In exchange for this last small corner of land, George agrees to look after the old lady's garden for the rest of her life.

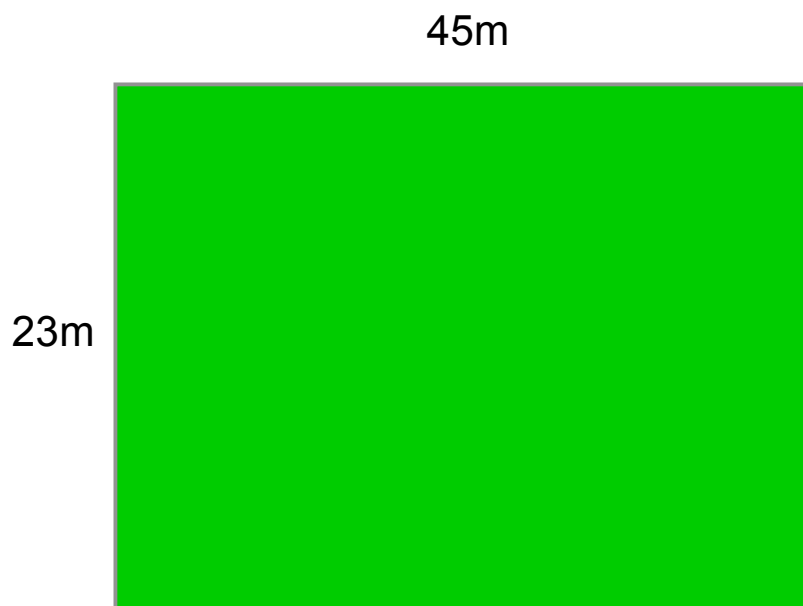
Here's what George's enlarged field now looks like :



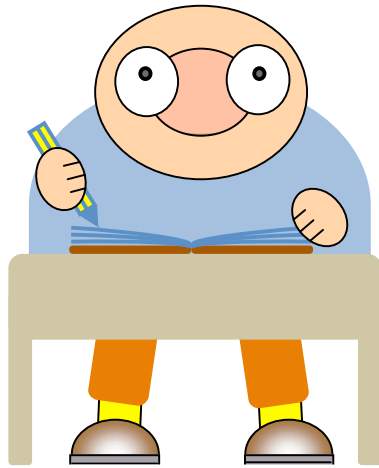
Obviously this last small corner measures 5m by 3m, so its area must be  $15\text{m}^2$ . Altogether George now has these four separate areas to farm :



In the autumn George takes out the hedges between these fields, to give himself just one large field. What are the measurements of the new enlarged field? It's not very hard to work out :



When spring arrives, George decides to sow barley on his new enlarged field. First of all though he must work out the area of the field so he knows how much barley seed to order. George sits down in his farm office and begins to think . . .



How can George work out the area of his field? He knows he has to multiply 45 by 23, but that's the problem! When he was at school George never really got the hang of long multiplication and whatever he did learn he's now forgotten. A large tear trickles down George's cheek as he realises that he's completely lost.

Luckily, George's wife Lucy pops in to the farm office to see him. 'What on earth is the matter?' she asks George. George tells her his problem. Lucy is sensible – and practical. First of all she makes him a cup of cocoa in his favourite mug and then she asks him a question . . .

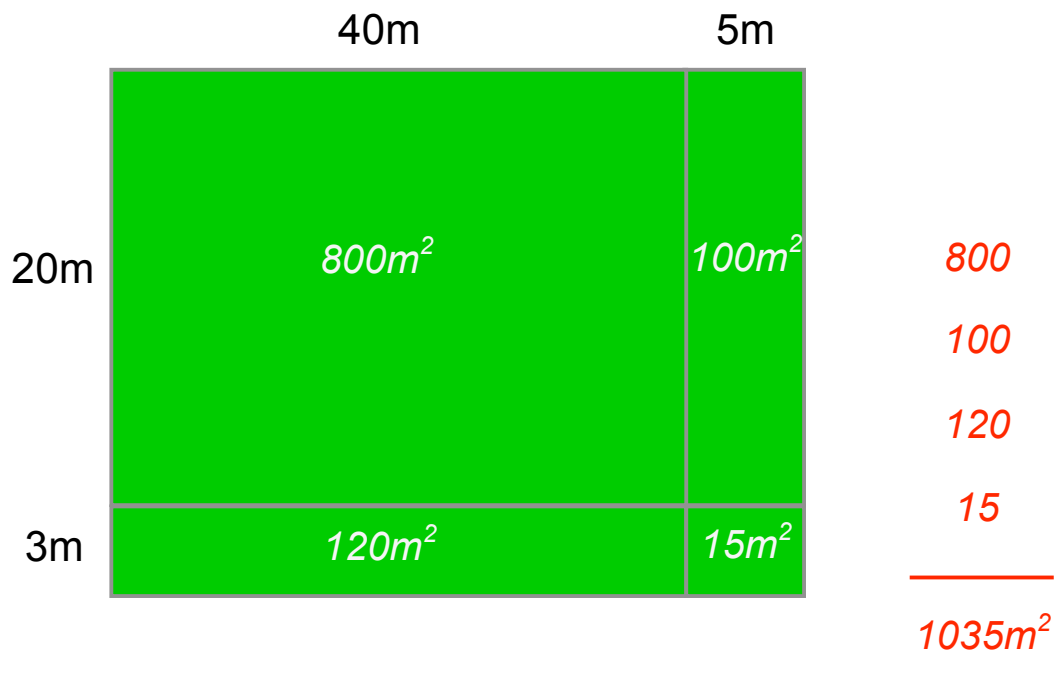
'When the field was in four separate parts, you know, before you made it into one large field, did you know the areas of the separate parts?'

'Yes', says George, 'But it's too late now, I've forgotten what the areas were! I just don't know what to do.'

Lucy thinks for a minute or two and then she makes a suggestion. Can you guess what it is?

‘Why not draw a rectangle to stand for your field,’ she suggests, ‘and then divide it up so it looks like it did before? Then you can work out the separate areas of the four parts, just like you did before . . . and add them together!’

George is impressed. He does just what Lucy suggests and this is what he ends up with :



So now we know!

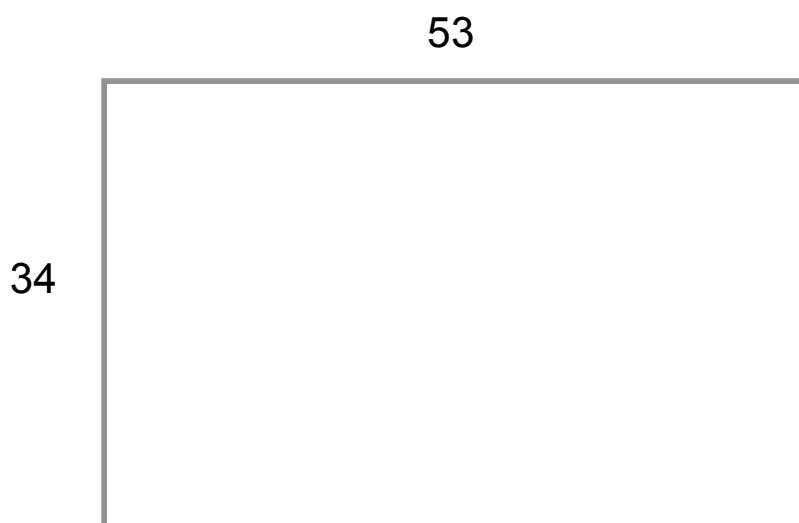
## chapter 2

At the end of his day's work, George calls in at the Farmer's Arms Hotel down in the village. He's looking forward to a pint of beer and a chat with some of his fellow-farmers. George soon spots his old friend Henry, sitting alone at a small table and looking very unhappy indeed. 'What's the matter old chap?' George asks Henry, 'You're usually all smiles and cheerfulness!'

'I've got a bit of a problem,' says Henry, 'I want to plant out my top field with barley – but first I need to work out the area of the field . . . I know I need to use long multiplication but to be honest I just don't know how to do it.'

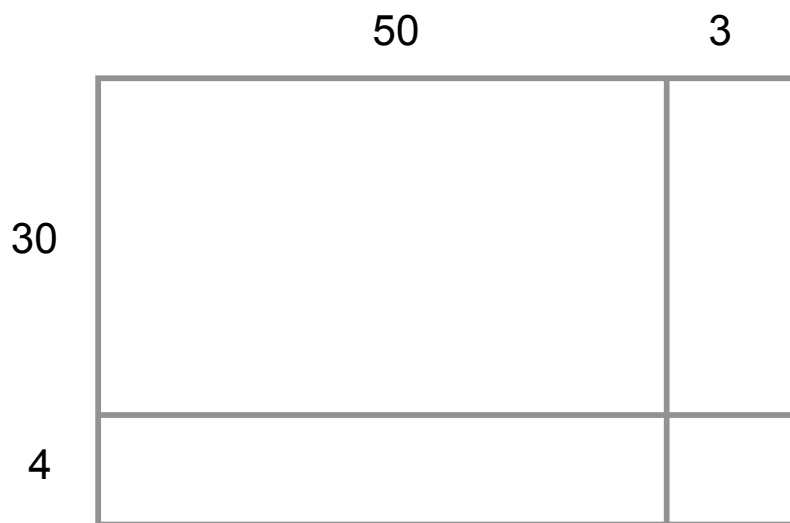
'No need to worry,' says George, 'Just tell me the dimensions of your field and I'll show you an easy way to work out the area.'

George is as good as his word. Henry tells him that the field measures 53m by 34m and George promptly draws a diagram :

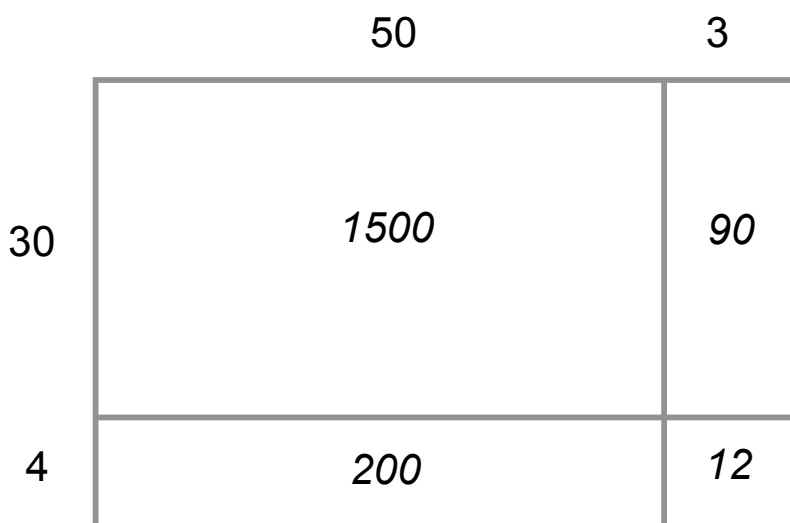




What does George do next? He shows Henry how to split up this field into four parts, like this :



Next, George puts in the areas of the different parts of Henry's field :



*\* You'll notice that George has left out the units on his diagram and you might well wonder whether this is important. The answer is that it doesn't really matter as long as we remember that we're talking about  $m$  and  $m^2$ .*

All that's left for us to do now is to add together the four separate areas to get our total :

	50	3	
30	1500	90	1500
			90
			200
4	200	12	12
			<hr/>
			1802
			<hr/>

Henry is delighted – he's got the answer he wants and he understands how George got it. George beams with pride. (He forgets to tell Henry that it was actually his wife Lucy who showed him this way of doing things.)

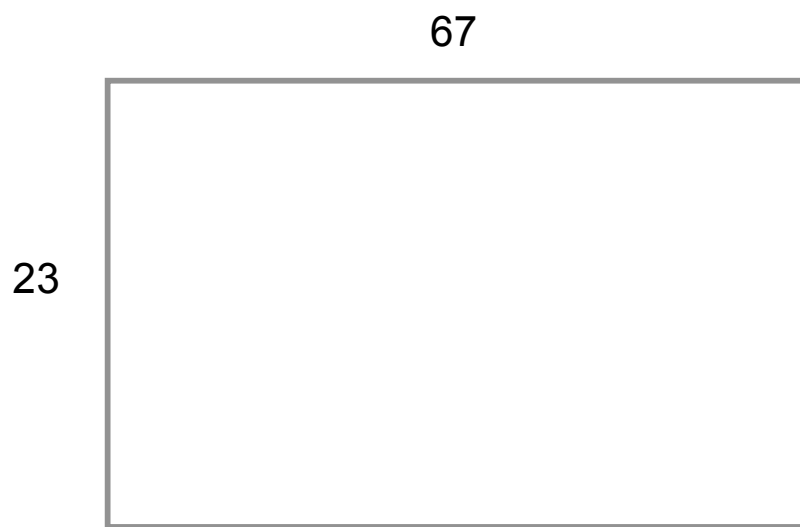
'What do you call this method?' asks Henry. 'I call it *Farming Times*,' says George. George and Henry raise their glasses and drink a toast, 'To Farming Times!', they say and both of them smile.

### chapter 3

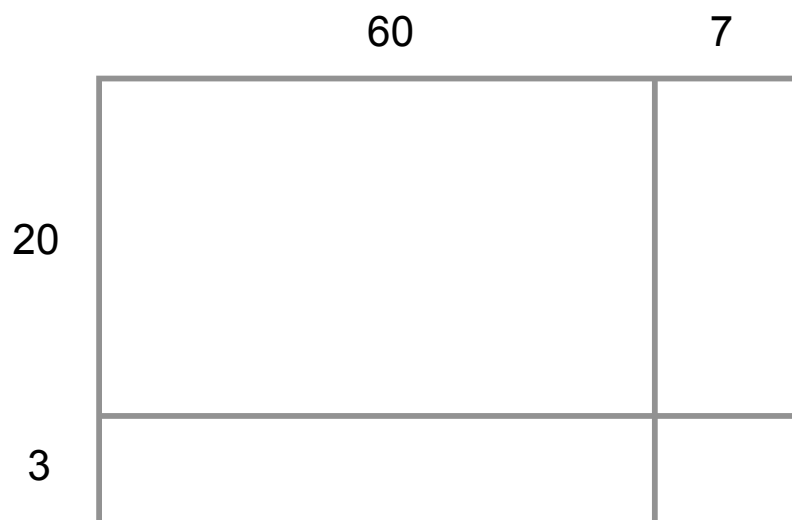
Now we've got the idea, let's try one or two more examples . . . but now instead of finding the areas of fields we'll think of it as just multiplying numbers together.

*example 1.* Find  $23 \times 67$

First of all we draw the rectangle :



Next we split it up into four parts, just like we've done before :



Now we put in the four products :

	60	7
20	1200	140
3	180	21

Finally we add these products together to get the total :

	60	7	
20	1200	140	1200 140 180 21 <hr/> 1541
3	180	21	

And that's our answer!  $23 \times 67 = 1541$

Here are another two examples.

*example 2.*    35 x 44

	40	4	
30	1200	120	1200 120 200 20 <hr/> 1540
5	200	20	<hr/>

*example 3.*    26 x 72

	70	2	
20	1400	40	1400 40 420 12 <hr/> 1872
6	420	12	<hr/>

## notes

- Grid methods for long multiplication have been around for a long time but have become popular again of late. What we've outlined here is just one way of introducing grid multiplication to pupils; the name 'farming times' is our own. Pupils taught various methods for long multiplication often say that this is their favourite – it's straightforward to understand and to apply and it's easily remembered.
- If you're using this way of introducing grid multiplication you might choose to keep your diagrams as simple as possible by using from the start eg '40' or '7' instead of '40m' or '7m' for the dimensions of the fields and eg '1200' or '350' instead of '1200m<sup>2</sup>' or '350m<sup>2</sup>' for the areas. For some pupils including the units might just be an added complication; the point after all is to get pupils to see how the grid method works. (You can make the point about units at a later stage.)
- Some pupils like to do the final adding up in two stages, across first of all and then downwards, like this :

	70	2	
20	1400	40	= 1440
6	420	12	= 432
			<hr/> 1872

- The accompanying spreadsheet *FARMING TIMES.xls* is well worth downloading. You can select your own dimensions and you will then see the different products and totals worked out automatically. Use the spreadsheet via an interactive whiteboard to illustrate the method to pupils – or use it simply to generate further long multiplications / answers to give to pupils.
- See our 'farming times – worked examples' for questions and answers on this topic.

