

Steps into Numeracy

Multiplying Numbers

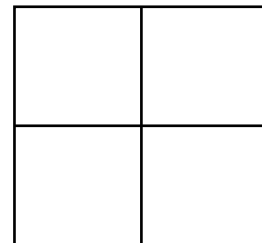
This guide introduces a general method for multiplying any two numbers together.

Multiplication grids

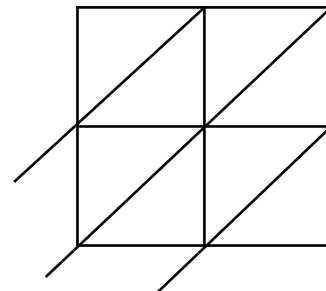
Being able to multiply together two numbers without a calculator is a useful skill to have. You may remember long multiplication techniques you learned at school, this guide introduces a method of multiplication using a grid. This method has several advantages over long multiplication; it is highly visual and requires fewer steps than long multiplication. It is best illustrated by an example.

Example: Calculate 63×49 .

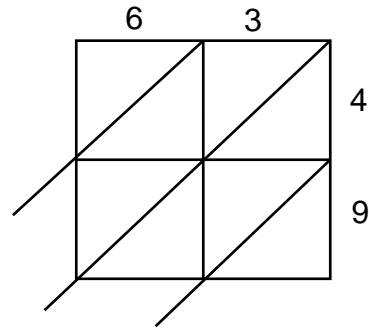
- (1) Construct a grid of squares which has the number of columns equal to the number of digits in the first number and the number of rows equal to the number of digits in the second number. As both 63 and 49 have two digits here you construct a 2 by 2 grid.



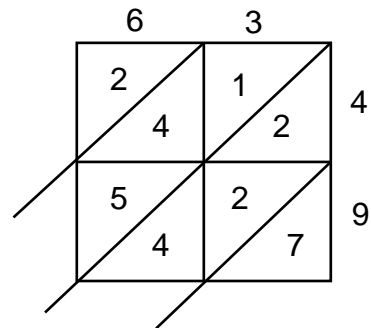
- (2) Bisect the squares diagonally from top right to bottom left. Extend these lines slightly out of the grid at the bottom left.



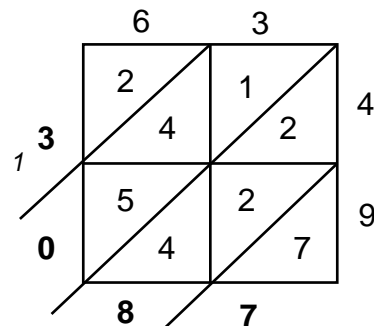
- (3) Write the first digit of the first number at the top of the first column, the second digit of the first number at the top of the second column and so on. Here the first digit of the first number is 6 and is written at the top of the first column, the second digit is 3 and is written at the top of the second column. Next write the first digit of the second number at the end of the first row, the second digit of the second number at the end of the second row and so on. Here the first digit of the second number is 4 and is written at the end of the first row, the second digit is 9 and is written at the end of the second row.



- (4) Fill in each square in the grid with the result of multiplying the number at the top of the column by the number at the end of the row. Each square is divided in two by a diagonal line; tens go above the line with units underneath. Here the top left square has 6 at the top of the column with 4 at the end of the row so $6 \times 4 = 24$ is inserted into the square with 2 above the diagonal and 4 below. Similarly $3 \times 4 = 12$ is inserted into the top right square, $6 \times 9 = 54$ into the bottom left square and $3 \times 9 = 27$ into the bottom right square.



- (5) Add up all the digits in each diagonal of the grid in turn **starting with the bottom right diagonal** and write the answer in the space provided by the extension of the diagonal line. Any tens are carried into the next diagonal sum. Here, the first diagonal has only the number 7 in it, so this is written in the space. The sum for the second diagonal is $2 + 2 + 4 = 8$. The sum for the third diagonal is $1 + 4 + 5 = 10$ so 0 is written in the space and 1 is carried over into the next sum. The sum for the final diagonal is 2 from the grid plus 1 carried over from the third diagonal so $2 + 1 = 3$ is inserted.

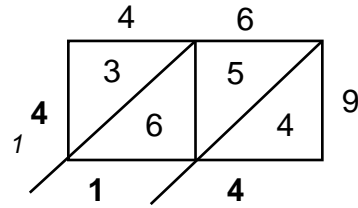


- (6) Read anti-clockwise around the results of the sums to give the answer. The answer is highlighted in bold in the square above so $63 \times 49 = 3087$. Your answer can be checked using a calculator.

Example: Calculate 46×9 .

The multiplication grid for 46×9 is a 2 by 1 grid as shown to the right:

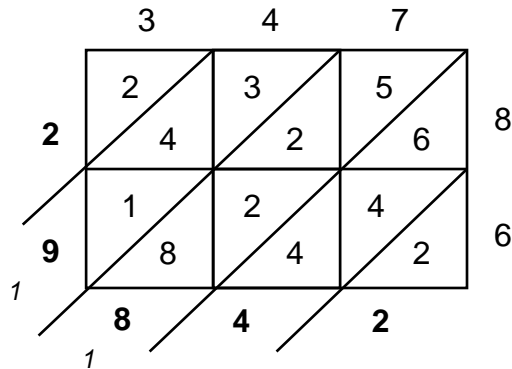
So $46 \times 9 = 414$.



Example: Calculate 347×86 .

The multiplication grid for 347×86 is a 3 by 2 grid as shown to the right:

So $347 \times 86 = 29842$.

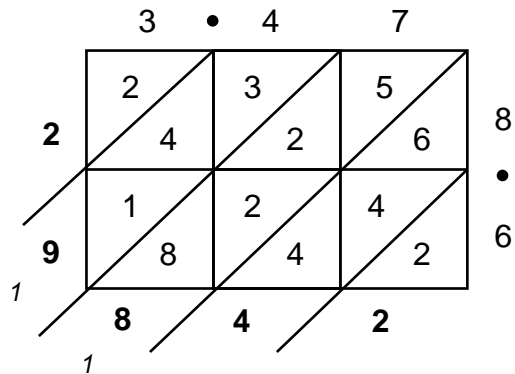


Extending the method to decimal numbers

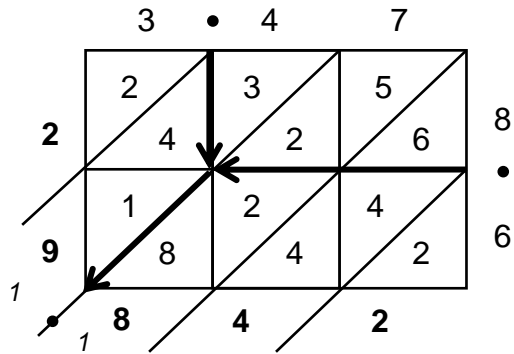
A useful extension of this technique is that it can be used to multiply decimal numbers. This only requires a slight adjustment of the method.

Example: Calculate 3.47×8.6 .

Here you construct the grid as before and calculate the answer without the decimal points (see right). Then the decimal points are put where they appear in the numbers ensuring that they are positioned in line with the grid lines.



Follow the grid line down from the point at the top and across from the point on the right. Where these grid lines cross you follow the diagonal down and left to find the position of the decimal point in the answer.



So $3.47 \times 8.6 = 29.842$.



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